Forest Carbon Partnership Facility (FCPF)
Carbon Fund

Emissions Reduction Initiative (IRE) Document

ER Program Name and Country: Mexico

Date of Submission or Revision: November 3, 2017

GENERAL INFORMATION ON COMPLETING THE ER-PD

Purpose of the ER-PD

ER Programs that have been included in the pipeline of the FCPF Carbon Fund are expected to provide detailed information on the design of the ER Program using the template provided in this document. By completing and sending the ER Program Document, a REDD Country Participant or its authorized entity officially submits the ER Program to the Carbon Fund.

The ER Program Document, in combination with other documents such as the country's Readiness Package, provides the information required by the Carbon Fund Participants to decide whether to proceed to negotiating an ERPA for the proposed ER Program.

One type of information that ER Programs are expected to provide in order to be considered in the FCPF Carbon Fund, is a demonstration of conformity with the FCPF Carbon Funds' Methodological Framework. This Framework contains a set of criteria and indicators (C&I) that will be used by Carbon Fund Participants to select ER Programs. The ER-PD will assist ER Programs to provide information on how it meets the criteria and indicators of the Methodological Framework and it will assist review by the Carbon Fund. For ease of reference, and where applicable, the sections in this ER-PD refer to the corresponding criteria specified in the MF.

The Methodological Framework contains a glossary, which defines specific terms used in the Methodological Framework. Unless otherwise defined in this ER-PD template, any capitalized term used in this ER-PD template shall have the same meaning ascribed to such term in the MF.

Guidance on completing the ER-PD

Please complete all sections of this ER-PD. If sections of the ER-PD are not applicable, explicitly state that the section is left blank on purpose and provide an explanation why this section is not applicable.

Provide definitions of key terms that are used and use these key terms, as well as variables etc., consistently using the same abbreviations, formats, subscripts, etc.

The presentation of values in the ER-PD, including those used for the calculation of emission reductions, should be in international standard format e.g. 1,000 representing one thousand and 1.0 representing one. Please use International System Units (SI units – refer to http://www.bipm.fr/enus/3_SI/si.html) and if other units are used for weights/currency (Lakh/crore etc.), they should be accompanied by their equivalent S.I. units/norms (thousand/million).

If the ER –PD contains equations, please number all equations and define all variables used in these equations, with units indicated.

Executive Summary

Please provide a short (2-page maximum) description of the proposed ER Program, highlighting the key characteristics of the ER Program and the methodological approach applied

Deforestation and forest degradation are the main causes of the loss of natural capital in Mexico. Although deforestation has fallen in recent years, it is still one of the main phenomena behind the loss of natural capital in Mexico. Deforestation can be the product of a process that occurs in a single step or as the result of a gradual degradation leading to the sustained loss of plant cover and the land's capacity to achieve regeneration, with the subsequent loss in capacity of ecosystems to provide environmental goods and services. This situation is worsened by institutional problems that limit the multidisciplinary reach of public policies and intergovernmental collaboration. The driving forces behind deforestation and forest degradation vary from region to region and are specific to the context of each region.

More than 15 years of experience in sustainable forest management. When creating the National Forestry Commission (CONAFOR), the Federal Government has made the commitment to reduce deforestation and forest degradation, as well as to preserve environmental services that are generated by the forest ecosystems, for which it has designed and implemented programs such as paying for environmental services, community forestry and sustainable forest management, which have produced successful results in various parts of the country. In turn, significant steps have been taken to strengthen public policy instruments in forestry matters and ensure institutional reforms in the forestry sector.

Political commitment at a national, state and local level to deal with the climate change agenda. The National Climate Change Strategy and the Environment and National Resources Sector Program 2013–2018 (PROMANART), the Special Program on Climate Change (PECC) and the National Forestry Program 2014–2018 (PRONAFOR) set reducing emissions due to deforestation and forest degradation as a priority through the National REDD+ Strategy (ENAREDD+). It is important to point out that the states play an essential role in implementing the IRE, as it is at the state level that agreements will be reached for aligning policies and accountability in terms of emission reduction. In turn, state governments are developing or have already developed their own state laws on climate change, state strategies for climate change and REDD+. In turn, several municipalities have developed their Municipal Climate Action Plan (PACMUN).

REDD+ in Mexico: integrated land management. Mexico began its process of preparing for REDD+ in 2010, and as part of this process, and through widespread participation from civil society and various stakeholders and sectors in the country, it has developed the National REDD+ Strategy (ENAREDD+), which seeks to drive forward an integrated land management model that recognizes that the processes of deforestation and forest degradation of forestry resources have their origins both within and beyond the forestry sector, so it is only by mainstreaming public policies and actions, and by taking a territorial approach, can the pressures that exist on forest-based ecosystems be reduced and restructured.

Early REDD+ Actions (ATREDD+). Mexico has made several efforts to tackle the main causes and driving forces behind deforestation and forest degradation, and to promote REDD+ within the context of sustainable rural development. As part of these efforts Early REDD+ Action Areas (ATREDD+) were established in five states (Campeche, Chiapas, Jalisco, Quintana Roo and Yucatán), where 21% of the country's forest surface area is located, which is where the Emissions Reduction Initiative (IRE) will be implemented, focusing on specific regions in each state. As part of these ATREDD+ measures, actions have been promoted at federal, state and municipal levels, with involvement from a range of different sectors and stakeholders. In these areas, forestry governance has been improved, sustainable forest management capacities have been developed, and innovative land management actions trialed.

The Emissions Reduction Initiative (IRE) represents an opportunity to trial the REDD+ comprehensive land management model. The program takes an integrated approach to land management in rural areas and includes the lessons learned from measures implemented in the ATREDD+. The IRE promotes a dual approach: both top-down and bottom-up, establishing the link between territory-level planning, taking local needs into consideration, and budgetary planning and programming at a federal and state level. The IRE is aimed at consolidating actions in four categories:

a. Institutional arrangements to strengthen **co-ordination between sectors** and foster sustainable rural development.

b. **Land governance** models that promote the involvement of stakeholders at different scales within an area, under the principle of collaborative actions that make it possible for results to be obtained in reducing emissions.
c. **Actions** specifically designed to **address the needs of the region** on matters of forests and climate change.
d. **Policies and programs** drawn up between the agricultural and forestry sectors that help to combine efforts and co-ordinate resources with other bodies.

The investments made as part of the Forestry Investment Program (FIP) help to establish conditions to alleviate the pressure on natural forests, whereas the IRE will implement actions in the territory using a combined approach so that those owning or in possession of forest land reduce deforestation and forest degradation on their land in a sustainable way, and, over time, transforming and strengthening how natural resources are managed at a landscape level.

States and areas of intervention of the IRE. The IRE will be developed in the states of Campeche, Chiapas, Jalisco, Quintana Roo and Yucatán, and each one of these has specific regions of interest where actions will be focused. In total, the IRE will be implemented in 11 intervention areas.

The specific activities of the IRE will translate into innovative long-term planning instruments: Investment Programs (IPs). The IRE, which has a five-year duration, is structured at the territorial level through Investment Programs that seek to have an impact on reorienting and reprogramming subsidy programs to deal with regional needs, taking planning instruments into account at the local level. The Investment Program for each region establishes the general activities to be carried out during IRE implementation in order to tackle the drivers of deforestation and forest degradation identified in the territory. Investment Programs establish the general and complementary activities to be carried out over the course of the five years. Second-stage activities are also planned that will help to strengthen and extend the initial activities, and which will be funded with resources from the payment for reducing emissions resulting from implementation of the initial investments during the first few years. For these activities, the Investment Programs only include a preliminary outline, as said second-stage activities are to be defined at a local level through a participatory process.

Activities implemented using an integrated approach to halt deforestation and forest degradation. The activities implemented in the territory to tackle the causes of deforestation and forest degradation will comprise a package of actions that include: i) modifying economic activities that lead to deforestation or forest degradation and which are revenue-generating activities; ii) increase the economic value of the forest; and iii) effectively limit activities that harm forests. The Investment Programs are aimed at ensuring that all activities carried out contain the three elements.

Using integrated land management to transform productive landscapes at the territorial level by diversifying the agents in the territory, who can help to build capacities at various points within the territorial unit, as well as strengthening trust, transparency and leadership mechanisms among agents and/or technical advisers. Accordingly, the intervention model seeks to support the training and consolidation of Public Territorial Development Agents (APDTs) or other Territorial Development Agents (ADTs) to promote broader spatial integration at the landscape level and ensure actions are followed throughout the IRE implementation process.

The REDD+ preparation and IRE processes have been participation-based. The ENAREDD+ preparation process has included involvement from a range of stakeholders and sectors through various platforms. Similarly, the IRE and Investment Program preparation process have also enjoyed broad social involvement. The participation process for the Investment Programs was coordinated by APDT and was carried out with representatives at a local level through workshops and forums.

National Monitoring, Reporting and Verification System. The IRE will use the National Monitoring, Reporting and Verification System (SNMRV) to measure and monitor changes in forest cover. The SNMRV was consolidated in July 2015, and is a robust and transparent system, as well as being sufficiently flexible to enable continuous improvement.

Emissions related to deforestation and degradation. The IRE considers reducing emissions from deforestation and forest degradation, and does not includes within its accountability the stored carbon and additions to this stock, nor sustainable forest management. It records CO_2 emissions resulting from gross deforestation (forest land changing to another use), as well as CO_2 emissions associated with forest degradation (land that is still forest but which is losing carbon, assuming a change from woodland to bush or herbaceous forest); CO_2, CH_4 and N_2O emissions associated with degradation from forest fires in ecosystems vulnerable to fire are also recorded. The reference level uses a historic ten-year period, from 2001 to 2011.

Activity data and emission factors. The main input used for developing activity data are the Soil And Vegetation Use series produced by the National Institute of Statistics and Geography (INEGI). To calculate emission factors, data from the two cycles were used (2004-2007 and 2009-2014) from the National Forestry and Soils Inventory (INFyS).

Reference level and emission reduction potential. As a result of the analyses carried out by the SNMRV, the IRE Reference Level was established as: 24'012,031 tCO_2e/year.

Low risk of displacement and reversion. The risk of emissions displacement is low or medium for all of the main causes of deforestation; similarly, the risk of reversion was also determined to be low or medium for all indicators analyzed. This is due to the fact that the focus for REDD+ adopted by Mexico is based on promoting sustainable rural development through integrated interventions at the territorial level, which are reflected in a series of measures with which to tackle, in a joint and combined way and at various levels, the causes of deforestation and forest degradation, by combining resources from different sources that support the rural sector, ensuring inclusive involvement and maintaining ways of life. Furthermore, replacing productive activities is not under consideration at all, so the risk of these activities no longer being accounted for is generally low.

Investment from different sectors for territory development. Activities in the IRE will be funded from existing public resources and with the commitment for them to be applied using the initiative's integrated vision. The estimated required investment for implementing the IRE is $5,435,936,604 Mexican pesos. However, it is estimated that this figure is under-estimated, as private investments also exist, as well as additional public investment that may be combined within the framework of the IRE, with guidance from the APDT or ADT for sustainable land management.

Respecting environmental and social safeguards. As established in the latest version of the ENAREDD+, in Mexico safeguards are defined as principles, conditions or social and environmental criteria guiding the design and implementation of policies, programs and other actions. Mexico has expressly recognized the REDD+ safeguards, and the ENAREDD+ includes the development of a National Safeguards System (SNS) and a Safeguards Information System (SIS). Specifically, for the IRE, safeguard plans will be developed for each State, and the preparation and implementation process will be led by the State Governments. These plans will be aligned with the provisions established in the Environmental and Social Management Framework (ESMF), which will in turn be consistent with the REDD+ safeguards of the UNFCCC and the Operational Policies of the World Bank.

The IRE will result in non-carbon benefits. As well as reducing emissions, the IRE will achieve various non-carbon benefits of social and environmental nature, due to the integrated and coordinated action of the different stakeholders involved, and which will depend on the conditions in each state and each region. These benefits include strengthened social capital, promoting sustainable ways of life, conserving biodiversity and ensuring the provision of goods and environmental services.

Capacity to transfer ownership of reducing emissions avoided and distribution of profits. The General Law on Sustainable Forestry Development (LGDFS) establishes that only as an exception will the federation issue authorisations for changes in land use in forests, making financial payment under the heading of environmental compensation obligatory; in the case of authorisations for land use in forests (timber and non-timber), these authorisations do not involve any right to emit greenhouse gases, and they are associated with many obligations, with a view to encouraging natural recovery and/or reforestation of the areas depleted as a result of the way in which they have been handled. Any action, work or activity apart from the forest activities inherent in the forestland use, and particularly forest activities carried out in violation of the law, constitute an infringement punished by the legal framework. In view of this, ownership of the avoided emissions is not determined by ownership or tenure of the land and cannot be awarded to smallholders, communities and ejidos since deforestation in Mexico constitutes a prohibition which is punishable by the State, which implements public policies to tackle of deforestation and degradation. On that basis, the Government of Mexico has the legal capacity to transfer the emission reduction permits for the FCPF Carbon Fund. Nevertheless, the right to receive financial benefits from results-based payment for avoided emissions will relate not only to land owners but also to the inhabitants of the regions who, despite not having ownership rights, make the effort to halt deforestation and degradation of forestland using the mechanisms established for this purpose, while observing their right, at all times, to full and effective participation in designing the benefit sharing mechanisms and to decide on their own priorities with regard to the development process.

Data administration and register. Mexico intends to use the Forest Registry, which has been developed within the framework of the General Law on Climate Change (LGCC). Furthermore, to prevent double counting from occurring, the Forest Registry will be indirectly linked with the National Emissions Registry (RENE), and will develop processes and functions, such as: operating checks, unique identification (series number) and geographical verification of existence of projects or other activities in the area.

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ACRONYMS

Acronym	Meaning
ADT	Territorial Development Agent
AECID	Spanish Agency for International Development Cooperation.
AFD	French Development Agency
AM	Allometric modeling
ANP	Protected Area of Nature
APDT	Public Territorial Development Agent
ARS	Regional Associations of Foresters
ASAC	Citizen Assistance Monitoring Area
ATREDD+	Early REDD+ Actions
BPG	Best Practice Guide
BUR	Biannual Update Report
CDI	National Commission for the Development of Indigenous Peoples
CDM	Clean Development Mechanism
CiClima	Inter-secretarial Commission on Climate Change of the state
CIDRS	Inter-secretarial Commission on Sustainable Rural Development
CMDRS	Municipal Councils for Sustainable Rural Development
CO_2	Carbon Dioxide
COEFyS	State Forestry and Land Council
COMCAFE	Commission for Coffee Promotion and Development in Chiapas
CONABIO	National Commission for Biodiversity Knowledge and Use
CONAF	National Forestry Council
CONAF GT-ENAREDD+	ENAREDD+ Working Group of the National Forestry Council
CONAFOR	National Forestry Commission
CONAGUA	National Water Commission
CONANP	National Commission for Protected Nature Areas
COOPCAFE	Coordinator for Small Coffee Producers in Chiapas
COPLADE	State Development Planning Committees
COPLADEMUN	Municipal Development Planning Committees
COSEMER	Social Conflicts in Rural Environments Program
CPEUM	Political Constitution of the United Mexican States
CSO	Civil society organization
CTC-REDD+	REDD+ Technical Advisory Committee
DA	Activity Data
DBH	Diameter at breast height
DR-CCRB	Regional Directorates for Biological Corridors and Resources Co-ordination
EFs	Emission Factors
EMA	Mexican Accreditation Organization
ENAREDD+	National REDD+ Strategy
ENCC	National Strategy for Climate Change
ER-PIN	Emissions Reduction Initiative Idea Note
FAO	The Food and Agriculture Organization of the United Nations
FCPF	Forest Carbon Partnership Facility
FEDCAA	State Fund for Agricultural and Agro-industrial Commercial Development
FIP	Forestry Investment Program
FIRA	Trusts Established in Connection with Agriculture
FMCN	Mexican Fund for the Conservation of Nature
FND	National Finance Institute for Agricultural, Rural, Forestry and Fisheries Development
FRA	Forest Resources Assessment
GIS	Geographic Information System
GT-REDD+	REDD Working Group of the Inter-secretarial Commission on Climate Change
ICCC	Inter-secretarial Commission on Climate Change
IIEG	Jalisco Institute of Statistical and Geographical Information
INAH	National Institute of Anthropology and History
INAI	National Institute of Information Access and Data Protection
INECC	National Institute of Ecology and Climate Change
INEGEI	National Greenhouse Gas Emissions Inventory
INEGI	National Institute of Statistics, Geography and Information
INFYS	National Forestry and Land Inventory
INIFAP	National Institute of Forestry, Agricultural and Livestock
INMUJERES	National Institute of Women
IP	Investment Program
IPCC	Intergovernmental Panel of Experts on Climate Change
IRBIO	Institute of Productive Reconversion and Bioenergetics

IRE	Emissions Reduction Initiative
IUCN	International Union for Conservation of Nature
JIBIOPUUC	Intermunicipal Board of the Puuc Biocultural Reserve
JICOSUR	Intermunicipal Board for the Costa Sur
JIMA	Intermunicipal Environmental Board
JIRA	Intermunicipal Board for the Integral Management of the Ayuquila Lower River Basin
JIRCO	Intermunicipal Board for the Integral Management of the Coahuayana River Basin
JISOC	Intermunicipal Board for Sierra Occidental y Costa
LAIF	European Union Latin American Investment Fund
LFRA	Federal Law on Agricultural Reform
LGCC	General Law on Climate Change
LGDFS	General Law on Sustainable Forestry Development
LGEEPA	General Law on Ecological Balance and Environmental Protection
LULUCF	Land use, land-use change and forestry
MAC	Feedback and Grievance Mechanism (Mecanismo de Atención Ciudadana) (MAC)
MADL	Strategic Alliance Mechanisms with Local Development Agents
MADMEX	Activity data monitoring system for Mexico
MBC	Mesoamerican Biological Corridor
ESMF	Environmental and Social Management Framework
MMU	Minimum Mapping Unit
MREDD+	Mexico Alliance for Reducing Carbon Emissions from Deforestation and Forest Degradation (REDD+)
NAMAS	Nationally Appropriate Mitigation Actions
NGO	Non-Governmental Organization
NNREF	National Forest Emissions Reference Level
NOM	Official Mexican Standard
NTFP	Non-timber Forest Products
OIC	Internal Control Body
OTC	Community Land Planning
PA	Federal Agrarian Attorney
PACMUN	Municipal Climate Action Plan
PACREG	Regional Climate Action Plans
PBCC	Forests and Climate Change Project
PDF	Probability Density Function
PEACC	State Action Program on Climate Change
PEC	Special Concurrent Program for Sustainable Rural Development
PECC	Special Program on Climate Change
PEPY	Yucatán Peninsula Special Program
PES	Payment for Environmental Services
PESL	Special Program for the Conservation, Restoration and Sustainable Development of the Lacandona Jungle in Chiapas State
PGPI	General Plan for Indigenous Peoples
PND	National Development Plan
PO	Operational Policies
P-Predial	Medium-Term integrated development land Program (P-Predial)
PROCAMPO	Direct Rural Support Program
PROCEDE	Common Land Rights-holder Certification and Urban Land Ownership Program
PROFEPA	Federal Attorney for Environmental Protection
PROFOS	Program to Promote Social Organization, Planning and Regional Forestry Development
PROGAN	Sustainable Livestock Production and Cattle and Beekeeping Planning Program
PROMARNAT	Environment and Natural Resources Sector Program
PRONAFOR	National Forestry Program
PSUs	Primary Sampling Units
RAMSAR	Convention on Wetlands of International Importance
RAN	National Agricultural Register
RBPs	Results-Based Payments
RDBMS	Relational Data Base Manager System
RE	Emissions Reduction
RED MOCAF	Mexican Network of Forestry Campesino Organizations (Civil Association)
RENE	National Emissions Register
RITA	Indigenous Tourism Network of Mexico
R-Package	REDD+ readiness package
SAGARPA	Agriculture, Livestock, Rural Development, Fishing and Food Secretariat
SCT	Communications and Transport Secretariat
SDR	Rural Development Secretariat of Campeche
SE	Secretariat of the Economy
SEDARU	Agricultural and Rural Development Secretariat of Quintana Roo
SEDATU	Agricultural, Land and Territorial Development Secretariat

SEDER	Rural Development Secretariat of Jalisco and Rural Development Secretariat of Yucatán
SEDIS	Social Development and Integration Secretariat of Jalisco
SEDUMA	Urban Development and Environment Secretariat of Yucatán
SEFIPLAN	Finance and Planning Secretariat of Quintana Roo
SEMA	Ecology and Environment Secretariat of Quintana Roo
SEMADET	Environment and Territorial Development Secretariat of Jalisco
SEMAHN	Environment and Natural History Secretariat of Chiapas
SEMARNAT	Environment and Natural Resources Secretariat
SEPAF	Planning, Administration and Finance Secretariat of Jalisco State
SESA	Social and Environmental Strategic Assessment
SHCP	Treasury and Public Credit Secretariat
SIAP-SAGARPA	Agri-Food and Fisheries Information Service of the la SAGARPA
SIGA	Integrated Support Management System
SIIPP-G	Integrated Information System of Government Program Standards
SIL	Specific Investment Loan for Forests and Climate Change
SINACC	National Climate Change System
SIS	Safeguards information System
SMAAS	Environment and Sustainable Development Secretariat of Campeche
SNMRV	National Monitoring, Recording and Verification System
SNS	National Safeguards System
SRD	Sustainable Rural Development
SRE	Foreign Relations Secretariat
SSP	State Safeguards Plans
SRS	Stratified Random Sampling
SSUs	Secondary Sampling Units
TSA	High Agricultural Court
TUA	Unitarian Agricultural Courts
UCOSIJ	Union of Communities of the Sierra de Juárez Civil Association
UESCO	State Union of Community Foresters of Oaxaca Civil Association
UMAFOR	Forestry Management Unit
UNFCCC	United Nations Framework Convention on Climate Change.
UNOFOC	National Union of Communal Forestry Organizations (Civil Association)
UTEMRV	Technical Unit Specializing in Monitoring, Recording and Verification
WB	World Bank

1. Organizations responsible for the management and implementation of the proposed Emissions Reduction Initiative

1.1. Organization of the Emissions Reduction Initiative that would sign the Emissions Reduction Purchase Agreement (ERPA)

Name of Organization	National Forestry Commission (CONAFOR)
Type of organization and description	The National Forestry Commission (CONAFOR) is a Decentralized Public Entity of the Federal Public Administration with full legal status and its own assets created by decree published in the Official Journal of the Federation on April 4 2001. According to article 3 of its foundation decree and article 17 of the Sustainable Forestry Development Law (LGDFS), CONAFOR is the federal institution responsible for developing, promoting and fostering activities concerned with production, conservation and restoration in forestry matters, as well as being involved in formulating plans and programs, and in applying sustainable forest development. The functions of CONAFOR are established in article 22 of the Sustainable Forestry Development Law. Furthermore, the provisional Article Three, numeral II, subsection a of the General Law on Climate Change (LGCC) establishes that CONAFOR will design strategies, policies, measures and actions to reduce deforestation and forest degradation, which will be incorporated into the forestry policy planning instruments for sustainable development, taking sustainable development and community forestry management into account. Therefore, it acts as a focal point for preparing and producing instruments for REDD+ in Mexico.
Contact person	Mr Jorge Rescala Pérez
Title	Managing Director
Address:	Periférico Poniente No. 5360 Col. San Juan de Ocotán, Zapopan, Jalisco, C.P. 45019
Telephone number:	+52 (33)-3777-7000
E-mail	jorge.rescala@conafor.gob.mx
Website	www.conafor.gob.mx

1.2. Organization responsible for managing the Emissions Reduction Initiative

Is it the same organization as the one identified in 1.1?	Yes, and at sub-national level the following governmental agencies are identified:
Include details on the organizations that will manage the proposed Emissions Reduction Initiative:	
Name of organization	Environment and Natural Resources Secretariat of Campeche (SEMARNATCAM)
Type and description	Responsible for promoting the protection, restoration and conservation of the ecosystems, natural resources, and environmental goods and services in the State, and fostering sustainable development and use, as well as formulating and driving state policy on matters of natural resources (Article 32 of the Organic Law on Public Administration in Campeche).
Relationship with the CONAFOR	Organization responsible for implementing REDD+ in the State and, in co-ordination with the CONAFOR, for implementing programs and activities aimed at addressing the drivers of deforestation and forest degradation in Campeche as part of the Emissions Reduction Initiative.
Contact person	Mr Roberto Alcalá Ferráez
Title	Environment and Natural Resources Secretary of Campeche
Address:	Av. Patricio Trueba de Regil Esq. con Calle Niebla Fracciorama 2000 C.P. 24090, San Francisco de Campeche
Telephone number:	(981)-81-197-30
E-mail	transparencia@campeche.gob.mx
Website	http://www.semarnatcam.campeche.gob.mx
Name of organization	Rural Development Secretariat of Campeche (SDR)
Type and description	Its functions include formulating, supervising, controlling and assessing

	programs of agricultural, livestock, hydraulic and agro-industrial development, tackling and solving rural problems in the State and, in co-ordination with the SMAAS, conserving farm land, pastures and forests (Article 30 of the Organic Law on Public Administration in Campeche). Presides over the Inter-secretarial Commission on Sustainable Rural Development of the State.
Relationship with the CONAFOR	It has the formal relationship of implementing conservation and forestry development programs in the State. It co-ordinates with SAGARPA to implement agricultural programs by reconciling public programs at a local level. It will collaborate with the effort to halt the drivers of deforestation and forest degradation in the State as part of the Emissions Reduction Initiative.
Contact person	Armando Toledo Jamit
Title	Rural Development Secretariat of the State of Campeche
Address:	Calle Ricardo Castillo Oliver Lote 12 Sector Fundadores Barrio de San Francisco Ciudad de San Francisco Campeche, Camp. C.P. 24010
Telephone number:	981 81 197 00
E-mail	transparencia@campeche.gob.mx
Website	http://goo.gl/JK8v1W
Name of organization	Planning Secretariat of Campeche
Type and description	State department tasked with projecting and coordinating state-wide planning for development, and, in participation with a range of social groups and with both federal and municipal levels of government, for drawing up the State Development Plan, as well as analyzing and authorizing the resources of public investment programs, in accordance with the priorities of said Plan (Article 45 of the Organic Law on Public Administration in Campeche).
Relationship with the CONAFOR	In co-ordination with the State Department of the National Forestry Commission, it monitors the actions included in the State Development Plan to move the organization toward sustainable forest development.
Contact person	Ramón Arredondo Anguiano
Title	State Government Planning Secretary
Address:	Calle 8 S/N, Centro Histórico San Francisco de Campeche, Camp. CP:24000
Telephone number:	981 81 19 2 00
E-mail	
Website	http://www.campeche.gob.mx
Name of organization	Environment and Natural History Secretariat (SEMAHN) of Chiapas
Type and description	Agency tasked with coordinating actions of the various departments and bodies of the State Public Administration, relating to the formulation and instrumentation of state policies to mitigate greenhouse gas emissions, and to promote development projects to reduce and capture greenhouse gas emissions (articles 21 and 22 of the Law on Adapting to and Mitigating Climate Change in the State of Chiapas).
Relationship with the CONAFOR	Responsible entity for implementing REDD+ in the State, implementing forestry activities, and, in co-ordination with the CONAFOR, implementing programs and activities aimed at addressing the drivers of deforestation and forest degradation in Chiapas.
Contact person	Mr Carlos Orsoe Morales Vázquez
Title	Environment and Natural History Secretary
Address:	Calzada Cerro Hueco S/N, El zapotal C.P. 29094 Tuxtla Gutiérrez, Chiapas.
Telephone number:	Switchboard: (961) 61 4 47 00, (961) 61 4 47 01, (961) 61 4 47 65
E-mail	semahn@chiapas.gob.mx
Website	http://www.semahn.chiapas.gob.mx
Name of organization	Rural Secretariat for Chiapas
Type and description	Agency tasked with managing farming and rural development in the state, and with providing the government with rural development policy proposals

	with the aim of raising the standard of living of families living in rural environments (Article 35 of the Organic Law on Public Administration in the State of Chiapas).
Relationship with the CONAFOR	It will collaborate with the effort to tackle the driving forces behind deforestation and forest degradation in the State. Presided over by the Inter-secretarial Commission on Sustainable Rural Development of the State.
Contact person	Mr José Antonio Aguilar Bodegas
Title	Rural Secretary
Address:	Carretera Juan Crispín-chicoasén Km. 2.5 C.P. 29020 Tuxtla Gutiérrez, Chiapas
Telephone number:	Switchboard: (01 961) 61 70390
E-mail	jaguilar@secretariadelcampo.gob.mx secretario@secretariadelcampo.gob.mx
Website	http://www.secam.chiapas.gob.mx
Name of organization	Planning, Public Management and Programming Secretariat of the Government of Chiapas
Type and description	Agency that follow up and complies with government programs that are considered priority, evaluates public strategies and policies established in the State Development Plan, formulates planning policy, co-ordinates integration of the State Development Plan and oversees its observance (Article 30-A of the Organic Law on Public Administration of the State of Chiapas).
Relationship with the CONAFOR	Collaborates in the process of planning resources and integrating strategies to reduce deforestation and forest degradation in sector-specific and municipal planning instruments, in order to achieve the goals set.
Contact person	Mr Juan José Zepeda Bermúdez
Title	Government Secretariat of Planning, Public Management and Programming
Address:	Boulevard Andrés Serra Rojas No. 1090, Torre Chiapas, Col. Paso Limón C.P. 29045 Tuxtla Gutiérrez, Chiapas
Telephone number:	Switchboard: (01 961) 69 1 4020, Ext. 66574
E-mail	
Website	http://www.chiapas.gob.mx
Name of organization	Environment and Territorial Development Secretariat (SEMADET) of Jalisco
Type and description	Tasked with designing policies, strategies, measures and actions to tackle climate change in the state. Tasked with promoting the incorporation of State Policy on matters of climate change as an issue that cuts across sector-based policies of the State and its municipalities (article 13, Jalisco Law on Action against Climate Change).
Relationship with the CONAFOR	Through the Forestry Directorate, it coordinates and aligns its activities and goals with those of the state and national CONAFOR, and implements State MRV and REDD+ strategy in Jalisco. It co-ordinates the REDD+, Mitigation and Adaptation Working Groups, and the Inter-institutional Commission for Action against Climate Change in the State of Jalisco.
Contact person	Ms Magdalena Ruiz Mejía
Title	Environment and Territorial Development Secretary
Address:	Av. Circunvalación Agustín Yáñez 2343
Telephone number:	30308250 ext. 55610
E-mail	magdalena.ruiz@jalisco.gob.mx
Website	http://semadet.jalisco.gob.mx/
Name of organization	Rural Development Secretariat (SEDER) of Jalisco
Type and description	Agency tasked with defining and driving forward policies, programs and actions to promote agricultural, fishing, aquafarming and agro-industrial development, and integrated and sustainable rural development of the State of Jalisco (Article 14 of the Rural Development Law of Jalisco).
Relationship with the CONAFOR	It will collaborate with the effort to tackle drivers of deforestation and forest

	degradation in the State. Presides over the Inter-secretarial Commission on Sustainable Rural Development of the State.
Contact person	Héctor Padilla Gutiérrez
Title	Rural Development Secretary
Address:	Av. Hidalgo 1435, primer piso
Telephone number:	3030-0600 Ext. 56600, 56647, 56644
E-mail	hectorpadilla@jalisco.gob.mx
Website	http://seder.jalisco.gob.mx
Name of organization	Social Development and Integration Secretariat of Jalisco
Type and description	Is the entity responsible for fostering social development, recognizing social rights and creating the necessary mechanisms to ensure their compliance, as well as planning, instrumenting, executing, monitoring and assessing public policies on matters of social development (Article 14, Social Development Law for the state of Jalisco).
Relationship with the CONAFOR	There is no direct relationship, but the application of its programs shares the same territorial space as the CONAFOR programs, which means that the actions of both organizations can be complementary to ensure sustainable rural development; currently, the IRE is bringing the organizations together to align public policy.
Contact person	Mr Miguel Castro Reynoso
Title	Social Development and Integration Secretary
Address:	Av. Circunvalación Jorge Álvarez del Castillo # 1078
Telephone number:	3030-1213, 3030-1219
E-mail	miguel.castro@jalisco.gob.mx
Website	http://www.jalisco.gob.mx
Name of organization	Ecology and Environment Secretariat (SEMA) of Quintana Roo
Type and description	Agency tasked with promoting, stimulating and following up of policies, plans, projects and other actions that are carried out from the various areas and sectors of public administration and society on matters of climate change action (article 8, Quintana Roo Law on Action against Climate Change). The department also proposes, agrees on, and coordinates the necessary actions and measures to protect the environment with the aim of preserving, restoring and strengthening ecological balance and reducing the environmental fragility of ecosystems in the State (article 34 of the Organic Law on Public Administration in the state of Quintana Roo).
Relationship with the CONAFOR	Responsible for implementing REDD+ in the State, and, in co-ordination with the CONAFOR, for implementing programs and activities aimed at addressing drivers of deforestation and forest degradation in Quintana Roo.
Contact person	Biol. Alfredo Arellano Guillermo
Title	Ecology and Environment Secretary
Address:	Av. Efraín Aguilar 418 Colonia Campestre, Chetumal, Quintana Roo, Mexico C.P. 77030.
Telephone number:	(983) 835 0500, 835 0650
E-mail	
Website	http://sema.qroo.gob.mx
Name of organization	Urban Development and Environment Secretariat (SEDUMA) of Yucatán
Type and description	Tasked with managing the application of projects, actions, financial and human resources that help with the conservation and management of natural resources of the state, promoting the protecting and conservation of protected areas of nature and formulating Environmental Planning Programs for State Territory, Urban Development, and Conservation of the State’s Architectural Cultural Heritage (article 6, Yucatán State Law on Environmental Protection).
Relationship with the CONAFOR	Entity responsible for implementing REDD+ in the State, and, in co-ordination with the CONAFOR, for implementing programs and activities aimed at halting the drivers of deforestation and forest degradation in Yucatán.

Contact person	Dr Eduardo A. Batllori Sampedro
Title	Urban Development and Environment Secretary
Address:	Calle 64 No. 437 x 53 y 47-A, Centro, Mérida, Yucatán.
Telephone number:	(999) 930-3380 ext. 44032
E-mail	eduardo.batllori@yucatan.gob.mx
Website	http://www.seduma.yucatan.gob.mx/index.php
Name of organization	Rural Development Secretariat of Yucatán
Type and description	Agency tasked with planning, fostering and organizing farming, forestry, fishery and agro-industrial activities, providing technical advice for producers, and driving forward and assessing rural development actions to raise the standard of living of campesino families in coordination with interested public and private organizations (article 41 of the Organic Law on Public Administration of Yucatán).
Relationship with the CONAFOR	It will collaborate with the effort to tackle drivers of deforestation and forest degradation in the State. Presides over the Inter-secretarial Commission on Sustainable Rural Development of the State.
Contact person	C. Juan José Canul Pérez
Title	Rural Development Secretary
Address:	Calle 21 No. 444 Frente a la Plaza Cívica de la Ciudad Industrial, C.P. 97983, Mérida, Yucatán.
Telephone number:	Telephone number: (999) 930 3830 Ext. 60001
E-mail	
Website	http://www.desarrollorural.yucatan.gob.mx/SFAPMain.jsp

1.3. Agencies and organizations involved in the Emissions Reduction Initiative

Please list existing partner agencies and organizations involved in the design and implementation of the proposed ER Program or that have executive functions in financing, implementing, coordinating and controlling activities that are part of the proposed ER Program. Add rows as necessary.

Federal Agencies

Name	Capacities and roles in the Emissions Reduction Initiative.	Name of contact, telephone number and email
Environment and Natural Resources Secretariat (SEMARNAT)	According to article 5 of the General Law on Ecological Balance and Environmental Protection (LGEEPA), this Secretariat is tasked with formulating and implementing actions to mitigate and adapt to climate change, and with designing policies and instruments to tackle climate change. Presides over the Climate Change Fund Technical Committee, and the Inter-secretarial Commission on Climate Change. Tasked with recording emissions generated by fixed and mobile sources of emissions that are identified as subject to being reported. Co-ordinates the Special Program on Climate Change. Presides over the National Forestry Council (CONAF).	Rodolfo Lacy Tamayo Sub-secretary of Planning and Environmental Policy rodolfo.lacy@semarnat.gob.mx +52 55 54902127
Agriculture, Livestock, Rural Development, Fishing and Food Secretariat (SAGARPA)	Agency tasked with promoting conditions to achieve integrated rural development; its functions include reducing conditions of inequality among farmers, foresters and others in the rural population (article 188, Law on Sustainable Rural Development). Co-ordination with this agency is key for articulating public policies in the framework of REDD+ and for fostering strategies and programs that promote Sustainable Rural Development (SRD) to help the IRE's development.	Mely Romero Celis Rural Development Sub-secretary +52 5538711122

Name	Capacities and roles in the Emissions Reduction Initiative.	Name of contact, telephone number and email
	Presides over the Inter-Secretariat SRD Commission and coordinates the Special Concurrent Program[1].	

State Agencies

Name	Capacities and roles in the Emissions Reduction Initiative.	Name of contact, telephone number and email
Environment and Territorial Development Secretariat (SEMADET), State Government of Jalisco	Tasked with designing policies, strategies, measures and actions to tackle climate change in the state. Technical Secretary of the Inter-institutional Commission for Action against Climate Change in the State of Jalisco. Presides over the REDD+ Working Group of the ICCC in the State. Tasked with promoting the incorporation of State Policy on matters of climate change as an issue that cuts across sector-based policies of the State and its municipalities (article 13, Jalisco Law on Action against Climate Change). Responsible for implementing REDD+ in the State. In co-ordination with the CONAFOR, it implements programs and activities aimed at halting the drivers of deforestation and forest degradation in the State of Jalisco.	Ms. Magdalena Ruiz Mejía, Environment and Territorial Development Secretary. 30308250 ext. 55610 magdalena.ruiz@jalisco.gob.mx
Rural Development Secretariat (SEDER), State Government of Jalisco	Agency tasked with defining and driving forward policies, programs and actions to promote agricultural, fishing, aquafarming and agro-industrial development, and integrated and sustainable rural development of the State of Jalisco (Article 14 of the Rural Development Law of Jalisco). It will collaborate with the SEMADET in the effort to halt the drivers of deforestation and forest degradation in the State. Presides over the State of Jalisco Inter-Secretariat Commission on Sustainable Rural Development of the State.	Héctor Padilla Gutiérrez, Rural Development Secretary. 3030-0600 Ext. 56600, 56647, 56644 hectorpadilla@jalisco.gob.mx
Planning, Administration and Finance Secretariat of Jalisco State (SEPAF)	Responsible for the State of Jalisco Public Administration Performance Assessment System, and for monitoring and assessing its results indicators (Article 20.b of the Planning Law for the State of Jalisco and its Municipalities). It will support state resources and goods being allocated to actions that are a priority in state development planning. It helps to integrate actions identified in the IRE in the State's budgeting.	
Jalisco Institute of Statistical and Geographical Information (IIEG)	Its role is to analyze, validate and disseminate statistical information on public policies for the purposes of developing the organization, acting as a consultative body, and optimizing processes and resources inherent to generating statistical information (Article 3, Organic Law on the Jalisco State Institute of Statistical and Geographical Information). It will support improvements in estimating emission factors in the States.	
Environment and Natural History Secretariat (SEMAHN), State	Tasked with coordinating actions of the various agencies and bodies of the State Public Administration, relating to the formulation and instrumentation of state policies to mitigate greenhouse gas emissions, and to promote	Mr Carlos Orsoe Morales Vázquez, Environment and Natural History Secretary (961)

[1] This Program consists of the public policies aimed at generating and diversifying employment and ensuring the wellbeing of the rural population and their involvement and inclusion in the national development process, giving priority to situations of high and very high marginalization and to economically and socially weak populations.

Name	Capacities and roles in the Emissions Reduction Initiative.	Name of contact, telephone number and email
Government of Chiapas	development projects to reduce and capture greenhouse gas emissions (articles 21 and 22 of the Law on Adapting to and Mitigating Climate Change in the State of Chiapas). Technical Secretary of the Inter-Secretarial Commission on Climate Change in the State. Presides over the REDD+ Working Group of the ICCC in the State. Responsible for implementing REDD+ in the State. In co-ordination with the CONAFOR, it is tasked with implements programs and activities aimed at halting the drivers of deforestation and forest degradation in the State of Jalisco. It supports improvements in estimating emission factors in the States.	61 4 47 01, (961) 61 4 47 65 semahn@chiapas.gob.mx
Rural Secretariat, State Government of Chiapas	Agency tasked with managing farming and rural development in the state, and with providing the government with rural development policy proposals with the aim of raising the standard of living of families living in rural environments (Article 35 of the Organic Law on Public Administration in the State of Chiapas). It will collaborate with the SEMAHN in the effort to halt the drivers of deforestation and forest degradation in the State of Chiapas. Presides over the the Inter-secretarial Commission on Sustainable Rural Development of the State.	Mr. José Antonio Aguilar Bodegas, Rural Secretary for Chiapas. (961) 61 70390 , jaguilar@secretariadelcampo.gob.mx, secretario@secretariadelcampo.gob.mx
Planning, Public Management and Programming Secretariat of the State Government of Chiapas	Entity that follows up and complies with government programs that are considered priority, evaluates public strategies and policies established in the State Development Plan, formulates planning policy, co-ordinates integration of the State Development Plan and oversees its observance (Article 30-A, Organic Law on Public Administration of the State of Chiapas). It will support state resources and goods being allocated to actions that are a priority in state development planning. It helps to integrate actions identified in the IRE in the State's budgeting.	Mr Juan José Zepeda Bermúdez, Government Planning, Public Management and Programming Secretary (961) 69 1 4020, Ext. 66574
Urban Development and Environment Secretariat (SEDUMA), Government of the State of Yucatán	Tasked with formulating, driving, implementing and assessing environmental policy in the State of Yucatán (article 6, Yucatán State Law on Environmental Protection). Technical Secretary of the Inter-secretarial Commission on Climate Change in the State. Presides over the REDD+ Working Group of the ICCC in the State. Responsible for implementing REDD+ in the State. In co-ordination with the CONAFOR, it is tasked with implements programs and activities aimed at halting the drivers of deforestation and forest degradation in the State of Yucatán. It supports improvements in estimating emission factors in the States.	Dr. Eduardo A. Batllori Sampedro, Urban Development and Environment Secretary. (999) 930-3380 ext. 44032 eduardo.batllori@yucatan.gob.mx
Rural Development Secretariat, State Government of Yucatán.	Agency tasked with planning, fostering and organizing farming, forestry, fishery and agro-industrial activities, providing technical advice for producers, and driving forward and assessing rural development actions to raise the standard of living of rural families in coordination with interested public and private organizations (article 41 of the Organic Law on Public Administration of Yucatán). It will collaborate with the SEDUMA in the effort to halt the drivers of deforestation and forest degradation in the State of Yucatán. Presides over the Inter-secretarial Commission on Sustainable Rural Development of the State.	Mr Juan José Canul Pérez, Rural Development Secretary (999) 930 3830 Ext. 60001

Name	Capacities and roles in the Emissions Reduction Initiative.	Name of contact, telephone number and email
Administration and Finance Secretariat of the State Government of Yucatán	Responsible for setting the rules, guidelines and procedures of a technical, programming and budgetary nature to be observed by the Departments and Bodies of the State Public Administration for formulating their programs, which will serve as the basis for integrating the General State Budget (Article 35, Organic Law on the Public Administration of Yucatán). It will support state resources and goods being allocated to actions that are a priority in state development planning. It helps to integrate actions identified in the IRE in the State's budgeting.	Alfredo Dájer Abimerhi, Secretary, Calle 59 S/N, entre Avenida Itzáes y calle 90 Col. Centro, C.P. 97000, Mérida, Yucatán 930 33 40 Ext. 57010
Ecology and Environment Secretariat of Quintana Roo	Tasked with promoting, stimulating and following up the policies, plans, projects and other actions that are carried out from the various areas and sectors of public administration and society on matters of climate change action (Article 8, Quintana Roo Law on Action against Climate Change).	Biol. Alfredo Arellano Guillermo, Ecology and Environment Secretary. Av. Efraín Aguilar 418 Colonia Campestre, Chetumal, Quintana Roo, Mexico. C.P. 77030. (983) 835 0500, 835 0650
Agricultural, Rural and Indigenous Development Secretariat, State Government of Quintana Roo	Tasked with formulating, implementing, driving through and assessing sector-specific policies and programs on economic development and promotion on matters of agriculture, fruit growing, horticulture, beekeeping, livestock, agro-industry, rural development, logging, and the development of indigenous population and marginal groups (Article 36, Organic Law on the Public Administration of the State of Quintana Roo). It will collaborate with the SEMA in the effort to halt the drivers of deforestation and forest degradation in the State of Quintana Roo. Presides over the Inter-secretarial Commission on Sustainable Rural Development of the State.	C. Pedro Pérez Díaz, Agricultural and Rural Development Secretary. 9838351630 Extension: 42302. pedro.perez@groo.gob.mx
Finance and Planning Secretariat (SEFIPLAN) of the State Government of Quintana Roo	Tasked with promoting the formulation of bill proposals, regulations and other provisions on matters of planning, programming, budgetary policy, information, assessment, institutional co-ordination and regional development, social development and attending to marginal groups (Article 32, Organic Law on the Public Administration of the State of Quintana Roo). It will help to ensure that resources and goods are allocated to actions that are a priority in state development planning. It helps to integrate actions identified in the IRE in the State's budgeting.	Juan Melquiades Vergara Fernández, Secretario (983) 835 05 00 Av. 22 de Enero No. 001 Col. Centro. C.P. 77000. Chetumal, Quintana Roo, Mexico
Environment and Sustainable Development Secretariat (SMAAS) of the State Government of Campeche	Responsible for promoting the protection, restoration and conservation of the ecosystems, natural resources, and environmental goods and services in the State, and fostering sustainable development and use, as well as formulating and driving state policy on matters of natural resources (Article 32 of the Organic Law on Public Administration in Campeche). Technical Secretary of the Inter-Secretarial Commission on Climate Change in the State. Presides over the REDD+ Working Group of the ICCC in the State. Responsible for implementing REDD+ in the State, and, in co-ordination with the CONAFOR, for implementing programs and activities aimed at halting the drivers of deforestation and forest degradation in the State of	Mr. Roberto Alcalá Ferráez, Environment and Natural Resources Secretary of the State of Campeche. (981)-81-197-30

Name	Capacities and roles in the Emissions Reduction Initiative.	Name of contact, telephone number and email
	Campeche. It supports improvements in estimating emission factors in the states.	
Rural Development Secretariat, State Government of Campeche.	Its functions include formulating, supervising, controlling and assessing programs of agricultural, livestock, hydraulic and agro-industrial development, tackling and solving rural problems in the State and, in co-ordination with the SMAAS, taking part in measures to conserve farm land, pastures and forests (Article 30 of the Organic Law on Public Administration in Campeche). It will collaborate with the SMAAS in the effort to halt the drivers of deforestation and forest degradation in the State of Campeche. Presides over the Inter-secretarial Commission on Sustainable Rural Development of the State.	Armando Toledo Jamit, Rural Development Secretary of the State of Campeche. 981 81 197 00. transparencia@campeche.gob.mx

Municipal agencies

Name	Capacities and roles in the Emissions Reduction Initiative.	Name of contact, telephone number and email
Intermunicipal Environmental Boards	Decentralized public bodies of associated municipal governments. They have an Advisory Council with participation from Federal, State and Municipal levels of government. As APDT, four intermunicipal boards in Jalisco and one in Yucatán were involved in developing the IRE.	

Other departments involved in managing the territory and in the national climate change policy:

Department	Description
National Commission for Protected Nature Areas (CONANP)	Tasked with fostering and developing activities aimed at conserving the ecosystems and biodiversity in protected natural areas, in its areas of influence, in areas set aside to protect aquatic species and other priority conservation species, as well as formulating, implementing and assessing subsidy programs to foster the development of activities to protect, manage and restore ecosystems and their biodiversity through the rural and indigenous communities in marginal areas inside protected areas of nature, within its areas of influence and other regions (Article 70, Interior Regulations of the Environment and Natural Resources Secretariat). The implementation of the Emissions Reduction Initiative needs to take into account that there are areas where specific regulations and decrees are in place, as well as restrictions to certain activities.
National Institute of Ecology and Climate Change (INECC)	Responsible, with involvement as appropriate from other departments and bodies, for coordinating, promoting and developing scientific and technological research relating to national policy on matters of biosecurity, sustainable development, environmental protection, conservation and restoration of the ecological balance and conservation of the ecosystems and climate change (Article 22, General Law on Climate Change). Tasked with integrating information to draw up national communications for the UNFCCC and BUR. Technical advice on drawing up State Action Program on Climate Change in collaboration with State Governments, and Municipal Climate Action Plans with local governments.
National Commission for Biodiversity Knowledge and Use (CONABIO)	Responsible for coordinating actions and studies relating to furthering the knowledge on and the preservation of biological species, and promoting and fostering scientific research activities for exploring, studying, protecting and using biological resources with a view to conserving the country's ecosystems and drawing up criteria so they can be sustainably managed (Creation Agreement of the Inter-secretarial Commission for Biodiversity Knowledge and Use). It also operates as Public Agent for Territorial Development (APDT) in the Mesoamerican Biological Corridor area (Chiapas and Quintana Roo).

Department	Description
Federal Attorney for Environmental Protection (PROFEPA)	Its functions include scheduling, ordering and conducting visits or other types of inspections to oversee and assess compliance with legal provisions applicable to restoring natural resources, conserving and protecting forest and wildlife resources, and their ecosystems, species, etc., as well as establishing policies and administrative guidelines to that end (Article 45, Interior Regulations of the Environment and Natural Resources Secretariat). Responsible for prevention and forestry stewardship, in compliance with article 158 of the Sustainable Forestry Development Law.
National Institute of Women (INMUJERES)	Federal government body tasked with promoting and fostering conditions that enable non-discrimination, equality of opportunities and treatment between genders, the full exercise of all women's rights and their equitable involvement in the political, cultural, economic and social life of the country (Article 4, Law on the National Institute of Women).
National Institute of Statistics and Geography (INEGI)	It is responsible for standardizing and coordinating the National Statistical and Geographical Information System, as well as the statistical and geographical activities carried out by State Units with the aim of obtaining Information of National Interest (Article 1 of the Interior Regulations of the National Institute of Statistics, Geography and Information). Tasked with generating maps on land use and vegetation in the country, which are used for the National Forestry and Land Inventory (INFYS). Tasked with carrying out the population and housing census, including calculating marginalization and poverty.
National Commission for the Development of Indigenous Peoples (CDI)	Its aim is to guide, coordinate, promote, support, foster, monitor and assess public programs, projects, strategies and actions for the integrated and sustainable development of indigenous peoples and communities (article 2 of the CDI Law). It will support spaces and platforms for the processes of consultation and participation (particularly with indigenous peoples) developed as part of the Emissions Reduction Initiative.
Agricultural, Territorial and Urban Development Secretariat (SEDATU)	Stimulate national land planning in order to secure the most benefit, including regularizing farm ownership and the various figures involved, and planning and designing appropriate population distribution and land planning for population centers. The Secretariat also collaborates in applying agricultural legal principles, legislation and regulations. (Article 41, Organic Law on Federal Public Administration).
Secretaría de Turismo (SECTUR)	Conduct the design and implementation of public policies aimed at strengthening the development of tourism, promoting innovation in the sector, improving the quality of tourist services and the competitiveness of national tourism, promoting cross-cutting strategies that articulate government actions, private and social sector, contributing to the sustainable and inclusive growth of tourism.
Register Register	Responsible for controlling rights-holder and communal land ownership, and for ensuring the legal certainty of documentation resulting from application of the Agricultural Law. Records rights-holder regulations and certain acts of assembly (articles 10 and 31 of the Agricultural Law).
Federal Agrarian Attorney	Decentralized agency with social service duties and tasked with defending the interests of rights-holders, common-holders, heirs of rights-holders and common-holders, ejidos, communities, smallholders, neighboring farmers and agricultural workers, by applying the provisions conferred by the current law and its corresponding regulations (Articles 134 and 135 of the Agricultural Law). Responsible for fostering basic agricultural organization for production and best use of land and natural resources.
Trusts Established in Connection with Agriculture (FIRA)	FIRA consists of four trusts, in which the Treasury and Public Credit Secretariat operates as trustor and the Bank of Mexico as trustee, the purpose of which is to facilitate access to credit by means of credit and discount facilities, as well as providing credit guarantees in rural areas. FIRA has a green credit development strategy that can finance generic activities identified in the IRE.
National Finance Institute for Agricultural, Rural, Forestry and Fisheries Development (FND)	A public decentralized body of the federal public administration, under the authority of the Treasury and Public Credit Secretariat, with legal status and assets in its own right. It helps to foster development in agricultural, forestry and fishing activities, and all other economic activities linked to the rural environment, in order to increase their productivity and improve the standard of living of the rural population, by grating sustainable credit and providing other financial services to Rural Producers and Financial Intermediaries, working to ensure improved organization and continuous

Department	Description
	improvement (article 2, Organic Law on National Finance Institute for Agricultural, Rural, Forestry and Fisheries Development). FND is a relevant stakeholder in the implementation of the FIP in Mexico.

Relevant co-ordination platforms:

Platform	Description
Inter-secretarial Commission on Sustainable Rural Development (CIDRS)	Body responsible for coordinating and monitoring programs aimed at promoting sustainable rural development. It develops the Special Concurrent Program for Sustainable Rural Development (PEC), which seeks to draw up and integrate public policies to deal with climate change and promote sustainability in rural areas.
Inter-secretarial Commission on Climate Change (ICCC).	This is the permanent mechanism for coordinating actions between the agencies and entities of the Federal Public Administration on matters of climate change, and is made up of 14 State secretariats. Its purpose is to co-ordinate the actions of agencies with regard to formulating and implementing national policies for the prevention and mitigation of greenhouse gas emissions, as well as adapting to the effects of climate change and promoting programs and strategies to ensure compliance with UNFCC commitments.
National Climate Change System (SINACC)	Inter-institutional co-ordination platform made up of the ICCC, the INECC, the C3, the municipal authorities associations, the Congress of the Union, and the states.
REDD Working Group of the Inter-secretarial Commission on Climate Change (WG – REDD)	Created in 2009 by the ICCC, this working group has the mandate of bringing together the main stakeholders that have an impact on the development of the REDD+ initiative for Mexico, and developing the National REDD+ Strategy. The Group is made up of the SAGARPA, the SEMARNAT, the SEDESOL, the Communications and Transport Secretariat (SCT), the Treasury and Public Credit Secretariat (SHCP), the Secretariat of the Economy (SE) and the Foreign Relations Secretariat (SRE).
ICSRD, ICCC, GT-REDD+ in the states.	Inter-institutional co-ordination platforms that operate at the state level.
Advisory Councils of the Intermunicipal Boards	The Advisory Council of the Intermunicipal Boards is the governing body of the Decentralized Public Body and is made up of the presidents of the associate municipalities, representatives from State Government, the Federal Government, society and academic institutions. Its role in the IRE is crucial for bringing investment programs and municipal rural development policies into line with one another, and ensuring intergovernmental collaboration.

Participatory Platforms:

<table>
<tr><th>Platform</th><th>Description</th></tr>
<tr><td>Working group for the National Forestry Council ENAREDD+[2] (CONAF GT-ENAREDD+)</td><td rowspan="3">Created to provide its opinions and give recommendations to the CONAFOR in the REDD process in Mexico. Civil society is involved in the design and implementation of REDD+ through the CTC-REDD+, the CONAF GT-ENAREDD+ and the CTCs in the states.</td></tr>
<tr><td>National REDD+ Technical Advisory Committee (CTC – REDD+)[3]</td></tr>
<tr><td>REDD+ Technical Advisory Committee (CTC – REDD+) States and Region (Yucatán Peninsula)</td></tr>
</table>

[2] http://goo.gl/7bHTwY

[3] www.reddmexico.org.mx/instituciones/ctc-redd/

Platform	Description
Indigenous Peoples Advisory Council	This is a regulatory and plural body through which the CDI seeks to build a constructive and inclusive dialogue with indigenous peoples and society as a whole. It consists mainly of indigenous members. The council has considered specific REDD+ issues and processes related to the indigenous population.
Sustainable Rural Development District Council	Platform for producers and other stakeholders in rural society to get involved in defining regional priorities, planning and distributing resources that the Federation, states and municipalities devote to supporting the investments made, and for sustainable rural development at the district level.
Municipal Council for Sustainable Rural Development	The Municipal Council for Sustainable Rural Development is an advisory, managerial and participatory body for producers and other stakeholders in the rural areas to get involved in defining regional priorities, and for planning resources upon which the Federation, State Government and Municipalities agree. The purpose of the council is to foster and strengthen the ordered involvement of civil society and government departments that converge in the municipality focusing on rural development, to support investments made and for sustainable rural development.

REDD+ initiatives:

Name	Description
Mexico Alliance for Reducing Carbon Emissions from Deforestation and Forest Degradation (REDD+)	Project with USAID funding that, through the consortium led by The Nature Conservancy, seeks to promote an appropriate framework for implementing the REDD+ mechanism in Mexico, by contributing to the National REDD+ Strategy (ENAREDD+) process in close collaboration with the CONAFOR and other government institutions. This Project financed the development of the participatory process for the Investment Program in Yucatán, Campeche and the Frailesca region in Chiapas.

Stakeholders in the region[4]:

Stakeholders	Description
National non-governmental organizations	Tasked with issuing recommendations to this document through the CTC – REDD and other participatory platforms, and to any effort made as part of REDD+ in Mexico.
National welfare organizations (including organizations representing Campesino and indigenous peoples) and owners of forest land.	Tasked with issuing recommendations to this document through advisory councils such as the CONAF and other and other participatory platforms, and to any effort made as part of REDD+ in Mexico.
Regional Associations of Foresters (ARS).	These associations have promoted projects in terms of forestry production, as well as forestry organization and planning, the marketing of forestry products and the exchange of experiences, among others.
Forest landowners and landholders[5] and inhabitants of forest communities	Individuals or groups of individuals who will benefit directly from the results generated by the activities carried out in their areas as part of the IRE.
Indigenous peoples and communities	Individuals or groups of individuals who will benefit directly from the results generated by the activities carried out in their areas as part of the IRE.

[4] Furthermore, Annex 1 includes the detailed list of stakeholders that have been involved in the preparation process for REDD+ in Mexico.
[5] The role of indigenous peoples and communities, and that of forest landowners and landholders, is crucial for the success of the Emissions Reduction Initiative (IRE). They will voluntarily take part in designing and implementing the Emissions Reduction Initiative (IRE).

Stakeholders	Description
Research centers, national universities	Active involvement in developing methodologies, reference levels, distribution of benefits, and quantifying carbon levels.
International co-operation organizations	Potential funding entities for processes and technical assistance as part of REDD+ preparation and implementation.

2. Context and strategic reasoning behind the Emissions Reduction Initiative

2.1. Current status of the Readiness Package and summary of additional achievements in the country's preparation activities

Indicate the current status of the Readiness Package. Provide information when the Readiness Package was endorsed by the FCPF Participants Committee, and if applicable provide a brief update on REDD+ readiness activities that have taken place since this endorsement. Please reference all relevant supporting information and provide links

Mexico has adopted REDD+ as one of the mainstays to mitigating the effects of climate change. The National REDD+ Strategy (ENAREDD+), which has been developed through a participatory process[6] starting with the "Vision of Mexico on REDD+: Toward a National Strategy"[7], whose public consultation process[8] came to an end in early 2016, establishes sustainable rural development as the way for REDD+ to be implemented in Mexico. Furthermore, Mexico signed the readiness FCPF donation agreement in November 2014, and presented its Mid-Term Progress Report in March 2015[9]. The FCPF Readiness Fund in Mexico has supported the preparation for REDD+ through the funding of an analytical, participatory and inclusive process to finalize the National REDD+ Strategy (ENAREDD+)[10].

As regards the Readiness Package (R-Package), the participatory self-assessment was carried out between October 2015 and February 2016. Before the national self-assessment exercise was carried out with the parties involved, a preliminary progress report on Mexico's readiness process for REDD+ was drawn up to provide systematized information for the various stakeholders involved on the advances made in each of the components.

The process of self-assessment with the parties was carried out using a standardized methodology that was developed based on experience and lessons learned resulted in a pilot workshop inside the CONAFOR with the aim of putting the FCPF proposed methodology and assessment framework to the test. As a result of the pilot workshop, the need was detected to adjust the FCPF Assessment Framework that would lead to improved understanding for the assessors, and the assessment criteria and guideline questions were adapted to the context of the country, respecting the meaning of the criterion and the relevant aspects considered in the questions.

Subsequently, the assessment was carried out with the stakeholders involved, by holding workshops at different scales with the aim of integrating the various perspectives, points of view and different levels of information about the REDD+ preparation process. At a national level, two workshops were held, with the CONAF Indigenous and Campesino Roundtable[11] and the National CTC[12].

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[6]The participatory platforms involved include the Technical Advisory Committee (CTC-REDD) and the REDD+ Working Group of the Inter-Secretariat Commission on Climate Change (CICC WG-REDD).
[7] Mexico's view of REDD+ was presented during COP16 in 2010.
[8] See Section 5.1.1.1
[9] During the committee meeting of participants, held in May 2015, through Resolution PC/19/2015/2, the PC determined that Mexico has met the five criteria laid out in Resolution PC/10/2011/1.rev.; and decided to allocate funding to Mexico of up to an additional US$ 5 million to continue with its readiness preparation.
[10] The expected results are: The final version of ENAREDD+, including feedback from the various stakeholders, a completed Environmental and Social Management Framework, including feedback from various stakeholders, and a grievances redress mechanism for REDD+ at the state level, piloted in an Early Action Area (ATREDD+).
[11] Held on February 18, 2016, with the involvement of five representatives from social organizations in the forestry sector and four representatives of indigenous organizations at a national level.
[12] Carried out on February 11, 2016 with the involvement of 17 representatives from different sectors.

A workshop was also held at the regional level in the Yucatán Peninsula[13] (Campeche, Quintana Roo and Yucatán), along with a workshop at the state level in the state of Chiapas[14]. The participants, working agenda and results of the workshops held can be seen in the R-Package available at https://goo.gl/1ZetqE

The inputs from the assessments carried out were used to complement the progress report and were compiled in the R-Package, documenting the country's progress, setting out the lessons learned, and appraising existing deficiencies and pending activities.

The general results of the self-assessment process are set out below:

Table 1 Results of the national self-assessment for each component of the R-Package

Component	Subcomponent	Progress Assessment
1: Organization and Consultation for the preparation	1a: National management mechanisms for REDD+	
	1b: Consultation, dissemination and social involvement	
2: Preparation of the REDD+ Strategy	2a: Land use assessment, factors causing changes in land use, forestry law, policy and management	
	2b: REDD+ strategy options	
	2c: Implementation framework	
	2d: Environmental and social impacts	
3: Reference levels		
4: Forestry monitoring and safeguards information system	4a: National forest monitoring system	
	4b: Safeguards information system, co-benefits and other impacts.	

The R-Package was presented at the 21st Participants Committee meeting (PC21) in May 2016. All related documents can be accessed at: https://www.forestcarbonpartnership.org/mexico

2.2. Ambition and strategic reasoning behind the Emissions Reduction Initiative

Please describe the ambition and strategic rationale for the proposed ER Program. Describe the ambition and significance of the ER Program in relation to the total forest-related emissions and removals in the country (please note that a detailed description of the estimation of the ERs expected from the ER Program is included in section 13, here describe the relative importance of the ER Program compared to the overall emissions and removals in the country).

Describe how the ER Program is consistent with national policies and development priorities and will contribute to the development and/or implementation of components of REDD+, specifically the current national REDD+ strategy through the implementation of a variety of interventions.

Refer to ***criterion 1*** *of the Methodological Framework*

The Emissions Reduction Initiative (IRE) focuses on integrated land management in rural areas, has taken the lessons learned from the ATREDD+, and promotes a dual approach: both top-down and bottom-up, establishing the link between territory-level planning, taking local needs into consideration, and budgetary planning and programming at a federal and state level. Furthermore, the IRE includes additional activities tackling deforestation and forest degradation that are not currently considered in subsidy programs or other financing mechanisms, and which extend the actions and achievements of said subsidies to halt deforestation and forest degradation.

Mexico has a total of 88,078,158 ha of forest. The IRE includes five states in the Mexican Republic covering 21% of the forest surface area in Mexico, with a total surface area of 18,572,734 ha of forest. The main causes of deforestation and forest degradation in these five states are of considerable ecological importance, and there is significant political and social commitment to implement measures to reduce emissions. Regarding total emissions from the forestry sector in the country, the States included account for 36%, according to the forest reference emission level (FREL).

[13] Held on November 27, 2015 with 25 people taking part.
[14] Held on February 9, 2016 with 26 participants.

2.3. Political commitment

Please describe the highest level of political commitment to the ER Program, including the levels of support within the different levels of government and whether a cross-sectoral commitment exists to the ER Program and to REDD+ in general.

Mexico has policy instruments that set reducing emissions due to deforestation and forest degradation as a priority through the National REDD+ Strategy (ENAREDD+).

The objective of the 2013-2018 National Development Plan (PND): *Prosperous Mexico*, includes Objective 4.4. *To foster and guide growth that is green, inclusive and facilitating, which preserves our natural heritage while also generating wealth, competitiveness and employment.*

The National Strategy for Climate Change (ENCC) establishes as one of the pillars of national policy having climate policies and actions that are cross-cutting, joined-up, coordinated and inclusive. It also includes:

- Line of action (P1.12) *Guarantee a balancing of policies, programs and institutional agreements for climate change and sustainable rural development, with the aim of tackling deforestation and forest degradation as a multifaceted problem in all three tiers of government*
- Mitigation measures (M4): *Foster best practices in agriculture and forestry to increase and preserve natural carbon sinks*
- Line of action (M4.5): *Design and operate plans, programs and policies aimed at reducing deforestation and the degradation of forests, as part of the REDD Strategy, which should focus on sustainable development of rural areas and landscape, with respect for social and environmental safeguards.*

The Special Program on Climate Change (PECC) is the instrument that establishes the objectives, strategies, actions and goals to be used to tackle climate change. These include:

- Objective 2: *Conserve, restore and sustainably manage ecosystems, guaranteeing the appropriate environmental services to mitigate and adapt to climate change.*
- Strategy 2.3: *Implement sustainable agricultural, forestry and fishery practices that reduce emissions and reduce the vulnerability of ecosystems.*
    - 2.3.1: *Avoid greenhouse gas emissions from deforestation and forest degradation through early actions in the field.*
- Strategy 2.4: *Develop instruments that will promote sustainability and reduce emissions resulting from agricultural, forestry and fishery activities, and reduce the vulnerability of ecosystems.*
    - 2.4.4: *Develop internationally established components to reduce emissions caused by deforestation and forest degradation within the REDD+ mechanism*
    - 2.4.5: *Promote integral land management that incorporates the strengthening of collaboration mechanisms between government to help with the processes of adaptation and mitigation.*

The National Forestry Program 2014-2018 (PRONAFOR) sets out the objectives, strategies and lines of action to be developed by the Federal Government to help achieve the goals for that period, in line with the PND and the Environment and Natural Resources Sector Program 2013-2018 (PROMARNAT). The PRONAFOR includes the following objectives and strategies:

- Objective 4: *Foster and strengthen forestry governance and local capability development*
- Strategy 4.1: *Develop and promote management models that are integrated into the area*
- Objective 5: *Promote an institutional framework to facilitate sustainable forest development.*
- Strategy 5.1: *Foster combined and coordinated policies and public programs with a focus on cross-sector land management.*
- Strategy 5.5: *Promote the reduction of GHG emissions from deforestation and from forest and jungle degradation*
    - 5.5.1: *Develop a national strategy to reduce GHG emissions from deforestation and from forest and jungle degradation*
    - 5.5.3: *Implement a national monitoring, reporting and verification system for GHG emissions associated with deforestation and forest degradation.*
    - 5.5.4: *Integrate a national social and environmental safeguards system.*

Through the CONAFOR, the Federal Government has made the commitment to reduce deforestation and forest degradation, as well as preserving environmental services that are generated by forests, for which it has designed and implemented programs such as paying for environmental services, community forestry and sustainable forest management. Furthermore, the CONAFOR has undertaken efforts such as the Specific Investment Loan for Forests and Climate Change (SIL) and the Forestry Investment Program (FIP), which are aimed at helping communities become stronger through the sustainable management of forestry goods and services, through nationwide priority community programs, actions to devise policy and increase institutional strength, and carry out innovative actions in the areas of early REDD+ action.

Finally, Mexico seeks to pilot the Intervention Model for REDD+ that has been built in a participatory approach since 2010 through the current Emissions Reduction Program (IRE), the letter of intent for which was presented on October 7, 2014[15]. This Initiative represents an opportunity for Mexico to achieve its National Determined Contribution (NDC) goals in two main aspects: 1) achieve a zero deforestation rate in 2030, and 2) contribute to the commitment to reduce 22% of GHG by 2030.

At a state level, the Governments of the five States[16] are committed to implementing the IRE, and this is reflected in the Coordination Agreements to be formalized between the CONAFOR and the State Governments with the aim of developing and implementing the IRE through Investment Programs via the Public Territorial Development Agents or other territorial development agents, with the aim of reducing emissions caused by deforestation and forest degradation in the state, with a focus on comprehensive land management. The states also have institutional arrangements and legislation aimed at providing a legal backing to actions taken as part of the IRE[17].

A political commitment exists in the five states involved in the Emissions Reduction Initiative (IRE), which includes taking measures on an ongoing basis to draw together public policies in the area[18]. In this regard, the degree of progress made in the various states is presented in section 6.1.

Both the investment programs and the Emissions Reduction Initiative (IRE) have been validated on inter-secretariat platforms where in which various government departments that are key for both the Investment Programs and the IRE are involved.

During the operation of the IRE, the CONAFOR will implement a monitoring and assessment mechanism for periodic and systematic reviews of IRE progress, in terms of management indicators and in monitoring generic and complementary actions, as well as designing an impact assessment for said initiative.

3. IRE location

3.1. Emissions Reduction Initiative area of accountability

Please present a description (including location and size, in hectares) of the proposed Accounting Area of the ER Program, including the administrative jurisdictions or national-government-designated area(s) covered by the ER Program and its location in the country. Also provide a map of the Accounting Area, preferably as a GIS shape file (using WGS 84)

*Refer to **criterion 2** of the Methodological Framework*

The IRE area of accountability is the five states of the Mexican Republic where Early REDD+ Actions (ATREDD+) are taking place: Campeche, Chiapas, Jalisco, Quintana Roo and Yucatán. These five states account for almost 15% of the country's surface area (see Table 2).

Table 2 Surface area of the five states in the Emissions Reduction Initiative (IRE)

State	Total surface area (ha)	Surface area of forest (ha)[19]

[15] The letter of intent from Mexico can be accessed at: https://goo.gl/P075yA

[16] In the Agreement, the states are represented by the Governors, the State Government Secretary, the Finance Secretary and the Environment Secretary.

[17] For more information on the establishment of institutional arrangements in the states, such as the CICCs, the GREDDD+ and legislation, see sections 1.3, 6.1.1 and 4.5.

[18] Over the following months and before the ERPA, the State Governments will hold cross-sector meetings to coordinate changes in their Rules of Operation.

[19] Forest surface areas are determined using Series V of the Charter on the use of Soil and Vegetation, published by the INEGI in 2012 and categorized according to the methodology established in the *Reference Level Proposal for Forestry Emissions in Mexico* (CONAFOR, 2015), where descriptions are given of the correspondence of vegetation groups and development stage with the Charters on the Use of Soil and Vegetation and the types of vegetation included in the IPCC forest land category.

Campeche	5,750,272	4,201,826
Chiapas	7,407,300	3,712,921
Jalisco	7,801,184	4,155,948
Quintana Roo	4,459,784	3,711,158
Yucatán	3,958,251	2,790,879
IRE total	29,376,791	18,572,733
National total	195,623,981	88,078.158

In the five states, the IRE was developed and managed at the state level, with involvement from all five state governments. However, IRE interventions (actions in the field) will be focused on regions, referred to hereinafter as *areas of intervention*, which were defined between State Governments and CONAFOR State Offices, based on the deforestation and forest degradation dynamics in each state, the work carried out in each area, the presence of institutions to act as Public Agents for Territorial Development, political and social commitment, and the potential for results to be presented. Their location is shown in the figure below, and Table 3 includes the characteristics of each area of intervention in the five states.

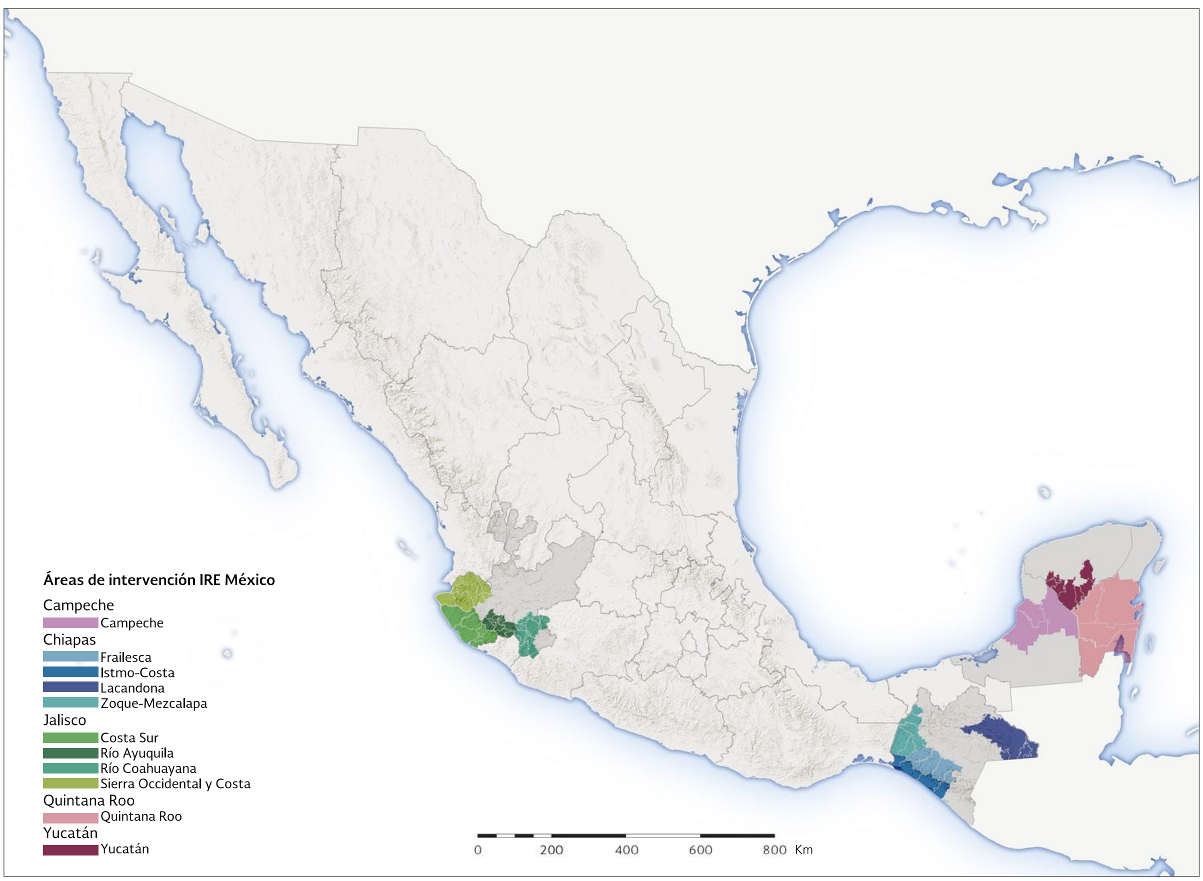

Figure 1 Areas of Intervention within each state participating in the IRE.

Table 3 Characteristics of the areas of intervention in the five IRE states

State	Area of intervention	Municipalities	Surface area of intervention	% state forest present in the area of intervention
Campeche		Campeche, Champotón and Hopelchén	1,205.729	23

State	Area of intervention	Municipalities	Surface area of intervention	% state forest present in the area of intervention
Chiapas	Frailesca	Ángel Albino Corzo, El Parral, La Concordia, Monte Cristo de Guerrero, Villaflores and Villa Corzo	1,839.610	34
	Istmo-Costa	Arriaga, Mapastepec, Pijijiapan and Tonalá		
	Lacandona jungle	Ocosingo, Marqués de Comillas, Benemérito de las Américas and Maravilla Tenejapa		
	Zoque-Mezcalpa	Cintalapa de Figueroa, Jiquipilas, Ocozocoautla de Espinoza, Mezcalapa and Ostuacán		
Jalisco	Ayuquila Lower River Basin	Unión de Tula, Ejutla, El Limón, El Grullo, Autlán de Navarro, Tonaya, Tuxcacuesco, San Gabriel, Tolimán and Zapotitlán de Vadillo	2,913.087	50
Jalisco	Costa Sur	Casimiro Castillo, Cuautitlán de García Barragán, Cihuatlán, La Huerta, Tomatlán and Villa Purificación		
Jalisco	Coahuayana River Basin	Quitupan, Valle de Juárez, Concepción de Buenos Aires, Mazamitla, Tamazula de Gordiano, Zapotlán el Grande, Gómez Farías, Zapotiltic, Tuxpan, Tecalitlán, Pihuamo and Tonila		
Jalisco	Sierra Occidental y Costa	Atenguillo, Cabo Corrientes, Guachinango, Mascota, Mixtlán, Puerto Vallarta, San Sebastián del Oeste and Talpa de Allende		
Quintana Roo	Central and South Region	Felipe Carrillo Puerto, José María Morelos, Bacalar and Othón P. Blanco	3,368.182	73
Yucatán	Puuc biocultural region	Muna, Santa Elena, Ticul, Oxkutzcab, Tekax, Tzucacab, Peto and Yaxcaba	816.604	25
		Total	8,303.602	**N/A**

3.2. Environmental and social conditions in the IRE area of accountability

Please provide a brief (maximum 2 pages) description of the present environmental and social conditions in the Accounting Area of the ER Program including:

Existing vegetation types, including the presence of undisturbed natural forests (short description of the major types and estimation of area as percentage of the total accounting area);
Climatic conditions and the occurrence (frequency and estimation of areas affected as percentage of the accounting area) of catastrophic climate related events such as those related to wind (hurricanes), drought (fire) or precipitation (floods);
Soil characteristics (short description of the major soil types, their organic matter content (if known) and estimation of area per soil type as percentage of the total accounting area);
Presence of rare and endangered species and their habitat;
Overview of stakeholders and rights-holders, including from the point of view of linguistic and socio-cultural diversity;
Population demographics and growth;
Main livelihoods and economic activities in and around the Accounting Area and the dependence of local populations on forest resources.

The different IRE states have particular environmental and social conditions, as described below:

3.2.1. Summary of social conditions of IRE states

1. Distribution of ownership

Table 4 Distribution of ownership in the five states

States	# AC	# de ACs with forest surface area
Campeche	380	376
Chiapas	2.003	1.695
Jalisco	1.346	1.135
Quintana Roo	277	277
Yucatán	731	707
Total	4.737	4.190

AN= Agrarian Nuclei

2. Rural and urban population per state.

Table 5 Information on rural and urban populations in the five IRE states

State	Proportion of urban population (%)	Proportion of rural population (%)	Total population (inhab.)
Campeche	75	25	822.441
Chiapas	49	51	4,796,580
Jalisco	87	13	7,350,682
Quintana Roo	88	12	1,325,578
Yucatán	84	16	1,955,577
Total	75	25	16,250,858

3. Degree of marginalization per municipality per state

Table 6 Degree of marginalization of the total population per municipality in the IRE states

State	Very high	High	Medium	Low	Very low
Campeche	0	0	4	5	2
Chiapas	48	39	29	1	1
Jalisco	4	1	48	51	21
Quintana Roo	0	0	4	3	3
Yucatán	10	23	68	4	1
Proportion	16.8%	17.0%	41.4%	17.3%	%

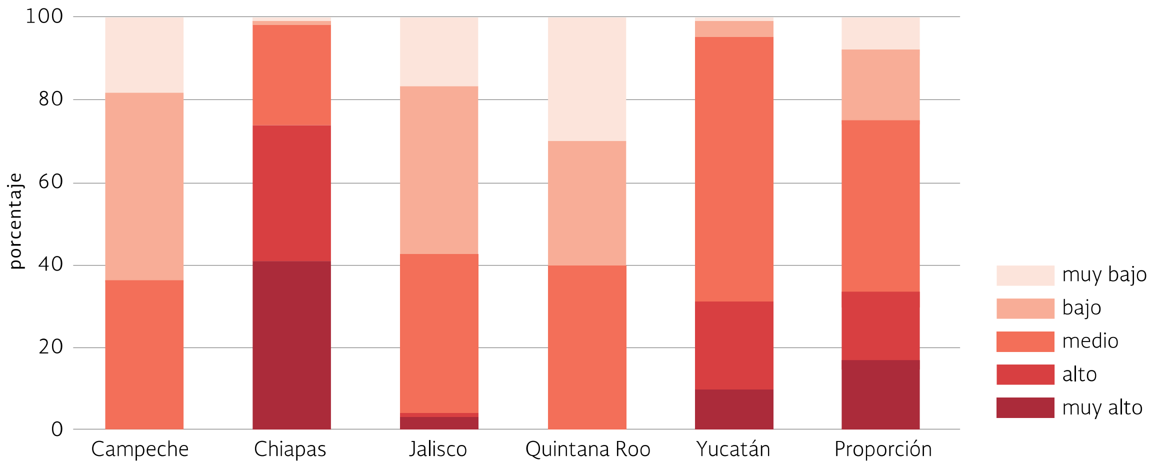

Figure 2 Degree of marginalization per municipality per state

3.2.2. Summary of environmental conditions of IRE states

The following is a summary of the environmental conditions of the five IRE states; Annex 2 includes more details on this section and information on the areas of intervention of each state.

Campeche

The surface area covered by forest in Campeche is 4,201,827 ha, according to the vegetation keys used in the Biennial Report (BUR)[20].

Forest fire propensity

From 1995 to 2013, forest fires affected sensitive ecosystems (according to the Official Mexican Standard NOM-015-SEMARNAT/SAGARPA-2007) in the state of Campeche, in an average surface area of 3118 ha per year,according to official data from CONAFOR. Fires occurred in the state every year and the surface area affected by fire was less than 1,000 ha/year for almost all (42%) of the years recorded. In the rest of the period, the burnt surface did not exceed 5,300 ha, except for in 2003, when it rose sharply to more than 25,000 ha.

Relative impact of forest fires on state forests

For the same period, each year the areas affected did not exceed 0.6% of the state's surface area of forest.

Propensity and vulnerability to tropical cyclones

From 1970 to 2011, the state of Campeche was affected by 17 tropical cyclones, with their intensities ranging from tropical depression up to 5 on the hurricane intensity scale. The state was mainly affected by tropical storms (59% of the times that a tropical cyclone occurred), tropical depressions (23%), and much less frequently by hurricanes classed as category 1 (6%), 4 (6%) and 5 (6%).

Chiapas

The surface area covered by forest in the state of Chiapas is 3,712,921 ha, according to the vegetation keys used in the Biennial Report (BUR)[21] .

Forest fire propensity

From 1995 to 2013 in Chiapas, the annual surface area affected was generally lower than 30,000 ha/year, with most of the lowest records occurring from 2004 onwards. This state has peaks in terms of burnt surface area in the years associated with the presence of El Niño, particularly 1998, when the affected surface area (more than 198,808 hectares) was more than six times higher than the average for the period (30,735 ha/year), and in 2003, when 67,335 ha were affected.

Relative impact of forest fires on state forests

[20] Section 8.3.1 includes the vegetation groups that form part of the Forest Land category of the IPCC (used in the BUR) and the types of vegetation of the INEGI Charter on the Use of Soil and Vegetation.

[21] Section 8.3.1 includes the vegetation groups that form part of the Forest Land category of the IPCC (used in the BUR) and the types of vegetation of the INEGI Charter on the Use of Soil and Vegetation.

The area affected each year by fires in Chiapas between 1995 and 2013 was generally less than 1% of the state's forest area, based on information from the INEGI Series. An exception was 1998, when fires reached historic figures in the state due to the meteorological phenomenon of El Niño, and almost 3% of the state's forest areas was affected.

Propensity and vulnerability to tropical cyclones
In the case of Chiapas, in the 41-year period from 1970 to 2011, the state was directly affected by 20 tropical cyclones, of which 55% were tropical storms (winds of up to 118 km/hour), 35% were classed as tropical depressions (maximum wind speeds of 62 km/hour) and only 10% reached the level of a category 1 hurricane (winds of up to 154 km/hour).

Maximum wind speeds in the state of Chiapas between 1994 and 2000 did not reach 140 km/hour, which occurred on one occasion in 1997 with Hurricane Rick (category 1 and speeds of 140 km/hour).

However, what most affects ecosystems in the state of Chiapas is not wind speed (measured by the Saffir-Simpson scale) but rainfall causing landslides and, on some occasions, they do have an impact on forest areas and riparian forests.

Based on the information available, it can therefore be concluded that forests in the state of Chiapas have not generally been significantly affected by the tropical cyclones that have reached the region, with tropical cyclones capable of causing limited damage occurring every 20 years, on average.

Jalisco

The surface area covered by forest in the state of Jalisco is 4,155,948 ha, according to the vegetation keys used in the Biennial Report (BUR)[22].

Forest fire propensity
From 1995 to 2013, in the state of Jalisco, forest fires affecting more than 6,000 ha were recorded every year except for 1997, resulting in an average burnt area of 17,510 ha/year.

Relative impact of forest fires on state forests
In no year from 1995 to 2013 did the damaged surface area exceed 1% of land in the state with forest cover. In this period, a total surface area of 332,696 ha was burnt, accounting for 7% of the average forest area in the state in said period.

Propensity and vulnerability to tropical cyclones
Between 1970 and 2011, Jalisco was affected by 26 tropical cyclones, of which three (11%) were tropical depressions, seven (27%) were tropical storms, eight (31%) were category 1 hurricanes, seven (27%) were category 2 hurricanes, and one (4%) was a category 4 hurricane. In particular, the category 2 hurricanes were recorded on average once every six years in the period, whereas a category 4 hurricane only occurred once. It is worth noting that in 2015, Hurricane Patricia occurred, classed as the most intense in recent history and which flattened large areas of forest, leading to a large concentration of combustible material, increasing the risk of high-intensity forest fires.

Quintana Roo

The surface area covered by forest in the state of Quintana Roo is 3, 711, 158 ha, according to the vegetation keys used in the Biennial Report (BUR)[23].

Forest fire propensity
In the state of Quintana Roo between 1996 and 2005, covering surface areas of less than 7,000 ha per year, from 2006, the state suffered significant spikes in the extent of fires every two or three years, particularly in 2011, which reached almost 80,000 ha. Forest fires affected an average of 17,104 ha a year during the period recorded.

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[22] Section 8.3.1 includes the vegetation groups that form part of the Forest Land category of the IPCC (used in the BUR) and the types of vegetation of the INEGI Charter on the Use of Soil and Vegetation.
[23] Section 8.3.1 includes the vegetation groups that form part of the Forest Land category of the IPCC (used in the BUR) and the types of vegetation of the INEGI Charter on the Use of Soil and Vegetation.

Relative impact of forest fires on state forests
Between 1995 and 2013, the annual surface area of forest in Quintana Roo affected by fires generally accounted for less than 1% of the state's land covered by forest, except in 1995, 2006 and 2011.

Propensity and vulnerability to tropical cyclones
Between 1970 and 2011, Quintana Roo was affected by 34 tropical cyclones, of which 41% were tropical storms, 26% were tropical depressions, 6% were category 1 hurricanes, 12% were category 3 hurricanes, 9% were category 4 hurricanes, and 6% were category 5 hurricanes. This implies that the state suffered the effects of category 4 or 5 hurricanes approximately every 12 years, and category 3 hurricanes around every ten years.

Considering the 41 years of data from 1970 to 2011, it can be noted that during said period in Quintana Roo nine tropical cyclones occurred with the potential to significantly affect the state's forests (i.e., hurricanes of category 3 or above) for an average of one approximately every five years.

Certain recent studies[24] have documented that the damage caused to forest cover by hurricanes and fires has been notable, having a direct and negative effect on the state's forest ecosystems. According to some of them, the regularity of hurricanes threatens the forestry sector in Quintana Roo due to the direct impact on the trees and because after a hurricane the biomass of dead and highly combustible vegetation, with high risks of forest fires. They also indicate that the forest affected by a hurricane is often thought of as an unproductive system, which increases the risk of a change of use of the land.

Yucatán

The surface area covered by forest in the state of Yucatán is 2,790,879 ha, according to the vegetation keys used in the Biennial Report (BUR)[25].

Forest fire propensity
From 1995 to 2013, the state of Yucatán recorded a total surface area affected by forest fires of 83,454 ha, with an annual affected surface area of 4,392 ha. Between 1995 and 2002, the damaged surface area remained less than 4,000 ha; however, with the exception of the years 1998 and 1999, the most relevant years of the period 1995 to 2013 were the years 2003 and 2009 with approximately 12,414 and 15,463 ha, respectively.

Relative impact of forest fires on state forests
In terms of the surface area covered by forest in Yucatán, the areas affected each year by fires from 1995 to 2013 never exceeded 0.55% of the total amount.

Propensity and vulnerability to tropical cyclones
Between 1970 and 2011, the state received 19 tropical cyclones, of which 31.6% were tropical depressions, 31.6% were tropical storms, 5.3% were category 1 hurricanes, 10.5% were category 3 hurricanes, 15.8% were category 4 hurricanes, and 5.3% were category 5 hurricanes.

During said 41-year period, Yucatán was affected on six occasions by hurricanes with an intensity capable of causing significant and serious damage to the forest stand in the state (e.g. category 2 and above). This can be interpreted by stating that 31.6% of the times that a hurricane reached the state during the period recorded, the state's forests could have suffered potentially significant damages, and a hurricane was recorded in the state with this potential approximately every seven years. In fact, category 4 and 5 hurricanes were recorded on average approximately once every ten years in the period, whereas category 3 hurricanes occurred once every 20 years.

[24] For example, Mascorro, V.S., Coops, N.C., Kurz, W.A. and Olguín, M. (2014). Attributing changes in land cover using independent disturbance datasets: a case study of the Yucatan Peninsula, Mexico. Regional Environmental Change DOI: 10.1007/s10113-014-0739-0, and Calmé, S., Pozo, C. y Armijo Canto, N. (2011). Challenges facing biodiversity conservation in Quintana Roo. In: Pozo, C., Armijo Canto, N. and Calmé, S. (editors). 2011. The Biological Wealth of Quintana Roo. An analysis for its conservation, Volume I. Frontera Sur College (Ecosur), National Commission for Biodiversity Knowledge and Use (Conabio), Quintana Roo State Government and Small Donations Program (ppd). Mexico City

[25] Section 8.3.1 includes the vegetation groups that form part of the Forest Land category of the IPCC (used in the BUR) and the types of vegetation of the INEGI Charter on the Use of Soil and Vegetation.

4. Description of the actions and interventions to be implemented in the Emissions Reduction Initiative.

4.1. Analysis of the driving forces and underlying causes of deforestation and forest degradation and the existing activities that can lead to conserving or increasing forest carbon reserves.

Please present an analysis of the drivers, underlying causes and agents of deforestation and forest degradation. Also, describe any policies and other activities that are already in place and could contribute to conservation and enhancement of Carbon Stocks. Please provide clearly referenced sources for the analysis. Please distinguish between both the drivers and policies within the Accounting Area of the proposed ER Program, and any drivers or policies that occur outside the Accounting Area but are affecting land use, land cover and Carbon Stocks within the proposed ER Program Accounting Area. Draw on the analysis produced for the ER-PIN and the country's Readiness Package (R-Package), and identify any remaining gaps in information/data.

Refer to ***criterion 27, indicator 27.1*** *of the Methodological Framework*

4.1.1 Deforestation and forest degradation in Mexico

Deforestation[26] and forest degradation[27] are one of the main phenomena causing the loss of natural capital in Mexico; it is a complex problem that directly affects an essential public asset, namely the ability of ecosystems and the land to provide the necessary environmental services for ecological processes to be maintained and for society and the economy to function properly. The loss or decrease in the provision of environmental services, such as the loss of biodiversity, or the disruption of hydrological and geochemical cycles, compromises the resilience of society and ecosystems to deal with the problems caused by climate change, and limits the ability of local societies to ensure their own development.

Deforestation can be the product of a process that occurs in a single step (e.g. change of land use in forest areas[28]) or as the result of a gradual degradation leading to the sustained and permanent loss of plant cover (and therefore of carbon) and the ecosystem's capacity to achieve regeneration (Balderas et al., 2015). Thus, in general, land use changes are a response to regional, national or international market pressures to move to the extraction of timer products, mining, converting forests to agricultural production areas, tourist, urban and industrial developments, and infrastructure projects (e.g. dams, roads and highways). In this context, the land use change control measures in place are deficient and there is little or no effective co-ordination between the legislation in place and the various government sectors (CONAFOR, 2014).

The near or direct causes are human activities or actions at the immediate local level, such as the expansion of agricultural borders, which occurs as a result of intentional land use changes and has a direct impact on forest cover. The underlying (or indirect) causes are fundamental social processes, such as dynamics in human population or agricultural policies, which consolidate the direct causes and can operate at a local level or have a direct impact both nationally and at the global level. None of these causes is unique, and there is no linear relationship, and they do not operate independently, so a diagnosis can identify different combinations of a range of causes according to different historical and geographical contexts. Some are common to large geographical areas, but most are specific to smaller regions or territories (Geist and Lambin, 2002).

Anthropogenic changes in the country's forest cover rose sharply from the middle of last century (Challenger A, Dirzo R, 2009) when the most significant opening up of land in the history of Mexico occurred, moving from 5.9 million hectares to 14.7 million hectares used for agricultural purposes. The basic infrastructure was also created that allowed for economic growth in the Mexican countryside. For example, between 1930 and 1985, low-irrigation agricultural land rose from 500,000 hectares to 5.6 million hectares, as a result of more than a

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[26] In accordance with the LGDFS, it is defined as forest vegetation being lost, whether induced or by natural causes, and altered to any other condition;

[27] In accordance with the LGCC, it is defined as a reduction in carbon content in the natural vegetation, ecosystems or soils due to human intervention, with regard to the same vegetation, ecosystems or soils if no such intervention had occurred; in accordance with the LGDFS, it is defined as the process of reduced capacity of forest ecosystems to provide environmental services and production capacity.

[28] According to the LGDFS, it is defined as the full or partial removal of vegetation from forest areas, in order for said areas to be used for activities not related to forestry.

thousand dams being built. In the 1980s, agricultural land increase by almost 1.7 million hectares, as a result of the food self-sufficiency policy (Anta and Carabias, 2008).

In turn, extensive cattle farming, which in 1940 accounted for 38.8 million hectares in the country, rose by 1983 to 90.4 million hectares (Carabias et al., 2009), becoming the main driver of deforestation and forest degradation in the country. The rise in cattle farming, both free grazing and intensive milk production in Mexico led to large swathes of forestland, particularly tropical forest areas, being converted to use as pasture or for producing feed for cattle. (Anta and Carabias 2008)

Urban growth is another direct cause of the loss of forestland (Chalenger and Dirzo 2009). Additionally, the multiplication and accelerated growth of unregulated settlements has affected valuable ecosystems, mainly in coastal areas, but in other fragile ecosystems as well (Anta and Carabias, 2008).

It is estimated that in Mexico temperate forest and both humid and dry forests covered a surface area of approximately 98 million hectares (Sánchez Colon et al., 2009), accounting for just over 50% of the country's land. Currently, these ecosystems cover only 64 million hectares, which is 32% of the total surface area (CONAFOR 2014).

The original surface area covered by forest (lowland, mid-height and mountain forests) was 40 million hectares, and by 2002, this figure had fallen to 27 million hectares (Sánchez Colon et al., 2009). Deforestation began sharply from the 1970s onwards, when millions of hectares were turned into rain-fed agricultural land for maize production and irrigation districts for export products, as well as large areas of land used for cattle grazing (Challenger A, Dirzo R 2009). The latest data reported in the FRA 2015 indicate that mountain and mid-height forests (humid and sub-humid) currently cover a total surface area of 14.2 million hectares, whereas lowland forests cover 16.1 million hectares.

In turn, it is estimated that the temperate forests or conifers and broad-leaved trees, and mesophilic mountain forest originally covered an area of 47 million hectares, which by 2002 had fallen to 34 million hectares (Sánchez Colon et al., 2009). By 2010, this surface area had been reduced to 31 million hectares, and of these, 22.2 million hectares were forest in a relatively good state of conservation (primary forest), accounting for 66% of the remaining surface area. The most important factors in the destruction of these forests and their biodiversity are the opening up of areas of subsistence-based agriculture, extensive cattle farming, urban growth, illegal felling, and forest fires (Challenger A, Dirzo R, 2009).

As well as the loss of forest in the country, a major part of the remaining vegetation is in a certain state of degradation. The most intense period for this degradation occurred between 1979 and 2002, for all forest types. Over this period, significant degradation was observed of semi-deciduous and semi-evergreen forest, especially in the Yucatán peninsula and in the states of Campeche and Quintana Roo. As primary vegetation, these forests were reduced by 50% in this period, whereas secondary forests increased by 23%. In turn, the proportion of temperate forests of conifers and conifer/broad-leaved trees in secondary condition rose from 10% in 1979 to 32% in 2002. (Sánchez Colon, et al., 2009).

Preliminary estimations exist of forest degradation at a national level, in which it is calculated that this could affect between 250,000 and 300,000 ha per year (FAO, 2010; CONAFOR, 2014b). The processes of forest degradation are more complex than those of deforestation, as they can be the result of a non-irrigated variation (e.g. crop rotation) or gradual changes in cover (Skutsch et al., 2013). Degradation is a process which is mainly related to meeting local needs (subsistence and livelihoods), although it can also sometimes be a response to external market demands. In general, degradation is the result of pressure from local users, whose use of resources exceeds the forest's ecological load and regeneration capacity as a result, for example, of selective felling, over-grazing, the expansion and intensification of crop rotation and the extraction of firewood, timber, poles and other forest products. Forest degradation can be associated with deficient administration of a commonly owned resource (CONAFOR 2014) which, combined with market demand for goods (such as wood, meat and non-timber forestry products), leads to dynamics of continued degradation. Mention should also be made of forest fires, as depending on the ecosystems where they occur, and on their causes, severity and frequency, the continued degradation of affected forests can lead in the medium and long term to the definitive loss of forest cover. Another cases is the impact of forest management, which although it can be a tool for halt deforestation and forest degradation, if the right practices are not applied properly, it can lead to processes of degradation in forest ecosystems with high carbon content.

The dynamics of deforestation and forest degradation indicated above led Mexico to have one of the highest rates of deforestation in the world, leading to irreversible tendencies in terms of biodiversity loss (Sarukhan et al., 2009). Additionally, the LULUCF sector generates emissions that account for 6 to 9 per cent of the country's carbon emissions[29] (SEMARNAT- INECC, 2012).

In general, the variation in deforestation rates can be explained by sociodemographic, economic and institutional changes that have occurred in the country over the past 20 years. On the one hand, some areas of forest in Mexico have suffered a process of depopulation as a result of high rates of migration to cities or to the United States of America, reducing the pressure on forest ecosystems (Merino, 2014). The pressure from extensive cattle farming has also fallen in recent years, due to a combination of low meat prices, recurring droughts and the presence of organized crime, which has led to a reduction in herds grazing in forest areas.

It is important to state that the institutional and legal framework in Mexico has evolved favorably in the creation and development of institutional capacities to halt the processes involved in the loss of forest ecosystems. The creation of institutions linked to the environmental sector such as the Federal Attorney for Environmental Protection (PROFEPA), the National Forestry Commission (2001) and the National Commission for Protected Nature Areas (2000) have had favorable impacts on the conservation of forest ecosystems in the past 15 years. The amount of forestland decreed as a Protected Nature Area has risen significantly, currently covering more than 18 million hectares, where management capacities have been generated to ensure effective conservation. Furthermore, forestry policies for sustainable conservation and management have been strengthened with significant budgetary increases. Only the national Environmental Services program has maintained a forest cover under conservation at more than 2.5 million hectares over the past eight years. Furthermore, since 1995, community forestry management has been strengthened, particularly in temperate forests of conifers and conifer/broad-leaved trees; it is estimated that 45% of land with forest cover of any kind is owned by ejidos and communities (RAN, IICA, 2012). However, if only woodland-type forest is considered, the figure rises to 70% (Merino, Martínez, 2014).

Despite the fact that rates of deforestation have fallen at the national level, it remains a major problem, with new regional dynamics of deforestation observed that could worsen in coming years if the necessary steps are not taken to contain them. Some of the most important risks that could be generated by an increase in deforestation include extensive cattle farming incentivized by the rise in beef prices, which, together with the current policy of livestock repopulation and without changes in production systems that promote increased forage productivity could create an incentive for forest owners to change the use of forestland to grazing land and the production of maize for cattle feed. Problems of plagues and diseases, such as the current problem of coffee leaf rust, can lead to a highly significant change of production systems in the mountain areas of Chiapas and Oaxaca, affecting major surface areas of mesophilic mountain forest, due to the replacement of shade-grown coffee varieties and the expansion of new varieties. Additionally, the national and international market incentive for cash crops such as palm oil, avocado, agave, soy, maize and biofuels, among others, and urban growth along the coast linked to the development of tourism, are other dynamics that exert pressure on natural resources.

4.1.2 States with Early REDD+ Actions (ATREDD+)

Dynamic of deforestation and forest degradation

To assess the dynamic of deforestation and forest degradation in states with early REDD+ action areas, the inputs used were official cartographic information on soil and vegetation use at a scale of 1:250,000, provided by the National Institute of Statistics and Geography (INEGI). Full details can be found in section 8.

Deforestation in states where the Emissions Reduction Initiative is to be implemented amount to a total of 2,454,013 hectares in the period from 1993 to 2012. Table 7 shows the data for deforestation and forest degradation in the five states for this period.

In short, the State of Chiapas recorded the largest surface area with deforestation and forest degradation. The states in the Yucatán Peninsula (Campeche, Yucatán and Quintana Roo) record large areas of recovered forest, which are the result of the complex dynamic of land use and the capacity for recovery of mid-height forests; however, the proportion of secondary vegetation in this region is very high. In turn, in the states of Jalisco and

[29] The figure of 9% relates to data reported for the land use, land-use change and forestry (LULUCF) sector at the Fourth National Communication at the United Nations Framework Convention on Climate Change, and 6.3% was the figure reported at the Fifth. It is notable that this latter percentage was obtained with the same data used in the Fourth Communication, so emissions from the sector may have been underestimated in the Fifth Communication (http://www2.inecc.gob.mx/publicaciones/download/685.pdf).

Chiapas, major areas are being lost and recovery is very low, as these two states have greater environmental and physiographic diversity, which makes the dynamic of land use more diverse and complex, not allowing ecosystems to recover sufficiently.

High rates of deforestation are recorded in the IRE states. More recent studies that have used data at the land level through the National Forestry and Land Inventory show that in the IRE states there is a greater risk of deforestation than the average for the rest of the country (2.3% annual) (National Institute of Statistics, 2013). Specifically, the risk of deforestation for the states in the Peninsula is as follows: Yucatán 4.12%, Quintana Roo 2.88% and Campeche 2.20%, whereas for Chiapas it is 2.60% and Jalisco 3.20% (National Institute of Statistics, 2013).

Table 7 Changes in surface area with forest cover per state and per period.

Period	Process	Unit	Campeche	Quintana Roo	Yucatán	Chiapas	Jalisco	Total
Series II-III 1993-2002	Defor.	ha	325,271	101,269	241,259	587,557	254,490	1,509,846
		ha/year	36,141	11,252	26,807	65,284	28,277	167,761
	Degra.	ha	241,282	275,005	254,808	512,955	462,122	1,746,172
		ha/year	26,809	30,556	28,312	56,995	51,347	194,019
Series III-IV 2002-2007	Defor.	ha	223,711	96,093	163,858	329,700	243,089	1,056,451
		ha/year	44,742	19,219	32,772	65,940	48,618	211,291
	Degra.	ha	58,901	167,650	109,063	78,641	30,565	444,820
		ha/year	11,780	33,530	21,813	15,728	6,113	88,964
Series IV-V 2007-2012	Defor.	ha	117,098	76,764	148,089	74,519	24,452	440,922
		ha/year	29,275	19,191	37,022	18,630	6,113	110,230
	Degra.	ha	56,534	44,948	36,889	7,980	849	147,200
		ha/year	14,134	11,237	9,222	1,995	212	36,800
Total II-V 1993-2012	Defor.	ha	666,080	274,126	553,206	991,776	522,031	3,007,219
		ha/year	35,057	14,428	29,116	52,199	27,475	158,275
	Degra.	ha	356,717	487,603	400,760	599,576	493,536	2,338,192
		ha/year	18,775	25,663	21,093	31,557	25,976	123,063

Source: Author's own, based on the Land Vegetation Use Series of the INEGI.

Direct and indirect causes of deforestation and forest degradation

The causes of deforestation and forest degradation in the areas selected for the IRE are generally similar in all the regions where there are forests in the country; however, they differ in size and in the type of stakeholders involved. These causes are associated with processes of economic growth and unsustainable production. In areas with levels of marginalization, land management activities usually focus on meeting local needs of self-consumption and savings. In the outskirts of urban areas, urban growth in agricultural areas and land used for pasture creates new pressure on the frontier between agriculture and forest.

Local-level factors define the potential for different forestry, agricultural or livestock production activities to be developed. When these characteristics determine an aptitude for agricultural and livestock-based activities, a region can undergo greater deforestation or forest degradation. These factors include: the type of ecosystem and its capacity for production; the capacities of local stakeholders to make decisions on the use of communal resources and draw up sustainable management plans; coordination between different interest groups; efficiency in the use of resources (e.g. use of economy heaters rather than conventional heaters); the proximity to agricultural areas where fire is used and to highways; access to subsidies and other sources of funding; and the degree of compliance with formal and informal rules at the local level for managing natural resources (Skutsch et al., 2013).

Another indirect factor behind deforestation relates to the institutional structure, which, in some cases, has limited capacities to oversee and comply with the legal framework for managing natural resources and controlling land use changes. This problem is also reflected in difficulties in controlling illegal activities resulting from organized crime (e.g. illegal felling) and the fact that such crime exists with impunity, collusion and corruption in some sectors.

The following table lists the direct causes of deforestation and forest degradation in ATREDD+ areas and for each cause, the effects and the state where they occur were identified. This table is a synthesis of the findings presented in the following sections.

Table 8 Direct and indirect causes of deforestation and forest degradation in ATREDD+ areas

Direct cause of deforestation and forest degradation	EFFECTS Deforestation	EFFECTS Forest degradation	State where effect is relevant
Extensive cattle farming with use of induced or cultivated grazing land.	Conversion of lowland or mid-height forest, oak forest and scrubland to induced grazing land	Other uses, such as foraging with intensities greater than the load capacity or grazing coefficient, generate a gradual degradation of forests and land. Fires from burning cleared material Demand for poles for fencing. Fragmentation of forest areas.	Chiapas Quintana Roo Yucatán Campeche Jalisco
Extensive grazing on rough pastures	Does not cause direct change in forest cover. Over-grazing and ongoing degradation can lead to the loss of forest cover.	In situations of over-grazing, the underbrush biomass is reduced, harming renewal and leading to degradation of the land. Changes in vegetation composition and structure. Loss of forage productivity.	Jalisco Chiapas
Hillside agriculture	Conversion of lowland forest, mid-height forest, pine-oak forest and scrub to cropland	Fragmentation of forest areas. Degradation of land due to reduced or abandoned fallow cycle, use of agrochemicals and over-burning. Outbreaks of fires caused by crop burning.	Chiapas Jalisco
Cash-crop farming	Conversion of upper and mid-height forests to cash crops (palm oil, soy, Jatropha, sugarcane) Conversion of dry forest to agave crop farming. Conversion of temperate forest to avocado crop farming.	Reduction of forest biomass and soil degradation, forest fragmentation, changes in the composition and structure of vegetation, fires caused by agricultural burning.	Chiapas Quintana Roo Yucatán Campeche Jalisco
Degradation of shade coffee varieties	Risk of land change use to grazing land, clearing new areas for coffee.	Reduced cover of shade-giving tree species	Chiapas
Tall grasslands reconverted to agriculture and grazing land	Forest cover converted to pastures for cattle grazing	Fragmentation of mid-height forest, degradation of land. Fires from burning cleared material and pasture	Chiapas Quintana Roo Yucatán Campeche
Deforestation due to traditional agriculture	Forests converted to grow corn when crop rotation comes to an end.	Fragmentation of forest. Land degradation due to inappropriate crop practices when the rest period is reduced (left fallow or allowed to go to grass). Land degradation (erosion and reduced nutrients and moisture). Burning.	Chiapas Quintana Roo Yucatán Campeche Jalisco
Commercial irrigated agriculture	Conversion of riparian vegetation and wetlands to farmed crops. Risk of agricultural frontier being extended by irrigated cash crops being extended.	Water diverted for irrigation and to dry out land, affecting riparian vegetation and wetlands Land degradation due to salination and contamination from agro-chemicals.	Chiapas Quintana Roo Yucatán Campeche
Illegal extraction of wood (various purposes)	Does not cause major changes in forest cover	Reduced biomass and density of canopy cover. Impact on species populations being exploited. Changes in vegetation composition and structure. Reduced wood stocks with commercial value (quantity, quality and value).	Chiapas Quintana Roo Campeche Yucatán Jalisco
Reduced populations of species with commercial value in managed forests	With a low production level of commercially valuable wood and high production costs, logging loses its appeal. Preference for other land uses. Land-use change.	Other uses, such as foraging with intensities greater than the load capacity or grazing coefficient, generate a gradual degradation of forestland. Management can interfere with the regeneration of ecosystems when not undertaken sustainably.	Campeche Quintana Roo Chiapas Jalisco

Direct cause of deforestation and forest degradation	EFFECTS Deforestation	EFFECTS Forest degradation	State where effect is relevant
Improper forestry practices in areas under forestry management.	Does not lead to changes in forest cover, but degradation of forest mass can lead to it being replaced by fruit crops.	Reduced biomass and density of canopy cover. Reduced wood stocks (quantity, quality and value). Mature stands and habitat components removed. Increased uniformity of forest mass. Reduced productivity (lower increases each year) Changes in composition and structure. Fragmentation caused by roads. Ecosystem affected by forest management and unsuitable management practices	Jalisco Chiapas Quintana Roo Yucatán Campeche
Illegal logging (areas with no forest management)	Gradual risk of land use change due to process of degradation	Degradation of forest areas from illegal felling	Chiapas Quintana Roo Yucatán Campeche Jalisco
Illegal extraction of firewood and charcoal in pine and tropical forests	Does not lead to changes in forest cover, but degradation of forest mass can lead to it being replaced by grazing land in the future.	Reduced biomass and density of canopy cover. Impact on species populations being exploited. Changes in vegetation composition and structure. Reduced wood stocks (quantity, quality and value).	Chiapas Yucatán Campeche Quintana Roo Jalisco
Extraction of non-timber forest resources	Does not cause changes in forest cover.	Does not lead to significant reduction of biomass and density of canopy cover. Impact on species populations being exploited.	Chiapas Quintana Roo Yucatán Campeche Jalisco
Frequent low-severity forest fires	Does not cause changes in forest cover. In fires replacing stands, the reduction in cover is temporary and is offset by regeneration.	Degradation only occurs when the historical rhythm of fires is altered due to: (1) increased frequency (with damage to stands in regeneration), (2) when fire is suppressed (accumulation of combustible material and increased danger of high-severity fires), or (3) synergetic effects from other factors exist (felling, over-grazing) that combine with the fire. Damage to wood quality.	Chiapas Jalisco Yucatán Campeche Quintana Roo
Forest fires of a high or moderate severity.	The increased frequency of fires (associated with fragmentation, invasion of pastures, greater burn frequency) leads to the forest cover converting to savannah.	Reduced canopy cover and biomass. Changes in structure and make-up of species. Higher vulnerability to new fires. Replacement by other types of vegetation favored by fire.	Quintana Roo Campeche Jalisco Chiapas
Open-cast mining	Forest cover converted to areas lacking vegetation.	Fragmentation of forest remaining following deforestation and by roads. Soil loss. Sedimentation and contamination of bodies of water. Landscape quality altered.	Chiapas Jalisco
Increase of urban sprawl and establishment of unregulated human settlements	Conversion of areas of forest cover.	Fragmentation of forest (in neighboring residential areas or inside wooded areas). Accumulation of garbage in areas next to urban centers. Water diverted for urban use and to dry out land, affecting riparian vegetation and wetlands	Quintana Roo Yucatán Jalisco
Roads, tracks and infrastructure works	Conversion of areas of forest cover to roads. Indirect effects: change of land use to agriculture, livestock, urban centers and property speculation facilitated.	Fragmentation of forest. Increased risk of fires. Access to forest areas for extraction of resources facilitated.	Jalisco Chiapas Quintana Roo
Tourism	Areas of forest cover converted due to tourist developments.	Reduced cover in areas frequented by the public (including mangroves). Damage to vegetation and soil, and increased risk of fires in areas with high visitor density. Accumulation of garbage in areas frequented by the public.	Quintana Roo Jalisco

Direct cause of deforestation and forest degradation	EFFECTS Deforestation	EFFECTS Forest degradation	State where effect is relevant
Invasion of land due to agricultural conflicts and land tenure problems	Land-use change to establish agricultural parcels.	People without rights over the land (neighboring communities, landholders without agricultural rights, descendants of ejidos and settlers) exert pressure on forest resources. Fragmentation of the social ownership of the land, increase in minifundia with a process of dividing the land and the landscape into smaller parcels.	Chiapas
Hurricanes and others extreme climate events	Does not cause major changes in forest cover.	Damage to trees, and make-up of forest and abundance of species affected.	Quintana Roo Jalisco Chiapas
Plagues and tree diseases	Results in significant changes to forest cover, with the risk of a change in land use occurring	Factor causing forest degradation	Jalisco Chiapas

Table 9Indirect causes of deforestation and forest degradation in ATREDD+ areas

Indirect (underlying) cause of deforestation and forest degradation	EFFECTS Deforestation	EFFECTS Forest degradation
Lack of competitiveness of sustainable forest activities	Change of land use to more profitable activities than timber and logging	Degradation of forests and jungles from extensive grazing and illegal felling
Poor community organization /weakening of social capital	The shortage of local mechanisms to control land use, poor community governance and weak organization for production lead to unsustainable practices and land use change.	A lack of land governance capabilities and a weak organization for production lead to unsustainable land uses and practices, causing forest degradation.
Shortage of planning instruments to align public investments	Public subsidy programs create contradictory incentives and lead to the loss of forest areas	Public subsidy programs create contradictory incentives and lead to forest degradation
Economic incentives for production activities fail to take elements of sustainability into account	Agricultural sector funding programs do not take into account environmental and social risk assessment mechanisms and indirectly promote the increase of farmed land, particularly grazing land, leading to the loss of forest areas.	Agricultural sector funding programs do not take into account environmental and social risk assessment mechanisms and indirectly promote the increase of cattle herds in forest areas, leading to forest degradation. These incentives also focus on landowners and help to widen social differences between regions and within communities themselves.
Lack of institutional capacity to enforce the law	Limited operational capacity of inspection and protection agencies such as the Federal Attorney for Environmental Protection (PROFEPA) to sanction land use change.	Limited operational capacity of inspection and protection agencies such as the Federal Attorney for Environmental Protection (PROFEPA) to sanction the unregulated use of forest areas.
High commodity prices.	Commodities-led market incentive for land-use change.	Market incentives led by commodities (specifically meat) increase the demand for forage, leading to forest degradation through over-grazing.
Lack of local mentoring and assessment	Because the local mentoring and technical assessment is limited, it does not include the explicit promotion of sustainable practices and projects, leading to unsustainable practices.	Because the local mentoring and technical assessment is limited, it does not include the explicit promotion of sustainable practices and projects, leading to unsustainable practices.

Indirect (underlying) cause of deforestation and forest degradation	EFFECTS Deforestation	EFFECTS Forest degradation
Poverty and marginalization	Lack of job opportunities for young people and low family income increase the pressure on natural resources, deforestation due to larger surface area used for agriculture	Lack of job opportunities for young people and low family income increase the pressure on natural resources. Forest degradation due to increase unregulated use of forest resources, firewood, charcoal, etc.

In short, the direct causes of deforestation and forest degradation can be divided into illegal activities, unsustainable agricultural and forestry practices, and land use change (Balderas et al., 2015). However, structural and underlying causes do exist that should be taken into consideration in the design of actions to tackle deforestation and forest degradation. These underlying (or indirect) causes may occur at different levels both within and outside the area of intervention, and can be divided into three main groups (CONAFOR, 2011):

1. Economic causes associated with the higher cost of opportunity for agricultural activities and high transaction costs to ensure sustainable logging and the lack of economic incentives to promote sustainable production activities. Owners and communities are given few incentives to maintain forests faced with the market demand for specific products (e.g. food, meat, dairy products, biofuel and illicit crops, among others), combined with the currently low commercial value of ecosystems such as deciduous and semi-deciduous forest.

2. Causes of an institutional origin and due to sector-specific policies, which includes the unwanted effect of subsidy programs, chiefly in the agricultural sector, the lack of synergy between public programs in the various sectors and the development of urban and tourism-based infrastructure and development without taking their effect on deforestation and forest degradation into account. Lack of local mentoring and assessment due to the reduced capabilities of government institutions on matters of rural extension.

3. Social factors linked to the lack of organizational capacities and leadership between communities and ejidos to undertake sustainable exploitation of forest resources, due to local needs and demographic growth. Situations that are worsened by the increasingly fractious nature of the social fabric, the weakness of local institutions and the lack of land governance mechanisms at different scales.

At the local level, indirect causes vary depending on local socioeconomic or ecological conditions, and are expressed in different ways to those at the national and state level. In turn, causes at the state or national level are chiefly determined by factors of a structural nature, such as the legal and institutional framework, or causes relating to public policies and the development of national and international markets.

Below are the indirect (i.e. underlying or structural) causes and effects of deforestation and forest degradation in ATREDD+.

It is worth stating that deforestation and forest degradation processes are not linear or based on a single factor, and as such, the descriptions of these processes are generalizations of what occurs in the regions analyzed.

4.1.3 state of Jalisco

Dynamic of deforestation and forest degradation in Jalisco

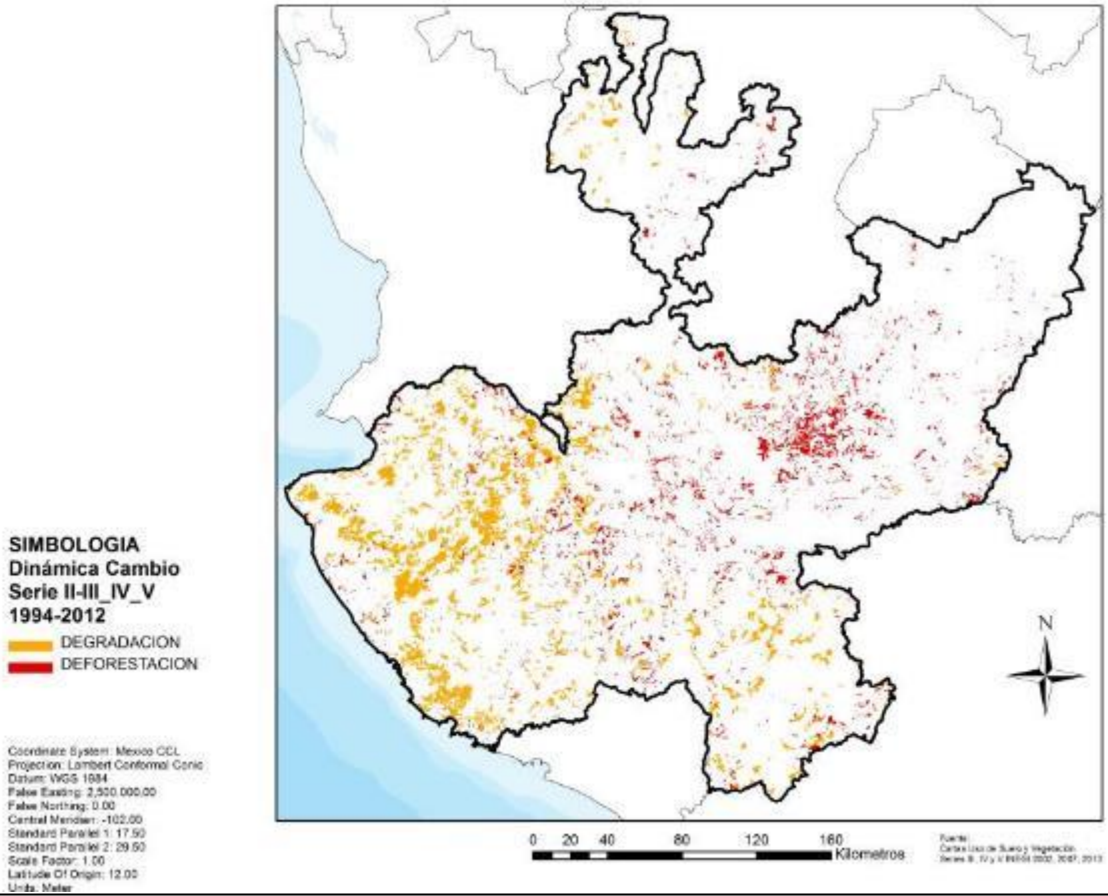

Figure 3 Changing dynamic of forest cover in the state of Jalisco from 1994 to 2012.

In the state of Jalisco, annual deforestation of more than 48,000 ha/year was recorded from 2002 to 2007, with lower levels recorded in the previous and subsequent periods. It is interesting to observe that although forest degradation has declined since its highest point of 51,347 ha/year in the 1993-2002 period, similar amounts of deforestation to this degradation occurred in the subsequent period, suggesting that deforested areas have previously been degraded. Table 10 shows the deforested surface area by type of vegetation (which have been grouped into categories to help with their description and to capture the details of the dynamics of deforestation and forest degradation as described in this section.

Table 10 Deforested and degraded surface area in the state of Jalisco from 1993 to 2012

			Deforestation	Degradation
Series II to III 1993-2002	Total	ha	254,490	462,122
	Yearly	ha/year	28,277	51,347
Series III to IV 2002-2007	Total	ha	243,089	30,565
	Yearly	ha/year	48,618	6,113
Series IV to V 2007-2012	Total	ha	24,452	849
	Yearly	ha/year	6,113	212

Table 11 Deforested surface area by vegetation type in the state of Jalisco[30]

Jalisco	Series II to III	Series III to IV	Series IV to V	Total

[30] Section 8.3.1 includes the vegetation groups that form part of the Forest Land category of the IPCC (used in the BUR) and the types of vegetation of the INEGI Charter on the Use of Soil and Vegetation.

Coniferous forest	23,687	10,586	2,184	36,457
Oak forest	74,441	69,137	5,846	149,424
Mesophilic mountain forest	1,189			1,189
Deciduous tropical forest	120,529	140,654	13,392	274,575
Semi-deciduous tropical forest	28,826	21,408	2,929	53,163
Other woody types	5,818	1,304	101	7,223
Total	254,490	243,089	24,452	522,031

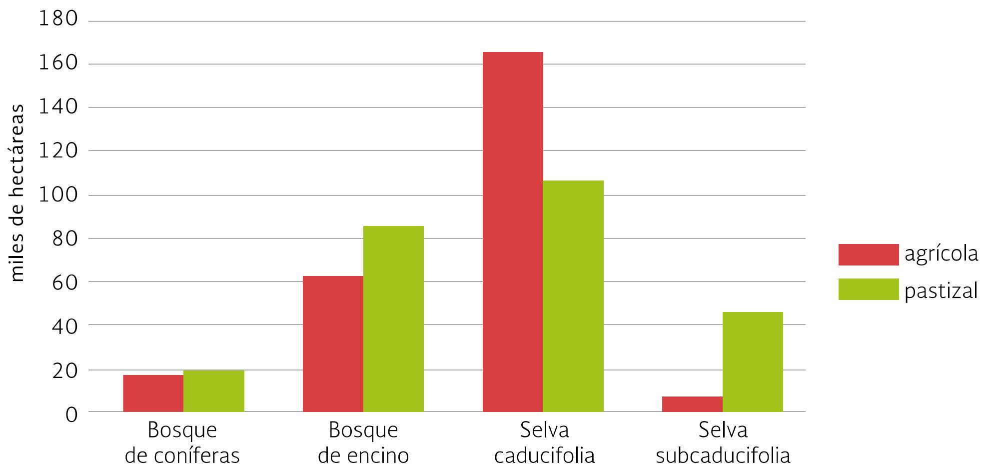

Figure 4 Main losses of ecosystems to agricultural uses in the state of Jalisco from 1993 to 2012.

In the state of Jalisco, deforestation has been dominated by the loss of deciduous forest (see Figure 4); the use made of associated vegetation located mainly in the region of Los Altos in Jalisco during the period from 1993 to 2002 was divided between agriculture and livestock, whereas in the 2002-2007 period, the change was almost exclusively to agricultural use, linked mainly to the accessibility of financing and investment to plant agave for tequila production due to the high prices of the distillate (Skutsch et al., 2013); due to the almost year-round crop and the economic dynamic of the area, this change in land use can be considered permanent. However, in the state's coastal basin region, where most of the forested area is currently to be found, deforestation has been predominantly caused by the land being converted to pasture for grazing (73%) over the 1993-2002 period, whereas in the 2002-2007 period deforested areas were divided between farmland and grazing for livestock. It is important to indicate that most of the degradation in the state has occurred in this region, and is highly likely to be lost in the near future. This is why activities in the Emissions Reduction Initiative will focus on the coastal basin region.

Analysis of land use change in the 1993-2012 period enabled degradation to be identified in 429,749 hectares of forest and jungle in the area of intervention, namely the state's coastal basins. Of this surface area, 276,056 hectares correspond to forest degradation from primary to secondary forest; most of this degradation was due to the oak forest degradation (167,056 ha). In turn, tropical forest areas suffered degradation in 153,693 ha, of which 91,116 were in lowland areas, and 62,577 were mid-height forest, which were most affected, due to the smaller area covered. The largest extent of degradation mainly occurred between 1993 and 2002.

In the same period, deforestation was reported in 240,910 hectares, just under half of the degraded area. The highest levels of deforestation occurred in tropical forest areas, with 146,000 hectares deforested, of which 96,530 hectares correspond to deforestation or loss of secondary tropical forest, which represents 65% of the total surface area of tropical deforestation. These figures clearly indicate that deforestation is occurring mainly in areas where the vegetation is already degraded. Forest areas were affected by deforestation in 94,430 ha, of which 57,464 correspond to primary forest and 36,966 ha to secondary forest. Most of the losses in temperate forests are of deciduous oak forest.

Mid-height semi-deciduous tropical forest, lowland deciduous tropical forest and oak forest are where most land use changes occur. Most of the surface area lost from these ecosystems was turned into pasture for cattle grazing.

The areas with the highest apparent levels of loss are north of Ayutla, west of the Sierra de Quila protected area and along the Mascota-Ameca and Mascota-Ayutla/ Unión de Tula highways; and on the Manzanillo-Puerto Vallarta highway by Cihuatlán, La Huerta, Tomatlán and Cabo Corrientes (Skutsch et al., 2013).

Causes of deforestation and forest degradation in Jalisco

In the area of intervention in Jalisco, most of the forest area (60%) is spread out on land owned by ejidos and communities, and the rest (40%) belongs to private owners. As explained previously, it is on land owned by these ejidos and communities where the highest degrees of degradation and deforestation are occurring.

The main direct causes of deforestation are as follows:

- **Extensive cattle farming with use of induced or cultivated grazing land and rough pasture.** Expansion of cattle of farming in the area has been, and still is, the main factor behind land use change and deterioration in the make-up of the flora in tropical forests and oak forests. The livestock production system used in this region is poorly adapted to the agricultural and ecological conditions, as a mixed-use land system, with free grazing in forests, use of artificial pastures and complemented by agricultural waste. Over-grazing has led to an ongoing process of degradation of forest areas, and increased forage demand due to the growth of grazing land leads to new areas opening up for pastures to be established. The increase in cattle herds is currently one of main risks of deforestation in the area.
  In the area of intervention, the greatest loss of forest surface area occurred in the period from 1993 to 2002, when cattle herds increased by almost 1.2 million head of cattle in the area in 1994, directly related to the boost in beef cattle that occurred from 1995 onward. To date, these areas have not been recovered. The slow-down in deforestation for the 2007-2012 period is related to the fall in the number of heads of cattle in the area (0.63 million cattle in 2007). However, deforestation may have increased given that the number of heads of cattle rose to almost 1 million in 2014, helped in part by the price in meat; the risk of deforestation is even higher due to the amount of degraded forest area.
- **Conversion to farmland for cash crops** such as agave and avocado. The growth in agave plantations, which between 1998 and 2004 expanded in the region to provide the raw material for the tequila-producing industry and, to a lesser extent, for mezcal and raicilla industries, led to a trend in converting from non-irrigated maize, and from lowland deciduous tropical forest and oak forest, to plantations for this crop. The profitability of avocado is another cause for this crop to have spread, mainly in the municipalities of la Cuenca del Río Coahuayana, where avocado plantations are established mainly in fields or agricultural areas, displacing grazing land and crops to new areas of forest cleared for this purpose, or directly on areas of degraded forest that change gradually over time. The surface area for avocado plantations rose in the region from 334 ha in 2002 to more than 1,200 ha in 2007.
  Rain-fed farming for maize has predominated in the region using the "coamil" crop system (hillside farming with a cycle of fallow, stripping and burning), which continues to be a cause for change in forest cover, although the rate of expansion is low, and there is even conversion from agricultural area to grazing land or secondary tropical forest, which may be associated with the low levels of rain-fed agricultural production (Jardel et al., 2012).
- **Urban growth due to tourism-led development.** The growing number of tourism-led developments along the coastal area, and chiefly in Puerto Vallarta, has triggered population growth, and although the developments are mainly reported on agricultural land, the campesinos selling them look for new land to farm, leading to deforestation.

In terms of degradation, the main direct causes identified in the region are as follows:

- **Illegal extraction of wood for burning, poles and other local uses** is common practice among campesino families, which causes reduced biomass, impacts on particular species populations, and changes in vegetation composition and structure. The extraction of non-timber forest products is commonplace among poorer Campesino families, as it is an additional source of income in some periods of the year (Graf, 1993; Benz, et al, 2000; Rosales-Adame and Bussink, 2001).
- **Inadequate forestry management practices**, which result in reduced biomass and changes in the structure and make-up of the vegetation, due to the fact that no complementary activities are carried out, there is no follow-up to the planning instruments put in place, and logging practices are inadequate or deficient, an example of which would be when all the waste from logging is left in situ, which acts as combustible material and causes fires. (Jardel, et al, 1989)
- **Plagues and tree diseases.** The lack of any strategy to effectively detect pests and diseases in forest areas, limited institutional coordination and ineffective monitoring measures have led to a deterioration in the forest surface area

- **Extensive cattle farming and over-grazing**, which are the main causes of degradation in the area concerned; it is over-grazing, particularly of cattle, which can prevent species from regenerating or re-sprouting, due to the fact that how the cattle (mainly beef) has been managed in the region is based on grazing on rough pastures, chiefly deciduous and semi-deciduous tropical forest and oak forest, for most of the year, and on the stubble or farmland left fallow following the harvest during the dry season (Graf, 1993; Louette et al., 2001).
- **Illegal extraction of wood and illegal crops** should be considered not only as causes of forest degradation, but also as factors that influence social breakdown and conflicts, and which come to act as an obstacle to implementing projects on the sustainable use of forest resources and the conservation of wooded areas. Illegal felling can be considered an agent of deforestation in areas with high levels of pressure on resources, and as an activity that causes forest degradation where it is managed on a small scale, which has been strengthened by the increased demand for construction in areas of coastal tourism and the low prince of pine timber incentivizing illegal activity (Jardel, 1998). In the case of illegal crops, these have expanded and although they do not cause deforestation, the initial burn-off in preparation for the crop or to remove its remains is one of the biggest causes of forest fires (Balcázar, 2011), and thus of forest degradation.
- **Frequent forest fires**, particularly in ecosystems that are sensitive to fire (mesophilic forest, lowland and mid-height tropical forest) bring about changes in vegetation composition and structure. If the clearings brought about by fire are not filled by another use of the land, the vegetation regenerates and the fire only causes degradation, but if the space is taken over by another activity, it is considered a stripping fire that leads to a change in land use. It is important to point out that fires can only be considered as a cause of forest degradation when they affect ecosystems that are sensitive to fire or they break the natural fire cycles or regimes in ecosystems that depend on fire to maintain the equilibrium, such as in pine forests, where fires are cyclical and contribute to the health of the ecosystem. (Jardel et al., 2012).

For the region, the following underlying causes of deforestation and forest degradation have been identified (Jardel et al., 2012; Skutsch et al., 2015; Graf, 1993):

- **Lack of employment and of any momentum in the local economy**, with economic development concentrated in the urban areas of the main municipalities, and with no innovation or momentum in the production sectors in rural areas. Furthermore, most subsidies are aimed at people with ownership rights of both land and resources, to the exclusion of a majority of the population in local communities, namely young people
- **Low standards of protection**, whereby legislation exists but there is a lack of knowledge, of enforcement and sanctions for those not complying with the law, including low protection capabilities. Corruption exists at inspection levels, which turn a blind eye to illicit activities for reasons of money, friendship or fear.
- **Lack of follow-up to public programs and policies**, and a poor focus of public policies: they do not focus on the areas of greatest need; reduced operation capabilities of public institutions to accompany program implementation; excess regulations and overbearing bureaucracy; undue influence between technical advisors and civil servants tasked with authorizing public support.
- **Lack of community organization with a view to sustainable forestry use.** Community organization is the pillar on which any successful production program at the community level is based, as a lack of organization and dysfunctional mechanisms for managing communal resources (ejido and communal assemblies) lead to projects cut short, poor management of economic resources and over-exploitation of forestry resources, among others, and as such it is necessary to foster and strengthen community organization to achieve the objectives of any program.
- **Infrastructure, growth of urban areas.** Developing road and communications infrastructure in itself results in a process of deforestation; however, it is much more significant that said development triggers processes of deforestation and forest degradation in the areas that the infrastructure runs through, as it facilitates access to previously inaccessible natural resources. Moreover, urban areas have experienced considerable growth, which on the whole is not planned to ensure the provision of environmental goods and services from neighboring ecosystems.
- **Causes associated with land governance.** The dismantling of community organization, dysfunctional aspects of the mechanisms for managing communal resources (ejido and common holder assemblies), lack of compliance with existing legislation, lack of co-ordination mechanisms between sectors, weakness of inter-gubernatorial co-ordination mechanisms, a civil society that is poorly organized and lacking a participatory attitude, along with a lack of institutional capabilities to promote development, all lead to varying degrees of deforestation and forest degradation.

The following table shows the dynamics of deforestation and forest degradation, and the indirect causes leading to it:

Table 12 Dynamics and underlying causes of forest degradation and deforestation in the state of Jalisco.

Dynamic	Region	Socioeconomic factors	Institutional and governance factors
Degradation of forest areas from extensive cattle farming	Sierra Occidental y Costa Ayuquila Lower River Basin Coahuayana River Basin Costa Sur Ayuquila Upper River Basin	• High price of meat. • Perception of wealth through cattle ownership. • Lack of forestry culture creates poor grazing management practices. • Higher short-term profitability than forest cultivation. • Lack of forestry management instruments for the production of forage resources. • Leasing of pastures by owners without livestock. • Lack of economic alternatives for owners of tropical forests who do not keep livestock. • Sale to cattle farmers of communal usage rights held by ejidos.	• Government incentives to livestock farming through subsidies. • Program to repopulate cattle herds. • Lack of help and empowerment to implement good livestock management practices. • Livestock associations efficient in managing subsidies and in developing their activity. • Dismantling of public programs fostering livestock farming and forestry development. • Dismantling of public programs fostering livestock farming and forestry development. • Deficient organization within ejido communities. • Tropical forest being parceled within ejido communities. • Deficient internal organization of ejido and other communities, and lack of rules on the use of communal areas.
Deforestation of forest and tropical forest areas to establish pasture for livestock grazing	Sierra Occidental y Costa Ayuquila Lower River Basin Coahuayana River Basin Costa Sur Ayuquila Upper River Basin	• High price of meat • Lack of alternative production options for owners of oak forests and lowland tropical forestland. • Higher value of tropical forests and deciduous oak forests as forage than for timber-based products. • Higher short-term profitability. • Lack of funding schemes for more sustainable production systems. • Lack of revenue for producers without livestock. • Sale of land by producers without livestock to cattle farmers.	• Government incentives for cattle farming through subsidies not suited to agro-ecological conditions. • Lack of technical assistance to establish more sustainable production systems. • Livestock associations efficient in managing subsidies and in developing their activity. • Dismantling of public programs fostering livestock farming and forestry development.
Deforestation by clearing areas for growing agave	Ayuquila Lower River Basin Coahuayana River Basin Ayuquila Upper River Basin	• Higher profitability and revenues than exploiting lowland tropical forests and traditional crops (maize). • Increased demand for raw material for tequila production. • Increased tequila exports.	• High market value of products and by-products. • Commercial and export agreements on products with various countries, which has created great demand for these products. • Government incentives to grow agave.
Deforestation by clearing areas for growing avocado	Coahuayana River Basin Sierra Occidental y Costa	• Higher profitability and revenues than exploiting forests for timber and traditional crops (maize). • High price of avocado. • Increased demand for avocado for export. • Sale of parcels and ejido community rights to people from outside the communities.	• Government incentives to grow avocado (2015 Year of the Avocado in Jalisco). • Lack of institutional capabilities to protect land-use change.
Deforestation by clearing areas for growing hillside crops	Sierra Occidental y Costa Ayuquila Lower River Basin Coahuayana River Basin Costa Sur	• Marginalization and poverty. • Lack of production options. • Campesino culture.	• Dismantling of government programs in the poorest communities to break the poverty cycle.
Degradation due to the extraction of timber and non-timber elements for own use	Sierra Occidental y Costa Ayuquila Lower River Basin Coahuayana River Basin Costa Sur	• Lack of job opportunities and production alternatives. • Demand for poles and timber for housing.	• Programs to improve housing insufficient. • Programs to combat poverty focused on reducing the gap in infrastructure and services, and not on generating income. • Lack of public support for housing.

Dynamic	Region	Socioeconomic factors	Institutional and governance factors
Degradation of forest areas from illegal extraction of timber and non-timber products for the market	Sierra Occidental y Costa Ayuquila Lower River Basin Coahuayana River Basin	• High transaction costs for legal timber trade. • Demand from local saw mills to use illegal timber. • Low timber prices due to imports. • Difficulty in accessing credit. • Demand for regional products, which has led to uncontrolled extraction of resources (chiltle and raicilla). • Demand for poles for fencing due to growth in cattle farming.	• Lack of capabilities by public departments for forestry protection. • Lack of local government capabilities to foster legal wood trade. • Deficient internal organization of ejido and other communities. • Increase in organized crime. • Lack of institutional capabilities of regional forestry organizations.
Degradation due to the extraction of timber through forestry management schemes	Sierra Occidental y Costa Ayuquila Lower River Basin Coahuayana River Basin Costa Sur	• Inappropriate management practices. • Inadequate forestry systems. • Over-exploitation of resources. • Lack of forestry culture. • Low access to financing for technification and industrial modernization. • High production costs.	• Corruption in the processes involved in authorizing forestry permits. • Lack of institutional capabilities of regional forestry organizations. • Deficient internal organization of ejido and other communities.
Degradation due to forest fires	Sierra Occidental y Costa Ayuquila Lower River Basin Coahuayana River Basin Costa Sur	• Lack of production options that lead to clandestine burning to prepare for legal or illegal crops or to encourage pastures to re-sprout for cattle to graze. • Non-resident owners and isolation of land leading to poor use of resources. • Lack of care by people passing through or tourists.	• Inadequate schemes regarding campaigns to prevent and combat fires. • Lack of institutional offerings in terms of agricultural and livestock development to discourage the use of fire.
Deforestation and forest degradation to establish human settlements and infrastructure	Sierra Occidental y Costa Ayuquila Lower River Basin Coahuayana River Basin Costa Sur	• Need for housing due to growing development of tourism on the coast. • Need for transport links to carry goods or to access new communities or tourist developments. • Improve channels of communication to encourage trade activities and tourism, particularly near the coast.	• Greater weight and value given to tangible material goods and of economic development and production, than to products and services of forests and tropical forests, and for the conservation of natural resources.

4.1.4 State of Chiapas

Dynamic of deforestation and forest degradation in Chiapas

Table 13 summarizes the extent of deforestation and forest degradation over the period from 1993 to 2012. Although it can be observed that deforestation has fallen notably in recent years, the rates are notably high, compared with the levels in other states. There is also a strong process of primary forest cover degradation. Table 14 shows the deforested surface area by type of vegetation (which have been grouped into categories to help with their description and to capture the details of the dynamics of deforestation and forest degradation as described in this section.

Table 13 Deforested and degraded surface area in the state of Chiapas from 1993 to 2012.

			Deforestation	Degradation
Series II to III (1993-2002)	Total	ha	587,557	512,955
	Yearly	ha/year	65,284	56,995
Series III to IV (2002-2007)	Total	ha	329,700	78,641
	Yearly	ha/year	65,940	15,728
Series IV to V (2007-2012)	Total	ha	74,519	7,980
	Yearly	ha/year	18,630	1,995

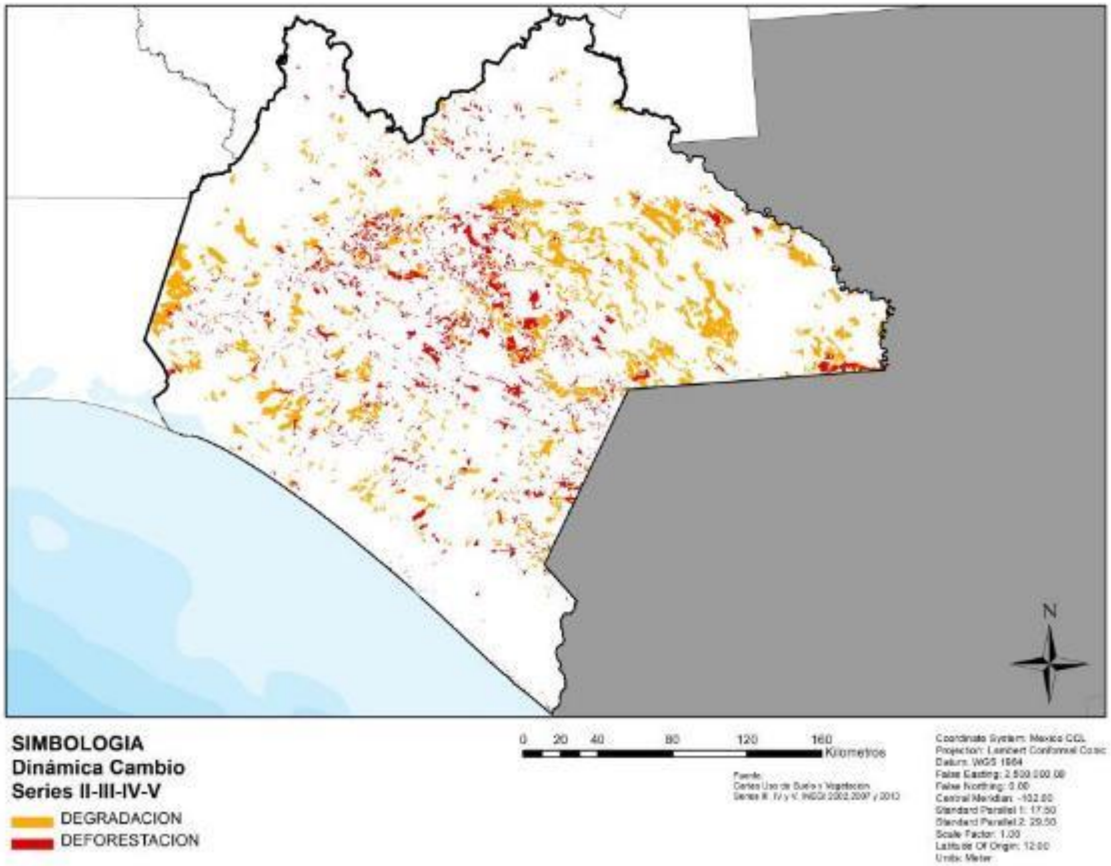

Figure 5 Changing dynamic of forest cover in the state of Chiapas from 1994 to 2012

Table 14 Deforested surface area by vegetation type in the state of Chiapas[31]

Chiapas	Series II to III	Series III to IV	Series IV to V	Total
Coniferous forest	119,543	49,020	7,339	175,902
Oak forest	48,449	23,040	5,826	77,315
Mesophilic mountain forest	39,443	25,764	7,455	72,662
Deciduous tropical forest	156,292	54,691	3,192	214,175
Evergreen tropical forest	195,455	172,941	46,836	415,232
Semi-deciduous tropical forest	19,465	3,562	1,327	24,354
Other woody types	8,910	682	2,544	12,136
Total	587,557	329,700	74,519	991,776

The main driving force behind deforestation in the period from 1993 to 2002 is the transformation of forest areas into grazing land for cattle (701,776 ha), followed by transformation into farmland (279,768 ha). There has been transformation into urban areas, but this is a small fraction in comparison with the other activities.

[31] Section 8.3.1 includes the vegetation groups that form part of the Forest Land category of the IPCC (used in the BUR) and the types of vegetation of the INEGI Charter on the Use of Soil and Vegetation.

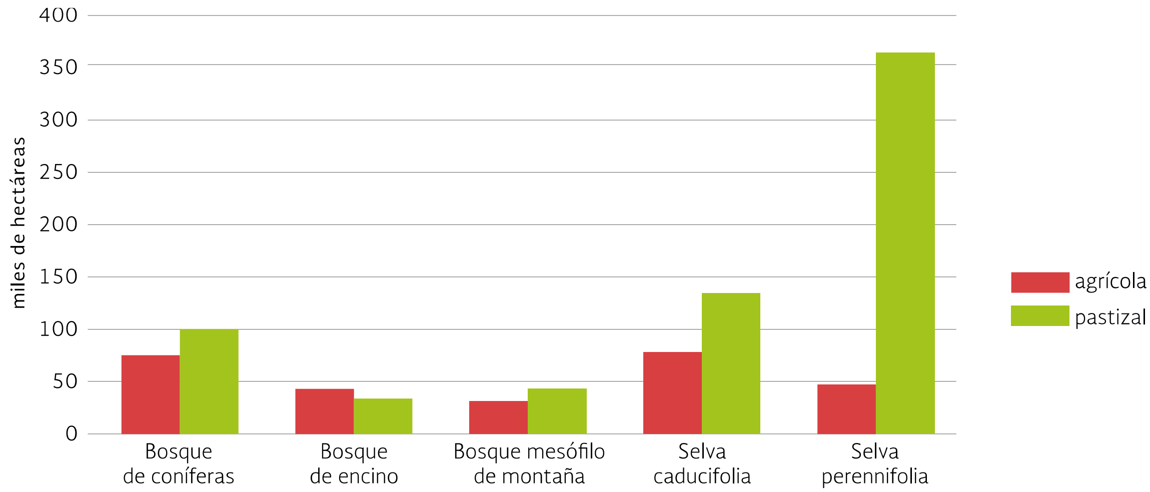

Figure 6 Change in forest cover to agricultural and livestock uses in the area concerned in the period from 1993 to 2012 in the state of Chiapas.

Causes of deforestation and forest degradation in Chiapas

In the state of Chiapas, there is considerable diversity of conditions in terms of ecosystems and in social terms; however, the clearing of forest areas to create grazing land has spread across large surface areas throughout the region. The vegetation types that suffered most from deforestation in the state are secondary evergreen tropical forests, followed by secondary deciduous tropical forests, secondary conifer forests, primary tropical forests and secondary mesophilic forests (de Jong et al., 2012).

The forest types that suffered most from degradation were conifer forests, followed by evergreen tropical forest and mesophilic forests (de Jong et al., 2012). Furthermore, the direct causes of deforestation and forest degradation in the state (Paz et al., 2012; GAIA, 2013, Castillo et al., 2010).

The state of Chiapas has great cultural diversity and a very broad ecosystem, so the dynamics through which deforestation and degradation occur are also diverse, and generally down to several causes (Covealeda et al., 2014).

The main driving forces behind deforestation in the state are as follows:

- **Hillside and traditional agriculture** Deforestation due to agriculture in the state is related to the objective of food security and cash flow in the case of maize, flower-growing and vegetable crops. Maize crops have recently been threatened by low yields, a plague attack, high costs of supplies and low price obtained for the maize when sold. Despite this, most producers continue to farm their parcel of maize, due its basic function of providing family food and the existence of a strong traditional culture of growing this crop. One dynamic that is common is the division of land by ejidos to their children to set up homes and land to farm, leading to areas of tall grassland areas being cleared (having first extracted firewood and timber). The government programs with most influence in this dynamic have been the direct rural support program PROCAMPO and "Maíz solidario" (Rural Secretariat), which provide chemical supplies or cash for fertilizers and pesticides, although access to these programs is restricted to those who can prove tenure of the land.
- **Cash-crop farming**. Plantations of African oil palm (*Elaeis guineensis*), which is one of the crops that has spread since the 1980s, both in the coastal plains and Soconusco areas, and in the Lacandona Jungle, has become the main cause of deforestation due to agriculture in these regions. Additionally, increased forage demand for milk production has incentivized the production of maize as cattle feed, particularly in the coastal plains.
- **Extensive grazing on rough grazing land and induced pastures.** Deforestation due to cattle farming is the main dynamic of land use change detected in the regions of the Lacandona Jungle and the Sierra Madre. This dynamic is related to cash flow and savings objectives among producers in the regions. In the Lacandona Jungle region, the dynamic is associated as part of the process of the region's colonization, during which wood was extracted for sale and livestock was introduced to justify use of the land. Additionally, the reigning environmental conditions (warm climate, large flat areas and ready availability of water) helped to strengthen this activity, which has also been supported by government programs, particularly The Sustainable Livestock Production and Cattle and Beekeeping Planning Program (PROGAN).

In the Sierra Madre, deforestation for reasons of cattle farming was detected mainly in the lowland areas (central depression and coastal plain), where there are large stretches of land used by extensive cattle farms, producers' organizations, and the possibility of accessing markets and government programs (PROGAN, basically) (Covaleda et al., 2014).

The main causes of forest degradation in the state are:

- **Illegal extraction of timber and firewood.** Forest degradation due to timber extraction is a widespread dynamic across several regions in the state and is related to the objective of cash flow and capitalization (market) (Covaleda et al., 2014).
  Public policies do not enable a controlled extraction of precious woods and in some places, generally outside Protected Nature Areas, protection by the authorities (PROFEPA) is lacking. Furthermore, in some ejido communities the matter of wood extraction has been regulated. This situation favors the existence of traffickers who buy precious woods obtained using clandestine methods at low prices.
  An additional problem, observed in the 1990s, when attempting to promote forestry management practices in tropical forest areas in Marqués de Comillas (Comparán, 1997), was the lack of a market for many tropical wood species, which meant that extraction focused mainly on a small group of species considered valuable which, once depleted, rendered the forests worthless (Castillo, 2007). Furthermore, not all timber extraction is for commercial purposes, as wood is also extracted by inhabitants in some areas for use in carpentry or building houses, although in this case they tend to use species with less commercial value.
  The use of wood as fuel for cooking and heating is a deeply rooted custom in rural areas of the state. Firewood extraction is related to forest degradation only when high population density exerts strong pressure on a scarce resource. Furthermore, the fact that gas is not used to heat homes and LP gas prices are rising, and given the limitations of its distribution network, which does not reach many communities, firewood is preferred as a fuel as it can also be bought in small amounts, which means there is no need to spend large sums to acquire it.
- **Degradation of shade coffee varieties.** The good prices fetched for coffee in recent years, combined with the existence of producers' organizations in the area, pre-existing channels through which to sell the product and the support provided by government program, created ideal conditions for producers to take an interest in coffee or to increase the surface area of their production to the detriment of areas covered by mesophilic mountain forest. Furthermore, the presence of coffee leaf rust in recent years has produced a drastic fall in productivity, leading to coffee plantations expanding into forest areas. Additionally, the use of varieties resistant to coffee leaf rust but intolerant of shade is leading to a drop in tree canopy cover, causing deforestation.
  In the tropical forest, producers indicate that between 2000 and 2005 coffee production fell, coffee plantations were abandoned and some were turned into pastures. This change was brought about by the fall in the price of coffee. However, from 2005, the price improved and this led to some coffee plantations being restored and some producers opening up new parcels of coffee.

The following table shows the main factors behind the dynamics in land use change:

Table 15 Dynamics of deforestation and forest degradation in the state of Chiapas.

Dynamic	Region	Socioeconomic factors	Institutional and governance factors
Deforestation due to livestock (upper part)	Frailesca Zoque-Mezcalapa Istmo-Costa	• A culture of saving through cattle ownership (occasionally by investing the money received from relatives who have emigrated).	• Lack of access to other forms of saving. • Lack of access to technical assistance to implement more sustainable management practices (outside the work of NGOs). • Government program that incentivize cattle farming (PROGAN, municipal support). Without technical supervision, these programs help to incorporate cattle even if the physical characteristics are in place to do so.
Deforestation due to livestock (lower part)	Frailesca Zoque-Mezcalapa Istmo-Costa Lacandona	• Regional cattle-farming culture. • A culture of saving through cattle ownership. • Bad cattle-farming practices cause grazing land to degrade due to compaction and erosion. • Good aptitude for cattle farming in the area.	• Existence of market to sell products. • Higher profitability than growing maize. • Difficult access to other forms of saving and funding for agricultural activities. • Lack of access to technical assistance to implement more sustainable management practices (outside the work of NGOs). • Government programs that incentivize cattle farming (PROGAN, municipal support).

Dynamic	Region	Socioeconomic factors	Institutional and governance factors
Deforestation due to agriculture (African oil palm)	Istmo-Costa Lacandona	• Economic motivation. • Good crop price. • Possibility of acquiring land at low prices. • When African oil palm was incentivized, cattle prices were low.	• Regional presence of palm oil extraction companies (purchasing product and technical assistance) • No Protected Nature Area in the region • Existence of support from the state-government-run Institute of Productive Reconversion and Bioenergetics (IRBIO) to establish the crop: support for planting • Support from the IRBIO for processing companies • Aid through the Humid Tropic program of the SAGARPA. • The State Fund for Agricultural and Agro-industrial Commercial Development (FEDCAA) participates with a liquid and fiduciary guarantee to back financing: credit for supply packages.
Forest degradation from shade coffee plantations	Frailesca Zoque-Mezcalapa Istmo-Costa	• Regional coffee-growing culture, production system known in the region. • Suitable Agro-ecological conditions for coffee: grown in the shade under mesophilic forest cover.	• Good coffee prices on the market in recent years. • Existence of sales channels already established. • At the federal level: PROCAFE and SAGARPA programs. • State public policy support for coffee: COMCAFE, COOPCAFE • Support from municipalities (seedlings and fertilizer).
Degradation due to illegal timber extraction	Frailesca Zoque-Mezcalapa Istmo-Costa Lacandona	• Lack of internal regulations in some ejido and other communities on tree extraction in forest areas, although regulations do exist in nature reserve areas (El Triunfo and Pico El Loro-Paxtal). • Local housing built using timber.	• Roads built/improved, facilitating access to forest areas that were previously hard to access. • No forestry management plans approved by SEMARNAT in place.
Degradation due to extensive cattle farming		• High price of meat. • Perception of wealth through cattle ownership. • Lack of forestry culture creates poor grazing management practices. • Higher short-term profitability than forest cultivation. • Lack of forestry management instruments for the production of forage resources. • Lack of economic alternatives for owners of tropical forests who do not keep livestock.	• Government incentives to livestock farming through subsidies, such as the program to repopulate cattle herds. • Lack of help and empowerment to implement good livestock management practices. • Livestock associations efficient in managing subsidies and in developing their activity. • Dismantling of public programs fostering livestock farming and forestry development. • Dismantling of public programs fostering livestock farming and forestry development. • Deficient internal organization of ejido and other communities, and lack of rules on the use of communal areas.
Degradation due to the extraction of firewood	Frailesca Zoque-Mezcalapa Istmo-Costa Lacandona	• Uses and customs: use of firewood as fuel in the home.	• Price of LP gas with regard to firewood. • Shortage of support for public policies aimed at establishing and managing dendroenergy plantations in priority areas, wood-saving stoves, etc.
Degradation due to forest fires	Frailesca Zoque-Mezcalapa Istmo-Costa Lacandona	• Use of fire as a tool for maintaining agricultural areas. • Use of fire as a way to help clandestine hunting of species such as iguana and turtles.	• Lack of community organization to control fire in agricultural and livestock activities. • Shortage of institutional capability to promote integral fire management actions.

4.1.5 Yucatán Peninsula

Dynamic of deforestation and forest degradation in the states of Yucatán Peninsula

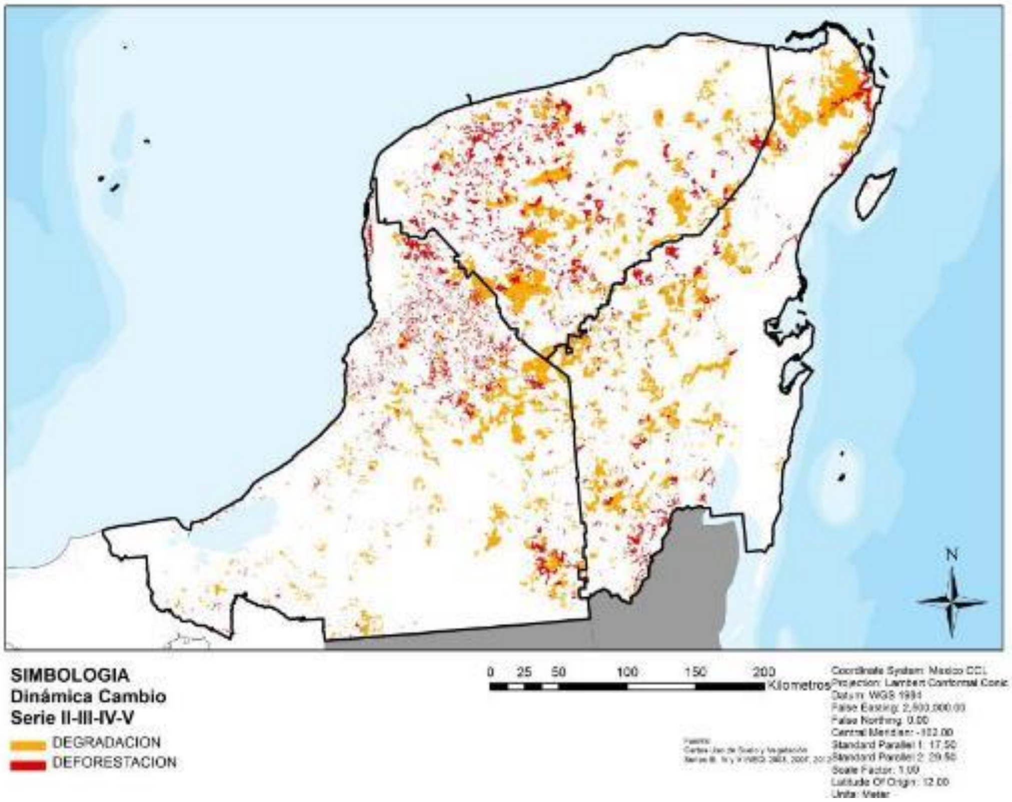

Figure 7 Changing dynamic of forest cover in Yucatán Peninsula from 1994 to 2012

The three states in Yucatán Peninsula (Campeche, Quintana Roo and Yucatán) share certain similar ecological and social characteristics, which enable certain dynamics to be analyzed jointly, and as such they are presented as a whole; however, it is also important to state that substantial differences to exist.

In Yucatán Peninsula, most of the natural forest is tropical (mainly mid-height and lowland, with very few areas of mountain forest) and parts of this area are tall grassland (secondary or replacement forest, which forms part of a long rotation of the milpa crop-growing system).

There are currently different estimations of the assessment of deforestation rates due to the different definitions of forest, methods, time periods studied and scales of analysis (Rueda, 2010), and most studies focus on the loss and partial recovery of forest cover, paying particular attention to the regions in the center and south of the Peninsula (Turner et al., 2004; Bray and Klepeis, 2005; Vester et al., 2007; Ellis and Porter-Bolland, 2008), probably related to the fact that this part of the Peninsula is designated a biological corridor.

For the period from 1993 to 2002, the predominant process in Campeche is one of deforestation, whereas in Quintana Roo it is degradation of evergreen tropical forest; in contrast, the state of Yucatán recorded similar rates of deforestation and degradation. For the two following periods, the state of Campeche continued with significant deforestation, predominantly for conversion to cattle farming. In the first two periods, the state of Quintana Roo recorded a higher rate of degradation than deforestation; one important difference in the state is that between 2002 and 2007 there was a major trend of change to human settlements and infrastructure, which was an important factor in deforestation. The state of Yucatán has shown a clear and growing trend in the rate of deforestation. Tables 16, 17, 18, and 19 show the deforested surface area in each state by vegetation type (grouped into categories for ease of description and to capture details of the dynamics of deforestation and forest degradation as described in this section.

Table 16 Deforested and degraded surface area in the Yucatán Peninsula from 1993 to 2012.

	Campeche		Quintana Roo		Yucatán	
	Defor,	Degra,	Defor,	Degra,	Defor,	Degra,

Series II to III (1993-2002)	ha	325,271	241,282	101,269	275,005	241,259	254,808
	ha/year	36,141	26,809	11,252	30,556	26,807	28,312
Series III to IV (2002-2007)	ha	223,711	58,901	96,093	167,650	163,858	109,063
	ha/year	44,742	11,780	19,219	33,530	32,772	21,813
Series IV to V (2007-2012)	ha	117,098	56,534	76,764	44,948	148,089	36,889
	ha/year	29,275	14,134	19,191	11,237	37,022	9,222

Table 17 Deforested surface area by vegetation type in the state of Chiapas (ha).[32]

Campeche				
Deciduous tropical forest	36,266	23,673	9,772	69,711
Evergreen tropical forest	222,460	146,982	71,778	441,220
Semi-deciduous tropical forest	51,755	37,680	31,013	120,448
Other woody types	14,790	15,376	4,535	34,701
Total	325,271	223,711	117,098	666,080

Table 18 Deforested surface area by vegetation type in the state of Quintana Roo (ha)[33]

Quintana Roo				
Deciduous tropical forest	403	54		457
Evergreen tropical forest	87,036	83,765	62,303	233,104
Semi-deciduous tropical forest	3,521	9,381	11,440	24,342
Other woody types	10,309	2,893	3,021	16,223
Total	101,269	96,093	76,764	274,126

Table 19 Deforested surface area by vegetation type in the state of Yucatán (ha).[34]

Yucatán				
Deciduous tropical forest	108,736	61,928	43,759	214,423
Evergreen tropical forest	2,743	4,275	1,586	8,604
Semi-deciduous tropical forest	124,915	92,706	101,387	319,008
Other woody types	4,865	4,949	1,357	11,171
Total	241,259	163,858	148,089	553,206

[32] Section 8.3.1 includes the vegetation groups that form part of the Forest Land category of the IPCC (used in the BUR) and the types of vegetation of the INEGI Charter on the Use of Soil and Vegetation.
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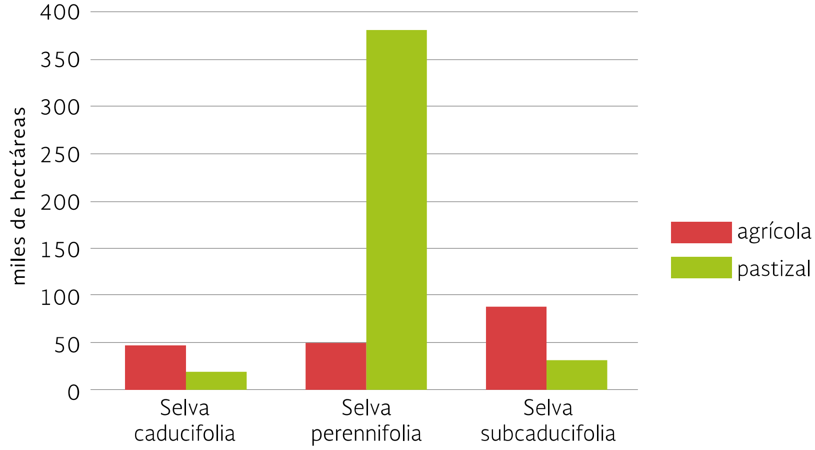

Figure 8 Change in forest cover to agricultural and livestock uses in the area concerned from 1993 to 2012 in the state of Campeche.

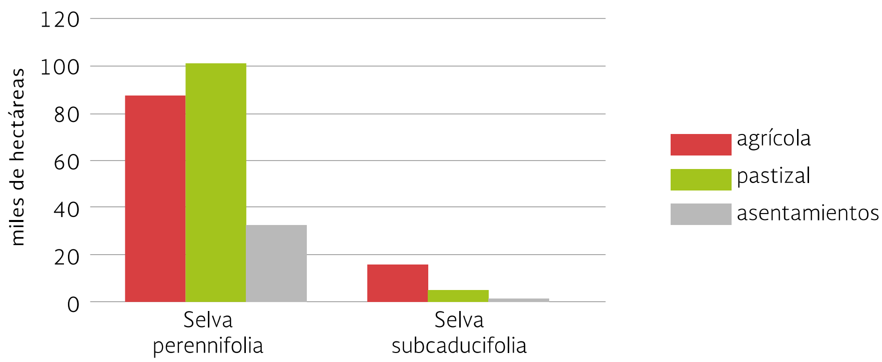

Figure 9 Change in forest cover to agricultural and livestock uses in the area concerned from 1993 to 2012 in the state of Quintana Roo.

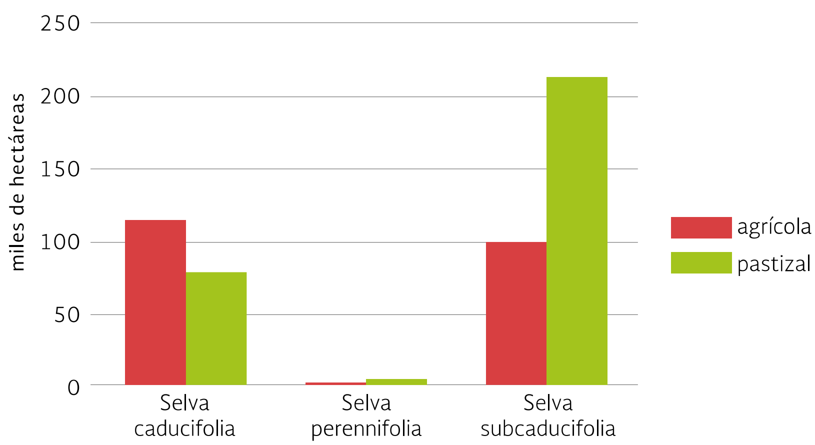

Figure 10 Change in forest cover to agricultural and livestock uses in the area concerned from 1993 to 2012 in the state of Yucatán.

Causes of deforestation in the Yucatán Peninsula

There are a great many driving forces or causes behind deforestation and forest degradation in Yucatán Peninsula (Balderas et al., 2015; Ellis et al., 2015). In general, for the three states in the region, the causes or determining factors for deforestation have been identified as the following:

- **Cash-crop, irrigated and slash-and-burn agriculture.** Agriculture is one of the most important causes of deforestation in the Peninsula. Extensive deforestation carried out in the area in the 1970s and 1980s, and which continues to this day, was due in large part to the policy of the government at the time, which was strongly aimed at clearing areas to promote large-scale agriculture (Ellis et al., 2015), a process that was particularly significant in Campeche and Quintana Roo. In the southern region of Quintana Roo, sugar cane is a direct and substantial cause of deforestation (Calmé et al., 2011). Another important dynamic is the presence of Mennonite communities in the region. Since the late 1970s and early 1980s, Mennonite camps were created that have become large forest areas in areas for market-based mechanized agriculture to achieve high maize yields (Skutsch et al., 2015); in some case they have bought the rights of a significant part of communal land in some ejidos (Ellis and Porter-Bolland, 2008); this dynamic has been recorded mainly in Campeche and Quintana Roo. Production in the Yucatán Peninsula is focused on the beef, poultry and pork industry. Large parts of the land used by Mennonite communities in the Peninsula have been leased to common holder communities. However, following the 1992 reform, several such communities became smallholdings, which has enabled these groups to purchase land. (Balderas, et al, 2015).

  Traditional farming is deeply embedded in the culture of Yucatán Peninsula and has a tendency to become increasingly sedentary, leading to a permanent change in forest cover (Ellis, 2015); agriculture of this kind is due more to a need for subsistence than to market demand. The main crop farmed is still maize. This crop has recorded a loss in terms of dynamics, as fewer and fewer hectares are being sown, and a large proportion of those that are kept are subsidized by the government (Romero-Montero, 2014), leading to a certain level of pressure being maintained on forest ecosystems.
- **Extensive grazing on grazing land and induced pastures.** Conversion from forest to pasture to raise cattle is the main driving force behind land use change in recent decades in the Yucatán Peninsula (Villalobos and Mendoza, 2010; Ellis et al., 2015). There are significant shortcomings in how bovine and ovine products are sold, as there are no established chains of value and producers often sell directly on site.

  The central area of the Peninsula is characterized by the importance of its biological corridors and buffer areas between the biosphere reserves of Sian Kaan and Calakmul. The main land use change to pastures has occurred in the municipalities of José María Morelos and Bacalar in Quintana Roo, Peto and Chemax in Yucatán, and Hopelchen and Calakmul in Campeche (Díaz Gallegos, et al, 2008). It is important to state that in many areas of the Peninsula there is a predominance of small-scale cattle rearing, with a significant increase in recent years (Radel, et al, 2010); however, converting tropical forest to pasture occurs without necessarily counting the number of heads of cattle in those areas (Balderas, et al, 2015), but rather as a measure prior to buying the cattle or as an investment for the future.
- **Increase of urban sprawl and tourism.** Urbanization is an important driving force behind deforestation in the Peninsula and is linked to tourism-related economic growth in the region. Urban growth in several areas (such as around Cancún and Mérida) has modified the landscape, leading to the original habitat being lost by roads being built and population centers being established for people who have found jobs in tourist areas (Calmé et al., 2011; Ellis et al., 2015).

  The Peninsula has some of the country's important tourist destinations, which has led to the north coast of the state of Quintana Roo above all experiencing a loss of coastal dunes, mangroves, tropical forests and biodiversity in general. The recent growth in tourist development on the south coast of Quintana Roo poses the risk of a new front of deforestation if preventive measures are not taken (Hirales-Cota et al., 2010).

  Combined with the changes in land use and their consequences, tourist activity has had a significant impact on the dynamic of rural (and particularly Mayan) population, by fostering migration to urban centers, leading to land being abandoned, among other effects.
- **Illegal extraction of wood and other natural resources.** Regulation is a barrier to incorporating small areas into formal management, and the administrative transaction and permit costs account for a large percentage of the expected revenue from forestry production. (Ellis, et al, 2015). Most of the authorized volume is not sold, as it cannot find a market due to the fact that sawmills have not evolved or integrated into the timber industry (they still concentrate on selling boards to local carpenters). However, this has not managed to prevent illegal felling from taking place.

In general, for the three states in the region, the causes or determining factors for deforestation have been identified as the following (Balderas et al., 2015):

- **Conversion to subsistence-based farmland**. In most of Yucatán Peninsula there is widespread subsistence farming based on the milpa crop-growing system, which involves a long cycle in which an area is stripped and burned before being used to grow maize, beans, squash and other crops for a period of two or three years; later, the area is left for a number of years to allow the vegetation to grow back. For this reason, the landscape is made up of occasional areas of crops spread out in large areas of grassland in various stages of development.

- **Illegal extraction of firewood.** Combined with this, the energy needs of the population mean that in some areas extracting firewood is a significant cause of forest degradation. In marginal and isolated areas, firewood is the main fuel used for cooking and heating water; in poor regions around urban areas, they do generally also have the option of using LP gas for cooking, but it depends on the economic conditions. Therefore, demand for this resource depends on the distance to urban centers, the extent to which better cookers and heaters are used, and the economic conditions of the homes in these areas (Balderas et al., 2015). Most pressure is felt in Yucatán, due to the smaller size of the agricultural population centers. In Campeche and Quintana Roo, there is less pressure due to the significant forest stand and larger areas of commonly held land.
- **Hurricanes and forest fires.** Hurricanes are a frequent and often severe occurrence in Yucatán Peninsula. The frequent impact of hurricanes directly affects wooded areas because after a hurricane the biomass of dead and highly combustible vegetation increases, with high risks of forest fires; additionally, the forest affected by a hurricane is often thought of as an unproductive system, which increases the risk of a land use change (Calmé et al., 2011; Mascorro et al., 2014). Between 2005 and 2010, a total of 12 hurricanes were reported that have had significant effects on the general pattern of deforestation in the Peninsula (Mascorro et al., 2014).
- **Charcoal production.** As with other wood products, the commercial production and transport of charcoal requires an approved management plan. Obtaining a permit of this kind is complicated, as it requires the internal co-operation of the charcoal producers within the ejido community area and an extensive administrative process. As a result, many people produce charcoal illegally, using trees cut down each year for the milpa crop-growing system on their own land, renting forest resources (grassland) from other owners or simply by using the forest resources available in areas that appear to have been abandoned. Demand for this product comes chiefly from urban areas in the peninsula and other more distant urban centers, such as Mexico City, Monterrey and Guadalajara. In these areas, charcoal is sold under the brand names of intermediaries and large-scale buyers (Balderas et al., 2015).

The following indirect or underlying factors or causes behind deforestation and forest degradation in Yucatán Peninsula were identified (Ellis et al., 2015; Balderas et al., 2015).

- **Economic causes**. High prices for agricultural and livestock products, increased demand from national markets for agricultural and livestock products, land being taken over, property speculation and tourism-led development.
- **Institutional and political causes**. Lack of co-ordination between government rural development programs (credits and subsidies for agriculture and livestock between the different sectors), corruption, prominence given to infrastructure projects and the lack of local standards for forest management and conservation.
- **Social factors**. Population growth, poverty, lack of investment and competitiveness in the forestry sector, unemployment (revenue outside of forestland), migration and job opportunity costs, the availability of land (privatization and division), proximity to towns or villages and roads being built, sale of land to Mennonites and modernized farming methods.

  Other problems are related to the internal organization of communities for timber extraction. In some ejido areas, the forest is still commonly held land. In others, the forest is divided in such a way that each ejido owns a specific part of the forest; this means that people can receive large profits one year and then nothing for many years after (Balderas et al., 2015). Additionally, within ejido assemblies it has been hard to create and develop community forestry businesses due to changes in local authorities and because of the process involved in making decisions. These are often subject to local and regional political interests, leaving the technical aspects by the wayside. Another fundamental problem is that the management style under the common land structure does not save resources to be reinvested in other assets, as traditionally all revenues are shared among the ejidos, particularly in communities with small forest resources.
- **Land tenure and governance.** Land tenure is one of the institutional factors that have had an influence on deforestation processes. Rights holder communities with collective ownership and small areas with individual rights have experienced less deforestation compared with communities where the land is either fully or partially divided into parcels.

  Privatization, albeit of an informal kind, has provided new opportunities for greater capital investment in individual exports and a diversification of production that includes livestock, vegetable crops and agro-forestry. More privatized ejido communities experienced higher levels of deforestation, whereas communities with more collective property can be more effective in the conservation of areas of tropical forest (Digian et al., 2013). Furthermore, when communities have working rules for managing forest areas, the presence of developed infrastructure, demographic growth, agricultural expansion and development programs do not lead to a higher rate of deforestation (Ellis and Porter Bolland, 2008).

Table 20 Dynamics and underlying causes of forest degradation and deforestation in specific regions in Yucatán Peninsula.

Dynamic	Location	Socioeconomic factors	Institutional and governance factors
Forest degradation and deforestation due to subsistence farming	Solidaridad, Quintana Roo North West, Yucatán Benito Juárez, Quintana Roo South, Yucatán Felipe Carrillo Puerto, Quintana Roo	• Demographic growth and marginalization. • Marginalization and poverty. • Lack of production options. • Campesino culture.	• Dismantling of government programs in the poorest communities to break the poverty cycle.
Forest degradation due to mechanized agriculture	Hopelchén and Campeche, Camp. Bacalar, Quintana Roo	• Migration and markets.	• Influence of government programs.
Degradation due to deficient forestry management	Othon P. Blanco, José María Morelos, Felipe Carrillo Puerto, Quintana Roo	Lack of technical control over production processes. Dependency on private firms for forestry activities	Deficient internal organization.
Degradation due to charcoal production	Oriente, Yucatán	• High transaction costs for legal timber trade. • Demand for charcoal in urban areas.	• Lack of capabilities by public departments for forestry protection. • Lack of local government capabilities to foster legal wood trade. • Deficient internal organization of ejido and other communities.
Deforestation and forest degradation to establish human settlements and infrastructure	Progreso, Yucatán Mérida, Yucatán Campeche, Campeche	• Demographic and economic growth. • Need for housing due to growing development of tourism on the coast. • Need for access roads.	• Lack of capabilities by public departments in planning urban growth.
Deforestation and forest degradation to establish grazing land.	Noreste, Yucatán Lázaro Cárdenas, Quintana Roo Poniente, Yucatán Candelaria and Escárcega, Camp Othón P. Blanco, Quintana Roo	• High demand for meat in urban areas. • Lack of alternative production options for owners of tropical forestland. • Migration.	• Agricultural and livestock programs by the government to encourage cattle farming. • Lack of technical assistance to establish more sustainable production systems. • Existence of organized producers or rentier companies.
Degradation due to hurricanes and fires	Benito Juárez and Lázaro Cárdenas, Quintana Roo Mérida, Yucatán Center, Yucatán Solidaridad, North West Quintana Roo, Yucatán José María Morelos, Quintana Roo	• Human activity and land use change.	• Authorization to use material brought down by hurricanes in general takes a long time to be given. • Lack of protection.
Tourism	Cozumel, Quintana Roo Holbox, Quintana Roo Isla Mujeres, Quintana Roo Benito Juárez and Solidaridad, Quintana Roo Tulum, Quintana Roo	• Tourist development and demographic growth.	• Greater weight and value given to tangible material goods and of economic development and production, than to products and services of forests and tropical forests, and for the conservation of natural resources.

4.2. Assessment of main barriers for REDD+

Please describe the major barriers that are preventing the drivers from being addressed, and/or preventing conservation and Carbon Stock enhancement from occurring. Draw on the analysis produced for the ER-PIN and the country's Readiness Package (R-Package).

As explained in the previous section, deforestation and forest degradation are complex and multifaceted phenomena, particularly considering that in Mexico forests are in landscapes with multiple types of land use. Most forestland property (commonly held land, communities and smallholdings) has a multiple variety of land uses (forestry, agricultural, livestock, urban).

In these areas, deforestation and forest degradation can be explained in general terms by the existence of activities with higher immediate profitability than can be obtained by ensuring that ecosystems are maintained (which includes sustainable use). In particular, this means cattle farming and agriculture, the products from which have a high commercial value, are positioned as more profitable activities that forestry use, particularly in forestry ecosystems where the current market value is low, such as deciduous and semi-deciduous tropical forests, and oak forests, leading to strong pressure being exerted on forest areas. Furthermore, agriculture and livestock farming are often undertaken by means of practices that are not very sustainable or using unsuitable management practices that lead to deforestation and forest degradation, and which are often eligible for subsidies, thus increasing their profitability (figure 11).

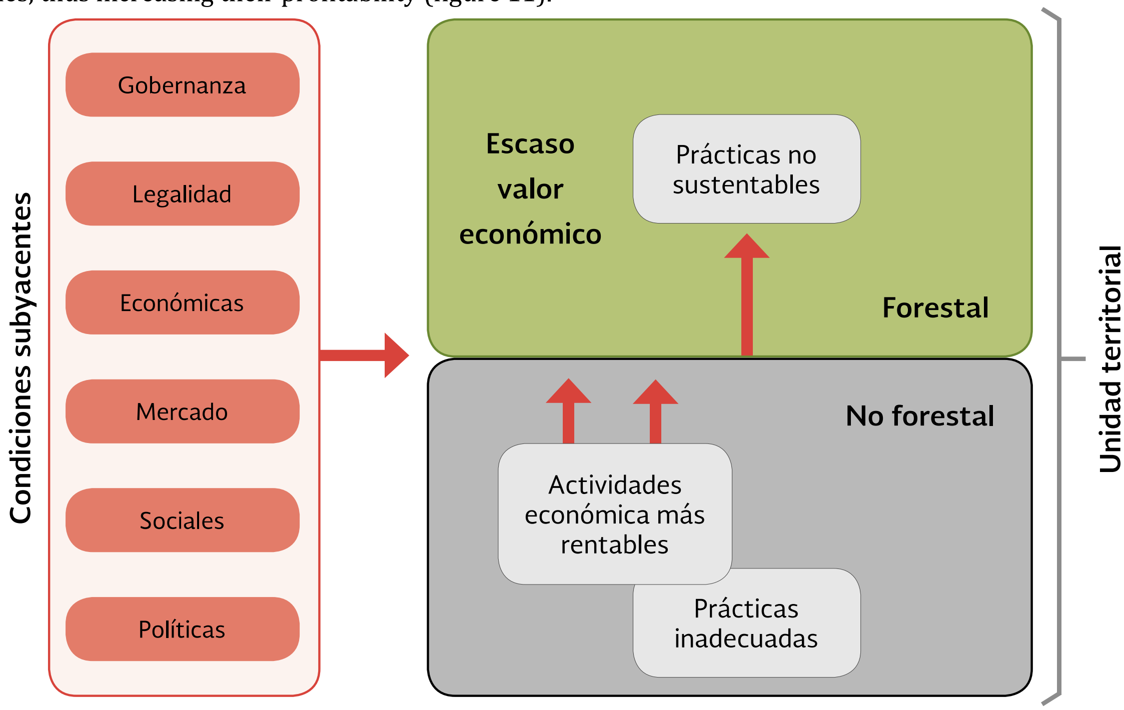

Figure 11 Deforestation and degradation in tropical and oak forests

In cases where forest ecosystems do offer products with a high commercial value (such as conifer forests and tropical mountain forests), it is also true that transaction costs (both economic -administrative, permits, hiring specialists- and in terms of organization and capability) are so high that they act as a disincentive for sustainable forestry management, which leads to the illegal extraction of timber and non-timber products, or to land use change for other activities (figure 12).

The processes of deforestation and forest degradation are not linear; they do not have unique causes or similar dynamics in the various regions of the country, but rather are a combination of events that have their origin in conditions that go beyond the users of forest resources, making both their analysis and the search for solutions notoriously more complex. These conditions can also be analyzed at different levels and taking different approaches, as their presence also has impacts of varying magnitude and complexity on the deforestation and forest degradation processes.

Outside the environmental sector, little value tends to be given to forest ecosystems and the services that they provide, which means that economic and market conditions are established that encourage more profitable economic activities than ensuring sustainable forest use. This situation leads to, among other things, government subsidies that favor production activities with no long-term vision or any environmental considerations that focus on the landscape, and which also have negative external factors not included in the market prices of goods and services. Furthermore, the way that subsidies are designed leads to them being applied unequally, in detriment to the poorer producers and inhabitants of forest areas (regardless of whether or not they own the land), limiting to an even greater extent their chances of finding a way out of poverty, a situation made worse by the difficulties that these producers face in finding alternatives types of funding.

Social and political conditions are another element that contributes to the decision-making process that helps bring about deforestation and forest degradation, given that in the forest areas of Mexico they have deteriorated due to the growing number of people without ownership rights who are users of forest resources, but who, faced with the lack of job opportunities, have seen their poverty worsen, leading to increased pressure on natural resources.

Finally, the weakness of institutions and social organization at the local level mean that unfavorable governance and legality conditions arise that limit how far legislation can be enforced, sustainable activities developed and economic benefits be distributed more equally. The barriers to controlling unsustainable forestry activities are associated with high transaction costs and a lack of information on how to go about making a sustainable use of forest resources. In terms of illegal activities, the main barrier is in terms of a lack of ability to apply existing legislation, which also results in low social capital.

All these conditions have an influence on decisions regarding unsustainable land management practices, leading to deforestation and forest degradation, and which form the basis of the barriers described below.

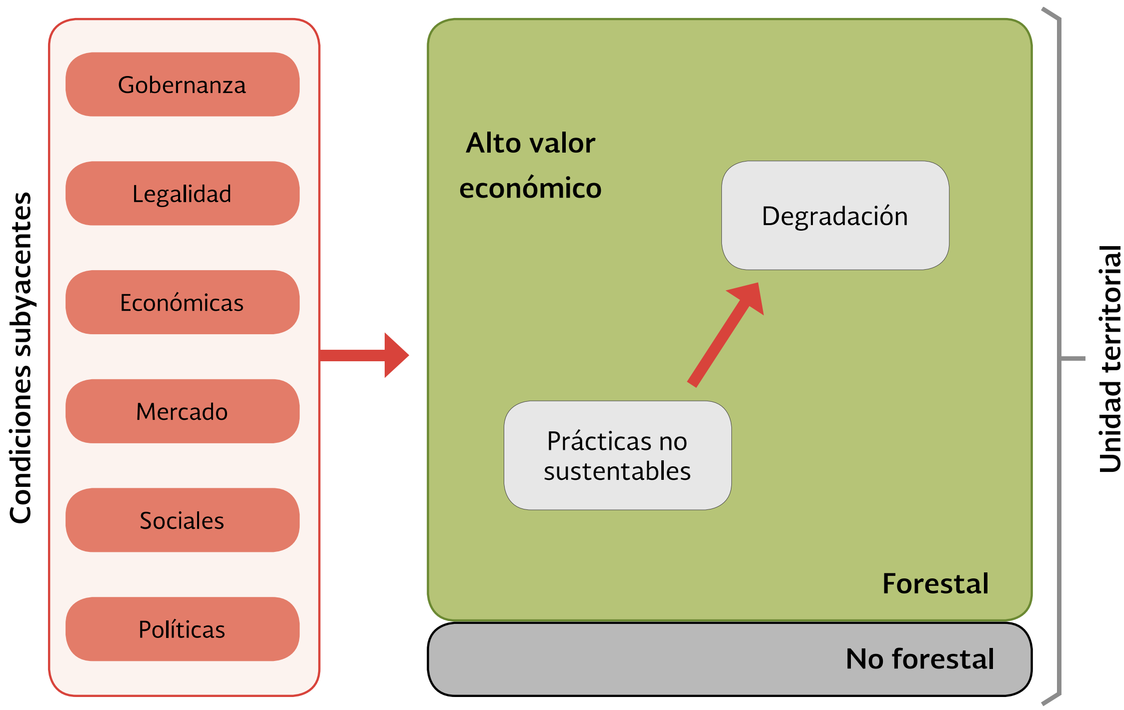

Figure 12 Degradation of temperate forests.

The barriers to preventing the driving forces behind deforestation are analyzed, taking into account the complexity of the phenomenon of deforestation and forest degradation, for which an approach is taken from the perspective of the intervention model for REDD+ established in the ENAREDD.

Barriers to securing institutional arrangements, strengthening coordination between sectors and boosting sustainable rural development

Co-ordination between sectors is an essential element for success in implementing the Emissions Reduction Initiative. However, despite the fact that a legal framework does exist at both federal and state level that enable cross-cutting conditions for public policy and co-ordination between sectors for rural development and combatting climate change, public programs are implemented in a disjointed and un-coordinated way, particularly in forest areas where agricultural, livestock and forestry activities all occur in the same space. This is basically due to:

- Co-ordination platforms between sectors, such as sustainable rural development commissions at the state level, are generally not fully functioning bodies, and are sometimes not formally installed, even though it is a legal obligation within the framework of the Special Concurrent Program.
- Institutional arrangements at the regional and local level (regional and municipal SRD committees) generally make decisions without any planning instrument that enables them to channel public investments, not solely to bring instruments into line with one another but also to ensure a more coherent approach to the demand for support from beneficiaries and the programs offered.

- The lack of recognition by the forestry, agricultural and livestock sectors in terms of the importance and the role that the committees of inter-municipal assemblies can have as platforms for co-ordination between sectors and collaboration between governments.
- A centralizing vision whereby federal and state departments do not establish the right mechanisms for municipal governments to become effectively involved in designing and implementing development policies in the field, making collaboration between governments all the more difficult.

Barriers to establishing land governance models that promote the participation of different stakeholders at different scales within an area, under the principle of collaborative actions that enable results to be obtained in terms of reducing emissions.

Land governance for REDD+ involves the interaction of a series of stakeholders with common interests (stakeholder network) at different levels (community, municipal, regional, state, etc.) under a particular institutional framework, all interrelated through a series of key components, such as: the flow of information in terms of the right quality and knowledge, innovative cross-cutting policy and finance instruments, collaboration schemes between similar land governance scales (associations of common landholders and/or communities, private owners' associations, municipal associations, state associations), intergovernmental collaboration mechanisms, participation platforms, developing social capital and stakeholder capability capital (Torres and Graf, 2015).

An appropriate governance scheme at the landscape level has been designed under a multi-scale principle, ranging from the basic unit (parcel), the landscape unit (as is the case with the ATREDD+) or economic unit (river basin supplying the forest and livestock region, among others), effectively interacting between them and with other scales of land administration (state, regional, national, global).

Governance at the landscape level, such as the case of implementing REDD+ where various stakeholders are involved (common landholders and communities, private owners, civil society organizations, technical services providers, municipal governments) implies a strong development of capabilities of all the stakeholders involved. The lack of institutional and technical-administrative capabilities of all stakeholders is a significant barrier to achieving the goal of reducing emissions.

Most forests are owned by ejidos and communities that mostly live in conditions of marginalization and poverty. Many of them are severely limited in terms of internal organization and technical capability, factors that are among the main underlying causes of deforestation. The problem of internal organization among ejidos and communities, resulting from the weakening of their internal governance mechanisms, such as their general assembly, and their internal bodies, such as the ejido commissioner and the board of protection, are one of the main barriers to ensuring a successful development of activities and above all to ensure that actions and commitments continue over the long term.

Strengthening social capital and developing the institutional capabilities of ejidos and communities to implement actions to reverse deforestation processes requires some form of ongoing technical mentoring. The ongoing drop in the ability of state and federal public institutions to ensure this kind of mentoring is a critical obstacle to solving this problem.

The fall in staff numbers in federal and state public institutions (particularly in the forestry sector) has been overcome by hiring private technical assistance services that are not paid for through subsidies. However, these services not only have technical deficiencies, they also tend to maximize revenues by reducing their costs as much as possible. They therefore favor the kind of help given to a certain type of producers (chosen for their geographic location or type of ownership) and promote support concepts being chosen that generate the most revenue but do not necessarily trigger beneficiary development processes. Technical assistance services, however, are hired sector by sector, so their interventions do not trigger processes of co-ordination between sectors and their programs.

The drop in the ability of public institutions to mentor local organization processes and the development of capabilities in ejido and other communities to control the technical production process is a significant obstacle to having any effect on the driving forces behind the deforestation process.

In turn, regional producers' organizations, which could play a key role in helping producers to strengthen their capabilities, have in themselves major institutional shortcomings and organizational problems.

The failure to apply the legal framework through court processes and by means of inspection and protection is yet another obstacle. At times, these obstacles show up the lack of material resources, trained human resources and information in the public sector.

Obstacles to ensuring a joined-up approach to policies and programs drawn up between the agricultural and forestry sectors that help to combine efforts and coordinate resources with other bodies.

One of the main obstacles is the lack of alignment between public policies and co-ordination between institutions from different sectors at the local level, and the fact that rules of operation for public rural development programs, particularly in the agricultural and livestock sector, do not establish criteria that link them to the goals of forest conservation, and can even lead them to become perverse incentives that do in fact generate deforestation or forest degradation.

The economic value of some forest ecosystems is very limited, due to their low potential for any commercial use (such as dry tropical forests and oak forests) or the prevailing social, economic or political conditions in the place, making it very difficult to find a way to ensure a sustainable use of products with any commercial potential (such as tropical mountain and mid-height forests). In the first of these cases, the main non-timber forest product generated by these ecosystems is forage, and to a lesser degree charcoal and firewood, which means that they are chiefly used for cattle grazing. The lack of forest management instruments in these ecosystems geared toward forage production, the application of subsidies favoring increased cattle numbers over increased forage productivity; the lack of technical capability among civil servants, technical service providers, producers and financial intermediaries to implement production systems that are more suited to the agro-ecological conditions, such as forestry grazing systems; and the deficient alignment between forestry programs and programs fostering extensive cattle farming are among the key obstacles to reversing the deforestation and forest degradation of these ecosystems.

Sustainable forest use is at a disadvantage in Mexico in terms of economic and social issues that reveal a low competitive nature determined by high transaction costs in obtaining authorizations for sustainable forestry management, the difficulty in securing financial inclusion for agricultural population centers, the high costs of supplies and industrialization.

Additionally, agricultural and livestock production activities tend to be more profitable due to the fact that negative external factors are not included in the prices of goods on the markets, and government instruments to promote the sector also do not include activities that effectively ensure sustainability.

When the processes of land use change yield to economic pressure from outside rural communities, i.e. in the outskirts of urban areas and due to markets at both the national and international level, it will be very hard to create economic incentives for an assessment of forestry environmental services to compete at similar levels. In this case, the obstacles to overcome in order to control land use change refer to difficulties in applying the existing legal framework on matters of land planning, urban development, regional planning and infrastructure.

In short, the main obstacles to implementing REDD+ relate to the lack of co-ordination between institutions; the lack of full information between different interest groups regarding sustainable management practices and the legal framework; high transaction costs of a sustainable use within the legal framework; the lack of funding and access to capital to develop sustainable activities; problems in transferring and adopting technology in rural areas; fewer incentives for sustainable practices within the context of public policies and subsidy programs; the reduced capabilities between stakeholders in rural areas in conditions of poverty to ensure sustainable management; public failures associated with the lack of enforcement of the legal framework in court cases, problems of corruption and collusion; and the lack of co-ordination in governance and planning processes to include environmental and REDD+ criteria in development programs, including how subsidy programs are designed.

4.3. Description and justification of the actions and interventions planned as part of the Emissions Reduction Initiative that will lead to lower or zero emission levels.

Please describe the proposed ER Program Measures (new or enhanced actions, measures, policy interventions or projects), including those related to governance, and justify how these ER program Measures will address the drivers and underlying causes of deforestation and forest degradation and/or support Carbon Stock enhancement, to help overcome the barriers identified above (i.e., how will the ER Program contribute to reversing current unsustainable resource use and/or policy patterns?). Please explain the prioritization and timelines of the planned ER Program Measures based on the implementation risks of the activities and their potential benefits.

*Refer to **criterion 27, indicator 27.2** of the Methodological Framework*

The IRE forms part of the REDD+ National Strategy and the experience of implementing Early REDD+ Actions, from which significant co-ordination agreements were reached between the federal government and the state and municipal governments for designing and implementing specific activities in each of the states. Additionally, the activities planned are based on various successful experiences of the states such as community forestry management (Torres Rojo, 2015), beekeeping and coffee-growing organizations (Moguel, Toledo, 2004). These activities were planned for the IRE through the Investment Programs.

4.3.1 Investment Programs

General description

To stop and revert deforestation and forest degradation, the Emissions Reduction Initiative (IRE) brings land management instruments together where specific investments are established with a five-year timeline (Investment Programs), which include activities from various sectors, in terms of both production and conservation, in significant regions of the states involved. These programs identify the implementation of practices relating to production and to managing natural resources that promote rural development and have an impact on the causes of deforestation and forest degradation. They are aimed at owners, holders, users and/or beneficial owners of forestry resources.

The Emissions Reduction Initiative represents an opportunity to trial the REDD+ integrated territorial management model. The Investment Programs are the innovative management instrument that seeks to have an impact on redesigning subsidy programs to deal with regional needs, taking planning instruments into account at the local level, such as the Community Land Planning (OTC) and the Integrated Development Land Program (P-PREDIAL). The IRE seeks to promote a dual approach: both top-down and bottom-up, establishing the link between the real situation on the ground, and budgetary planning and programming at a federal and state level.

The Investment Programs are aimed at reducing the main obstacles to implementing the sustainable rural development approach through comprehensive land management, by:

1. **Integrating the view of stakeholders at the regional/local level on activities to be developed on the ground.** The Investment Programs were created by means of an inclusive and participatory process at the local level, and will help to determine the various stakeholders' needs at this level and ensure that their view is included.
2. **Identifying and designing activities to tackle the causes of deforestation and forest degradation in a specific region**. The Investment Programs identify activities to be implemented at a local scale leading to lower emissions caused by deforestation and forest degradation, and which promote sustainable rural development. These activities will be included in land management instruments (Municipal Sustainable Rural Development Programs), which influence the budget and programs that the state and federal governments will assign to the agricultural and livestock sector in the State.
3. **Promoting the participation of different stakeholders at different scales within an area (land governance model).** This multi-level strategy enables the causes of deforestation and forest degradation to be tackled more efficiently and on different fronts:
    - Local and ejido communities: They identify the needs of the region to tackle deforestation and forest degradation, and will subsequently implement the IP activities.
    - Civil society organizations, such as local development agents, which help to implement actions with agricultural population centers.
    - Academic and research institutions: They generate information, knowledge and applicable technology to develop general activities, monitoring and assessment, among other processes.
    - Public Territorial Development Agents (APDTs): They support the participatory construction of the Investment Programs.

- Municipalities: In their various public policy instruments they include activities identified at a local level through the Investment Programs, and through these manage their budget with the appropriate Secretariat at the state level.
- State government: The state government ensures policy and program co-ordination between the agricultural and forestry sectors in a particular area, taking into account the needs identified at the regional level. They manage the Budget with the Federation.
- Federal government: The federal government co-ordinates IRE implementation with the state governments, ensuring that this implementation is aligned with the ENAREDD+ and with national forestry and climate change policy.

4. **Encourage coordination and planning of activities in the area by different sectors, mainly the agricultural/livestock sector**. Co-ordination between the agricultural/livestock and forestry sectors, helping to combine efforts and co-ordinate resources with other bodies.

Types of activities

Investment Programs consider activities to be implemented in two stages; the first is to be implemented throughout the whole term of the IRE and consists of investments for generic activities through subsidies in various sectors, the implementation of which will be guided based on a synergetic approach in each area, resulting from joint planning and the participatory process, and which will also be strengthened by various complementary activities. The second stage, which will begin to be implemented once the first results-based payment is received, includes additional activities on top of those already being implemented to tackle deforestation and forest degradation that do not currently form part of any subsidy programs or other financing mechanisms, and which strengthen the achievements obtained in the first stage, extending the scope of actions taken to halt deforestation and forest degradation (CONAFOR, 2015c)[35]. In terms of defining second-stage activities, the lessons learned from projects 3 and 4 of the FIP will be taken into account. The activities planned for the first stage may continue to be implemented even though activities from the second stage are already in place, as they are expected to strengthen rather than replace activities in the first stage.

The activities proposed in the Investment Programs are not aimed at changing the types of production of the inhabitants of the forest areas, but rather they seek to modify practices that pose a risk to maintaining forest cover. This is with the aim not to disrupt practices, some of which are ancestral, which each producer (or group of producer) has decided to follow as their means of subsistence; however, there is always the possibility that those decisions can be redirected toward activities and proposals in the investment programs that are perceived to be of more use, not just economically but in a broader practical sense that would enable them to enjoy a better quality of life.

According to the particular conditions of the region covered, each Investment Program includes a combination of complementary actions that identify and foster synergies between the different subsidy programs that affect the same particular area (parcel, micro-region). Each Investment Program identifies generic activities that have a clear direct or underlying effect on the drivers of deforestation and forest degradation; furthermore, for each generic activity, complementary activities are identified that effectively enable or allow the generic activities and their sub-activities to be appropriately carried out.

[35] The activities identified in the second stage will be scheduled on an annual basis.

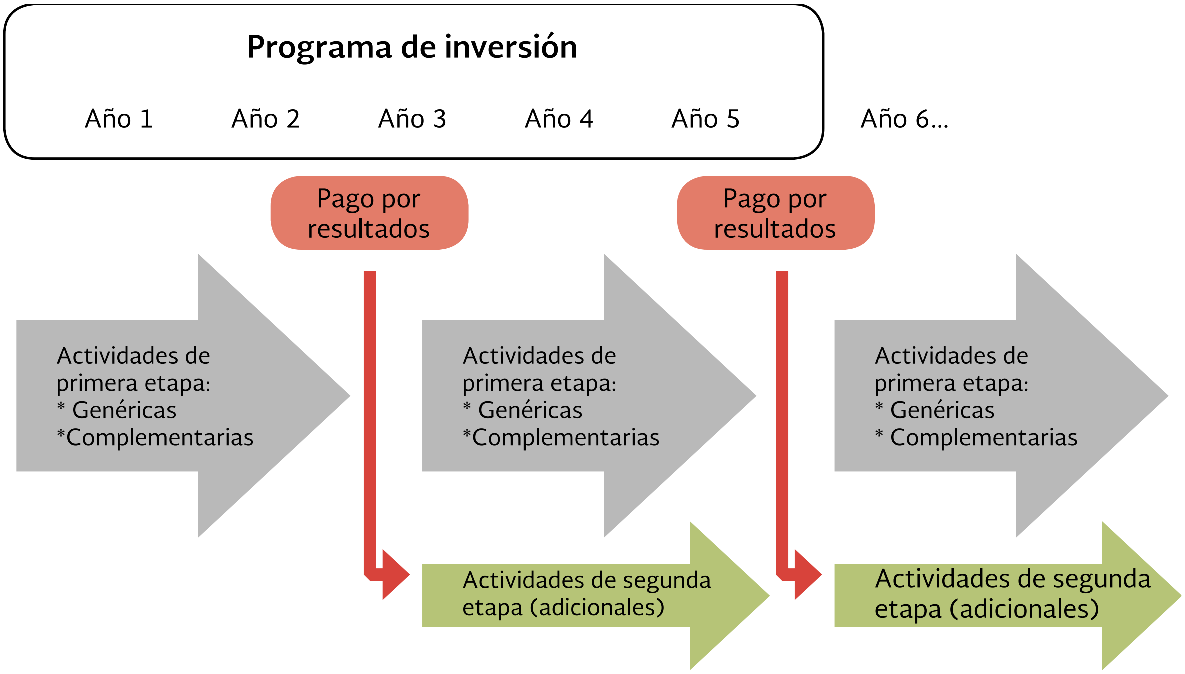

Figure 13 Types and duration of activities to be carried out during IRE implementation.

The complexity of the direct and underlying causes of deforestation and forest degradation require actions to be taken in different spheres simultaneously in order to eliminate said causes. The synergy of the generic activities and the subsidies applied for implementation will seek to have an impact on the factors involved in determining the deforestation and forest degradation process in each basic land unit (figure 13). The aim therefore is to modify or contain practices that lead to deforestation or forest degradation while also increasing revenue from forest ecosystems to create an incentive to ensure sustainable use.

In most cases, a single generic activity is not sufficient to achieve a change in conditions that determine deforestation and degradation, even those that may be considered highly effective, such as Payment for Environmental Services, but with limited duration. It is therefore necessary not just for the activity leading to deforestation and/or forest degradation to be modified by altering practices that are not sustainable, but also to influence an increase in market value of the forest resources affected by said activity. This increase in market value can be achieved by paying for environmental services, or for the direct use of forest resources for the sale of goods (use of wood, non-timber-based forestry products, such as beekeeping, forage, ecotourism, etc.).

It is important to consider that modifying production practices in some economic activities that are direct causes of deforestation does not necessarily have an effect on containing the dynamic by which deforestation is generated, so it is important to identify any additional activities (involving planning, and modifying the rules for subsidy supports, among others) that effectively restrict advances on forest areas. In general terms, what these activities require above is definitive management of creation of a specific instrument, such as establishing exclusion zones, in order for agricultural or livestock subsidies to be granted. Accordingly, during the IRE implementation period, it is expected that the activities in the area become more refined (they may be reduced or expanded) depending on the results submitted and on modifications made to any support instruments that arise from the agreements reached and negotiations made between institutions, in order to ensure that the economic value of the forest ecosystems rises and limits are placed on the extent of the forest area lost.

Developing the Investment Programs

Preparation for the IPs is based on the work carried out as part of the country's preparation for REDD+ and particularly on consolidating the commitment made by the State Governments on the ER-PIN. All IPs were prepared following the general procedure described in section 5.1.2.1. To that end, a collaborative effort was made in which State Governments, led by the CONAFOR State Offices, defined the working areas (of at least two municipalities and 350,000 ha), based on the deforestation and forest degradation dynamics in each state, the work carried out in each area, the presence of institutions to act as Public Agents for Territorial Development, and the potential for results to be presented. The IRE will therefore be executed in the following areas of intervention:

Table 21 Areas of Intervention in IRE States

State	Area	Public Territorial Development Agent
Campeche	Centre	Pending
Chiapas	Istmo-Costa	CONABIO - Mesoamerican Biological Corridor
Chiapas	Zoque-Mezcalapa	CONABIO - Mesoamerican Biological Corridor
Chiapas	Frailesca	CONABIO - Mesoamerican Biological Corridor
Chiapas	Lacandona Jungle	CONABIO - Mesoamerican Biological Corridor
Jalisco	Ayuquila Lower River Basin	Inter-Municipal Environmental Association for the Integrated Management of the Ayuquila Lower River Basin (JIRA)
Jalisco	Coahuayana River Basin	Inter-Municipal Environmental Association for the Integrated Management of the Coahuayana River Basin (JIRCO)
Jalisco	Sierra Occidental y Costa	Inter-Municipal Environmental Assembly of Sierra Occidental y Costa (JISOC)
Jalisco	Costa Sur	Inter-Municipal Environmental Association for the South Coast (JICOSUR)
Quintana Roo	South	CONABIO - Mesoamerican Biological Corridor
Yucatán	Puuc biocultural region	Inter-Municipal Biocultural Association of the Puuc (JIBIOPUUC)

For each of the areas of intervention, and in collaboration with the CONAFOR, each State Government used a participatory approach to define the activities and interventions to be implemented in each IRE region to tackle the direct and underlying causes of deforestation and forest degradation. This participatory process was carried out using the methodology proposed by CONAFOR, although each state made the necessary adjustments to the process to adapt it to their situation and needs. The particular aspects of the process in each state are described in section 5.1.2.1. Because of the particular characteristics of the IPs, their aims, and the scale that they encompass, the Public Agents for Territorial Development (APDTs) played an important role in their development, by coordinating the participatory construction process. The APDTs will also help to follow up implementation of activities and report on results attained. The Investment Programs can be accessed using the following links, and Annex 3 includes a summary of each one.

- Investment Program Campeche: http://goo.gl/xioDqz
- Investment Program Frailesca region (Chiapas): http://goo.gl/kGIm2V
- Investment programs in the Istmo-Costa region (Chiapas): http://goo.gl/CqiVVc
- Investment Program Zoque-Mezcalapa region (Chiapas): http://goo.gl/Ew6XQ3
- Investment Program Lacandona region (Chiapas): http://goo.gl/2QQ6jb
- Investment Program Ayuquila Lower River Basin region (Jalisco): http://goo.gl/Q9kS6I
- Investment Program Coahuayana River Basin region (Jalisco): http://goo.gl/FyBR9t
- Sierra Occidental y Costa Region Investment Program (Jalisco): http://goo.gl/7ib5y7
- Investment Program Costa Sur region (Jalisco): http://goo.gl/W5ke0i
- Investment Program Quintana Roo: http://goo.gl/p8ESmT
- Investment Program Yucatán: http://goo.gl/dISLrw

4.3.2 Activities identified

The Investment Program for each region establishes the general activities to be carried out during IRE implementation in order to tackle the drivers of deforestation and forest degradation identified in the area (see section 4.1). For each generic activity, the potential subsidies and incentives were determined in different sectors to support their execution[36]. Complementary activities that will help with their implementation were also identified.

As stated previously, during execution of the IRE, activities will be implemented in two stages (see figure 13). In the case of additional activities (2nd stage), the Investment Programs will only include a preliminary outline, as they will be defined at the local level through a participatory process and will be funded with resources from the

[36] Some of these subsidies and incentives have been developed as part of the Forests and Climate Change Project, which includes funding from the Forestry Investment Program (FIP).

emissions reduction payment resulting from implementing the initial investments (see section 15.3 for more details).

The activities implemented in the area to tackle the causes of deforestation and forest degradation should comprise a package of actions that include: i) developing a revenue-generating activity; ii) increasing the economic value of forest; and iii) effectively limiting activities that harm forest areas. The Investment Programs are aimed at ensuring that all activities carried out contain these three elements.

The production practices proposed are expected to increase the productivity and profitability of the activities significantly, compared with a traditional system, so they must all necessarily be accompanied by other conservation or production activities that increase the value of the forest ecosystems, along with the corresponding activities to ensure the limits are set for areas with forest cover to avoid expansion into forest areas.

The IRE will promote various activities being carried out at the same time in the same land unit (whether private, ejido or communal property), which allows for a production activity to be developed, on the one hand, and for the value of ecosystem to rise, on the other. These activities may be various generic and complementary activities. The activities proposed may also be carried out by people who do not own the land, such as women, young people or avecindados (neighbors). The aim is to ensure the success of the IRE by "packaging" activities so that they are implemented jointly with a local focus, while at the same time facilitating access to financing and technical assistance to carry out all activities that enable sustainable production practices and help to increase the value of the ecosystems, and reducing social inequalities resulting from access to funding for production.

Below are the general activities identified and how they will tackle the causes of deforestation and forest degradation.

<u>Improving the milpa crop-growing system, intensifying traditional agriculture and conservation agriculture</u>

This activity includes actions relating to zero tillage, maintaining stubble, crop rotation and integrated plague management, and land conservation to ensure conservation agriculture is possible. The aim is also to carry out activities that will increase the productivity of traditional agriculture, particularly subsistence farming in short cycles of itinerant agriculture (for cases where slash-and-burn farming is practiced), or new forms or intensities of co-production, such as agro-forestry systems.

By implementing these actions, it is hoped to increase productivity to ensure sustainable and ongoing production that will also have an impact on the neighboring areas by easing the pressure to spread into new areas.

This is particularly important in areas where there are more itinerant parcels than the ecosystem can bear, to ensure that these parcels can remain productive without this posing a risk to forest degradation or deforestation, or threatening tropical forest recovery. Although there may be a reduction in the first few cycles, this general activity will help to increase productivity by reducing costs, which will enable the productivity of a parcel to be maintained without the need to spread into areas with forest cover.

The success of this activity requires a design that is suited to each ecosystem and type of farming practices in each region to ensure that the appropriate techniques are being used, and also requires technological and full support packages to enable users to access all components of the activity that enable them to ensure complete success of the conservation agriculture methods used. This requires co-ordination between the departments that currently partially provide some of the elements of the general activity within their subsidy programs, and which also include the appropriate mentoring and training.

This generic activity may be complemented with the recovery of forest areas by redirecting agricultural or cattle activities to forest activities, or at least to agro-forestry or forestry-based grazing. To a certain extent a redirection of this kind seeks to halt the advance of cash-crop farming, by providing an increased diversity of products that can be obtained from the land used.

Other complementary activities include production alternatives for non-owners of land, such as home-garden packages, family farms, community production projects, or activities to help general activities succeed, such as infrastructure for soil and water capture.

Sustainable cattle farming through intensive forest grazing and semi-intensification of cattle farming

Modifying cattle-farming practices in areas where the IRE will be implemented is key to ensuring the program's success. This general activity includes a wide variety of specific sub-activities that are pertinent for the various different contexts in the five states. These practices include forest grazing and semi-intensification systems, which consist of living fencing, protein banks, improved pastures and grazing land, and developing infrastructure and equipment, among other actions.

It is expected that, with the activities to help develop sustainable cattle farming, not only will this production activity continue, but the conditions of the cattle will also improve, and that there will be substantial improvement in the environmental conditions that will enable forest ecosystems to survive or improve.

Sustainable forestry and wildlife management

Strengthening and promoting activities for sustainable forestry management, whether for timber production, non-timber or wildlife management, enables the surface area to be increased with good management, a situation that ensures conservation and production activities at the same time. The activities to be promoted include those that are due to be supported by the CONAFOR, in all stages of production and marketing, from formulating management programs and technical studies, forestry management activities, and extraction and transformation activities, to activities designed to strengthen business capabilities and consolidate the forestry production chain. All these activities are included in the National Sustainable Forestry Management Strategy to Increase Production and Productivity (ENAIPROS), including aspects of coordination between institutions, community organization and access to funding, among others. Also included in this generic activity are actions aimed at forest restoration, reduced-impact forestry management, and actions relating to integrated fire management.

This generic activity also includes fostering activities relating to forestry products that had not been used as a priority, such as resins, honeys, seeds and medicinal plants, as well as promoting tourism.

Renovation and rehabilitation of coffee plantations

Activities proposed for renovating and rehabilitating coffee plantations so as to control coffee leaf rust will enable producers to have plantations with a better state of health that guarantees or increases revenues that they have previously had from this crop. Activities include establishing and maintaining agro-forestry plantations, implementing technological packages for sustainable land management, infrastructure and equipment, rehabilitating shade-grown coffee plantations, renovating plantations with suitable and transitional varieties, among others.

The activities proposed will have impacts in the medium term, a situation that may lead to lower revenues for producers in the short term while the coffee plantations reach expected production levels. Support for complementary subsidies in aid of forest cover in shade-grown coffee plantations will therefore be promoted.

It is also important to point out that strengthening coffee production could act as an incentive to extend coffee plantation numbers, associated with an interest in increasing production, leading to a change in land use in areas of mesophilic forest. To that end, it will be essential, through coffee-growers' organizations in the area, for agreements to be generated so as not to buy from or incorporate growers who have made a change to how forestland is used to an agro-forestry activity of some kind.

As complementary activities, sustainable and organic certification schemes will be promoted for coffee plantations, with support from coffee-growers' organizations and the market. Participatory research will also be carried out to determine varieties to match the region (e.g., shade-grown varieties), with INIFAP (technological showcases) to devise alternatives as quickly as possible.

Developing beekeeping

Beekeeping with both standard and stingless bees is an activity that can have a highly significant positive impact on halting deforestation and forest degradation, as the production process necessarily requires forest maintenance, and can be carried out in conjunction with other activities that also make use of forest resources. The production of honey and other beekeeping products can provide significant revenues for those producing them, who can be people who do not necessarily hold any agricultural rights. Promoting activities related to beekeeping, included those using stingless bee species, in areas where value chains are already in place and where there is potential for development, will be a key element of the IRE to ensure diversification and increased revenues from forest areas. This activity can be linked to restoration actions with honey crop plants in degraded or deforested areas.

Redirection of production.

In the areas of intervention there are places that were used for agricultural or livestock purposes and which are now unused, areas which are still used for activities of this kind but with very low productivity levels, and others that form part of the itinerant agriculture and which run the risk of deforestation or forest degradation due to pressures on the slash-and-burn system. For these cases, activities will be promoted aimed at redirecting production (to fruit plantations and commercial forestry activities, among others), or at enriching grasslands, to promote the recovery of these lands with the aim of them returning to forest cover and also including species that offer alternatives forms of income, such as pepper, breadnut, perennial fruit and precious woods, among others.

Production projects to increase revenue.

In order for the IRE to be a success, alternative forms of revenue need to exist in sectors of the population that cannot carry out production activities of the kind mentioned previously, as they have no agricultural rights (spouses, avecindados (neighbors), young people). Some of the activities that will be promoted include family vegetable plots, eco-tourism, and strengthening how the production and sale of goods is organized.

Strengthening local governance

Local governance is a key element for the IRE to work, as it enables the organizational bases to carry out the production activities successfully, regardless of whether they are part of the IRE, in areas commonly used by ejidos and communities. A more solid local governance allows for a framework of action on land use that would otherwise remain unprotected or without clear rules on how the land can be used. This general activity, which strengthens and facilitates the general production activities mentioned, seeks to promote internal and integrated development with a gender-based approach among ejidos and communities, by strengthening community organization, empowerment through seminars from community to community; drawing up land planning instruments such as the community land planning project and the PREDIAL Program; and participatory rural assessment, among other mechanisms.

Payment for environmental services

Payment for environmental services (PES), as a mechanism to provide economic incentives to owners and occupiers of forestland, with the aim of incorporating good sustainable management practices for ecosystems, as well as helping to increase their revenue, has proven to have a positive effect on land use decisions geared toward the sustainable use of forestry resources. Initially, the program established by the CONAFOR will be used, and will seek to move and strengthen specific schemes that will include state or municipal governments, and even investments from other sectors to establish funds that are concurrent with the CONAFOR.

PES is a highly important element of the strategy to halt the spread of agricultural and livestock activities, whether they be cash crops or subsistence based; however, it is essential for the commitment to keep land use unchanged to apply to the entirety of the area and not just the surface area under PES protection. It is also necessary to establish prior instruments (zoning, eligible areas) as limitations to obtaining subsidies for agricultural or livestock activities in areas catalogued as permanent forest.

Strengthening regulatory instruments.

As well as production activities generating revenue and raising the value of ecosystems, it is essential to strengthen regulatory and planning instruments to provide support, certainty, permanence and coherence to the actions undertaken. Accordingly, the aim is to ensure effective limitation of the spread of activities in detriment to forests. This can be achieved in a range of different and complementary, non-exclusive ways:

a. Formalizing community planning instruments such as OTC and P-PREDIAL, which clearly establish permanent forest areas where limits are placed on activities that do not make a sustainable use of forest resources.
b. Strengthening compliance with existing regulations, through inter-institutional co-ordination and increase protection capabilities.
c. Establishing operating rules that are in line with available support programs, which condition the support given to the conservation and sustainable use of forest surface areas throughout the entire land unit (such as, areas of eligibility for agricultural and livestock subsidies based on vegetation cover).

Matrix of activities

The following shows IRE activities in the five states to halt the particular causes of deforestation and forest degradation in the region for each of the Investment Programs.

Table 22 General activities for each region in each Investment Program

	Campeche	Chiapas				Jalisco				Quintana Roo	Yucatán			
Activity	Campeche	Zoque Mezcalapa	Lacandona Jungle	Frailesca	Isthmus-Coast	Sierra Occidental y Costa	Coahuayana River Basin	Costa Sur	Ayuquila River Basin	Quintana Roo	Puuc region	Department / program / component	Complementary activities	Second-phase activities
Sustainable cattle farming through intensive forest grazing and semi-intensification of cattle farming														
Improving pastures and grazing land	x	x	x	X	x	x	x	x	x	x	x	SEDER-Jalisco/Forest grazing systems SAGARPA/Rural productivity program/Production infrastructure for sustainable land and water use (COUSSA) SAGARPA/Livestock Development Program/PROGAN Production Component SAGARPA/Productivity and agri-food competitiveness program/Livestock sustainability component SAGARPA/Support program for small producers/Production incentives component SAGARPA/Agri-food productivity and competitiveness program/South and south-east production development component SEDER-Yucatán/Peso a peso INAES-Quintana Roo/Support for developing capabilities SEDER-Yucatán/Rural Development Direct Support Program (PADER) SDR-Campeche/Program to match funds in agricultural and livestock matters	Producer-to-producer exchange of experiences Technical assistance Technological research and transfer to improve systems Developing credit schemes Strengthening producers' organizations Training Production of forest forage species Biodiversity conservation practices Impact monitoring Designing technology packages for forest grazing systems adapted to the regions. Strengthening value chains	Certification for livestock and sustainable products Innovative finance instruments Strengthening sustainable markets Value chains
Managing pastures and grazing land	x	x	x	X	x	x	x	x	x	x	x			
Installation of living fences	x	x	x	X	x	x	x	x	x	x	x			
Protein banks	x	x	x	X	x	x	x	x	x	x	x			
Genetic improvement		x	x	X	x	x	x	x	x					
Equipment and infrastructure for production and processing	x	x	x	X	x	x	x	x	x	x	x			
Water conservation works and infrastructure for livestock production	x	x	x	X	x	x	x	x	x	x	x			
Improving the milpa crop-growing system, intensifying traditional agriculture and conservation agriculture														

<table>
<tr><th rowspan="2">Activity</th><th>Campeche</th><th colspan="4">Chiapas</th><th colspan="4">Jalisco</th><th>Quintana Roo</th><th>Yucatán</th><th rowspan="2">Department / program / component</th><th rowspan="2">Complementary activities</th><th rowspan="2">Second-phase activities</th></tr>
<tr><th>Campeche</th><th>Zoque Mezcalapa</th><th>Lacandona Jungle</th><th>Frailesca</th><th>Isthmus-Coast</th><th>Sierra Occidental y Costa</th><th>Coahuayana River Basin</th><th>Costa Sur</th><th>Ayuquila River Basin</th><th>Quintana Roo</th><th>Puuc region</th></tr>
<tr><td>Agro-forestry systems and enriching grassland</td><td>x</td><td>x</td><td></td><td>X</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td rowspan="7">SAGARPA/Support program for small producers/Production incentives component
SAGARPA/Program to match funds with federal entities/Agricultural, livestock, fishery and marine production or strategy projects
SAGARPA/Rural productivity program/Infrastructure for sustainable land and water use component
SAGARPA/Support fund for small producers/Fund for support in production projects in agricultural population centers component (FAPPA)
SAGARPA/Agriculture Development Program/Irrigation technification component
SAGARPA/Agriculture Development Program/Machinery and equipment modernization component
SAGARPA/Agriculture Development Program/Integrated production component
SAGARPA/Agriculture Development Program/Agro-production component
CONANP/Conservation and restoration of ecosystems program, Conservation for sustainable development program
SEDER-Yucatán/Rural Development Direct Support Program (PADER)
SEDER Yucatán/Improved milpa crop-growing system
SCampo Chiapas/Sustainable maize program
SCampo Chiapas/Agricultural and livestock financing
SAGARPA/Sustainable Modernization of Traditional Agriculture (MASAGRO) component
CONANP/ Temporary Employment Program (PET)
CONANP/Creole maize program (PROMAC)
SAGARPA/Incentives program for maize and bean producers (PIMAF)
SAGARPA/Food Safety Strategy Project (PESA)
SAGARPA/South and south-east production development</td><td rowspan="7">Producer-to-producer exchange of experiences
Technical assistance
Technological research and transfer to improve production systems
Developing credit and micro-credit schemes
Strengthening producers' organizations
Training
Impact monitoring
Strengthening value chains of products from sustainable agro-forestry</td><td rowspan="7">Certification of socially responsible production
Innovative finance instruments
Strengthening markets
Value chains</td></tr>
<tr><td>Land and water conservation practices</td><td>x</td><td>x</td><td>x</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td>x</td><td>x</td></tr>
<tr><td>Use of organic fertilizers and pest control</td><td>x</td><td>x</td><td>x</td><td>X</td><td></td><td rowspan="2">x</td><td rowspan="2">x</td><td rowspan="2">x</td><td rowspan="2">x</td><td>x</td><td>x</td></tr>
<tr><td>Use of improved or certified seeds</td><td>x</td><td>x</td><td>x</td><td>X</td><td></td><td>x</td><td>x</td></tr>
<tr><td>Infrastructure and equipment.</td><td>x</td><td>x</td><td>x</td><td></td><td>x</td><td></td><td></td><td></td><td></td><td>x</td><td>x</td></tr>
<tr><td>Improved irrigation systems</td><td>x</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>x</td><td></td></tr>
<tr><td>Zero tillage</td><td>x</td><td></td><td>x</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td>x</td><td>x</td></tr>
</table>

Activity	Campeche	Chiapas				Jalisco				Quintana Roo	Yucatán	Department / program / component	Complementary activities	Second-phase activities
	Campeche	Zoque Mezcalapa	Lacandona Jungle	Frailesca	Isthmus-Coast	Sierra Occidental y Costa	Coahuayana River Basin	Costa Sur	Ayuquila River Basin	Quintana Roo	Puuc region			
Incorporating organic matter	x	x	x	X						x	x			
Crop rotation	x	x	x	X						x	x			
Sustainable forestry and wildlife management														
Regional studies to support sustainable forest management.										x		CONAFOR/PRONAFOR/Forestry, supply and transformation component CONAFOR/PRONAFOR/Studies component CONAFOR/PRONAFOR/Forest restoration and production redirection component CONAFOR/PRONAFOR/Commercial forest plantations component CDI/Program for improving indigenous production and productivity. INAES/Support for developing capabilities, support for developing capabilities and support for INAES social banking. CONANP/Conservation for sustainable development program SEMARNAT/Wildlife management promotion program	Developing credit systems (FONAFOR, FOSEFOR) Technical assistance Monitoring Biodiversity conservation practices Strengthening community and producers' organizations Developing dendroenergy projects (that include production of wood-saving stoves)	Innovative financial instruments Strengthening markets
Supply basin studies														
Timber forest management program	x	x	x	X	x	x	x	x	x	x	x			
Manifest of individual environmental impact				X						x	x			
Technical study for the use of non-timber forest resources		x	x	X	x	x	x	x	x	x	x			
Unified technical document on forest logging	x				x					x	x			
Restoration		x	x	X	x									
Forest crops and habitat management	x		x	X		x	x	x	x		x			
Forest tracks		x				x	x	x	x	x	x			

Activity	Campeche	Chiapas				Jalisco				Quintana Roo	Yucatán	Department / program / component	Complementary activities	Second-phase activities
	Campeche	Zoque Mezcalapa	Lacandona Jungle	Frailesca	Isthmus-Coast	Sierra Occidental y Costa	Coahuayana River Basin	Costa Sur	Ayuquila River Basin	Quintana Roo	Puuc region			
Technological innovation for forestry operations		x	x		x	x	x	x	x					
Transfer of technology					x	x	x	x	x	x				
Preventive technical audit														
National and/or international forestry certification		x	x			x	x	x	x	x				
Certification of chain of custody										x				
Investment for trade and the forestry industry		x								x				
Support for administration, production and sales						x	x	x	x	x				
Incubation and integration of the business or forestry production chain					x	x	x	x	x	x				
Establishment and initial maintenance of commercial forestry plantations		x	x	X	x									
Established commercial forestry plantations			x											
Design of fire management plans at the community level.	x									x				
Integration of community brigades and training.	x									x				
Official CONAFOR brigades.	x									x				

Activity	Campeche	Chiapas				Jalisco				Quintana Roo	Yucatán	Department / program / component	Complementary activities	Second-phase activities
	Campeche	Zoque Mezcalapa	Lacandona Jungle	Frailesca	Isthmus-Coast	Sierra Occidental y Costa	Coahuayana River Basin	Costa Sur	Ayuquila River Basin	Quintana Roo	Puuc region			
Renovation and rehabilitation of coffee plantations														
Establishment and maintenance of agro-forestry plantations		x	x	X	x							CONAFOR/PRONAFOR/ Forest Restoration and Production Redirection Component CONABIO/Sustainable Rural Development in Biological Corridors Program SEMARNAT/Land Management Program for Production Sustainability SAGARPA/Support program for small producers/Production incentives component (PROCAFE) SAGARPA/South and south-east production development	Payment for environmental services Coffee leaf rust control Promoting certification Technical assistance Technological research and transfer to improve production systems Developing credit and micro-credit schemes Strengthening producers' organizations Training Impact monitoring	Innovative financial instruments Strengthening markets
Technology packages (inputs)		x	x	X	x									
Sustainable Land Management		x	x	X	x									
Infrastructure and equipment		x	x	X										
Community nurseries		x	x	X										
Developing beekeeping														
Equipment (production and harvest)	x	x								x	x		Credit Training Certification Strengthening markets	Innovative financial instruments
Technical consultancy (safety)	x													
Genetic improvement	x													
Strengthening of regulatory instruments														
Regional Ecological Land Planning	x		x	X		x	x	x				SEMARNAT/Local and regional ecological land planning program CONANP/Conservation for sustainable development program	Drawing up eligibility area maps for subsidies and credits for agricultural and livestock activities based on regulations	
Local ecological planning program											x			
Municipal development plan	x	x	x	X	x	x	x	x	x		x			

Activity	Campeche	Chiapas				Jalisco				Quintana Roo	Yucatán	Department / program / component	Complementary activities	Second-phase activities
	Campeche	Zoque Mezcalapa	Lacandona Jungle	Frailesca	Isthmus-Coast	Sierra Occidental y Costa	Coahuayana River Basin	Costa Sur	Ayuquila River Basin	Quintana Roo	Puuc region			
Payment for environmental services														
Payment for environmental services	x	x	x		x	x	x	x	x	x	x	CONAFOR/PRONAFOR/Payment for environmental services concept		
Local mechanisms for payment for environmental services through cost-sharing funds														
Strengthening of local governance														
Participatory rural assessment	x					x	x	x	x			CONAFOR/PRONAFOR/Governance and developing capabilities component SAGARPA/Rural Productivity Program/Strengthening Rural Organizations component SEDIS Jalisco/Program to strengthen the social fabric to develop production projects	Mentoring/consultancy	
Community to community seminars	x	x	x	X	x	x	x	x	x	x	x			
Community Land Use Planning	x	x	x	X	x	x	x	x	x	x	x			
PREDIAL program		x	x	X		x	x	x	x	x	x			
Community forestry promoter	x		x	X	x	x	x	x	x	x	x			
Developing capabilities	x			X							x			
Medium-term strategy plan for forestry sector social organizations		x	x	X	x					x	x			
Projects to strengthen forestry sector social organizations		x								x	x			
Implementing regional forestry sector social organizations projects										x	x			
Redirection of production														

Activity	Campeche	Chiapas				Jalisco				Quintana Roo	Yucatán	Department / program / component	Complementary activities	Second-phase activities
	Campeche	Zoque Mezcalapa	Lacandona Jungle	Frailesca	Isthmus-Coast	Sierra Occidental y Costa	Coahuayana River Basin	Costa Sur	Ayuquila River Basin	Quintana Roo	Puuc region			
Acquisition and plantation of perennial fruit crops to replace seasonal crops.	x			X						x	x	SAGARPA/Agri-food productivity and competitiveness program/Strengthening the production chain component CONAFOR/PRONAFOR/ Forest Restoration and Production Redirection Component		
Diversified grassland plantation	x		x								x			
Reactivation of protected agriculture										x				
Sustainable production systems and biodiversity conservation and management										x				
Producers' association and market initiatives										x				
Production projects to increase revenues														
Production projects with women	x	x	x	X						x		SEDER-Jalisco CONAFOR/Developing forestry communities in the south west (DECOFOS) SAGARPA/Support Program for the Productivity of Entrepreneurial Women PROMETE SAGARPA/Fund for Production Projects in Agricultural Population Centers Program (FAPPA) SEDESOL/Support for Production Stimulus PROMUSAG INAES/ Cash support for production projects (INTEGRA) INAES/ Support for organizational and business development CDI / Program for Improving Indigenous Production and Productivity CDI/Production infrastructure Secretariat for Tourism-Chiapas	Outreach: PROMUSAG, PROMETE SAGARPA	
Production projects with young people	x		x			x	x	x	x	x				
Production projects with avecindados (neighbors)	x		x	X										
Eco-tourism	x	x	x								x			
Small family farms	x										x			

4.4. Assessing land tenure and resources in the IRE accounting area

Please describe the land and resource tenure regimes in the Accounting Area based on the assessment carried out during the Readiness phase and, if applicable, an additional assessment of any issues related to land and resource tenure regimes in the Accounting Area that were considered critical for the successful implementation of the ER Program.

If any additional assessment of land and resource tenure regimes in the Accounting Area was necessary, provide the outcome of this assessment including:

- *The range of land and resource tenure rights (including legal and customary rights of use, access, management, ownership, exclusion, etc.) and categories of rights- holders present in the Accounting Area (including Indigenous Peoples and other relevant communities);*
- *The legal status of such rights, and any significant ambiguities or gaps in the applicable legal framework, including as pertains to the rights under customary law;*
- *Areas within the Accounting Area that are subject to significant conflicts or disputes related to contested or competing claims or rights, and if critical to the successful implementation of the ER Program, how such conflicts or disputes have been or are proposed to be addressed; and*
- *Any potential impacts of the ER Program on existing land and resource tenure in the Accounting Area*

Please elaborate how the additional assessment has been conducted in a consultative, transparent and participatory manner, reflecting inputs from relevant stakeholders.

Please describe any relevant issues gaps, conflicts, contested claims and potential impacts related to land and resource tenure regimes in the Accounting Area that have been identified and that are considered critical for the successful implementation of the ER Program and explain how these have been or will be taken into consideration in the design and implementation of the ER Program.

Refer to ***criterion 28, indicators 28.1 and 28.2*** *of the Methodological Framework*

4.4.1 Types of ownership in Mexico

The Constitution establishes a triangular structure for ownership: the original ownership by the Nation, public ownership and private ownership.

Original ownership is established in the first paragraph, which expressly states that the ownership of land and water located within the limits of national territory is held originally by the Nation, which exercises maximum power over said areas, and, based on that power, may grant said land or water for private ownership, or, once ownership has been transferred, dispose of said resources by means provided for by Supreme Law, whereby both the Constituent Congress of 1916 and doctrine have defined said ownership as "absolute ownership", "supreme ownership", "full ownership" and "eminent ownership", which is similar to the definition held in colonial or viceroyalty law, currently restricted by international law. Thus, although ownership of land and water can be transferred to individuals, this does not mean that ownership is always transferred of the natural resources located there, is always transferred, as paragraphs four and five of the aforementioned constitutional precept establish that direct ownership is held by the Nation, i.e. only the Nation can dispose of the resources and assets, living or otherwise, described in these paragraphs, but in use of that sovereignty it authorizes the governed (without their being able in these cases to establish private ownership) to make temporary use thereof through a lease, except for particular cases set out in the sixth paragraph of article 27 of the Fundamental Law.[37]
With *public ownership*, in counterpoint to the establishment of private property, the nation maintains direct ownership of properties and resources as established by the aforementioned precept. In other words, land, water and other resources that have not been transferred to private individuals to form private property remain assets of the nation, which are classed as public ownership.

Within this system, the nation has direct ownership of all natural resources of the continental shelf and the underwater shelves of the islands; the minerals or substances that form deposits of a nature that differs from land components; deposits of precious stones, rock salt and salts formed by sea water; fertilizers; solid mineral

[37] Revision restriction 288/2010. Esteva Mercantil Mexicana y Asociados, S.A. de C.V. June 2, 2010. Five votes. Speaker: José Fernando Franco González Salas. Secretary: Israel Flores Rodríguez. 163981. 2a. LXXVIII/2010. Second Division. Ninth Period. Judicial Weekly of the Federation and its Gazette. Volume XXXII, August 25, 2010, Page 468.

fuels; petroleum and all solid, liquid and gaseous hydrocarbons; and the space situated on national territory. They also include all territorial sea waters, inland sea waters and all hydraulic resources such as rivers, lakes, lagoons, estuaries, springs, runoffs, riverbeds and riversides. The nation also has exclusive ownership of the conduction, transformation, distribution and supply of electrical energy; the use of nuclear fuel to generate nuclear energy and the exclusive economic area beyond and adjacent to territorial waters. The Constitution authorizes the issue of leases to individuals or companies by means of an agreement granted by the Federal Executive, specifically referring to natural resources, minerals and water belonging to the nation, but not with regard to petroleum, electrical energy and nuclear energy.

Private ownership arises as a consequence of the principle of original ownership by the nation, which recognizes the transfer of ownership to individuals carried out before the Constitution came into force and the capability to continue doing so once it had been approved. In general terms, it is understood as ownership of land and waters by individuals.

Another system of ownership defined in this article of the Constitution is *social ownership*, which up to 1992 contained the rules relating to the agrarian reform program, the primary objective of which was to break up the large latifundia in the country, by means of expropriations, for the purpose of redistributing land ownership. The agrarian reform distributed around 100 million hectares to more than two million campesinos.[38]

The ejido is a social interest cooperative, composed of campesinos with assets constituted by the land that the State provides on an ownership basis, subject to its use and exploitation according to the procedures set out in law. For its part, the community is in a population center with a legal personality and holds agrarian rights recognized by a presidential, restitutive or confirmation resolution over its land. As a production unit, it has bodies for making decisions, execution and control that operate according to the principles of internal democracy, cooperation and self-management according to its traditions and customs.

In this way, in regions where the IRE will be carried out, there is clear and stable land tenure, which enables the mechanisms of local governance to be established or improved, and land owners to obtain permits to exploit their natural resources, which allows for initiatives such as the IPs to be implemented.

4.4.2 Distribution of land ownership in IRE states

53% of the country's surface area belongs to 29,441 ejidos and 2,344 communities, with a total surface area of 94 million hectares. With regard to forests and other wooded areas, the total area adds up to 66.4 million hectares in the country, of which 62% (40 million hectares) is owned by ejidos and communities, 32% relates to small individual ownership (21 million hectares), and the remaining 6% is owned by the State[39]. According to PROIGUALDAD, in Mexico there are 4.2 million ejidatarios(as) and comuneros(as), 19.8% of whom are women. By not owning the land, [women] cannot access equipment, infrastructure, credit, or leasing programs or economic support to pay for environmental services, and are not represented in decision-making to organize agricultural activities.

19% (6,089) of the country's Agrarian Nuclei and 17% (15.9 million hectares) of the area belonging to the Agrarian Nuclei nationally are found in the states of Campeche, Chiapas, Quintana Roo, Jalisco and Yucatán. These states are home to 28% of the forests in the country with a total of 18.4 million hectares and 29% of forests are ejido and community owned, totaling 11.6 million hectares. This surface area represents 63% of the total forests in the IRE states; however, there are strong differences between each state, particularly the state of Chiapas, which has the highest percentage with 74% of the forest area being ejido and community owned, while in Jalisco, this ownership type only concerns 44% of the surface area of this type of vegetation.

It should be noted that of the total Agrarian Nuclei in these states, only 149 belong to communities. Most of the communities are in the states of Chiapas and Jalisco.

Table 23 Percentage of Forest Owned by Ejidos and Communities by State

State	Total F	F in AI	Percentage of F of	F in possession of	Percentage of F in	Percentage of F in

[38] Serna de la Garza, José María. El régimen constitucional de la propiedad en México. Instituto de Investigaciones Jurídicas de la UNAM. 2005. Disponible en: http://bibliohistorico.juridicas.unam.mx/libros/5/2398/19.pdf Última consulta el 18 de marzo de 2016. P. 21

[39] Based on information from the RAN and series V of the INEGI Charter on the Use of Soil and Vegetation.

	(ha)	(ha)	the state that are in AI	AN in AI (ha)	possession of AN in AI in relation to the total number of F of the state	possession of AN in relation to the total of F in AI
	a	b	b/a	c	c/a	c/b
Campeche	4,201,827	1,004,753	24%	708,911	17%	71%
Chiapas	3,712,922	2,143,976	58%	1,254,625	34%	59%
Jalisco	4,155,948	2,053,514	49%	1,034,260	25%	50%
Quintana Roo	3,711,158	2,732,349	74%	2,373,509	64%	87%
Yucatán	2,790,879	695,324	25%	431,695	15%	62%
Total	18,572,734	8,629,916	46%	5,803,001	31%	67%

F: Forest area
AI: Area of Intervention
AN: Agrarian Nuclei

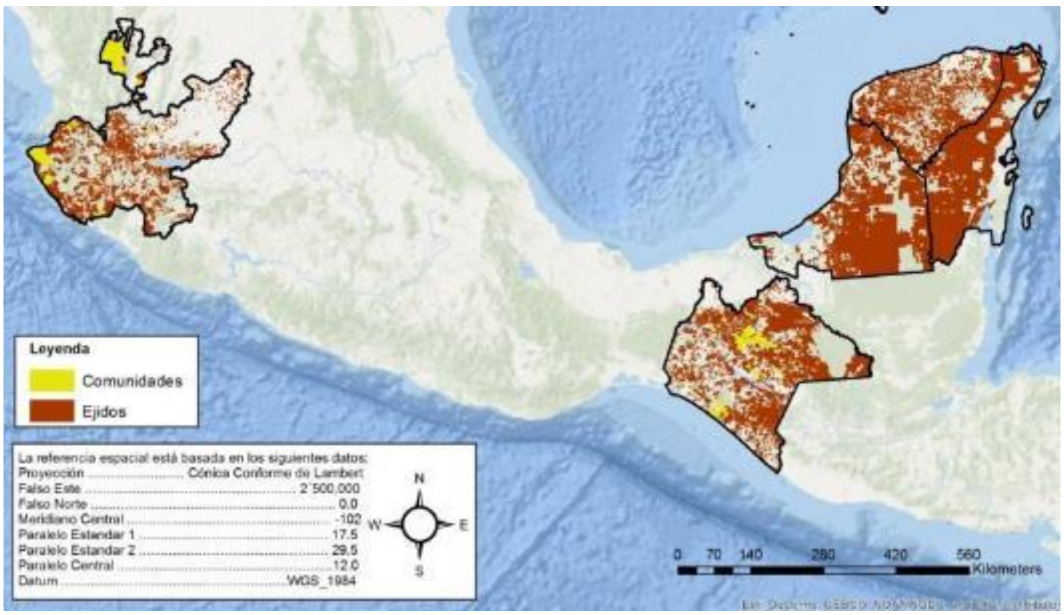

Figure 14 Classification of agrarian nuclei in IRE states.

4.4.3 Legal framework and conflict resolution tools[40]

Mexico has a solid legal framework and conflict resolution tools in the field of land tenure that are relevant for the development and implementation of this initiative.

Once the agrarian reform had run its course, the priority of the government turned to rural ownership planning, resolving conflicts over land tenure, promoting wide-reaching agricultural development through the social ownership system, and resolving land conflicts.

The policy for regularizing land tenure has operated through the Program of Certification of Ejido Rights and Entitlement of Urban Lots (PROCEDE), which is currently administered by the SEDATU. The main aim of PROCEDE was to ensure land tenure certainty by way of regularization, through the issue and presentation of certificates for common-use land, particular plots of land and urban land. The program was in operation from 1992 to 2006. This marked the official end of the program. Among its achievements are certifications for 28,454

[40]Zepeda, G. *Agrarian transformation. Los derechos de propiedad en el campo mexicano bajo el nuevo marco institucional. (Agrarian Transformation. The rights of ownership in the Mexican countryside under the new institutional framework.)* CIDAC, Research Centre for Development, AC. Porrúa, 2000.

agricultural groups, formed by 93,132,667 regularized hectares; and the issue of 9,569,129 documents that would benefit 4,445,213 individuals.[41]

By the end of PROCEDE, there were 2,421 agricultural groups in the country that were not dealt with due to objections to the program and they were unable to prove ownership of the land in question. They faced conflicts regarding land tenure, with reports of internal social conflicts.[42]

As a consequence, Fund for the regularization and registry of agrarian legal acts (FANAR). This program enables agricultural centers that were not regularized to begin the process that would give them legal certainty in terms of land tenure. FANAR supports people who have voluntarily decided to regularize the tenure of their land and who have no difficulty in their right to ownership being scrutinized, under the risk of being suspended from the program operation.

From this process in the policy of regularizing land tenure and management, social ownership in Mexico is made up of 30,258 regularized agricultural settlements, consisting of 94,487,480 hectares, within which are 80% of the forests, 74% of the biodiversity and two thirds of the coast.[43]A total of 4,780 Mexican families live in this area, who were given the right to use and exploit the land.[44]

The National Agrarian Registry (RAN) is the decentralized body of the Secretariat for Agricultural, Land and Urban Development, which is responsible for the control and ownership of community land, and for issuing legal certainty documents resulting from implementation of the Agrarian Law.

Its main responsibilities include: recording original operations and their changes to land tenure and the rights of ejidos and communities, as well as providing legal certainty documents on ownership, through regularization, certification and control of agricultural documentation.

In this way, through a series of programs, some of which have been completed, with others still in process, the RAN promotes the regularization of social tenure by generating documented legal certainty. Thus, institutional projects focus on perfecting the service, on regularization and legal order, on dealing with issues in the agrarian sector and on projects to do with social bonding and transparency.

Another of the priorities of the RAN has to do with modernizing the technical tools that make up both the cadastral information and the social ownership register in Mexico. Today, it has the advantage of generating large databases relating to social ownership integrated into a federal system, which makes it possible to demonstrate the complexity of the structure of georeferenced cadastral information and the mosaic of records of social ownership in the country.

All this information forms part of a rural land register. This information will be used to initiate the analysis processes that will help to determine the nature of production in each area, promoting effective land management based on sustainability and development. The aim is to create the conditions so that communities can grow in an ordered way, by defining the most appropriate areas, and areas that are fit and those that are inappropriate for human settlements and production activities, beyond identifying and preventing areas that could result in social conflicts.

The actions implemented by the FANAR programs, Alliances for Land Regularization and Planning, meant that, among other results, land ownership was awarded to 406 members of agricultural communities, thereby reducing the backlog in social ownership certification and regulation.[45]

The Federal Agrarian Attorney is a social service institution that forms part of the Federal Public Administration, which defends the rights of agriculture-based citizens, provides legal advisory services, agricultural arbitration and legal representation, and promotes the conciliation of interests, the regularization of rural ownership and

1. **41** Acosta Gutiérrez, Manuel Ignacio. Administering social ownership in Mexico. Available at: http://lagf.org/ArticleDetails?ARTID=31348&LID=ES&Act=View&title=La-administraci%C3%B3n-de-la-propiedad-social-en-M%C3%A9xico.

42 Idem.

43 Idem

44 Idem.

45 Idem.

the strengthening of legal certainty in rural areas. Responsible for fostering basic agricultural organization for production and improved use of land and natural resources, through actions that help with sustainable rural development and social wellbeing.

It is a decentralized agency of the Federal Public Administration, with its own legal status and assets, sectored in the Secretariat for Agrarian Reform,[46] has social service duties and is tasked with defending the interests of ejidatarios, comuneros, successors of ejidatarios and comuneros, communities, smallholders, avecindados (neighbors) and agricultural workers, by applying the provisions conferred by the current law and its corresponding regulations, when requested to do so, or ex officio.[47]

Its functions include:[48]

I. Assist and, where appropriate, represent people (...) in matters and before agricultural authorities:
II. Advise on legal matters brought by the people referred to in the previous article on their relations with third parties that have to do with the application of the Agricultural Law;
III. Promote and bring about the conciliation of interests between the people referred to in the previous article, in controversial cases relating to agrarian regulations;
IV. Prevent and report the violation of agrarian laws to the appropriate authority, in order to ensure that the right of those represented and urge the agricultural authorities to carry out their duties and issue pertinent recommendations;
V. Study and propose measures aimed at strengthening legal certainty in rural areas;
VI. Report any failure to comply with the obligations or responsibilities of agricultural officials or the employees of the agrarian justice administration.
VII. With the assistance and involvement of the local authorities, carry out inspection and supervision duties aimed at defending the rights of those represented;
VIII. Investigate and report cases where there is a suspicion of monopolizing or concentrating land above legally permitted surface areas.
IX. Advise and, where necessary, represent the people referred to in the previous article in their processes to obtain regularization and official recognition of their agrarian rights before the appropriate administrative or legal authorities.
X. Report to the Public Secretariat or the appropriate authorities the facts of which it is made aware and which may constitute a crime or which may be an infringement or administrative fault, as well as dealing, where appropriate, with reports of irregularities committed by the ejido general assembly that need to be submitted to the supervisory committee; and
XI. Any others as indicated by the Agricultural Law, its regulations, and any other laws in this regard.

In the reforms of 1992, section XIX of article 27 of the Constitution led to the *Agrarian Courts* to provide swift and honest justice in agrarian matters, with the aim of guaranteeing the legal certainty of tenure for ejido, communal and small ownership land. These courts are of federal jurisdiction and rule on agricultural cases that the Agricultural Law defines as those with the purpose of substantiating, determining and ruling on disputes that arise as a result of the application of the provisions contained in said law.

The competence of the High Agricultural Court (TSA) relates to the bringing of appeals for judicial review, the only such appeal provided for in all of the Agricultural Legislation, to examine and where appropriate modify sentences issued by the Unitarian Courts (TUA) in the following hypotheses: a) In cases referring to land boundary conflicts between two or more ejidos or communal groups, or concerning the boundaries of the land of one or more population centers with one or several small owners, companies or associations; b) In rulings relating to the restitution of land connected to ejido or communal population centers; and C) in rulings issued in proceedings for annulment against rulings issued by agricultural authorities.[49] As this provision refers to agricultural authorities, it does so with regard to public authorities of the State, and not to the organs of the community, which in the Agricultural Legislation become organs of representation, even when those who make up these communities continue to consider their assemblies, committees and supervisory councils as "authorities".
The High Court will also rule on which thesis should be observed when different TUA courts uphold contradictory theses in their rulings, which will also constitute case law without the ruling issued affecting the

[46] Agrarian Act, article 34
[47] Agrarian Act, article 35
[48] Agrarian Act. Article 136.
[49] Organic Law of the Agrarian Courts published in the Official Gazette of the Federation on February 26, 1992. Article 9, sections I, II and III.

specific legal situations resulting from the rulings issued in cases where the discrepancy has occurred. It adds that the case law in point will be mandatory for TUA courts.

The procedure to follow before the agrarian courts includes the following stages:
I. Ratification, answering and presentation of evidence.
II. Determining the action to be brought (dispute).
III. Admission and filing of evidence.
IV. Appeal to the parties to reach an amicable arrangement.
V. Statements and ruling.

In addition, in accordance with Articles 56, 57 and 58 of the Internal Regulations of the Agrarian Courts and with the aim of solving the problem raised in the ejido and communal population centers further away from the seats of the Agricultural Court Units, in 2014, 140 itinerant justice programs were carried out in the country, in which 1,780 villages were visited in 646 municipalities.

Table 24 Administration of agrarian justice: Positive resolutions of the Agrarian Courts by category[50]

Item	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013[2]
Surface area (ha)	298,914	15,519	49,167	18,300	8,176	6,538	223	1,285	1,877	6,052	2,941	4,779	2885	2,150	45,639
Provision of land	108,457	5,215	10,867	4,695	606	6,235	223	1,285	1,490	309			2,453	2,064	1,231
Extension of land	118,751	7,971	8,754	5,876	4,520				387		2,029	885		66	1,374
New population centers	65,320	2,333	27,418	3,383	2,654	303				5,642	912	3,893	432		43,034
Extension by incorporation of land	6,385		1,889	4,346	356					101					
Additional provision of land			259												
Volume of water (thousands of m^3)	22,912,525		1,624,970												
Provision of water	22,830,017		1,624,970												
Additional water provision	82,508														
Applicants	16,318	1,207	2,058	3,675	550	295	34	119	203	140	159	73	64	164	382
Provision of land	5,534	505	738	892	52	229	34	72	117				38	119	139
Provision of water															
Extension of land	8,257	529	920	804	298						39	51		45	52
Extension of water															
New population centers	2,025	183	279	82	159	69		47		91	120	22	26		291
Extension by incorporation of land	502		81	1,897	141					49					
Additional provision of land			50												

In the period between July 1992 and December 2014, the agrarian courts issued 748,133 rulings of the total cases received, totaling 791,864 files, which represents 94.48%, with 43,731 cases still outstanding at the end of 2014. The incorporation of new lawsuits, briefs and requests of those actionable serve as an indicator of the confidence that users of the agrarian justice have in such courts and the legitimacy of its jurisdictional bodies (see Tables 24 and 25).

Table 25 Administration of agrarian justice: Enforcement of rulings by Agrarian Courts by category[51]

Item	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013

[50] 1/ It is the culmination of the land endowment process that dictates the handover of land to campesinos, whose requests met the legal requirements, and which is published in the Official Journal of the Federation. These actions relate to the declaration of rulings and do not involve the physical handover of land; this is implemented by means of rulings issued.
2/ Preliminary figures, there were no positive resolutions up to June 2013.
Source: Agrarian Courts.
[51] 1/ These actions relate to the physical delivery of land and water to campesino applicants.

Surface area (ha)	532,405	44,029	75,018	60,492	13,014	21,255	21,144	12,568	13,599	5,639	18,933	12,364	6,267	6,371	2,296
Provision of land	224,648	18,994	30,008	31,088	1,764	8,855	21,144	12,568	13,599	5,639	18,933	12,364	6,267	6,371	2,296
Extension of land	254,555	19,726	34,487	17,137	5,568	5,908									
New population centers	33,526	5,309	9,432	10,085	3,620	6,492									
Extension by incorporation of land	19,676		443	2,182	2,062										
Additional provision of land			648												
Volume of water (thousands of m^3)	110,842,305	106,769													
Provision of water	101,711,576														
Extension of water	9,130,729	106,769													
Beneficiaries	32,881	4,166	3,897	3,186	1,527	993	1,845	1,506	1,214	889	968	928	904	764	85
Provision of land	10,604	1,806	1,074	1,336	139	443	1,845	1,506	1,214	889	968	928	904	764	85
Provision of water	38														
Extension of land	15,516	2,096	1855	1,440	1,145	319									
Extension of water															
New population centers	2,419	264	968	362	182	231									
Extension by incorporation of land	4,304			48	61										
Additional provision of land															

In a complementary way to the work of the Agrarian Courts, the Secretariat of Agrarian, Territorial and Urban Development (SEDATU) relies on the Program of Attention to Social Conflicts in the Rural Environment (COSOMER). This program stems from the recognition that to settle certain conflicts arising from the ownership and/or possession of land, the strict and imperative application of existing law is not enough; what is needed is its attention from a social character perspective, which reconciles the interests of the parties. The program is applicable throughout the national territory and focusses attention on social conflicts in the rural environment arising from disputes over the ownership and/or possession of social or private land that require immediate resolution because of the risk they pose to the stability, security and social peace in the region.

In order for a conflict to be eligible under the COSOMER, it must meet the following requirements, among others:

- Have exhausted the ideal legal avenues for resolving the conflict and the problem persists, or without having been exhausted, it is unforeseeable that they could bring the conflict to an end;
- That the subjects or groups involved are willing to definitively resolve the conflict through conciliation, as the preferential means, with the implementation of program resources through the suitable legal instruments;
- That the beneficiaries shall determine, by mutual agreement and under the terms provided for in the law, the form, use and/or distribution of economic resources that they receive as compensation; and
- In cases in which support consists of the acquisition of privately owned land for Agrarian Nuclei, that the commitment is received from the beneficiaries to incorporate them into the social regime in the applicable terms of the Agrarian Law.

The program supports the resolution of conflicts through granting beneficiaries compensation to use in the way that best suits their interests. The Agrarian Nuclei that assign their right to the land in the case of the dispute may receive extra aid for the same purpose, through other federal, state and/or municipal programs. The beneficiaries do not receive the program's resources until signing a settlement agreement and ratifying it before the corresponding TUA so that it legally qualifies and acquires the category of an enforceable ruling or, depending on the case, until it is ratified before a Public Notary.

During the period 2006–2012, the program succeeded in resolving a total of 949 cases; the benefit was derived benefiting 107,436 people, representing a surface area free of dispute covering 322,622 hectares (see Table 26). In addition, between 2013 and 2015, COSOMER resolved 77 agrarian conflicts involving more than 10,000 people and 22,585 hectares in 17 states, including Chiapas (six conflicts), and Jalisco (three), both ATREDD+.

P/ Preliminary figures for the month of July 2013. Source: Agrarian Courts.

Table 26 Conflicts resolved by COSEMER between 2006 and 2012

Year	Approved cases	Surface area freed of conflict	Beneficiary population
2006 (Dec.)	7	1,793.5	2,362
2007	165	69,533.0	8,056
2008	154	72,885.1	23,178
2009	178	83,317.6	24,105
2010	204	26,023.7	16,202
2011	159	43,063.0	17,427
2012 (Nov.)	82	26,008	16,106
Total	949	322,622	1070436

Other preventive measures to avoid conflicts over land tenure are given consideration through subsidies awarded. The investment programs of the IRE bring together and align the various government supports that can have an effect on the rural areas situated in the area of intervention.

These government supports, known as "subsidies" within the classification of economic instruments, constitute the initial investments or first-phase activities of the Investment Programs, and will be provided through the components for Forest Development, Environmental Services, Community Forestry and Production Chains of the PRONAFOR, under the responsibility of CONAFOR.

In the case of CONAFOR, the operating rules established for awarding subsidies relating to these first-phase activities include supports that will be awarded to individuals, companies, ejidos or communities that own or possess forest land and to those who are not owners but work in forestry for the purposes of the protection, conservation, restoration, exploitation, transformation, industrialization or marketing of forest products (article 8, Royal Order, 2016).

Within this same context, the operating rules indicate that subsidies will only be awarded when the established legal, technical, environmental, economic and social requirements are all met. These requirements include accreditation of the legal ownership or legitimate possession of the land for which the support is intended, with the corresponding legal title (article 19, Royal Order, 2016).

In strict adherence to the legal framework, the operating rules list the legal, civil and agrarian instruments with which applicants for subsidies can meet the requirements to accredit legal ownership or legitimate possession. To ensure greater certainty and security, the obligation is established so that for cases in which subsidies involve activities being carried out on an area of land, the applicant must submit the georeferenced polygons of the parcel and/or surface area where the support funding is to be applied.

This is coupled with the requirement established in operating rules on accrediting legal ownership or legitimate possession of the parcel, with the aim of avoiding any risk in the implementation of activities and the proper disbursement of the corresponding subsidies, and the permanence thereof. The operating rules establish limitations to accessing these subsidies. Thus, in numeral 11 of the 2016 operating rules, it states that subsidies will not be awarded to people whose lands or surface areas where the support funding will be applied are involved in legal proceedings or legal conflict of any kind.

For the SAGARPA, the operating rules establish that beneficiary will incur in non-compliance and the subsidy therefore cancelled when any conflict exists between beneficiaries (article 8, section X, subsection k, numeral 1.2, subsection e). For the case of the PROGAN, legal tenure of the land must be demonstrated in order to access the support (article 189, section II, b).

As well as the fact that the Mexican legal system establishes the instances (both administrative and judicial) by which any conflict relating to land tenure can be determined, the established procedures and requirements to receive subsidies, by means of which the first-stage activities of the investment programs will be funded, allow for mitigation of any possible risks in the execution and permanence of said activities and, therefore, in achieving the objectives of the investment programs so as to obtain (where appropriate), a payment for emissions prevented achieved as a consequence of the funding paid out by the State through the subsidies, in order to meet the goals and targets set in its public policy and in national and international commitments.

4.5. Analysis of laws, statutes and other regulatory frameworks

Please provide an analysis of the planned ER Program Measures in the context of relevant local, regional and national laws, statutes and regulatory frameworks, including relevant international conventions and agreements. . Please identify any potential compliance issues of the actions and interventions with these laws, statutes, regulatory frameworks, conventions and agreements; and identify legal and regulatory gaps. If applicable discuss how these issues will be addressed.

At **international level**, Mexico is a member of numerous environment and development treaties,[52] particularly, for the development and implementation of the IRE, the United Nations Framework Convention on Climate Change, which provides methodological guidance on REDD+ and the Convention concerning Indigenous and Tribal Peoples in Independent Countries (Convention No. 169 of the ILO), which establishes the guidelines for ensuring that the rights of indigenous peoples are respected.

The national **legal framework** applicable to this emissions reduction initiative mainly includes:

The **Political Constitution of the United Mexican States** represents the supreme reference law for issues relating to the social, economic and cultural development of the country. In Article 2, it establishes the recognition and guarantee of the right of indigenous peoples and communities to conserve and improve the habitat and preserve the integrity of their lands, as well as access to the use and enjoyment of the natural resources of the places they inhabit. Article 4 establishes that every person has the right to a healthy environment for their development and wellbeing, that the State shall guarantee the respect of this right and that environmental damage and deterioration will incur liability for those who cause it in terms of legal provisions.

With regard to the clarity of land tenure, Article 27 lays down the original ownership regime of the Nation that has the right to transfer ownership to individuals, constituting private ownership. This Article recognizes the legal personality of the ejido and communal population centers, so that the ownership of these of their land is protected both for human settlement and to perform productive activities. In addition, this Article provides that the State, through legal measures, will have an influence on the preservation and restoration of the ecological balance, promoting rural economic activities, as well as preventing the destruction of the natural elements. The foregoing represents the great guiding principle of environmental policy in Mexico. Articles 115 to 121 set out the characteristics of the states and municipalities and it is specified that they are obliged to publish and enforce federal law.

The constitutional reforms undertaken in 2011 in Article 1 relating to human rights establish the principles relevant to the IRE, as all persons shall enjoy the rights recognized in the Constitution and in the international treaties to which the Mexican State is a party[53]. Moreover, regulations in the field of human rights shall be interpreted at all times offering people the most extensive protection[54] and all the authorities have the obligation to promote, respect, protect and guarantee human rights in accordance with the principles of universality, interdependence, indivisibility and progressiveness. Accordingly, the State must prevent, investigate, punish and redress human rights violations, in the terms established by law[55].

The **Organic Law on Federal Public Administration**, the purpose of which is to establish the bases for organizing the Federal Public Administration, centralized and parastatal, including the decentralized agencies as is the case of the CONAFOR, in accordance with the provisions set out in Articles 1, 3, 9 and 45. In addition, Articles 48 and 49 of this law constitute the legal basis of CONAFOR being a decentralized public agency of the SEMARNAT.

[52] Other relevant treaties are the United Nations Convention on Biological Diversity (UNCBD), which includes work programs on forest biodiversity; the United Nations Convention on Desertification (UNCCD), which speaks of the need to ensure sustainable forest management, reforestation and soil conservation; the International Tropical Timber Agreement, which orders parties to promote the sustainable management of tropical timber; the RAMSAR Convention, which supports the conservation of the natural reserves of forested swamps; the International Convention on Economic, Social and Cultural Rights (ICCPR); the Inter-American Convention on Human Rights; the United Nations' Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW), the International Convention on the Elimination of All Forms of Racial Discrimination, and the Universal Declaration of Human Rights.

[53] Amended paragraph DOF 10/06/2011

[54] Added paragraph DOF 10/06/2011

[55] Added paragraph DOF 10/06/2011

The Agrarian Law is a statutory requirement of Article 27 of the Constitution in agrarian matters and general observance in the Republic as a whole, and establishes in Article 9 that ejido population centers or ejidos are a legal entity in their own right and with their own assets, and are owners of the lands that they have been endowed with or which they have acquired by means of any other title.

It should be noted that the Law establishes areas of forests or rainforests (Article 59) as ejido lands for common use and describes that lands for common use constitute the economic sustenance of life in the ejido's community and are those that have not been reserved by the Assembly for the settlement of the population center, nor as parceled land (Article 73). In addition, in its Article 134, the law establishes the Federal Agrarian Attorney as a decentralized body, with legal personality and own assets, sectorized in the Secretariat of Agrarian Reform. In addition, the Agrarian Attorny has social service functions and in charge of defending the rights of the ejiditarios, comuneros, successors of ejiditarios or comuneros, ejidos, communities, small landowners, residents and farm laborers, through the application of the powers conferred upon them by this law and its regulations as established in Article 135 of the Law.

The **General Law on Transparency and Access to Public Information**, regulating Article 6 of the Constitution, sets out to establish the principles, general bases and procedures for ensuring the right of access to information in the possession of any authority, entity, agency and body of the Legislative, Executive and Judicial powers, autonomous bodies, political parties, trusts and public funds, as well as any natural or legal person or union that receives and exercises public resources or performs acts of authority of the Federation, Federal Entities and municipalities.

The **General Law for Ecological Balance and Environmental Protection** (LGEEPA) is aimed at promoting sustainable development and establishing the bases for defining the principles of environmental policy and tools for its implementation, and the preservation, restoration and improvement of the environment. In the field of soil use, the law establishes a series of ecological criteria to guide preservation and restoration of the ecological balance, the sustainable use of natural resources and environmental protection actions. The law also considers environmental policy tools such as the Ecological Planning to regulate or induce the use of the land and production activities, with the aim of achieving environmental protection and the preservation and sustainable use of natural resources, by analyzing deterioration trends and how they might be used (article 3). The Laws may be general to the territory – regional, local or marine (Article 20-bis).

On the other hand, the law assigns responsibilities to states on matters relating to the formulation, management and assessment of the state environmental policy (Article 7). Finally, through Article 21, the law encourages the development and application of economic instruments to promote compliance with environmental policy objectives. By means of these instruments, it will encourage those who perform actions aimed at the protection, preservation or restoration of ecological balance and promote greater social equity in the distribution of the costs and benefits associated with the environmental policy objectives.

The **Sustainable Rural Development** Law (LDRS) lays down the coordination of public policies in the field, in the interest of economic development without negative environmental effects. In this way, Mexico seeks to promote sustainable rural development in the country, looking to advance in the construction of a cross-sectoral and inter-sectoral agenda around the issues concerning conservation, sustainable management and restoration of forest ecosystems.

As set out in Article 32, the Federal Executive will boost economic activity in rural areas with the participation of the States, Municipalities and the social and private sectors of the rural environment. These activities will aim to increase productivity and rural competitiveness in order to boost the income of producers and increase the natural capital for production, among others.

Moreover, its Article 24 establishes the creation of Councils for Sustainable Rural Development at municipal, district and state level as forums for participation from producers and other rural society stakeholders in defining regional priorities, the planning and distribution of resources that the Federation, the states and the municipalities allocate to support productive investment and sustainable rural development.

The **General Law on Sustainable Forest Development** (LGDRS) seeks to regulate and promote the conservation, protection, restoration, production, management, cultivation, management and harvesting of the country's forest ecosystems and resources, as well as to divide powers which, in terms forestry, lie with the

Federation, the States, the Federal District and the municipalities, with the aim of fostering sustainable forest development.

In June 2012, reforms and additions of various provisions relevant to the theme of REDD+ were made to the LGDFS: [56]

- The definitions of deforestation and degradation have been added to Article 7.
- It is established that the National Forestry and Soil Inventory must comprise the information based on the National Monitoring, Registration and Verification System, on emission reductions resulting from actions to prevent and combat deforestation and degradation of forest ecosystems (Article 45, Section IX). In addition, through the Second Transitional Article, it sets a period of not more than three years for the Federal Government to implement a national monitoring, registration and verification system, with the purpose of evaluating and organizing emission reductions resulting from actions to prevent and combat deforestation and degradation of forest ecosystems (REDD+).
- Article 134-bis has been added, which establishes that the owners and legitimate holders of forest land who, as a result of sustainable forest management, conserve and/or improve the environmental services, will receive the economic benefits derived therefrom.
- This Article also stipulates that the legal instruments and environmental policy to regulate and promote the conservation and improvement of environmental services, should ensure respect for the safeguards recognized by international law, as well as:
  - **I.** Free, prior and informed consent from the ejidos, communities and indigenous peoples;
  - **II.** Equitable benefit sharing;
  - **III.** Certainty and respect for ownership rights and legitimate possession, and access to the natural resources of the owners and legitimate holders of the land;
  - **IV.** Inclusion and territorial, cultural, social and gender equity;
  - **V.** Social diversity and participation;
  - **VI.** Transparency, access to information and accountability;
  - **VII.** Recognition and respect for the forms of internal organization, and
  - **VIII.** Cross-cooperation, integrality, coordination and complementarity between policies and instruments of the three tiers of government.

The **General Law on Climate Change** (LGCC)[57] is aimed, among other aspects, to regulate greenhouse gas and compound emissions to achieve a stabilization of their concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system by considering, where applicable, the provisions set out in Article 2 of the United Nations Framework Convention on Climate Change and other provisions arising therefrom.

This Law establishes two guiding principles. The first is the mitigation of greenhouse gas emissions (GHG), by means of regulatory (the National Inventory of Emissions and the National Emissions Register) and economic (the Fund for Climate Change) instruments aimed at contributing to the fulfilment of the aspirational emission reduction goals. The second guiding principle comprises adaptation measures, establishing diagnostic tools or the creation of tools for urban planning and the prevention of natural disasters. The LGCC establishes in Article 31 the need to include the planning, measurement, monitoring, reporting, verification and evaluation of national emissions.

With regard to the issue of mitigation, the LGCC indicates that the CONAFOR should design strategies, policies, measures and actions to move towards a zero-per-cent carbon loss rate in original ecosystems, to be incorporated into the forest policy planning tools for sustainable development, taking into account sustainable development and community forestry management[58].

[56] Available at http://goo.gl/7b9zNw , page 76

[57] The LGCC has the aim, among others, of regulating greenhouse gas and compound emissions to achieve a stabilization of their concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system by considering, where applicable, the provisions set out in Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC) and other provisions arising therefrom. In Article 32, it states that: *The national mitigation policy will be implemented based on a principle of gradual change, promoting the strengthening of national capacities for emissions mitigation and adaptation to the adverse effects of climate change, prioritizing those sectors with the greatest potential GENERAL CLIMATE CHANGE ACT CHAMBER OF DEPUTIES OF THE CONGRESS OF THE UNION General Secretariat of Parliamentary Services Last Reform DOF 02/04/2015 20 of 49 on reduction until culminating in those that represent the highest costs, in addition to fulfilling the international commitments of the United Mexican States on the matter.*

[58] Transitional Article Three of the LGCC

The purpose of the **Federal Metrology and Standardization Law** is to establish the General System of Measurement Units, to regulate matters relating to metrology, standardization, certification, accreditation and verification, and to establish a uniform procedure for the drafting of official Mexican standards by federal public administration agencies, and establish the national accreditation system of standardization and certification agencies, verification units, and test and calibration laboratories, among others.

Finally, the **Federal Penal Code**, under Title twenty-five, "Crimes Against the Environment and Environmental Management", criminalizes offences in environmental matters at the Federal level[59] and establishes, among other things, penalties from six months to nine years for the removal or destruction of natural vegetation, allowing an additional fine to be applied of between 100 and 3,000 times the minimum daily wage. The same fine shall be applied to those who illegally transport, trade, collect, store or process roundwood, chips or charcoal, as well as any other timber forest resource, or earth from forest soils in quantities of more than 4 m^3 or its equivalent in sawn wood, as applicable. If such actions occur within a protected natural area, it is considered a serious offence[60], and the penalties may increase by up to three more years and the economic penalty by up to another 1,000 days of fine.[61]

At the **state level**, the powers of the LGCC, as set out in article 8, instruct the states on formulating and assessing state policy in terms of climate change in line with national policy, as well as on drafting and implementing their program in the field of climate change. This context has motivated instruments related to the theme of climate change and other topics relevant to REDD+. Such as the State Laws on climate change, the development of REDD+ State Strategies and other relevant initiatives. The following table summarizes the instruments of the 5 states where REDD+ Early Actions are performed:

[59] Title Twenty-five, "Crimes Against the Environment and Environmental Management", was inserted in 1996 when the LGEEPA was reformed.

[60] When a crime is considered so serious that the accused's case is filed immediately so that the judge can order or deny the apprehension or search requested by the Public Secretariat, within 24 hours starting from the moment in which the filing of the case was agreed and the possibility of accessing benefit is lost if the accused is provisionally released on bail (with the payment of bail).

[61] Diagnosis of gaps and omissions in the legal framework applicable to REDD+ in Mexico. 2013. Mexico REDD+ Alliance. http://goo.gl/Ok3sLp

Table 27 Laws and instruments in IRE states

States	Laws						Instruments		Institutional Arrangements
	Climate Change Action Law	Planning Law	Sustainable Rural Development Law	Sustainable Forest Development Law	Ecological Balance and Environmental Protection Law	Other relevant legal instruments	Programs in the field of Climate Change[62]	REDD+ State Strategy	Inter-Secretarial Commission on Climate Change
Campeche	NO	YES	YES	YES	YES	Environmental Education Law, Social Development Law and the Wildlife Law	YES	YES	Installed
Chiapas	YES	YES	YES	YES	YES	Indigenous Rights and Culture Law	YES	In development	Installed
Jalisco	YES	YES	YES	YES	YES	Rights and Development of Indigenous Peoples and Communities Law, Regulation of State Law on ecological balance in the field of Protected Natural Areas, and Regulation of procedure of the state LEEPA concerning environmental impact	In development	In development	Decreed
Quintana Roo	YES	YES	YES	YES	YES	Wildlife Law, Burning and Prevention of Forest Fires Law and Rights, Culture and Indigenous Organization Law	YES	YES	Decreed
Yucatán	NO	YES	YES	NO	YES	Prevention and Fighting Agricultural and Forest Fires Law	YES	Yes	Decreed

The Planning Laws of the States and their Municipalities are key to the development of the ER initiative. These laws are intended to regulate the planning for the development of states, and prosecute, accordingly, the activities of the authorities and bodies responsible for planning. They also set the groundwork for municipal development planning, as an essential part of State planning, linked to the State and the nation's development goals and strategies.

In the state of Jalisco, Regional Climate Action Plans (PACREG) have also been developed, which are management instruments that incorporate the information in the Municipal Climate Action Programs (PACMUN) from each of the municipalities that make up an Intermunicipal Board[63]. They include an inventory and establish adaptation and mitigation measures at a regional level.

At the regional level, the States that comprise the Yucatán Peninsula (Campeche, Yucatán and Quintana Roo), have joined efforts and resources to develop a coordinated response to climate change through the *General Agreement of Coordination on Climate Change in the Yucatán Peninsula.* This agreement establishes the commitment of the three states to the development of three projects with a broad vision: the preparation of the Regional Strategy on Adaptation to Climate Change, the Regional Program on Reducing Emissions from Deforestation and Degradation (REDD+) and the creation of the Fund for Climate Action in the Yucatán Peninsula.

4.6. Duration of the Emissions Reduction Initiative

[62] In order to integrate the technical guidelines and public policy to be considered by the states in order to design and update their climate change programs, in January 2016 the General Directorate of Policies for Climate Change (DGPCC) of the SEMARNAT, in conjunction with the National Institute of Ecology and Climate Change (INECC), published the document on *Minimum Elements for Drafting Federal Entity Climate Change Programs* (http://goo.gl/nDUKoz)

[63] The Inter-Municipal Boards are decentralized public agencies, with influence in the territory of the municipalities that they comprise. These municipal associations promote strategic planning in the territories of their respective intervention, in addition to facilitating inter-governmental interaction and the coordination of public policies at the regional and local level.

Please describe the period over which the planned actions and interventions under the ER Program will be implemented, including proposed start and end dates.

The Emissions Reduction Initiative is designed to run for five years, including the activities of the two stages envisaged. If the Emissions Reduction Purchase Agreement (ERPA) is signed at the beginning of 2018, the implementation of activities would start the same year and would come to a close in March 2023.

5. Participation and consultation of stakeholders involved

5.1. Description of the consultation process with stakeholders involved

Please describe the stakeholder information sharing and consultation mechanisms or structures that have been used in the design of the ER Program, including the identification of the priority Non-Carbon Benefits, the implementation of necessary safeguards and so forth. As part of this description, explain how the information sharing and consultation mechanisms or structures were in a form, manner and language understandable to the affected stakeholders for the ER Program.

Separately, for the implementation phase of the ER Program, provide an overview of the plans for consultations and meetings, a description of publications and other information used and the mechanisms for receiving and responding to feedback, in order to show how the consultation process will be structured and maintained during this phase.

Describe how the sum of these actions will result in the full, effective and on-going participation of relevant stakeholders. Provide information on how the process builds on the stakeholder outreach and consultation process implemented as part of national REDD Readiness activities.

*Refer to **criterion 24, criterion 28, criterion 31 and indicator 34.2** of the Methodological Framework*

In Mexico, preparation for REDD+ has been carried out through a comprehensive and inclusive participatory process since 2010, culminating with the consultation of the National REDD+ Strategy (ENAREDD+). This process has provided experiences and important inputs for the actual construction of the Emissions Reduction Initiative, whose main elements have been designed in a participatory way. This section describes the participation process during preparation and the particularities of the construction of the IRE.

5.1.1 Participatory process during preparation for REDD+

The Emission Reduction Initiative forms part of the National REDD+ (ENAREDD+) Strategy and the Intervention Model in the REDD+ Early Action Areas,[64] based on the approach of sustainable rural development through integrated land management; both have had participatory construction processes that are relevant to the IRE and which are described in this section.

In addition, preparation for ENAREDD+ has had broad participation from civil society and various stakeholders in the country. Below are the main platforms for consultation, participation and information that are presented with and/or receive feedback on the REDD+ process in Mexico:

- ENAREDD+ Working Group of the National Forestry Council

The National Forestry Council (CONAF) is a consultative and advisory body on matters set out in the General Sustainable Forest Development Act (LGDFS) and on which opinion is sought. It comprises representatives of academic sectors, indigenous, industrial, non-governmental, professional, social communities (ejidos and communities), state councils and government. It is supported by five technical committees that assist in reviews, dealing with issues, plenary agreements and setting guidelines for issuing opinions and proposals with regard to the policies and criteria governing forest activity.

[64] The Intervention Model developed by CONAFOR was published in April 2015 and can be found at: http://goo.gl/DdqBRP

The ENAREDD+ working group was formed on July 30, 2013 within CONAF and has been actively involved in providing feedback on ENAREDD+ drafts[65]. Finally, in the Extraordinary Meeting of the National Forestry Council held in February of 2015, a favorable opinion was obtained on the latest draft of the National REDD+ Strategy. In 2015, four ENAREDD+ working group meetings were held.

At the state level, the LGDFS law (article 157) creates the State Forestry Councils, as advisory, consultancy and conciliation bodies in matters relating to the planning, supervision and evaluation of policies and the exploitation, conservation and restoration of forest resources. They include representatives from government departments, ejidos, indigenous communities, smallholders, and providers of forestry and industrial technical services. The Councils are linked to the Sustainable Rural Development Councils in the context provided for by the Sustainable Rural Development Law.

In the context of the IRE, Investment Programs have been submitted to these Councils in order to obtain their feedback.

- Indigenous and Campesino Roundtable

The Indigenous and Campesino Roundtable of CONAF was installed in October 2014, to feedback and support the consultation process of ENAREDD+ with an emphasis on procedures aimed at the rural population and indigenous peoples and communities, ensuring that are culturally appropriate. The Roundtable comprises the following organizations: the State Union of Community Foresters of Oaxaca, A.C. (UESCO) National Union of Communal Forestry Organizations (Civil Association) (UNOFOC), the Directing Council of the Mexican Network of Campesino Forestry Organizations A.C. (MOCAF NETWORK), the Indigenous Network of Mexican Tourism (RITA), the Wixárica Interstate Union of Nayarit, Jalisco and Durango Ceremonial Centers, and the Union of Communities of the Sierra de Juarez, A.C. (UCOSIJ). Between 2014 and 2015, the Indigenous and Campesino Roundtable met 7 times, with a work agenda focused on following up on the consolidation of the ENAREDD+ document and the consultation process, however these meetings further reported on the progress in the development of the IRE.

- National and state REDD+ Technical Advisory Committee (CTC)

The National Technical Advisory Committee for REDD+ (CTC-REDD), was created in 2010 as a specialist pluralist space to provide analysis and feedback on the REDD+ process; it is considered the advisory council[66] for the REDD+ Working Group of the CICC. This Committee has actively participated in the National Strategy process and in defining other preparatory REDD+ actions, through several themed working groups. The CTC-REDD+ represents a national platform for dialogue between stakeholders with representatives of various government institutions, non-governmental organizations, representatives of ejidos, communities and associations, indigenous peoples, academics and representatives of the private sector.

Before it was formalized in 2010, over a period of approximately six years the CTC-REDD+ had convened a large number of civil society organizations [67], which have been actively involved by attending meetings, reviewing documents and providing valuable information on the subject. Between 2010 and 2015, the CTC-REDD+ met on 19 occasions[68], of which three were held in 2014 and one in 2015. In this committee, an IRE feedback workshop was held on March 30, 2016.

At state level, the CONAFOR has stepped up the dialogue with state governments and other local stakeholders since 2011 to discuss different options for the REDD+ implementation framework. These processes also included creating regional or state Technical Advisory Committees (CTCs). On August 12 2011, the CTC-REDD+ was set up in Chiapas, on September 5, 2011 that of Campeche, in November 2011 that of the Yucatán Peninsula (Regional CTC-REDD+), in that same year in Quintana Roo and on October 13, 2013 that of Yucatán was set up.

- Safeguards Committee for the Yucatán Peninsula

This committee was formed in 2014 as a platform for participation and dialogue between stakeholders of civil

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[65] From July to December 2013, eight meetings were held, whereas in 2014 there were five meetings, in which the issue of ENAREDD+ was addressed.

[66] Agreed upon during the GTREDD+ meeting held on June 16, 2010

[67] Although the CTC-REDD+ was formally set up in May 2010, it was informally created in 2008 by the Technical Advisory Committee of the Payments for Environmental Services (CTC-PSA), promoted by the National Forestry Commission (CONAFOR), with the name "CTC-PSA Working Group for REDD".

[68] Meeting dates can be viewed at http://www.conafor.gob.mx/web/temas-forestales/bycc/redd-en-mexico/participacion/

society and government in the Yucatán Peninsula, specializing in the subject of safeguards. An open call was launched for the formation of this committee between CONAFOR and the secretariats of the environment of the 3 states of the Peninsula, as well as members of the state CTC, academia, NGOs, rural organizations, forest producers and other key stakeholders. Between 2014 and 2015, the Safeguards Committee met seven times.

The Committee is currently working to consolidate its scheme of governance and structuring with other existing platforms in the Peninsula. It focuses on giving feedback to the construction of the National Safeguards System and the Safeguards Information System by providing feedback to the development and future implementation of the IRE in the Yucatán Peninsula linked to the issuance of safeguards and providing inputs for the mainstreaming of safeguards in the Peninsula's REDD+ State Strategies and to provide feedback on the design and operation of the complaints mechanism for REDD+.

In relation to the IRE, on February 22 and 23, 2016 a meeting was held where the IPs were presented in a general way in the states of Chiapas, Quintana Roo and Yucatán and the results of its participatory construction were also fed back on the social and environmental risks identified and possible mitigation measures for these risks.

5.1.1.1 ENAREDD+ consultation

Since 2010, the ENAREDD+ has been built through a participatory process, which culminated in the public consultation process for the Strategy carried out in 2015 and early 2016, with the aim of gathering opinions and feedback, and to reach agreements or consent with regard to the objective, components and lines of action of the ENAREDD+, through full and effective participation, exchanging views, learning and mutual understanding with the population in order to have a Strategy that is culturally, socially and environmentally pertinent and feasible.

Accordingly, the ENAREDD+ document was put together as a result of the valuable efforts of representatives from indigenous peoples and communities, and representatives from local communities, civil society, academia, business organizations and various government departments.

To guide this public consultation process, the CONAFOR drew up a General Consultation Plan, and a Master Plan for the indigenous peoples and people of African descent consultation, both of which are available at www.enaredd.gob.mx

The consultation took place in three phases: informative, consultative and a phase for systematizing the results, and it included several procedures: virtual consultation, forums (state-wide and thematic), consulting boards and organizations involved, consulting communities of indigenous peoples and of African descent,[69] and consulting carried out through the Program to Promote Social Organization, Planning and Regional Forestry Development (PROFOS), with the aim of applying different treatments depending on the target population. Table 28 presents a summary of the results of the consultation in its different procedures:

[69] This approach was carried out in accordance with the Protocol for Implementing Consultations with Indigenous Peoples and Communities of the CDI with Standards from Agreement 169 of the International Labor Organization on Indigenous and Tribal Peoples in Independent Countries, and the following were the consultation phases for this procedure: prior agreements phase, fact-finding phase, consultation phase and consultation results phase.

Table 28 Results of the different ENAREDD+ Consultation procedures

Method				Total participants	No. of women	No. of men	No. of young people (under 30)	Number of people belonging to indigenous peoples and people of African descent.	No. of indigenous peoples and people of African descent represented
General	Virtual			3,222	849	2,373	942	409	41
	In person	State forums		5,084	1,076	4,008	650	468	14
		Themed forums	Public consultation forum to women from the rural sector	108	108	0	19	17	5
			Public consultation forum to young people from the rural sector	47	25	22	47	4	4
			Public consultation forum to the agricultural sector	94	18	76	7	4	3
	Participation and consultation councils and bodies			92	45	47	N/A[70]	92	Over 30
Specific	Indigenous peoples and communities			12,245	3,712	8,533	N/A[71]	12,245	50
	Local communities			5,468	1,116	4,265	N/A	N/A	N/A[72]
GRAND TOTAL				26,360	6,949	19,324	N/A	N/A	N/A

- **Inputs for the IRE from the consultation with indigenous peoples and people of African descent**

Through indigenous consultation, events were created for participation from indigenous peoples and communities, and people of African descent, where they could suggest proposals, raise concerns and make recommendations to ensure that the implementation of ENAREDD+ would be consistent and respectful of their forms of organization, their culture and the ways in which communities relate to their forest resources. A Master Plan was used to carry out this consultation.

The consultation was carried out in 209 locations in includes coverage of 209 locations in 23 federal entities, with the involvement of 50 people from indigenous communities and people of African descent. Since this consultation was carried out in several of the municipalities in IRE states, its results have been considered as inputs for drafting this document. Specifically, information was obtained concerning possible additional activities (second stage), for the distribution of benefits (section 15), measures to promote compliance with safeguards (section 14.1), and information on the mechanisms for reporting and dealing with complaints or concerns (section 14.3). The information has been incorporated in the appropriate sections of this document.

5.1.2 Participatory process in the construction and design of the IRE

The participatory process of the IRE is divided into two phases: its construction and its implementation. The following two sections describe each phase.

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[70] Participant age was not a required field on the attendance lists

[71] For the indigenous consultation, age was recorded in the following way: 0 to 12 years; 13 to 18; 19 to 59; and 60 and over
To determine the two first ranges, the provisions of the General Law on the Rights of Children and Adolescents were used, and to determine the last range, the Law on the Rights of Elderly Adults was used.
In accordance with the above, the participation by age in the consultation aimed at indigenous peoples and people of African descent was as follows:

- Up to 12 years of age, 108 participants
- 13 to 18, 348 participants
- 19 to 59: 7,717 participants
- 60 and above, 2,042
- No age given, 2,030 participants

[72] Due to the fact that each organization carried out its own process, in some attendance lists the number of young people and/or the number of people belonging to indigenous peoples and people of African descent was not recorded.

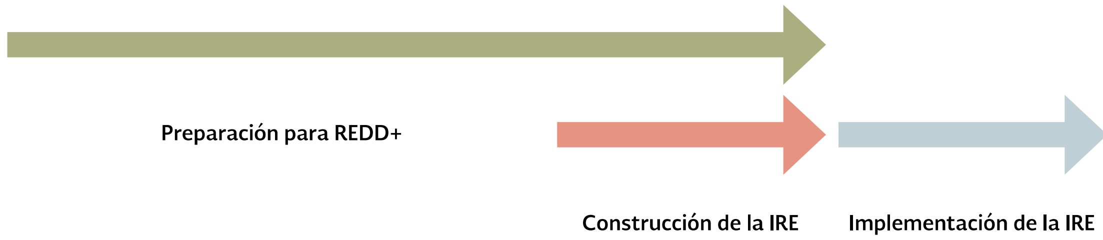

Figure 15 Phases of the REDD+ and IRE participatory process

The construction of the IRE was performed taking into account the views and opinions of different stakeholders at different levels. The processes that were part of the construction of this document are described below:

5.1.2.1 Construction of the Investment Programs

As described in section 4.3, the Investment Programs constitute the central element of the IRE because they contain the interventions that will be implemented to address deforestation and forest degradation in the areas of intervention of the 5 states included in this Initiative.

Figure 16 summarizes the general process that all the regions followed to develop the Investment Programs, and the particular characteristics of the process in each state is described further below.

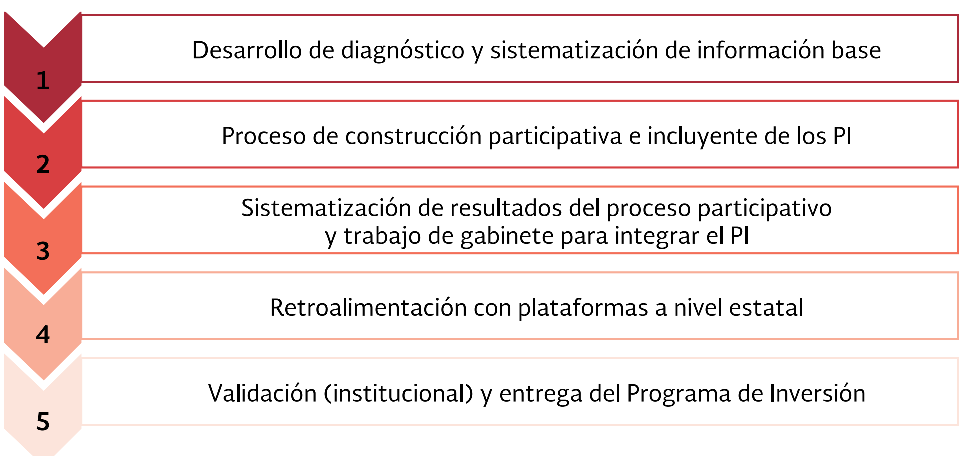

Figure 16 Construction process of the Investment Programs

- The formulation of the Investment Programs envisaged the development of a diagnosis and gathering basic information that involved the preliminary definition of activities to be included in the IP and of the areas of intervention. This process was conducted by the State Offices of CONAFOR for the 5 States of the IRE, in coordination with State Governments.

- Subsequently, the IPs were consolidated through a participatory and inclusive process, with the objective of integrating the local realities and needs and validating the activities. To guide the participatory process and the development of the IPs, the CONAFOR developed the "Guide for the participatory construction of Investment Programs"[73]. This guide was developed based on the views and suggestions of various stakeholders, which were obtained in different events, such as the national workshop for drafting the methodology, the UICN equity workshop to design and implement the Investment Programs, Regional and State Feedback Workshops held in Chiapas, Yucatán Peninsula and Jalisco, and feedback from experts in implementing local projects and projects dealing with gender.

[73] The guide can be viewed here http://goo.gl/GWMkYy

- The participatory construction process of the Investment Programs was coordinated by the APDT, who sought the participation of various stakeholders with the aim of coordinating efforts so that the future implementation of the activities of the IPs is more efficient. It is important to state that prior to this process and in order to train the APDTs, the CONAFOR, in collaboration with the State Governments and other partners (LAIF and MREDD+ Project), held a training course on the contents of the Guide, application of the participatory methods and inclusion of the gender perspective and cultural relevance in the development of the IPs.

- The participatory process of the IPs was conducted with representatives at local level through workshops. In these workshops, the main elements of the IP were fed back with the Agrarian Nuclei and other key stakeholders at local level in order to seek their views, recommendations and needs. During these events, inclusive participation was encouraged through direct invitations to young people and representatives from the indigenous population, as well as other affirmative gender actions (in the case of women). Additionally, Regional Forums were held with producer organizations, civil society and representatives from the indigenous population.

  Due to the particularities of the different IRE regions, the participatory process was conducted in different ways; this process is described for each state:

Campeche

- The ejidos who were invited to the workshops were selected considering the size of the ejido, forest area and deforested area. As well as ejidos, private owners were also invited.
- The call was made by the CONAFOR and invitations were sent directly to the ejido authorities and producers, requesting them to invite representatives for women, young people and non-owners. In this way, the existing governance structures were considered.
- The facilitation team adjusted the timetables of the workshop, food and words to promote participation and documentation of indigenous knowledge and traditions.
- The process was coordinated by the MREDD+ Alliance via the organization PARSIMONIA
- It benefited from the support of a Mayan facilitator speaker who encouraged participation in the native language of the Mayan population.
- Dates and venues of the workshops and forums:
    - Workshop with ejidos from Holpechén: February 11, 2016
    - Workshop with ejidos from Dzibalchén: February 12, 2016
    - Workshop with ejidos from Campeche: February 15, 2016
    - Workshop with ejidos from Champotón: February 16, 2016
    - Regional Forum: February 19, 2016
- In summary, the process had the following results:

Table 29 Results of the participatory construction process in Campeche

Information item	Results
Total workshops	4
Number of ejidos and communities represented	20
Total forums held	1
Number of participating organizations	12
Total number of participants	148
Number of female participants	31
Number of young participants	12

Chiapas

In the state of Chiapas, there are four Investment Programs, described below in the participatory process held in each region.

Frailesca

- The ejidos that took part in the participatory process were selected by prioritizing agrarian nuclei with a predominantly forestry-based vocation (>50% of forest cover), greater organizational capacity, existence of consolidated production processes, presence of agrarian nuclei without conflict or problems of representation, and participation in public programs aimed at halting deforestation.

- The participation of women was encouraged by inviting female leaders of working groups in ejidos or who are part of the Commissariat of the communities.
- The call was made by the APDT (CONABIO), with the support of the Advisory Group responsible for drafting the investment program. Additionally, CONANP through the administrations of the reserves present in the region supported the follow-up to the call to ensure the participation of stakeholders.
- In addition to the workshops with ejidos, sectoral workshops were held for representatives of producer organizations or key groups in the region, such as coffee producers, providers of professional services and forestry groups.
- The dates and venues of the workshops and forums were:
  - Workshop with Providers of Technical Services: December 10, 2015
  - Forum with producer organizations: October 23, 2015
  - Workshop with ejidos from Ángel Albino Corzo and Montecristo de Guerrero: January 11, 2016
  - Workshop with ejidos from Villaflores: January 12, 2016
  - Workshop with ejidos from Villa Corzo and el Parral: January 13, 2016
  - Workshop with ejidos from La Concordia: January 14, 2016
- In summary, the process had the following results:

Table 30 Results of the participatory construction process in the Frailesca region

Information item	Results
Total workshops	5
Number of ejidos and communities represented	78
Total forums held	1
Number of participating organizations	17
Total number of participants	207
Number of female participants	23

Istmo-Costa

- The ejidos were selected using a multi-criteria analysis that considered forested forest and degraded forest area, percentage of the ejido that has forest, area of productive activities (livestock and agriculture) and marginalization.
- The call was made by the APDT (CONABIO) and the CONAFOR, with the support of the organization Origins Conservation of Species and Spaces AC, as well as the support of the administrations of the Natural Protected Areas present in the region.
- The participation of women was encouraged by inviting female leaders of organized groups and representatives who were involved in the Commissariat of the communities and ejidos.
- The dates and venues of the workshops and forums were:
  - Workshop with ejidos from the municipality of Tonalá: November 30, 2015
  - Workshop with ejidos from the municipality of Arriaga: December 2, 2015
  - Workshop with ejidos from the municipality of Pijijiapan: December 9, 2015
  - Workshop with ejidos from the municipality of Masatepec: December 11, 2015
- In summary, the process had the following results:

Table 31 Results of the participatory construction process in the Istmo-Costa region

Information item	Results
Total workshops	4
Number of ejidos and communities represented	62
Total forums held	0
Number of participating organizations	0
Total number of participants	165
Number of female participants	48

Lacandona

- The region of the Lacandona Jungle was divided into five micro-regions taking into account historical and current socio-economic contexts. Within these micro-regions, the CONABIO maintains a permanent presence through its Local Technicians, Development Agencies and the Community Promoters. These five micro-regions are: Cañadas de Ocosingo, Maravilla Tenejapa, Nahá-Metzabok, Comunidad Lacandona and Valle de Santo Domingo, and Marqués de Comillas-Benemérito de las Américas. Ejidos with forest coverage were invited.

- The call was made by CONABIO, with the support of Development Agencies in each micro-region.
- The participation of women was encouraged by explicitly inviting female leaders of producer organizations and representatives of the Commissariat.
- The dates and venues of the workshops and forums were:
    - Forum with producer organizations: November 10.
    - Forum with livestock organizations and fruit producers: November 11.
    - Workshop with ejido authorities in Marqués de Comillas and Benemérito: November 16.
    - Forum with producers from the Marqués de Comillas and Benemérito region: November 17.
    - Workshop with cocoa farmers in the Lacandona zone: November 17.
    - Workshop with silvopastoral farmers in the Lacandona zone: November 18.
    - Workshop with livestock association farmers in Lacanjá Chanzayab: November 18.
    - Forum with representatives of ejidos and communities in the Lacandona zone: December 10.
    - Workshop with group of farmers in Cañadas de Ocosingo: December 7.
    - Workshop with representatives of ejidos in Cañadas de Ocosingo: December 8.
    - Workshop with representatives of ejidos and communities in the Lacandona zone: December 14.
    - Workshop with representatives of ejidos and communities in Maravilla Tenejapa: December 15.
    - Forum with Working Groups and Economic Organizations from Maravilla Tenejapa: December 16.
    - Workshop with representatives of ejidos and communities in the Lacandona Zone: December 17.

- In summary, the process had the following results:

Table 32 Results of the participatory construction process in the Lacandona region

Information item	Results
Total workshops	9
Number of ejidos and communities represented	78
Total forums held	5
Number of participating organizations	7
Total number of participants	407
Number of female participants	74

Zoque-Mezcalapa

- The ejidos convened as part of the participatory process were selected by considering their significance in forestry terms (forested area, surface area of degraded forest and forestry-based vocation) and vulnerability to deforestation and forest degradation (surface area under cultivated and induced pasture, and population pressure).
- The call was made by the APDT (CONABIO), with the support of the advisory group responsible for drawing up the Investment Programs and the administrations of the Natural Protected Areas in the region.
- The participation of women was encouraged by inviting female leaders of organized groups and representatives who were involved in the Commissariat of the communities and ejidos. Direct interviews were also held with female leaders of producer organizations, due to a low participation of women in the workshops.
- The dates and venues of the workshops and forums were:
    - Workshop with ejidos from Cintalapa and Jiquipilas: January 11, 2016.
    - Workshop with Agrarian Nuclei from the municipalities of Tecpatán and Mezcalapa: January 25, 2016
    - Workshop with Agrarian Nuclei from the municipalities of Cintalapa (north), Jiquipilas (north) and Ocozocoautla: February 4, 2016
    - Forum with producer organizations from the municipalities of Cintalapa, Jiquipilas, Ocozocoautla and Tecpatán: February 5, 2016
    - Forum with Agrarian Nuclei and organizations from the municipality of Ostuacán: February 8, 2016
- In summary, the process had the following results:

Table 33 Results of the participatory construction process in the Zoque-Mezcalapa region

Information item	Results
Total workshops	3
Number of ejidos and communities represented	30
Total forums held	2
Number of participating organizations	3
Total number of participants	91
Number of female participants	10

Jalisco

In the state of Jalisco, there are four Investment Programs, described below in the participatory process held in each region.

Costa Sur

- The workshops were conducted by grouping municipalities according to their proximity and easy access to each other.
- The call was made by the State Management of CONAFOR, the Secretariat of Environment and Territorial Development (SEMADET), the APDT (JICOSUR) and municipal governments.
- The participation of women was encouraged by inviting one woman per ejido and by sending a direct invitation to groups of women in the municipalities where they had been identified.
- The process was coordinated by the APDT for this region: JICOSUR.
- The dates and venues of the workshops and forums were:
    - Regional Forum in Cihuatlán: December 3, 2015
    - Workshop with ejidos from Tomatlán: December 4, 2015
    - Workshop with ejidos from Huerta and Cihuatlán: December 7, 2015
    - Workshop with the ejidos from Casimiro Castillo, Villa Purificación and Cuautitlán: December 9, 2015
- In summary, the process had the following results:

Table 34 Results of the participatory construction process in the Costa Sur region

Information item	Results
Total workshops	3
Number of ejidos and communities represented	26
Total forums held	1
Number of participating organizations	3
Total number of participants	51
Number of female participants	4

Ayuquila Lower River Basin

- The workshops were conducted by grouping municipalities according to their proximity and easy access to each other.
- The call was made by the State Management of the CONAFOR, the Secretariat of Environment and Territorial Development (SEMADET), the APDT (JIRA) and municipal governments.
- The participation of women was encouraged by inviting one woman per ejido and by sending a direct invitation to groups of women in the municipalities where they had been identified.
- The process was coordinated by the APDT for this region: JIRA.
- The dates and venues of the workshops and forums were:
    - Workshop with ejidos from Autlán and Union of Tula: November 23, 2015
    - Workshop with ejidos from El Grullo, Ejutla, El Limón and Tonaya: November 24, 2015
    - Workshop with ejidos from Tuxcacuesco: November 30, 2015
    - Workshop with ejidos from Zapotitlán de Vadillo: December 2, 2015
    - Regional Forum in Tonaya: December 4, 2015
- In summary, the process had the following results:

Table 35 Results of the participatory construction process in the Lower Basin of the Ayuquila River region

Information item	Results
Total workshops	4

Number of ejidos and communities represented	16
Total forums held	1
Number of participating organizations	7
Total number of participants	50
Number of female participants	11

Coahuayana river

- The workshops were conducted by grouping municipalities according to their proximity and easy access to each other.
- The call was made by the State Management of CONAFOR, the Secretariat of Environment and Territorial Development (SEMADET), the APDT (JIRCO) and municipal governments.
- The participation of women was encouraged by inviting one woman per ejido and by sending a direct invitation to groups of women in the municipalities where they had been identified.
- The process was coordinated by the APDT for this region: JIRCO.
- The dates and venues of the workshops and forums were:
    - Workshop with ejidos from Zapotlán el Grande and Gómez Farías: December 3, 2015
    - Workshop with ejidos from Valle de Juárez, Quitupan, Concepción de Buenos Aires and Mazamitla: December 7, 2015
    - Workshop with ejidos from Pihuamo, Tecalitlán and Tonila: December 8, 2015
    - Workshop with ejidos from Zapotiltic and Tuxpan: December 9, 2015
    - Regional Forum in Zapotlán: December 14, 2015
- In summary, the process had the following results:

Table 36 Results of the participatory construction process in the Coahuayana River region

Information item	Results
Total workshops	4
Number of ejidos and communities represented	40
Total forums held	1
Number of participating organizations	7
Total number of participants	106
Number of female participants	24

Sierra Occidental y Costa

- The workshops were conducted by grouping municipalities according to their proximity and easy access to each other.
- The call was made by the State Management of CONAFOR, the Secretariat of Environment and Territorial Development (SEMADET), the APDT (JISOC) and municipal governments.
- The participation of women was encouraged by inviting one woman per ejido and by sending a direct invitation to groups of women in the municipalities where they had been identified.
- The process was coordinated by the APDT for this region: JISOC.
- The dates and venues of the workshops and forums were:
    - Workshop with ejidos from Puerto Vallarta: December 1, 2015
    - Workshop with ejidos from Cabo Corrientes: December 2, 2015
    - Workshop with ejidos from San Sebastián: December 3, 2015
    - Workshop with ejidos from Mascota: December 4, 2015
    - Workshop with ejidos from Atenguillo, Mixtlán and Guachinango: December 8, 2015
    - Workshop with ejidos from Talpa: December 9, 2015
    - Regional Forum in Mascota: December 10, 2015
- In summary, the process had the following results:

Table 37 Results of the participatory construction process in the western and coastal region

Information item	Results
Total workshops	6
Number of ejidos and communities represented	43
Total forums held	1
Number of participating organizations	9
Total number of participants	110
Number of female participants	25

Quintana Roo

- In the state, there are six large forestry organizations that were created from the Pilot Forestry Plan, which succeeded in transferring forest exploitation from private forestry concessions to ejido organizations.
- These organizations have the function of transferring knowledge to groups of ejidos through technical and organizational assistance, government project management and international organizations.
- In view of the foregoing, it was decided between the three bodies that form the Interagency Group (CONAFOR, the APDT (CONABIO) and the Secretariat of the Environment of the State) to conduct a workshop with each organization and their member ejidos.
- The call was made by the Interagency Group to each representative of the regional organizations. Each organization passed on the invitations to the participatory workshops to the ejidos where they have a presence.
- The participation of women and young people was encouraged by including a request that they should be invited in the invitation.
- Largely due to the fact that communities in the region have local planning instruments (Community Land Planning or OTCs) that were constructed in a participatory way, information from these local instruments was used in the IP process. The information was organized and analyzed by the Interagency Group and was used as an input for the workshop activities.
- Mayan interpreters were used during the workshops to facilitate communication between participants.
- The process was coordinated by the APDT (CONABIO) with the strategic support of the Mexican Civil Council for Sustainable Forestry (CCMSS).
- The dates and venues of the workshops and forums were:
    - Workshop with the Union of Forestry Ejidos and Ecotourism in Solidarity (Civil Society): January 10, 2016
    - Workshop with the Society of Ejido Forest Producers of Quintana Roo (Civil Society): January 21, 2016
    - Workshop with the Selva Maya Alliance: January 24, 2016
    - Workshop with the “Yaax Sot Yook Ol Kaab” (Civil Association) Network of Producers of Environmental Services: January 25, 2016
    - Workshop with Producers of Ramón Maya Ox S.C: January 27, 2016
    - Workshop with the Society of Forestry Ejidos in the Maya Area (Civil Society): January 29, 2016
- In summary, the process had the following results:

Table 38 Results of the participatory construction process in Q

Information item	Results
Total workshops	6
Number of ejidos and communities represented	94
Number of participating organizations	6
Total number of participants	254
Number of female participants	35

Yucatán

- The ejidos that participated in the process were selected by weighting the following criteria:
    - Total area of the ejido
    - Deforested area from 2000 to 2013
    - Total population
    - Induced pasture area
    - Land area for common use
    - High biomass content and high risk of deforestation according to INECC
    - Surface area with forest cover in the ejido
- The call was made by the APDT (JIBIOPUUC) with the collaboration of the governments of the municipalities of the region.
- Mayan interpreters were used during the workshops to ensure that the information transmitted and received was in the local language and to prevent a loss of information.
- The participation of women was encouraged by inviting groups of women.

- The process was coordinated by the APDT (JIBIOPUUC) with the strategic support of the MREDD+ Alliance
- The dates and venues of the workshops and forums were:
  - Workshop with ejidos from the municipality of Peto (in San Dionisio): November 17, 2015
  - Workshop with ejidos from the municipality of Tekax (in Tekax): November 18, 2015
  - Workshop with ejidos from the municipality of Muna: November 19, 2015
  - Workshop with ejidos from the municipality of Tzucacab (in Catmís): November 24, 2015
  - Workshop with ejidos from the municipality of Tzucacab (in Tzucacab): November 25, 2015
  - Workshop with ejidos from the municipality of Tzucacab (in El Escondido): November 26, 2015
  - Workshop with ejidos from the municipality of Ticul: November 27, 2015
  - Workshop with ejidos from the municipality of Tekax (in Becanchén): November 28, 2015
  - Workshop with ejidos from the municipality of Yaxcabá (in Yodzonot): December 2, 2015
  - Workshop with ejidos from the municipality of Yaxcabá (in Yaxcabá): December 3, 2015
  - Workshop with ejidos from the municipality of Tekax (in Benito Juárez): December 4, 2015
  - Workshop with ejidos from the municipality of Ozkutzcab (in Huntochac): December 5, 2015
  - Workshop with ejidos from the municipality of Ozkutzcab (in Xul): December 7, 2015
  - Workshop with ejidos from the municipality of Peto (in Dzonotchel): December 8, 2015
  - Regional Forum in Mérida: December 10, 2015
  - Regional Forum in Oxkutzcab: December 16, 2015
- In summary, the process had the following results:

Table 39 Results of the participatory construction process in Yucatán

Information item	Results
Total workshops	14
Number of ejidos and communities represented	42
Total forums held	2
Number of participating organizations	20
Total number of participants	290
Number of female participants	66
Number of young people who participated	25
Number of indigenous people who participated	280

The summary of the results in each of the states is presented in the following table:

Table 40 Summary of the results of the IP participatory construction workshops in the five states

	Campeche	Chiapas	Jalisco	Quintana Roo	Yucatán
Total workshops held	4	20	17	6	14
Number of ejidos and communities represented	20	252	125	94	42
Total forums held	1	9	4	6	2
Number of organizations represented	12	27	26	6	20
Total number of participants	148	857	317	254	291
Number of female participants	31	156	64	35	66

The CONAFOR website contains fact-sheets with general information on each of the workshops and forums held in the states (http://goo.gl/WDd9kU).

The participatory process in each state was documented by the APDT, which also integrated the comments, observations and suggestions of stakeholders. Afterwards, clerical work was carried out to incorporate the Investment Program documents considering the results of the participatory process as well as information from studies, databases and consultancy reports, among others.

5.1.2.2 Feedback from the Investment Programs

The Investment Program documents were presented and fed back with various key stakeholders through institutional bodies and platforms and the participation of the civil society existing in the 5 states. This process is described below:

Campeche:

- Presentation of the progress of the Investment Program and Community Participation Plan to state government and non-governmental organizations (CONAFOR, SEMARNAT-CAM, TNC, CONABIO): February 2 and 9, 2016
- Feedback meeting from the first draft of the Investment Program with state government and non-governmental organizations of the CTC: (CONAFOR, SEMARNAT-CAM, SDR, CONABIO, CCMSS, PRONATURA, ECOSUR): March 1, 2016
- Exchange meeting between SEMARNAT-CAM/CONAFOR and the Secretary of Rural Development: March 7, 2016

Chiapas:

- State Congress on Forest Management and Rural Development to combat Climate Change: October 20, 2015
- State REDD+ (CTC REDD+) Technical Advisory Committee: August 24, November 25, 2015 and March 18, 2015
- State Forest Council: November 26, 2015

Jalisco:

- State Forest and Soil Council (COEFyS): October 30, 2015
- District Council for Sustainable Rural Development of the Lower Ayuquila River basin: October 30, 2015
- Meetings of the Board of Directors of Intermunicipal Boards:
    - JIRA: January 14, 2016 and February 22, 2016
    - JIRCO: February 29, 2016
    - JISOC: March 7, 2016
    - JICOSUR: February 12, 2016

Quintana Roo:

- Standing Committee on the Control and Monitoring of the Federal Agrarian Attorney: February 17, 2016
- REDD+ Working Group: February 16, 2016
- State Forest and Soil Council (COEFyS): March 3, 2016
- Social Organizations in the Forest Sector (OSSF): 11 March
- REDD+ Technical Advisory Committee: March 18, 2016

Yucatán:

- State REDD+ (CTC REDD+) Technical Advisory Committee: December 10, 2015
- Citizen Council of the JIBIOPUUC: December 16, 2015
- REDD+ Working Group: February 24, 2016
- Technical management of the JIBIOPUUC: February 26, 2016

Finally, each of the States selected the inter-institutional platform[74] to validate the Investment Programs. The details of the validation meetings are presented in table 41.

Table 41 Information from the Investment Program validation meetings

State	Interagency Platform	Stakeholders it comprises	IP validation date
Campeche	The State Inter-Secretariat Climate Change Commission (CIClima) is in the process of being provisionally defined.		In the consultation process
Chiapas	REDD+ Working Group of the CICC.	Secretariat of Environment and Natural History, Secretariat of the Countryside, Secretariat for the Sustainable Development of the Indigenous Peoples, Secretariat for the Development of the Southern Border and Link for International Cooperation, Secretariat of	March 31, 2016

[74] Refers to a space where different government bodies participate with the aim of promoting mainstreaming policies and structuring actions in the region.

		Development and Social Participation, Secretariat of Infrastructure and Communications.	
Jalisco	REDD+ Working Group of the CICC.	Secretary of the Environment and Territorial Development, Secretary-General of the Government, Secretary of Planning, Administration and Finance Secretary of Rural Development, Secretary of Education, Secretary of Mobility, Secretary of Innovation, Science and Technology, Secretary of Culture, Secretary of Health and Technical Assistance, Secretary of Economic Development, Secretary of Infrastructure and Public Works, Secretary of Social Integration, Secretary of Tourism, State Water Commission, Civil Protection and Firefighters Unit, Secretary of Environment and Natural Resources Secretary of Agricultural, Regional and Urban Development, Secretary of Agriculture, Livestock, Rural Development and Food, National Forestry Commission, National Water Commission, National Commission of Natural Protected Areas	March 3, 2016
Quintana Roo	The validation process that will be used by the REDD+ Working Group of the CICC		In the process of being validated
Yucatán	State Intersecretarial Climate Change Commission (CIClima)	Secretary of Budget and Planning, Secretary of Health, Secretary of Education, Secretary of Community and Social Policy, Secretary of Public Works, Secretary of Economic Development, Secretary of Tourism Promotion, Secretary of Promotion of Agriculture and Fisheries and Secretary of Urban Development and the Environment.	February 26, 2016

5.1.2.3 Participatory process to define non-carbon benefits

During the participation process with local stakeholders (workshops for the participatory construction of investment programs), the non-carbon benefits were identified that could be generated, preserved and enhanced during the deployment of the IRE. An exercise was also conducted to prioritize them where participants of the workshops defined which of these benefits were most important for them. This information served as input for Section 16 of this document.

5.1.2.4 Participatory process for IRE benefit sharing

The specific definition for how benefits are to be distributed will be established in the *IRE Benefit Sharing Plan*, which includes different scales or levels of implementation. It will endeavor to ensure that the resources of the IRE boost and provide continuity to the activities developed in the areas of intervention in each federal entity and will mainly favor people who are owners and inhabitants of the regions who make efforts to deal with the direct and underlying causes of deforestation and forest degradation.

The participatory process will be carried out using a methodology available in Annex 4. The preliminary version of the methodology was published for review by civil society on March 29, 2016 (http://goo.gl/u1zN3Y), with feedback from a workshop held in April 2016 with civil society, experts and state governments. In addition, the general guidelines for benefit sharing were discussed in a specific panel discussion during the national workshop of the CTC-REDD+, held on March 30, 2016.

5.1.2.5 IRE feedback with institutional platforms and participation from civil society

This initiative has been presented and fed back by key stakeholders through the REDD+ Technical Advisory Committee (CTC). The preliminary version of the IRE document was available to members of this Committee on the CONAFOR web page and fed back in a workshop that took place on March 30. Panel discussions took place at the workshop on the main themes of the Initiative: generic activities and their co-benefits, benefit distribution and ownership, emissions accounting and safeguards. A total of 23 people took part in this session, including representatives from civil society, the public sector, private sector and academia[75]. The event was broadcast live.

There are also plans to present the Emissions Reduction Initiative to the CONAF and the REDD+ Working Group of the CICC.

[75] The participants were as follows: María del Valle – CONABIO, Angélica Padilla – Pronatura, CTC Campeche, Angélica Lara – SEMARNAT Campeche, Mireya González- Conversa Creativa, Karen Fernández – SEMA Q. Roo, Alejandro Ranero – Kibeltik Clima y Medio Ambiente, Yenny Paredes – SEMA Q. Roo, Roberto Cornejo Huesca – RENAMUR, Margaret Skutsch – CIGA UNAM, Erick Alberto Rodríguez – UNAM Sostenibilidad, Ana Rosa Parra – CTC Q.R, Fernando Mondragón – Geoconservación A.C., Marcela Olguín – CCA, Juan Carlos Carillo – CEMDA, Jaime Aguilar López – RED NOREMSO A.C., Ana Rosa Parra – CTC Q.R., Roberto Vallejo – SEDUMA Yuc., Carmen Gómez – SEMADET, Hugo Cárdenas, Valeria García – CONANP, Danae Azuara – EDF, Pablo Montañez C. – SAGARPA and Gerardo Cerón – UNOFOC.

5.1.2.6 Transparency in the IRE construction process

The CONAFOR has an Emissions Reduction Initiative section on its web page which can be found at the following link: http://goo.gl/WDd9kU. This section includes the following information:

- General information on the IRE
- The document *Emissions Reduction Initiative Idea Note*
- Public invitations for APDTs to submit *Expressions of Interest* to develop Investment Programs (published since October 6, 2015)
- Publication of the *Guide on the participatory construction of Investment Programs (*available since December 17, 2015)
- A map with the location of the areas of intervention of the Investment Programs.
- Fact-sheets with general information of each of the participatory workshops made during the construction of the IPs.
- The documents on all the Investment Programs
- The draft (for feedback) of the Emissions Reduction Initiative document and its annexes.

5.1.3 IRE implementation participatory process

As has been described in section 4.3, the activities of the IRE will be implemented in two stages, including different processes and levels of participation. First-stage activities consist mainly of subsidies from CONAFOR and SAGARPA.

CONAFOR has operating rules for granting subsidies relating to activities involving sustainable forest and wildlife management, strengthening local governance, redirecting production, payment for environmental services and production projects to increase income. The procedure to provide support takes the following conditions into consideration:

- Voluntary in nature and will be awarded to individuals, legal entities, ejidos or communities that own or possess forest land, as well as to those who are not owners but work in forestry activity for the purposes of protecting, conserving, restoring, exploiting, transforming, industrializing or selling forestry products (article 8, Royal Order, 2016).
- They will be awarded without any distinction of gender, ethnicity, religion, socio-economic status and the CONAFOR shall seek to ensure that all social groups and genres have fair access to the support, for which promotion, distribution, operation and management of resources mechanisms are established, based on social equality criteria (Article 10 Royal Order, 2016).
- They are awarded when the legal, technical, environmental, economic and social requirements have been met and later priority criteria apply over marginalization, indigenous population, gender, among others (Article 23, Royal Order, 2016).

The allocation of support results have been published on the CONAFOR's web page (Article 24, Royal Order, 2016). The beneficiaries (natural or legal persons, ejidos or communities) who have been assigned support sign and submit a Consertation Agreement (Article 25, Royal Order, 2016), which is a legal instrument under public law through which rights and obligations between the CONAFOR and the beneficiary are established, with the aim of formalizing the activities that are of high priority to the country's development and which are declared of public utility and social interest for the nation.

In addition, the CONAFOR creates a database with information on the beneficiaries of the PRONAFOR every tax year, which is incorporated into the Integrated Information System of Government Program Registers (SIIPP-G) (Article 15, Royal Order 2016) with the aim of providing transparency and avoiding duplication of support granted. To make the analysis and assessment of the requests for support expeditious and transparent, all applications are published on the CONAFOR's web page; it disseminates and keeps an updated program of the receipt, analysis and assessment of requests; it indicates how it is assessed and the score assigned, establishing and justifying its viability or rejection; and comprises an interdisciplinary technical group that comprehensively analyses and assesses any requests for support and technical proposals that are received (Article 22, Royal Order, 2016)

SAGARPA, in turn, gives support for activities to improve the milpa crop-growing system, intensify traditional farming and conservation agriculture, sustainable livestock, renovate and rehabilitate coffee plantations, strengthen local governance, redirect production and production-related projects to increase income. The process for this support funding to be awarded includes the following considerations:

- Awarded to natural or legal persons or groups of persons (Article 5, Royal Order, 2016).
- The Executing Authority[76] analyzes applications against determining criteria and parameters. In the event that not all the requirements are met, the applicant is informed by publication in offices and delegations of the SAGARPA or on the website and is given a period of ten days to complete the application. The results of the beneficiaries are published in the same media (Article 6, Royal Order, 2016).
- Depending on the support, a technical and/or economic and/or financial, legal and social impact assessment and/or the criteria established in the Specific Assessment or Eligibility Criteria Document (Article 6, Royal Order, 2016).
- Depending on the support, the Executor or the Unit Responsible endorses the legal instrument that corresponds to the beneficiary. For example, for the development of productive projects, beneficiaries sign a Consertation Agreement that establishes the rights and obligations of the parties and prepares the groundwork for joining actions and resources for the implementation of the projects. To receive resources from the Trust Fund for the Promotion of Agriculture in the States, the beneficiaries sign a Specific Joining Agreement, which sets out the obligations of its implementation and verification (Article 3, Royal Order, 2016).

In addition to the above considerations, during implementation of the first stage, the procedures of other agencies will be taken into account, such as the INAES, CONANP, CDI, SEMARNAT and SEDESOL, depending on the activities to be implemented in each state.

The second-stage activities will be defined through participatory means. Once identified, the participation mechanisms to accompany its implementation will be defined, according to the type of activity, duration, scope, etc. These mechanisms will further encourage feedback and an adjustment of the second-stage activities throughout the IRE implementation process.

5.2. Summary of the comments received and how they were taken into account in the design and implementation of the Emissions Reduction Initiative

Please provide a summary of the comments received from stakeholders including the main topic, the type of stakeholder and a concise description of the comments (detailed minutes of meetings can be annexed or referenced if publicly available). Describe how these views have been, or will be taken into account in the design and implementation of the ER Program to ensure broad community support

As a result of the feedback process for this document with institutional platforms and civil society involvement, comments and observations were obtained that are shown in Annex 5, and how these comments were considered in the document is also described.

It should also be stated that the local vision of the communities and ejidos in the IRE was included in specific elements of the IRE, such as the design of the activities (interventions), the definition and prioritization of additional benefits to carbon and the identification of environmental and social risks associated with the interventions. For more information on these three topics, see the corresponding sections.

6. Operational and financial planning

6.1. Institutional and implementation arrangements

Please describe the institutional and implementation arrangements for the day-to-day operations of the ER Program. Describe how the ER Program Participants and other involved entities have sufficient capacity to undertake the proposed ER Program operations and to implement ER Program measures, including but not limited to: i) administrative oversight of the ER program; ii) development and operation of the Reference Level and Forest Monitoring System; iii) financial management; iv) Implementation of Benefit Sharing Plan and relevant Safeguard

[76] It is the central structure of the SAGARPA or authorized body that has the recognition and experience to be responsible for operating the Programs, Components or Strategic Projects of the Operating Rules.

Plan(s); v) feedback and grievance redress mechanism(s); vi) stakeholder consultations and information sharing; vii) implementation of ER Program measures. Describe how the implementation arrangements for the ER Program are linked to any national REDD implementation framework

Refer to ***indicator 27.2*** *of the Methodological Framework*

The Emissions Reduction Initiative will form part of the ENAREDD+ and the Intervention Model[77] based on the approach of sustainable rural development through integrated regional management. This initiative considers the four key elements proposed in the Model:

- Institutional arrangements to strengthen **coordination between sectors** and promote sustainable rural development.
- **Land governance** model that promotes the participation of various stakeholders at different levels in a region, under the principle of collaborative actions to obtain emission reduction results.
- **Actions** specifically designed to **address the needs of the region** on matters of forests and climate change.
- **Policies and programs** drawn up between the agricultural and forestry sectors that help to combine efforts and coordinate resources with other agencies.

6.1.1 Coordination between sectors

The institutional arrangements that operate to boost the forestry and rural development policy in Mexico should play a complementary role to achieving the REDD+ objectives. The IRE is based on the following institutional arrangements that promote the coordination of public policies that have an impact on the rural environment from various sectors and levels of government.

Alliances have been established in Mexico to strengthen coordination and collaboration among different institutions to have an impact on the region. **At the national level**, there are two main inter-secretariat commissions to promote the mainstreaming of public policies within the context of REDD+. The Inter-Secretariat Commission for Sustainable Rural Development (CIDRS) was created to coordinate and follow up the sectoral and special programs, the purpose of which is to promote sustainable rural development[78]. The Inter-Secretariat Commission on Climate Change (CICC) was created to take actions to mitigate and adapt to climate change[79].

The CICC has various working groups to comply with its duties: one of these is the Working Group on reducing emissions from deforestation and forest degradation (GT-REDD)[80] and this group drives REDD+ in Mexico and develops the national strategy on the subject.

In 2014, the GT-REDD+ of the CICC met on three occasions, having discussed and fed back on the following topics: Draft ENAREDD+, Consultation Plan for ENAREDD+ and Communication Strategy for ENAREDD+. In 2015, this platform did not meet, as efforts were focused on the theme of the National Consultation on ENAREDD+. During 2016, it is expected to submit the final version of the ENAREDD+ in this platform, as well as the IRE document.

Similarly, the LGCC establishes the creation of a National Climate Change System[81] to promote synergies as a joint way to tackle the country's vulnerability and to establish priority mitigation and adaptation actions.

[77] http://goo.gl/DdqBRP

[78] The CIDRS was created in article 10 of the LDRS and according to article 21 of the LDRS, comprises: The Inter-Secretariat Commission will comprise the heads of the following departments of the Federal Executive: a) Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food, headed by the Secretary; b) Secretariat of Economy; c) Secretariat of Environment and Natural Resources; d) Secretariat of Finance and Public Credit; e) Secretariat of Communications and Transportation; f) Secretariat of Health; g) Secretariat of Social Development; h) Secretariat of Agrarian Reform; i) Secretariat of Public Education; j) Secretariat of Energy; and any departments and entities of the Executive Authority deemed necessary, depending on the issues covered.

[79] The General Climate Change Act created the ICCC by a legal mandate and it is made up of the heads of the Secretariats of the Environment and Natural Resources; Agriculture, Livestock, Rural Development, Fisheries and Food; Health; Communications and Transport; Economy; Tourism; Social Development; Governance; the Navy; Energy; Public Education; Finance and Public Credit, External Relations and Agrarian, Regional and Urban Development.

[80] Article 49 of the LGCC

[81] The SINACC is made up of the Inter-Secretariat Climate Change Commission (CICC); the National Institute of Ecology and Climate Change (INECC); the Climate Change Council (C3); the federal entities; associations of municipal authorities; and the Congress of the Union.

Additionally, alliances have been established to strengthen coordination and collaboration among different institutions, specifically with the following legal instruments that directly or indirectly affect the IRE:

- *Collaboration Agreement between the National Forestry Commission and the Secretariat of Agriculture, Livestock, Rural Development, Fishing and Food (SAGARPA)*

It was signed in 2011, with the aim of providing a stimulus to and facilitating public management with a territorial approach that will enable public policy on agriculture and forestry to become more integrated and aligned, as well as promoting the development of climate change programs and strategies that make economic activities viable and improve the quality of life of the inhabitants of rural areas. On December 12, 2016 the CONAFOR and SAGARPA signed the new agreement to strengthen the commitment to collaboration between the institutions and to help to strengthen inter-agency cooperation on REDD+ issues. The Agreement forms part of several objectives and strategies of the Agricultural, Fisheries and Food Development Sector Program 2013-2018: 2.3 i*n coordination with the various tiers of government, promote strategic and productive projects with a regional impact,* and 4.2 *promote sustainable practices in farming, livestock, fishing and aquafarming activities.*

- *Agreement established in 2013 between the CONAFOR and the National Commission for the Development of Indigenous Peoples (CDI)*[82]

Established in 2013, the collaboration was agreed by corresponding actions to promote sustainable forest development for indigenous peoples and communities through the implementation and promotion of activities for the protection, conservation, restoration and sustainable use of forest resources and their ecosystems. This agreement lists the specific activities through which the purpose will be achieved, such as:

- Promoting sustainable forest management to influence the improvement of the quality of life of the indigenous peoples and communities;
- Establishing links to exchange information;
- Promoting the participation of indigenous communities in the protection, conservation, restoration and monitoring of forest resources.

- *Agreement between the CONAFOR and the National Institute of Women (INMUJERES)*

On September 23, 2013, the collaboration agreement between the National Institute of Women (INMUJERES) and the National Forestry Commission (CONAFOR) was formalized. The purpose of this Agreement is to generally establish the bases for collaboration between the two institutions, to incorporate the gender perspective in forest and climate change matters. It also establishes commitments for the training and identification of potential areas for attention to beneficiaries with a gender perspective, a review of operating rules and guidelines, and advice to technical areas in the field of equality.

Finally, the CONAFOR has strengthened coordination with the National Institute of Statistics and Geography (INEGI) within the framework of developing the National Monitoring, Reporting and Verification System to: (i) validate cartographic information (official products), (ii) provide technical support by the system to generate INEGI cartographic products, (iii) strengthen laboratories to quantify carbon in soil and mulch.

At the **state level**, the State Action on Climate Change Laws establish the formation of an Inter-Secretariat Commission on Climate Change[83] as a permanent mechanism for coordinating actions between the departments and entities of the Federal Public Administration with regard to climate change. In addition, all states have a Working Group[84] on reducing emissions from deforestation and forest degradation (GT-REDD+).

[82]With effect from November 30, 2018.

[83]The Law for Mitigation and Adaptation to Climate Change in the State of Chiapas (Article 13) creates the Inter-Secretariat Commission on Climate Change in the State of Chiapas on a permanent basis and with the necessary powers to develop the Mitigation and Adaptation to Climate Change policy in Chiapas. In Jalisco, Article 7 of the Law for Action on Climate Change creates the Interagency Commission for Action on Climate Change as the body responsible for coordinating and concluding the formulation and implementation of State Policy on climate change. Article 11 of the Law of Action on Climate Change in the State of Quintana Roo establishes the State Commission on Climate Change on a permanent basis as an inter-agency body for coordinating, following up and assessing the State Program, as well as being responsible for government coordination in formulating and implementing public policies for the State with regard to climate change.

[84]Currently only the Law on Climate Change in Chiapas establishes its formation in article 16.

In addition, the Law for Sustainable Rural Development mandates the establishment of Councils for Sustainable Rural Development in rural development states and districts. These Councils are bodies for the participation of producers and other stakeholders in rural society in the definition of regional priorities, the planning and distribution of resources that the Federation, states and municipalities allocated to support productive investments and sustainable rural development. These Councils are made up of representatives from government departments and entities, and social and private economic and social organizations from the rural sector.

The states have Planning Committees for State Development (COPLADE)[85], which are decentralized bodies of the state governments, with the aim of promoting and helping with the formulation, updating, instrumentation and assessment of state development plans. These governmental coordination bodies comprise departments and entities of the federal, state and municipal public administration and the representative organizations of the private and social sectors. In addition to being coordination bodies with other orders of government, they promote cooperation between the public sector and various society agencies.

Additionally, there are legal instruments that facilitate coordination between sectors. These include:

- *Coordination Agreements for the development and implementation of the IRE between the State Government and CONAFOR*

They aim to promote the development of the IRE through investment programs that are developed in the constituency of the States. It is through them that the states and the CONAFOR undertake to budget, manage and channel the economic, human and material resources necessary to achieve the objectives, in compliance with the applicable provisions and regulations.

- *Coordination Agreements for Sustainable Rural Development with the SAGARPA*[86]

The five States participating in this initiative have a coordination agreement[87] with the Secretariat of Agriculture, Livestock, Fisheries, Rural Development and Food. The purpose of these agreements is to contribute to achieving the national planning objectives, establish coordination procedures in the field of sustainable rural development, as well as promoting the planning of the comprehensive agricultural, aquaculture and fisheries development of the State.

- *Coordination Agreements on forests between the CONAFOR and state governments*

The objectives of these agreements are to establish the coordination activities between the CONAFOR and the State government to promote sustainable forest management in the state through the implementation and promotion of productive programs for the protection, conservation, restoration and sustainable use of forest soils and their ecosystems.

At the **municipal level** there are Planning Committees for Municipal Development (COPLADEMUN)[88]. Its structure and operation is similar to that of the COPLADES at municipal level.

There are also Municipal Councils for Sustainable Rural Development (CMDRS), which are based on the provisions that the Sustainable Rural Development Act establishes. They are made up of the municipal presidents, those responsible for the rural development area of each municipal government, representatives from producers and social organizations, and other stakeholders. These Councils seek to define the municipality's priorities in the field of rural development, as well as the planning and distribution of the resources that the Federation, the states and municipalities allocate to support productive investments, and for sustainable rural development.

At present, the Municipal Councils are in the process of being consolidated and are bringing an influence to bear on the rural environment in most of the country. Most of these Councils are being restructured and are intensifying their operation, and producers and their organizations are being appropriated by them.

The following table shows a summary of the main elements that make up the legal and institutional framework in the different orders of government.

[85]The planning laws of the States provide for the establishment of the COPLADE: Jalisco (Article 10),
[86] These agreements are based on article 27 of the Sustainable Rural Development Act and on articles 33–35 of the Planning Act.
[87]See the following links: Campeche: http://goo.gl/3Bj4d8 , Chiapas: http://goo.gl/SLTygR, Jalisco: http://goo.gl/UiBVWI, Quintana Roo: http://goo.gl/NZ3Kq3, Yucatán: http://goo.gl/2jQeHN
[88] Just as with the COPLADE committees, its creation is established in the planning laws of the States.

Table 42 Summary of the legal and institutional framework of the different tiers of government

Legal framework	Government order	Program framework/ public policy instrument	Platform	Platforms of participation in the legal framework
Sustainable Rural Development Act (LDRS)	Federal	Concurrent Special Program for Sustainable Rural Development 2014–2018[89]	CIDRS[90]	
	State	Sector Program for Sustainable Rural Development[91]		Council for State Sustainable Rural Development
	Municipal	Municipal Program for Sustainable Rural Development		Council for Municipal Sustainable Rural Development
General Law on Climate Change (LGCC)	Federal	National Strategy for Climate Change Special Climate Change Program (PECC)	CICC, GTREDD+, National Climate Change System	Climate Change Council C3
	State	State Program on Climate Change[87]	CICC and GTREDD+ State	
	Municipal	Municipal Climate Action Plan		
Planning Act (LP)	Federal	National Development Plan		
	State	Development Plan of the State and its Municipalities	COPLADE	
	Municipal	Municipal Development Plan	COPLADEMU	
Sustainable Forest Development Act (LDFS)	Federal	National Forestry Program (PRONAFOR) 2014–2018 Strategic Forestry Program for Mexico 2025		National Forestry Council
	State	State Forestry Program		State Forestry Council
	Municipal			Regional Forestry Councils

6.1.2 Land governance

Governance at regional level

The promotion of sustainable rural development with low emissions that allows us to confront the causes of deforestation and forest degradation will require addressing the diversity of contexts in forest landscapes, as well as coordination between the various stakeholders at different levels.

To do this, the generation of capacities and the strengthening of collaborative schemes at local level will be essential. Due to the foregoing, local agents have been driven with specific characteristics, functions and interactions that will serve to adequately implement the actions at landscape level. These Public Agents for Territorial Development (APDT) are any of the public bodies with a mandate related to the integrated rural development that work at regional level supporting the strategic regional planning, facilitating intergovernmental collaboration and the coordination of public policies at regional and local level to promote the sustainable management of natural resources.

According to the Intervention Model, the characteristics of the APDTs are:

- They have a legal personality and their own assets.
- They have their own technical staff
- They have the capacity for financial management
- They have the capacity to manage public and private resources.
- They have the capacity to develop comprehensive regional planning instruments at the level of river basins or biological corridors.
- Experience promoting actions for sustainable management of natural resources, and

[89] Download document at: http://goo.gl/TcYji7. The IRE is aligned with cross-sectoral objective 3 of the PEC: Implement a comprehensive policy of economic development, ensuring the sustainable management of natural resources.
[90] With participation from the Mexican Council, the Inter-Secretariat Commission may establish special, sector-specific and special concurrent emergency programs if situations arise to justify any such measures.
[91]As the LDRS sets out in article 12, on sustainable rural development, this will be implemented through the departments and entities of the Federal Government, and through its agreements with the governments of the federal entities, and through them, with municipal governments as per the provisions of article 25 of the Constitution.

- Capacity to develop strategic planning from collective decision-making.

So far, the following have been identified as APDTs:

1. Association schemes of municipalities known as Intermunicipal Environmental and Land Development Boards. The governance structure of the Intermunicipal Boards comprises an Advisory Council as a governing body in which decisions are taken collectively. This council will comprise the presidents of municipalities and representatives of state and federal governments, academia and civil society. In addition, Intermunicipal Boards have a citizen council and a technical-operational division that implements the agreements. There are currently nine Intermunicipal Boards: six in the state of Jalisco, and one in each of the following states: Chiapas, Quintana Roo and Yucatán.
2. The Mesoamerican Biological Corridor, whose technical support in the territories under its jurisdiction has enabled skills to be transferred to the ejidos and communities to kick-start processes involving the alignment of public policies and regional management. In particular, this last scheme enables public policies to be aligned based on ecosystem connectivity while preserving the natural vocation of the regions and generating local development[92]. The CBM works as an APDT in Quintana Roo and Chiapas.

In addition, other options are being identified that comply with the characteristics described above, to extend the work possibilities.

It is expected that throughout the implementation, collaboration between the APDTs or other territorial development agents and the state and federal institutions will be formalized in legal instruments such as agreements between the various parties.

Governance at local level

On the other hand, given the common nature of the resources of the forest areas as established by the Agrarian Act[93], the structure of governance established by the legislation for ejidos and communities enables them to enter into agreements that uphold collective decisions and actions concerning the fate of common-use land. The ejidos and communities have an assembly, an ejido commissariat and a supervisory board (Article 21). The assembly is the supreme body of the ejido, in which all ejidatarios or comuneros participate (article 22), and the ejido commissariat is the body responsible for implementing the assembly's agreements, as well as for the representation and administrative management of the ejido (article 32). Its members and alternates are elected at the assembly (article 37), and are in office for a maximum of three years; they may not be re-elected to any office within the ejido until the expiry of a period equal to that in which they were previously in office (article 39)

The Assembly meets at least once every six months when its rules of procedure or its customs dictate (Article 23). It may be convened by the Commission or by the Council on its own initiative or when requested to do so by at least twenty ejidatarios or 20 per cent of the total ejidatarios that make up the ejido population center (Article 24). In all assemblies a record is kept, signed by the members of the Commission, the Council and the ejido members present who wish to do so (Article 31). The Office of the Federal Agrarian Attorney (Article 134 and 135) acts as the government body that is responsible for ensuring compliance with agricultural legislation. The National Agrarian Registry (RAN) certifies the Assembly's agreements by verifying that they have been convened according to the legal protocol.

Additionally, its Article 41 provides that the ejido may have a board of villagers as a participation body from the community, which comprises the ejido members and residents of the population center. Its functions include making proposals and giving an opinion on issues related to the village, their public services and community work, among others.

6.1.3 Actions to address the needs of the region

The productive and sociocultural complexity that characterizes the rural environment makes an approach to development based on comprehensive strategies necessary to promote complementarity between the sectors.

[92] Source: Manual for the establishment and operation of an Intermunicipal Environmental Board. Rafael González Franco. SEMANAT-CONAFOR-CONABIO, 2015.
[93] Article 59, section three of the Agrarian Act.

The design of the actions carried out in the region must be based on a participatory planning and decision-making process. This will make it possible to implement the activities of the different units based on the planning instruments at regional level and in line with those that exist at ejido or community level.

This initiative proposes the Investment Program as a regional management and planning instrument that involves various activities that promote development at local level and that at the same time tackle the drivers of deforestation and forest degradation.

To be built through an inclusive and participatory process, the Investment Programs will serve as an instrument to meet the needs of stakeholders and incorporate their points of view. In addition, during its development the involvement of those who do not have ownership rights, such as women and young people, will be sought.

During their implementation, the Investment Programs will help to consolidate institutional efforts for the correct implementation of land management public programs to promote the development of local planning instruments such as Communitary Land Planning (OTC) and the Medium-Term integrated development land Program (P-Predial).

In addition, the CONAFOR, within its rules of operation, will launch Special Calls in order to have a specific offer of support through its programs in Investment Program areas.

6.1.4 Structuring of policies and programs

Currently, many of the institutions related to rural development are not working in a structured and coordinated way, as they only serve their sector. The same happens with the various levels of government, where sectorization has deepened even further. The lack of coordination between sectors and levels of government tends to result in the actions carried out in a region having isolated, limited results, in some cases running contrary to the aim of sustainable rural development. The features currently prevailing in the areas of intervention are:

- Provision of support without coordination within CONAFOR.
- Projects with various unaligned funding sources.
- Provision of support without inter-agency coordination.
- Low participation of municipal governments.
- Demand for subsidies does not comply with land planning at regional nor landscape level.

Through cross-sectoral policies and the establishment of mechanisms for intergovernmental cooperation, this initiative aspires to make the public programs that promote rural development more effective and to address local needs sufficiently with the aim of improving the livelihoods of the population that lives in the forest areas.

Forest loss and degradation has resulted in a decrease in forest production and productivity, either for the production of wood, fodder or other non-timber forest resources, limiting the possibilities of breaking cycles of poverty in forest areas. The IRE represents an opportunity to test approaches to structuring policies and programs between the agricultural and forestry sector, on significant regional scales, in order to complement efforts to cope with the deforestation and degradation of forests.

At federal level, the coordinating mechanisms that already exist (CICC, CIDRS, specific agreements, among others), serve as a platform for discussion and joint planning aimed at structuring policies and harmonization of the institutional offer. At state level, there is the greatest chance of achieving structuring, because it is the state governments that can directly influence the way in which investments are made and can ensure the coordination of the various federal agencies (1 in Figure 17).

The secretariats responsible for rural development in the states[94] and the SAGARPA delegations are key to IRE development, as their functions include integrated planning of the agricultural sector in the state, and promoting agricultural and agro-industrial activities to ensure coordinated actions and programs with federal and

94 The names of these Secretariats vary between states: Secretariat of Rural Development, Government of the State of Campeche; Secretariat of the Countryside, Government of the State of Chiapas; Secretariat of Rural Development (SEDER), Government of the State of Jalisco; Secretariat of Agriculture and Rural Development, Government of the State of Quintana Roo; Secretariat of Rural Development, Government of the State of Yucatán

municipal governments, and agreement with the social and private sectors. In addition, these Secretariats drive technical assistance and support programs to agricultural producers, actions to create jobs in the rural environment and increase of the productivity and profitability of economic activities in the countryside. Finally, they are responsible for designing, implementing, and operating the services and support for agricultural producers, in terms of financing, technical assistance, organization and training (1 in Figure 17).

The National Forestry Commission (CONAFOR) and the Environment Secretariats of the states are responsible for promoting the forestry sector, in terms of both production and the protection and conservation of forest resources. CONAFOR, in coordination with the States, continuously improves its rules of operation to adequately impact on the objectives of the IRE and supports owners and holders of forest land in the drafting of their planning instruments, such as P-Predial, with the purpose of facilitating the integration of the public programs of the different sectors at the level of agricultural center or small ownership (1 in Figure 17).

An important component for the IRE to operate are the Public Agents for Territorial Development or other Territorial Development Agents (2 in figure 17), who among other tasks are responsible for guiding the Investment Program participatory construction process (3 in figure 17) and its implementation. The APDTs play a fundamental role in the institutional structuring and specific policies for sustainable rural development, due to their ties to other levels of government and the territorial scope of several municipalities they can effectively influence municipal planning.

In each period of government, the municipalities prepare a Municipal Development Plan[95] (4 in figure 17), which is the basic planning instrument for municipalities, constructed through a municipal planning process by encouraging involvement from the various sectors and social groups, through a series of consultation forums, citizen participation bodies and other mechanisms laid down in legislation and municipal regulations[96]. In the case of the municipalities in which the APDT is a JIMA, and given that the Board of Directors is formed by the Municipal Presidents, they are responsible for ensuring that the actions and dynamic established in the Investment Programs are incorporated in the Municipal Development Plans (5 in Figure 17).

[95] According to the provisions set out in articles 101 and 102 of the Municipal Organic Act and article 20 of the Federal Planning Act.

[96] According to article 13 of the Sustainable Rural Development Act, municipal, support will be given for municipal, regional or basin rural development programs. In Jalisco, as well as Municipal Sustainable Rural Development Programs there are also Regional Development Plans, which are the instruments that deploy, in a particular portion of the region, the projects and the benefits of the various public, social and private institutions that share a particular sector of development, by grouping several municipalities together.

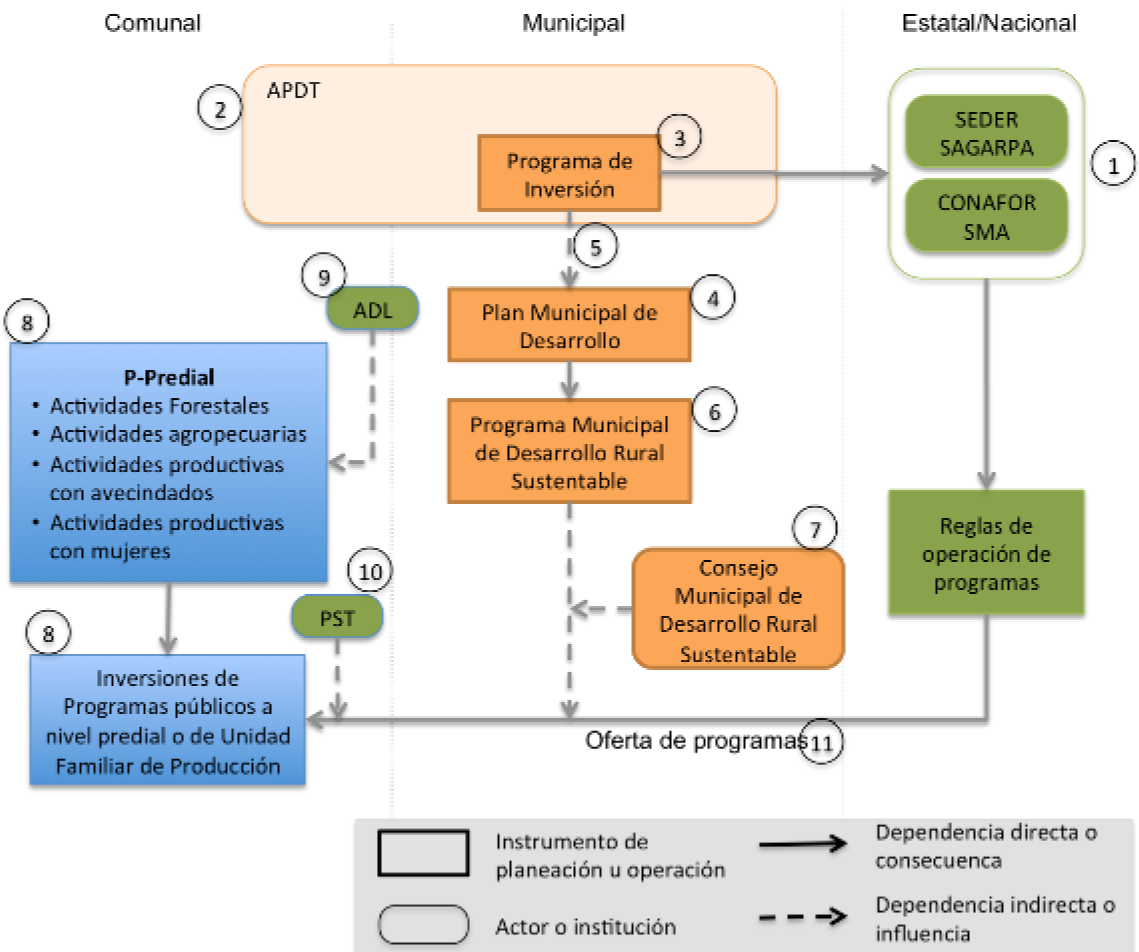

Figure 17 Process of structuring public policies and balancing the institutional offer based on the Investment Programs.

The municipalities have also developed a Municipal Sustainable Rural Development Program (6 in Figure 17), which is the strategic planning instrument that seeks to facilitate the comprehensive development of the municipalities, according to that which is established in the Municipal Development Plan. These programs incorporate strategic lines and actions to meet municipal priorities whose scope includes the institutional, social, environmental and economic (technical-productive).

The inclusion of the activities of the IRE in the Municipal Programs for SRD and in the Municipal Development Plan will allow the platforms established by law to drive rural development at municipal (Municipal Council for Sustainable Rural Development) and regional levels (District Council for Sustainable Rural Development, where operational) to have a planning instrument that frames public investment in each regional unit (7 in Figure 17).

The IRE seeks to increase agricultural and forestry productivity by ensuring the conservation of natural capital. The Investment Programs seek to promote the mainstreaming of programs between sectors. To do this, it is necessary to integrate in the rules of operation of each support item that has an impact on the implementation of the activities identified in the investment programs.

At the community or smallholding level, the Medium-Term integrated development land Program (P-Predial) is a short- and medium-term technical planning and following up instrument for each land unit (agrarian nuclei or smallholding), which, based on a technical, economic and social diagnosis, identifies and describes the processes, actions and subsidies that are necessary, technically justified and chronologically sequenced, allocated for community development by promoting rural production and productivity, and ensuring the protection, conservation, restoration and sustainable use of forest resources, with the participation of the people who own and possess the forest land, as well as male and female residents of the ejidos and forest communities (8 in figure 17). The P-Predial program must be formulated and contextualized with the respective Investment Program. This ensures that the investments of public programs at the land management or family production unit level will better match demand for support for the activities identified at each site, improving the effectiveness and synergy of the institutional offer.

The agrarian nuclei and owners can rely on the support of Local Development Agents in processes to create and strengthen social and human capital and technical support at local level, as well as the planning and implementation of instruments that result in specific projects to promote sustainable forest management and rural development (9 in the Figure). It also seeks to strengthen the performance of the providers of technical services, such as core elements for implementing actions (10 in figure 17).

Aligning the regional, municipal and community planning process enables local rural development participation platforms (Municipal and District SRD Councils) to be equipped with instruments that will lead to a coordinated offer of federal and state public programs (11 in figure 17) and its correspondence with the real demand of the needs identified by the beneficiaries of these programs, improving their effectiveness.

In this way it hopes to have instruments of different sectors, both state and federal, aligned and preferably unified to promote activities that reduce deforestation and degradation and strengthen productive activities.

Each of the States involved in the IRE has progressed in different ways to the process described above. The following table shows their degree of progress, from Investment Program development through to measures to help with implementing the Initiative.

Table 43 Progress in IP development and in measures to help implement the IRE in the various States

Activities	Campeche	Chiapas	Jalisco	Quintana Roo	Yucatán
Diagnosis development and systematization of basic information	Concluded. 1 diagnosis carried out	Concluded. 5 diagnoses carried out only 4 regions identified for the IRE.	Concluded. 4 diagnoses carried out.	Concluded. 1 diagnosis carried out	Concluded. 1 diagnosis carried out
Public Territorial Development Agents (APDTs) identified	The feasibility of two organizations set up and with influence in the region is currently being analyzed (INDEFOS and Promotora Ximbal)	Concluded. The CONABIO was defined as the APDT in the State for the four regions, due to its experience in implementing early actions in the Lacandona Jungle.	Concluded. The Inter-Municipal Boards are the ADPTs in each of the four regions.	Concluded. The CONABIO was defined as the APDT in the State. The AMUSUR is also a consolidated organization.	Concluded. The JIBIOPUUC was defined as the APDT in the State.
Training given for the APDT and stakeholders involved in developing the IP	Training given for the consultancy team in charge of developing the IP	Training given for the APDT and representatives from four social organizations that supported the APDT in building the IPs.	Training given for the APDT and consultants who supported the process in each region.	Training given to the APDT and non-governmental organizations that supported the process.	Training given to the APDT and State government representatives.
Development of a Participation Plan based on the *Participatory IP Construction Guide*.	A descriptive letter was drawn up to hold the workshops in the States.	A Participation Plan was created in the four regions to build the IPs, and a Participatory Construction Guide was created that was adapted to the contextual situation in the state.	The Participatory Construction Guide was adapted for each region.	A descriptive letter was drawn up to hold the workshops.	A descriptive letter was drawn up to hold the workshops.
Participatory and inclusive construction process of the Investment Programs	Concluded. In total, 4 workshops were held, with participation from 20 ejidos and 12 organizations.	Concluded. In total, in the state, 28 workshops were held, with participation from 252 ejidos and 27 social organizations.	17 workshops and four regional forums were held, with participation from 125 ejidos and communities, and 26 regional organizations.	6 workshops were held, with participation from 94 ejidos and communities, and 6 large organizations from the region.	Concluded, 14 workshops were held, where 40% of the ejidos in the region took part.
Systematization of the results from the participatory process	Concluded. 1 Investment Program integrated	Concluded. 4 Investment Programs integrated.	Concluded. 4 Investment Programs integrated, and a session was	Concluded. 1 Investment Program integrated	Concluded. 1 Investment Program integrated

and clerical work to integrate the IP			held on standardizing concepts to achieve consistency in terms of the concepts used across the four State documents.		
Feedback with social participation platforms at the state level	Meetings and IP presentations were held with state government and with the state Technical Advisory Committee.	The Investment Programs are presented to the REDD+ Technical Advisory Committee of the State of Chiapas, at the State Council for Forestry Development and at the State Council for Forestry Management and Rural Development to combat Climate Change.	The Investment Programs were presented in the district assemblies on rural development and the State Forestry Council.	The Investment Program was presented to the REDD+ Working Group, the State REDD+ Technical Advisory Committee, the State Sustainable Rural Development Council and the Standing Committee for Control and Monitoring (COPECOSE) of the Federal Agrarian Attorney.	Carried out through the REDD Technical Advisory Committee, and in regional forums, where forestry associations, academics and civil society organizations took part.
Definition of the inter-institutional platform to validate the Investment Program.	It was established that the Inter-Secretariat Commission on Climate Change (CICLIMA) will carry out the validation.	The inter-institutional platform chosen was the State of Chiapas Inter-Secretariat Commission on Climate Change, through the REDD+ Working Group. The Commission is recognized in the Law on Adapting to and Mitigating Climate Change in the State of Chiapas.	The REDD+ Working Group was defined as the inter-institutional validation platform.	The REDD+ Working Group of the state CICC State as the platform for inter-institutional validation.	The State Government established that the inter-institutional platform for validating the Investment Program should be the State Inter-Secretariat Commission on Climate Change (CiClima).
Validation on the inter-institutional platform and delivery of the Investment Program	Pending validation	On Marcg 31, the four Investment Programs were validated at the REDD+ Working Group of the State of Chiapas Inter-Secretariat Commission on Climate Change	The 4 state Investment Programs were validated by the REDD+ Working group on March 3, 2016.	Pending validation	CiClima carried out the validation on February 26, 2016.
Coordination Agreement signed to develop and implement the IRE between the State Government and the CONAFOR	Under review and in process of signature	Signed on April 22, 2016	Under review and in process of signature	Under review and in process of signature	Under review and in process of signature
Activities or lines of action of Investment Programs linked to Municipal SRD Programs and Municipal Development Plans	Proposals will be worked on to incorporate IP activities in the Municipal Development Plans. Local Environmental Regulations are also being drawn up in the municipality of Holpechén.	In early 2016, the Investment Program guidelines were included in the methodology guide for developing the Municipal Development Plans.	The agreement is in place with the Inter-Municipal Boards to include Investment Program activities in the Municipal Development Plans. These activities are certain to be included in 16 municipalities.	Proposals will be worked on to incorporate the established IP activities in the Municipal Development Plans. This is subject to the change in municipal and state government that will occur in October 2016.	Some of the generic IP activities were incorporated into the Municipal Sustainable Rural Development Plans. Proposals were drawn up for each municipality, describing the generic activities and the recommended area to be included in the Municipal Sustainable Rural Development Plans for 2017. The municipalities have also drawn up Local

					Environmental Regulations.
Link-up with the state planning system	Coordination between sectors only exists through the state CICC.	The Planning, Public Management and Programming Secretariat of the State Government of Chiapas will use the Investment Programs to help the planning processes in the State's Economic Regions.	Generic IP activities were included in the Regional Development Plans, which helps align investments at the State-Regional level with that included at the municipal level.		In preparation. At the CiClima it was agreed to allocate 18 million. For agricultural activities in the State, a basic budgeting unit still needs to be generated, as part of a budgetary program.
Public programs at the state level modified for the Investment Program	Yet to be drawn up.	Yet to be drawn up. State-level Public Programs that can be modified to strengthen Investment Program implementation are currently being analyzed.	The forest-grazing or silvopasture concept was included as a support concept in the SEDER for 2016, and the support concepts will be extended for 2017. The SEDIS has a five-year agreement for social investment aimed at supporting women and young people living in the IRE intervention area. The SECTUR has a pilot community tourism project in municipalities in the IRE area, and the hotel sector is becoming involved to support the payment of environmental services through a private funding mechanism.	Yet to be drawn up.	Yet to be drawn up. Work has taken place with the CONAFOR department to consider the necessary activities for supports to contribute to the Investment Program.
Defined financial mechanism that could be applicable for the IRE	The Peninsular Climate Fund is available, which will be administered by the autonomous universities of the three States that make up the Yucatán Peninsula.	Yet to be drawn up. A consultancy currently exists that is analyzing the strengths and weaknesses of existing funds at the state level and generating a proposal for a financial mechanism.	Yet to be drawn up. An environmental fund is being created for the state.	The Peninsular Climate Fund is available, which will be administered by the autonomous universities of the three States that make up the Yucatán Peninsula. The state also has the Environmental Fund for Quintana Roo.	The Peninsular Climate Fund is available, which will be administered by the autonomous universities of the three States that make up the Yucatán Peninsula.

6.2. Budget for the Emissions Reduction Initiative

Please use the table in Annex 1 to provide a budget for the ER Program covering costs and revenues of setting up and operating the ER Program until the end of 2020; and any budget available for proposed operations beyond the end date of the Carbon Fund ERPA. The budget should include cost estimates for measures and components of the ER Program along with any revenue the ER Program Measures may generate. The budget should include the different sources of funding, including payments from the Carbon Fund, other funders or buyers of ERs, grants, etc. that are available for the ER Program.

In this section, identify any financial shortfalls and propose a strategy to address these funding gaps.

The five IRE states have identified specific long-term innovative planning tool activities, known as Investment Programs (PI), with an initial timeframe of five years, aiming to overhaul the subsidy programs available to serve regional needs and make them more targeted.

The regions' PIs contain a set of general and supplementary activities to be carried out in implementing the IRE in order to tackle the main causes driving deforestation and forestry degradation in their territories. Moreover, they provide for second-stage activities that will build and expand upon the activities to be performed in the territory to further solidify the programs.

In broad strokes, the IRE activities that will be carried out in the territory to address the causes of deforestation and forest degradation comprise a suite of actions that include the following:_i) shifting away from income-generating economic activities that fuel deforestation or forest degradation, ii) raising the economic value of the forest, and iii) placing effective limitations on activities that are harmful to forests and jungles.

Accordingly, drawing on the participatory processes used to put together the eleven PIs in the five states working on the IRE, an approximate estimate was reached as to the amount of resources that would need to be invested in getting the IRE up and running. These amounts were adjusted to match available budgets.

As mentioned before, these amounts are merely indicative and will ultimately depend on the Federal Government's and the State Governments' budgets, as well as the conditions in which the initiative evolves. It bears noting that just as or even more important than the adjusted estimated investment will be achieving tie-ins and coordination with public policy and managing the institutional arrangements, updating and strengthening the regulatory framework to discourage deforestation practices, and pushing private investment.

The total amount considered for the IRE is 5,435,936,604 pesos, of which 3,977,659,104 (in other words, 73.2%) come from the Federal Government's subsidy programs, the State Governments, and resources from other stakeholders. Likewise, of the total amount, 829,977,500 (15.2%) has been spent on the preparation process.

The following tables show a summary of the financial plan, which can be found in more detail in Annex 6.
Likewise, each Investment Program has a detailed budget that can be viewed in the same annex.

- Budget by activity

Table 44 Budget by activity

Use of financial resources	Description		Investment					
		Preparation	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL investment
Costs relating to administrative supervision	Salaries of CONAFOR staff and of the Governments of the 5 States (approximate)	10,300,000	5,150,000	5,150,000	5,150,000	5,150,000	5,150,000	36,050,000
Costs for implementing the interventions that are part of the IRE.	Sustainable livestock, through intensive silvopastoral systems and semi-intensification of livestock		324,817,921	304,600,926	304,600,927	280,619,876	242,942,880	1,457,582,529
	Improving the milpa crop-growing system, intensifying traditional agriculture and conservation agriculture		195,073,869	297,340,709	247,948,170	247,448,170	247,348,170	1,235,159,089
	Sustainable management of the forest and wildlife		144,103,368	141,053,518	135,801,182	130,981,742	138,736,652	690,676,462
	Renovation and rehabilitation of coffee plantations		155,540,837	155,540,837	185,076,054	66,935,186	66,935,186	630,028,100
	Development of apiculture		2,691,976	2,691,976	2,691,976	2,691,976	2,691,976	13,459,880
	Strengthening of regulatory instruments		13,360,000	16,297,500	13,297,500	14,797,500	16,297,500	74,050,000
	Payment for environmental services		629,898,352	329,959,938	297,268,726	160,770,053	136,746,867	1,554,643,936
	Strengthening of local governance		41,334,761	41,827,511	42,486,511	43,592,511	43,317,511	212,558,804
	Productive reconversion		13,702,880	78,393,723	78,393,723	77,893,723	6,302,880	254,686,930
	Productive projects to increase income		54,734,308	54,734,308	55,034,308	55,034,308	54,734,308	274,271,538
	Total implementation costs		1,575,258,271	1,422,440,946	1,362,599,077	1,080,765,045	956,053,930	6,397,117,268
Reference Level and the National Monitoring, Recording and Verification System	Registration of the IRE: maintenance and support		950,000	950,000	950,000	950,000	950,000	4,750,000
	SNMRV: Staff, operations, workshops, rapid eye images, lifting of the INFyS, equipment maintenance and upgrading	772,350,000	117,040,000	117,040,000	117,040,000	117,040,000	117,040,000	1,357,550,000

Benefit Distribution Plan and Safeguards Plan	Consultancy for the construction of the benefit distribution mechanism	1,567,500						1,567,500
	Developing and implementing Safeguard Plans		2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	12,500,000
Environmental and Social Management Framework (ESMF)	Building, developing and implementing the ESMF (this includes workshops, developing material to be circulated and support consultancies in the five states)	1,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	16,000,000
Strengthening social participation	Platforms for safeguard-related participation (e.g. Safeguards Committee)	200,000	200,000	200,000	200,000	200,000	200,000	1,200,000
Feedback and Grievance Redress Mechanism (FGRM)	Operating costs	4,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	14,000,000
Public consultations and dissemination of information								-
CONAFOR operating costs	Salaries of CONAFOR staff and of the Governments of the 5 States (approximate)	40,400,000	20,400,000	20,400,000	20,400,000	20,400,000	20,400,000	142,400,000
Other costs	IRE preparation training workshops	160,000						160,000
Other costs	APDT operation		23,500,000	23,500,000	23,500,000	23,500,000	23,500,000	117,500,000
Total expenses		829,977,500	3,322,756,543	3,015,121,892	2,895,438,154	2,331,770,090	2,082,347,860	14,497,912,036

- Budget by origin of the resource

Table 45 Budget by resource origin.

			Investment					
Sources of financial resources	Description	Preparation	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL investment
Government budget for implementation	CONAFOR		699,716,010	527,948,530	490,663,981	349,951,868	333,408,593	2,529,485,253
	SEMARNAT		6,940,000	9,877,500	6,877,500	8,377,500	9,877,500	41,950,000
	CONABIO		2,500,000	2,500,000	2,500,000	2,500,000	-	10,000,000
	CONANP		-	-	-	-	-	-
	SAGARPA/State Governments		674,151,683	817,960,608	798,103,288	655,481,369	548,613,530	3,494,310,477
	State Governments		7,000,000	7,000,000	7,000,000	7,000,000	7,000,000	35,000,000
	Others		57,154,308	57,154,308	57,454,308	57,454,308	57,154,308	286,371,538
Government budget for operation	CONAFOR	794,077,500	129,490,000	129,490,000	129,490,000	129,490,000	129,490,000	1,441,527,500
	State Governments	11,900,000	27,950,000	27,950,000	27,950,000	27,950,000	27,950,000	151,650,000
Donations	FIP		42,997,561					-
Loans	FIP		84,798,710					-
Income from REDD+ activities								-
Income from the emission reduction sale (to contract)	It is hoped that payments for emission reduction results generated by the IRE will be received through the Carbon Fund. However, the amount will depend on the volume and price agreed on in the ERPA.	-	-	-	-	-	-	-
Total sources		805,977,500	1,732,698,271	1,579,880,946	1,520,039,077	1,238,205,045	1,113,493,930	7,990,294,768

7. Reservoirs, carbon sources and sinks

7.1. Description of sources and sinks selected

Use the table below to state all sources and sinks, associated with any of the REDD+ Activities in the ER Program, which will be accounted as part of the ER Program (add rows as necessary). The same sources and sinks will be accounted for, measured, and reported, and included in the ER Program Reference Level.

Also state sources or sinks, associated with any of the REDD+ Activities in the ER Program, that have been excluded, and justify their exclusion by making conservative assumptions for example on the magnitude of the sources and sinks omitted. At a minimum, ER Programs must account for emissions from deforestation. Emissions from forest degradation also should be accounted for where such emissions are significant (more than 10% of total forest-related emissions in the Accounting Area, during the Reference Period and during the Term of the ERPA). Emissions from forest degradation are estimated using the best available data (including proxy activities or data).

*Refer to **criterion 3** of the Methodological Framework*

The Reference Level presented in the following sections was constructed through Mexico's MRV System, with the same methodological approach used to construct the NFREL presented to the UNFCCC:

i. The IPCC 2003 Guidelines for Good Practices (GGP) were used, using the same assumptions, criteria and methodological approaches to those of the NFREL[97] and the BUR-2015[98].
ii. The same inputs were used for the Activity Data and Emission Factors as at the national level.
iii. A reduction *was made* in the national Activity Data and a switching matrix was created for each of the five states where the IRE will be implemented.
iv. Emission factors were calculated[99] at the state level by using the information from the INFyS for each state and in cases where there were insufficient data, information was taken from a neighboring or national state with the same eco-region. If the sample continued to be statistically insufficient EF were allocated at national level for these categories of national land use which is indicated for each emission factor calculated.
v. Activity Data and Emission Factors are used to estimate changes in carbon content for each activity, and conversion to CO2e.

The Forest Reference Emission Level (FREL) estimates all the emissions that have been quantified for the LULUCF sector in the most recent INEGI, and includes emissions from gross deforestation, forest degradation and degradation caused by fires in ecosystems sensitive to fire. To estimate forest degradation, a calculation was made of emissions associated with carbon losses in forest areas originally in primary condition that were downgraded to secondary condition as a result of degradation, taking as a basis the LGCC definition of degradation, which establishes that the phenomenon occurs when there is a reduction in the carbon content in the natural vegetation due to human intervention. It will also include as degradation any emissions due to forest fires in ecosystems that are sensitive to fire according to the Official Mexican Standard NOM-015-SEMARNAT/SAGARPA-2007[100].

For this initiative, the other REDD+ activities have not been included in the reference level estimate, and will not be recorded in the emission reductions. From a technical point of view, it could said that the methodological approaches to be used have not been developed and/or discussed, or that there is a lack of data to produce the reference level for these activities at IRE scales; however, in order to have an idea of the size of these activities, it is worth stating that at INEGI 2013 estimates were made for most transitions, in accordance with the BPG for the IPCC, and to estimate the increase in terms of carbon the data can be included for absorptions in "land converted to forest land", which amounts to 12,582.75 GgCO_2e, and for the case of conservation, data can be used on absorptions in "forest land that remains as forest land" (without including data on degradation), which amounts to 150,232.24 GgCO_2e; for the case of sustainable forest management, spatially explicit Activity Data is

[97] http://goo.gl/G0bq0m
[98] See http://goo.gl/B81sfG
[99] http://goo.gl/2VwGUH
[100] The Official Mexican Standard lays down the technical specifications of methods for using fire in forest lands and in areas used for agriculture.

needed to prevent any double recording from occurring with the other categories, as well as Emission Factors that are appropriate for the different types of management and cover types found in Mexico.

Table 46 Sources included in the Forest Emissions Reference Level and in the IRE

Sources/Sinks	Included in the IRE?	Justification/Explanation
Emissions from deforestation	Yes	Most of the USCUSS sector emissions are due to deforestation. They represent 64% of emissions.
Emissions from degradation	Yes	They are included because it is a significant activity with 31% of emissions; it also contributes to the loss of primary processes and functions to provide environmental services as well as to the loss of biodiversity (5% from fire).
Increase in carbon stocks	No	As a lesson learned from the CDM afforestation and reforestation projects, as well as in other projects in the voluntary carbon market, monitoring and following up on this type of project has proved to be very expensive; however, as it can be considered an activity that may be of interest to landowners in Mexico, this activity is being promoted with the implementation of the Mexican Standard for registering Carbon Forestry Projects and Certification of the Increase in Carbon Stocks (NMX-AA-173-SCFI-2015), where projects of this kind can be implemented.
Sustainable forest management	No	Not included in the FREL as the activity data and emissions factors needed to perform the calculation are not available.
Conservation	No	Not included in the FREL as the necessary data to perform the calculation is not available.

7.2. Description of carbon reservoirs and greenhouse gases selected

Please use the tables below to state all Carbon Pools and greenhouse gases that will be accounted as part of the ER Program (add rows as necessary). The ER Program should account for significant Carbon Pools and greenhouse gases except where their exclusion would underestimate total emission reductions. For the purpose of the FCPF Carbon Fund, significant Carbon Pools and greenhouse gases are those that contribute to more than 10% of total forest-related emissions in the Accounting Area during the Reference Period).

Explain whether any Carbon Pools and greenhouse gases have been excluded, and if so, justify their exclusion by making conservative assumptions for example on the magnitude of the Carbon Pools and greenhouse gases omitted.

Refer to ***criterion 4*** *of the Methodological Framework*

The following table explains which reservoirs were recorded in the FREL for each activity. This has the purpose of explaining how the methodological approaches are used to prevent double counting from occurring.

Table 47 Activities and carbon reservoirs accounted for in the FREL and in the IRE

Carbon reservoirs	Selected	Description/ Justification/Explanation
Above-ground biomass	Woody above-ground biomass	Trees and shrubs normally more than 7.5 cm in diameter. The calculation of carbon in living biomass at tree level is performed on the basis of the records of stems of woody plants (trees and shrubs), collected during INFyS sampling carried out in the field between 2004-2007 (CONAFOR, 2012). In the Estimate, dasometric data are used measured in 18,780 Primary Sampling Units (PSUs), which included 70,868 Secondary Sampling Units (SSUs) with dasometric data from 1,137,872 records of living woody plants (trees and shrubs) and 68,300 standing dead woody plants (trees and shrubs). Prior to the carbon estimate at tree level, a quality control protocol was carried out on the records of woody plants (trees and shrubs) from two perspectives: a) review of species nomenclature and b) a clean-up of dasometric information. To estimate the biomass contained in each living woody plant, an allocation algorithm of allometric models was applied, which used 226 allometric models[101] (at the species, genus or type of vegetation level) 189 specific biomass equations applied for estimating 2,636,127 individuals

[101] The database of compiled allometric models used to make the estimate can be found at the following link http://goo.gl/EjQvbP

		(91.57% of the observations) of the INFyS were used. These were "developed" in Mexico by Mexican investigators for local species and their database was completed by means of a comprehensive search of the bibliography available, complemented by 37 allometric models from international sources whose species, genus or type of vegetation were recorded in 242,644 observations (8.43% of the observations) of the INFyS. In some of these models the equation requires the use of specific wood densities to estimate the biomass and are suitable for their application country in ecological, statistical and spatial terms (strengthening REDD+ and South-South cooperation, 2014b).
	Herbs	Herbaceous vegetation that is located on the ground includes grasses, herbs and shrubs that are not woody. The INFyS has not quantified it; it was calculated on the basis of collecting literature at national level and was used for degradation from fires.
	Bushes	Low-height vegetation that is located above the ground with a diameter of less than 7.5 cm. The INFyS does not account for it; it was calculated on the basis of collecting literature at national level and was used for degradation from fires.
Biomass below ground	Roots	Fine roots. The allometric equations of Cairns *et al*. were used to quantify biomass below ground (roots) as a function of woody above-ground biomass, by ecosystem type. This equation is the IPCC's default equation.
Dead wood		Woody material found on dead leaves with a diameter of more than 7.5 cm. The INFyS does not account for it; it was calculated on the basis of collecting literature at national level and was used for degradation from fires.
Dead leaves	Fresh dead leaves	Dead biomass that has not entered into an advanced state of decomposition; includes needles, leaves, lichens and woody material less than 7.5 cm, which are above the mineral soil. The INFyS accounted for it for a few years in the second cycle; however this data was not processed as a whole since it was calculated on the basis of collecting literature at national level and was used for degradation from fires.
	Dead leaves in decomposition (fermentation)	Dead biomass that is in a state of decomposition includes needles, leaves, lichens and woody material less than 7.5 cm, which are above the mineral soil. The INFyS accounted for it for a few years in the second cycle; however this data was not processed as a whole since it was calculated on the basis of collecting literature at national level and was used for degradation from fires.
Organic Carbon		The contribution of organic carbon, even from a large deposit, is not considered, as such emissions are not significant (due to the rate of change in the depreciation over 20 years).

The input used to estimate aerial and subterranean woody biomass was the information obtained from the National Forestry and Soils Inventory (INFyS); as explained in sections of this document, the INFyS has measured two cycles (2004-2007 and 2009-2014), during which it has been subjected to processes of continuous improvement with the aim of fully recording the characteristics of forest land, adding certain variables of interest for carbon estimate during the second cycle. Currently, the information gathered in the two cycles is complete for all transitions in Aerial Biomass and Subterranean Biomass deposits, and as such are the only stores that were integrated into the report (Table 48). For the other stores, all the necessary information and methodology is available to estimate and will be completed in all its transitions, including integration of the information from the third cycle of the INFYS (2015-2020). Consequently, this has not been included in the NREF and once the third cycle is completed the possibility of incorporating it in this initiative will be analyzed.

Table 48. Situation of estimates of stores for each transition

Transition / Store	TF-TFd (Degradation)	TF-OU (Deforestation)
Aerial Biomass	Yes	Yes
Subterranean Biomass	Yes	Yes
Dead standing	No	Yes*
Stumps	No	Yes*
FWM	No	Yes*

Mulch	No	Yes*
Soils	No	Yes**

*** They are preliminary estimates at national level based on data from the INFyS Second cycle**
**** They are estimates with an IPCC tier 1 approach based on integrating various databases, meaning that there can be no adequate monitoring for the IRE**

The "Protocol for Estimating Greenhouse Gas (CO_2) Emissions and Removals Resulting from the Concentration of Organic Carbon in Mineral Soils" shows an approach for estimating the densities of carbon stored in soils. These densities were obtained based on information from the country. To establish the assumption that the soil does not contribute significantly as it is a less dynamic store, its contribution to the GHG emissions was analyzed.

For the storage calculated for soils, a default exchange rate of 20 years suggested by the IPCC was applied, in order to establish the carbon content of soils following conversion. By applying this stabilization criterion in the Emission Factors (carbon densities), it is possible to estimate emissions per year of soils due to changes resulting from deforestation, which are shown in the following table:

Table 49. Annual emissions of organic carbon from soils due to deforestation depreciated over 20 years (Mg of CO_2)

Estado	Periodo 1990-2001	Periodo 2002-2006	Periodo2007-2013
Campeche	453.61	561.51	367.43
Chiapas	579.69	585.55	165.38
Jalisco	182.82	314.36	39.52
Quintana Roo	160.13	273.55	273.13
Yucatán	275.24	336.48	380.12
Emisiones totales de conversión de suelos (Mg de CO_2)	1,651.48	2,071.44	1,225.59

The contribution of emissions due to deforestation on the land is 3% compared with the total emissions from deforestation therefore they will not be considered significant

With regard to "stock change factors", these are not used in the way indicated by the IPCC as we have information from the country; however, our estimate of the annual change in carbon stocks in mineral soils is not affected, as it sought only to adapt the IPCC sheets to the type of information that we had.

The carbon deposit in soils has been evaluated for the national report using information collected in the second cycle of the INFyS and information obtained by other INEGI initiatives; however, this reservoir will be duly evaluated with the information from the third cycle of the INFyS covering 2015-2020 and subsequent cycles.

With regard to deposits of dead wood and dead leaves, the IPCC 2006 mentions that deposits of dead organic material, which includes dead leaves and dead wood, tend to be larger after disturbances leading to tree replacement, such as deforestation; this is due to the fact that there are timber and non-timber components (such as trunks, stumps, tree canopies, branches, leaves, roots and non-commercial trees), which are left in the ground and are transferred to deposits of dead organic material. Subsequently there is a dynamic of loss and recovery until this situation stabilizes; this dynamic requires a separate estimate of natural inputs and outputs as well as contributions and losses due to the disturbances.

On the other hand the IPCC itself states that when using level 1 (tier1), in order to estimate the emissions in forestland which changes to other types of land use, the hypothesis is used in accordance with which all the dead wood and dead leaves are eliminated during the conversion, with no dead wood or leaves remaining or accumulating in the forestlands converted to other land uses (land for cultivation, human settlements, etc.).
In addition in the countries in which it is known that this hypothesis is false (e.g., where there is a generalized practice of cutting brushwood and burning, as is the case in Mexico), they are encouraged to use a higher level in order to account for these transitions.

The IPCC includes the values in tC/ha, for broadleaf and aciculated dead leaves for tropical and subtropical regions; but they do not include values for MLC.

Owing to the above it can be assumed that estimating emissions using an IPCC level 1 approach, with regard to components of dead organic material in deforested areas, could have led us to overestimate emissions in the past, in addition to overestimating reductions in emissions; due to the fact that it would be rather unreliable, or even erroneous, to assume a total loss of these deposits based on default values, or those obtained from literature (for example the figures used for fires), without understanding the real dynamic which led to deforestation.

During the third cycle of the INFyS quantification of the MLC, fresh dead leaves and the fermentation layer was included, as well as an estimate of organic carbon in the ground; when this information is available it will be analyzed in accordance with the methodology framework, to consider the possibility of including it in the second reporting period.

It is important to point out that if data from emissions associated with reservoirs not taken into consideration in this FREL are included in the future, said Reference Level will have to be recalculated.

The greenhouse gases included are presented in the following table:

Table 50 Greenhouse Gases included in the FREL and the IRE

Greenhouse gas	Included	Justification/explanation
CO_2	Yes	For deforestation and degradation (including forest fires)
CH_4	Yes	For degradation by forest fires
N_2O	Yes	For degradation by forest fires

8. Reference Level of Forest Emissions (FREL)

8.1. Reference period

Please provide the Reference Period used in the construction of the Reference Level by indicating the start-date and the end-date for the Reference Period. If these dates are different from the guidance provided in the FCPF Carbon Fund Methodological Framework, please provide justification for the alternatives date(s).

*Refer to **criterion 11** of the Methodological Framework*

The FREL is constructed from the historical period between the years 2001–2011. As set out in the following sections, the dynamic of change in forest cover in Mexico has been evaluated with the cartographic information from the INEGI Soil and Vegetation Use series, which cover a period from 1993 (series II) to 2011 (series V), which is the year for which the last official map of land cover in Mexico is available. This FREL will be used for the emissions reduction from the IRE for the 2017–2022 period corresponding to average emissions.

To provide a congruent report of the 2001-2011 period, annual emission values have been established by periods, in such a way that the value for the 2001 period comes from the annual estimate of the 1993-2001 period, the 2002-2006 values from the annual estimate of the same period (2202-2006), and the 2007-2011 values from the annual estimate of the 2007-2011 period. This approach of using a linear progression was recommended by the UNFCCC panel of experts.

In the case of the EF used for the period between Series II and Series III, it is assumed that the EF behave in a consistent way (before and after the INFyS period: 2004-2009). This is because there is no additional information and to assume different behaviours would involve making risky and unreliable assumptions.

8.2. Definition of forest used in the construction of the Forest Reference Emission Level

Please describe the forest definition used in the construction of the Reference Level and how this definition follows the guidance from UNFCCC decision 12/CP.17[102]. If there is a difference between the definition of forest used in the national greenhouse gas inventory or in reporting to other international organizations (including an FREL/FRL to the UNFCCC) and the definition used in the construction of the Reference Level, then explain how and why the forest definition used in the Reference Level was chosen. If applicable, describe the operational definition of any sub-classes of forests, (e.g., degraded forest; natural forest; plantation) used.

*Refer to **criterion 6, indicator 6.1 and criterion 12** of the Methodological Framework*

The definition of forest that is used to construct the FREL is consistent with that used to construct the NFREL and was established according to IPCC guidelines and directives, considering the definitions included in the regulatory framework of the country as an input, mainly in the Sustainable Forest Development General Law (LGDFS).

In the LGDFS, the definition of "forest land" includes all land covered by "forest vegetation" and is defined as "all plants and fungi that grow and develop naturally, forming forests, rainforests, arid and semi-arid areas and other ecosystems, giving rise to the development and balanced coexistence of other natural resources and processes, provided that they form masses of between 1500 m^2 and 1 ha". Taking the above definition into consideration, "forest" for the FREL of this initiative is defined as all "Forest Land" with a canopy cover of more than 10%, with trees over four meters high[103] - or trees able to reach this height in situ - and a minimum mapping unit of at least 50 hectares[104]. The MMU of 50 was defined based on the official cartographic inputs used (INEGI Series): for now with these maps it has not been possible to comply with the LGDFS definition; however, new initiatives are being developed, such as the MADMex, to achieve an MMU of at least 1 ha. This does not include land that is predominantly being used for agricultural or urban purposes. Section 9 will provide more details on the MADMEX initiative to comply with national and international forest definitions.

This definition was used to develop the INEGEI, which was included in the BUR presented at the UNFCCC on October 23, 2015[105]. Likewise, the forest definition is consistent with the progress made in the process of preparing REDD+ at national level, and responds to the comments made by the various stakeholders involved in this process (CTC, GT, CONAF, among others); which suggest using the broader definition so that it meets the objective of being inclusive in the implementation of REDD+ in Mexico (CONAFOR, 2014b).

It is worth highlighting that the definition used for the FREL considers some types of vegetation as forest that in the Global Forest Resources Assessment (FRA) are included as Forests and other forested lands. This type of vegetation is always considered forest in the FREL when the above parameters described in the definition of a forest are met.

Finally, it is important to highlight that Mexico is taking actions to generate and analyze new information and that it will make it possible to adjust the parameters used as a process of continuous improvement that will improve the consistency between the definitions of forest in the various national reports.

8.3. Average annual historical emissions during the reference period

Description of the method used to calculate average annual historical emissions during the reference period

Please provide a transparent, complete, consistent and accurate description of the approaches, methods, and assumptions used for calculating the average annual historical emissions over the Reference Period, including, an explanation how the most recent Intergovernmental Panel on Climate Change guidance and guidelines, have been applied as a basis for estimating forest-related greenhouse gas emissions by sources and removals by sinks.

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[102] UNFCCC SBSTA 12/CP.17 Annex Para. 4

[103] To define the height parameter, which cannot be established through remote sensors, INFyS tree height data was analyzed in order to estimate the minimum height based on the available field data.

[104] According to the characteristics of the INEGI Series.

[105] http://goo.gl/eQHfcO

Refer to ***criterion 5,6 and 13*** *of the Methodological Framework*

To create the IRE reference level, official information has been used, which consists of two main inputs, the Soil and Vegetation Use series generated by the National Institute of Statistics and Geography (INEGI, 1993, 2002, 2007 and 2011), and the National Forestry and Soils Inventory (INFyS) generated by the National Forestry Commission.

The methods for estimating activity data and emission factors are described below.

8.3.1 Activity Data: INEGI Series on the Use of Soil and Vegetation

The INEGI is responsible for providing official statistical and cartographic data at a national level, particularly the Use of Soil and Vegetation maps over time (also known as INEGI Series).

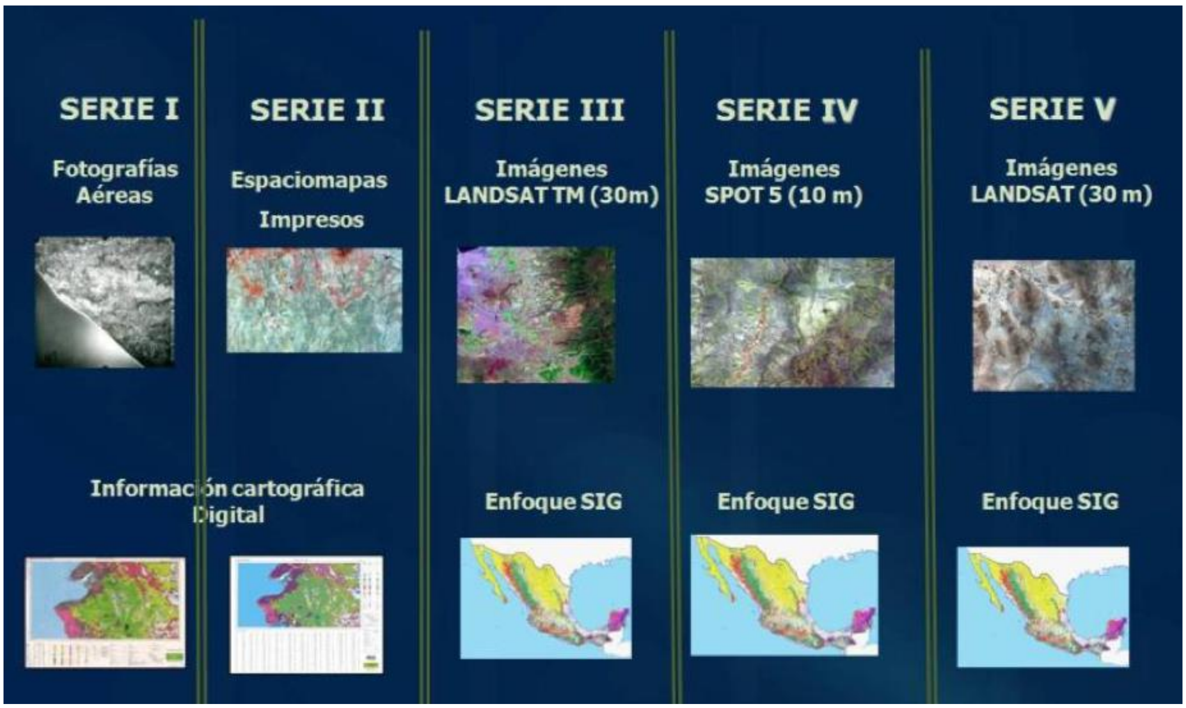


Figure 18. Shows the characteristics of the INEGI Series on the Use of Soil and Vegetation

These maps show the distribution of different types of vegetation and of the areas of land used for agriculture, livestock and forestry. They include accurate information on the representative species of plant cover and allow experts to identify the state of the vegetation cover in the entire national territory. They have a scale of 1: 250,000 with a minimum cartographic unit of 50 hectares. As of today, the INEGI has issued five Series, whose characteristics are shown in the following table:

Table 51. Main characteristics of INEGI's Land Use and Vegetation Series

	Series II	Series III	Series IV	Series V
Publication date	1996	2005	2010	2013
Remote sensors date	1993	2002	2007	2011
Field information date	1993-1998	2002-2003	2007-2008	2012-2013
Scale	1:1250,000	1:1250,000	1:1250,000	1:1250,000
Minimum mapping unit (vegetation)	50 ha	50 ha	50 ha	50 ha

Resolution	50 m per pixel at source, interpretation of printed image, scale 1:250,000	27.5 m per pixel	10 m per pixel	27.5 m per pixel
Data	Printed georeferenced maps	LANDSAT TM (30 m)	SPOT 5 (10 m)	LANDSAT TM (30 m)
Methodology	Analogue technology	Digital technology	Digital technology	Digital technology
Information	5 layers	14 layers	13 layers	14 layers

Methodological process for drafting INEGI's Land Use and Vegetation Series

Series II
Land Use and Vegetation Series II is designed to form part of a Geographic Information System, which is why it is structured into sets of data that are integrated into different covers or layers. The techniques and tools used to generate the Land Use and Vegetation information have a scale of 1:250,000 the methodological process considers the following steps:

a) **Preliminary interpretation.**
A first interpretation of the space maps[106] was performed in an analog way, superimposing an acetate with Land Use and Vegetation Series I polygons and then polygons that presented changes were identified, as were areas of interest to be inspected in the field, and the routes for the inspection visits were defined and hypotheses suggested on the areas of change.

b) **Field inspection**
Two types of points were worked on during the field visit: a) inspection points, which are those in which detailed information is collected and b) Observation points, in which only qualitative data are taken, concerning the type of vegetation, specific features of the terrain, etc. The field points information may contain information from agricultural activities that were carried out in a particular place or, information concerning the type of vegetation (natural or induced). The inspection was carried out via land and when necessary air support was used by means of a helicopter. During this stage, representative and/or dominant specimen samples of botanical species in the plant communities were collected, as this is important as an endorsement of the mapping information that was generated.

c) **Analysis and integration of the information.**
At this stage the information that was obtained from the preliminary interpretation and the field inspection is analyzed and the hypothesis suggested during the preliminary interpretation checked, based on the results of the field inspection. This information is reflected in the acetates and the respective corrections and modifications were made to the polygons, the information obtained in the field was compared with office records and updated information was obtained.

d) **Edition.** The updated information is then digitally edited and once the file is obtained it is disaggregated into the 9 layers (Figure 19) that integrate the vector information. This information is available to the user in digital or printed format.

[106] Maps printed on paper 60x90 cm with Landsat TM images from 1993 and 1994. Its format includes two degrees of longitude for one degree of latitude, covering approximately 24,000 km2 of territory. Each map includes the satellite image with a spatial resolution of 50x50 m in false color (combination 4,3,2 - RGB) to which the names of the main towns and some outstanding geographic features have been added. In these, vegetation, soils, bodies of water, irrigated crop and temporal areas, as well as urban areas stand out spatially.

Figure 19. Structure of the 9 vector layers of the Series

Series III

The methodological process for drafting **Series III** of Land Use and Vegetation Information, is basically the same as that used to generate **Series II**, except for some modifications and adaptations considering the use of new digital inputs (satellite images, vector information both thematic and from earlier series), the characteristics of the digital format, in addition to the need to generate reliable and quality information as quickly as possible.

The steps are described below:

1. **Preparing and sending inputs.**

The allocation of the blocks consists of 2 or more adjacent data sets. The allocation of each of the blocks is sent to the Regional Departments and Coordinating Bodies of the State with the purpose of communicating it to specialists and delivering to each of those responsible to update the following inputs:

- Satellite images
- Digital elevation model
- Vector information of Land Use and Vegetation of the previous series.
- Vector information of the different thematic series; soil sciences, geology, climate, topography and hydrology.

2. **Preliminary interpretation**

During this process, the office interpreted the different units of Land Use and Vegetation of Series II, taking the Landsat TM 2002 georeferenced image as a basis with the aim of detecting areas where vegetation cover changed, either by natural causes or by human activity, which is why the different themed layers were used as a support. The information resulting from this activity allows the identification of places to be visited during the field visit.

3. **Field inspection**

Once the preliminary interpretation was completed, the field inspection was planned, which is why a route of areas to inspect was established and the three types of points to see in the field were identified which are:

- Inspection: sites where information was collected with the aim of documenting a change in vegetation cover.
- Observation: sites where observations are made to confirm a situation detected in the preliminary interpretation.
- Monitoring: sites that correspond to specific ecological situations and that are Protected Natural Areas, ecologically protected areas, relictual vegetation area, and that deserve a visit for each update of the information with the aim of observing their behavior.

These points were visited in the field and a field report was prepared that included data obtained in the survey by Land Use specialists, the visit was conducted on land and was possibly aided by a helicopter.
While collecting information, the plant species characteristics were collected from the point with the aim of confirming or amending the type of vegetation determined.

4. **Analysis of the information**

At this stage definitive changes were made to the information, the vector structure and the attributes of the information (change of keys). The resulting information underwent a thorough validation process. For this activity, the information obtained during the field visit was used as the inputs mentioned in the preliminary information section.

5. **Identification of botanical material**

The botanical samples, duly preserved in the field, were sent to the INEGI's Botany Department, in order to identify and draw up the respective list. This information was useful, as it supports the updating work, in addition to characterizing the observation point raised, to be included in the corresponding field reports.

6. **Generating information layers**

Once the office's update was carried out, the different layers of information that the Series comprises were extracted, according to their characteristics (polygons, points or lines). Once the layers were generated, all the blocks were joined with the aim of generating the National Set for each one. It was delivered to the Department of Land Use with the information validated by the supervisors.

7. **Themed and digital validation**

Once the information was received by the Department of Land Use, the themed and digital validation was carried out, with the aim of ensuring consistency and an adequate structure. In the event of inconsistencies, the information is returned to generating instances for correction.

8. **Integration of national sets**

Once the information was verified, it was necessary to integrate the National Sets of each layer of information that the Series contains.

9. **Validation of alphanumeric information**

As has been mentioned above, the field information, duly georeferenced, located in the unusual layers of species, crops, sites of ecological importance and lines of ecological importance. This information is captured and available to users that require it.

10. **Release of the information**

Once the national sets have been integrated and validated, they are released and delivered to the Database Department for integration into the INEGI's Geographic Database and then distributed and sold.

<u>Series IV and V</u>

The methodological process for drafting **Series IV and V** of Land Use and Vegetation Information is presented below in Figures 20,21 and 22.

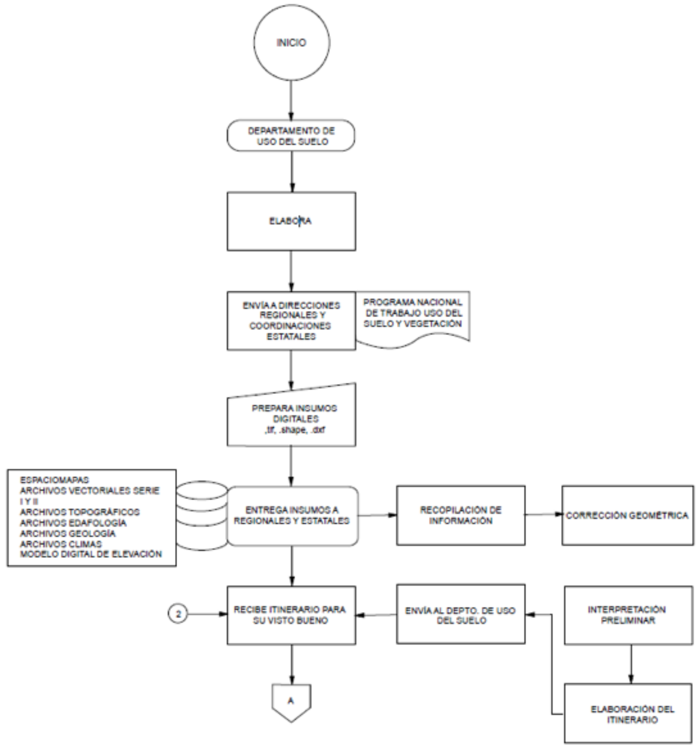


Figure 20: Methodological process for drafting Series IV and V (1 of 3)

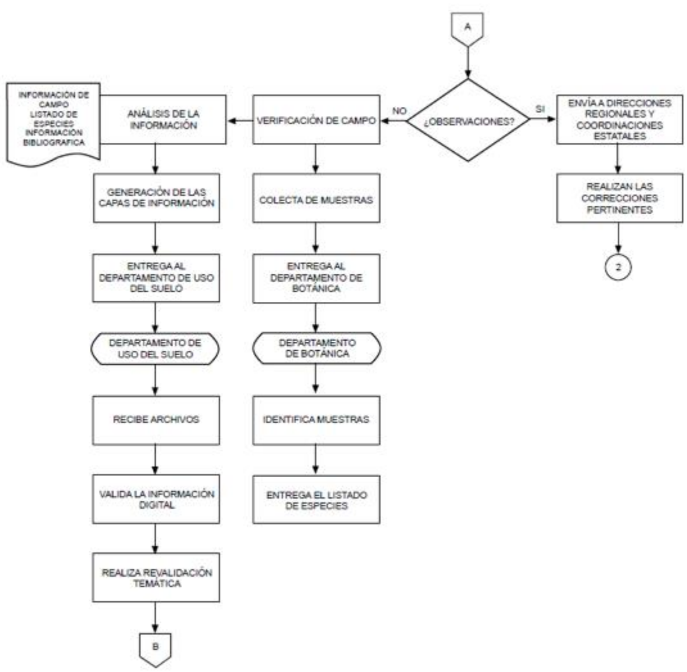


Figure 21: Methodological process for drafting Series IV and V (2 of 3)

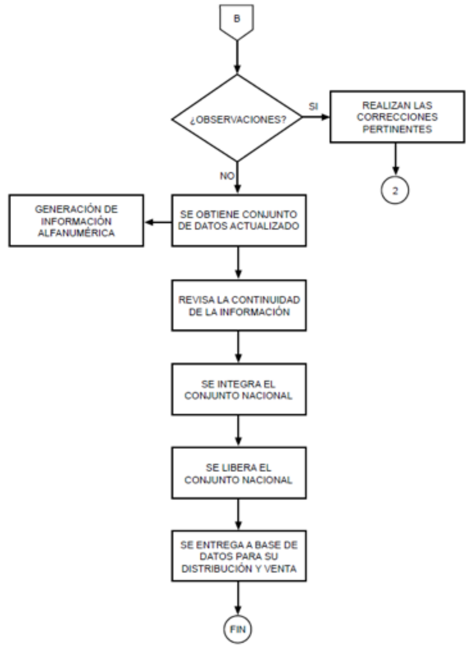


Figure 22: Methodological process for drafting Series IV and V (3 of 3)

Finally, it is worth mentioning that Series III and V were developed by interpreting Landsat TM 5 with a spatial resolution of 30x30 m pixels, and Series IV is supported by SPOT 4 images from 2007 and 2008 with a spatial resolution of 20x20 m pixels. With the aim of producing comparable information between Series, the SPOT images were re-sampled beforehand, changing the spatial resolution to 30x30 m pixels to integrate them in the map preparation processes.

The Land Use and Vegetation information that the INEGI draws up includes 217 different land uses and vegetation in a hierarchical structure for Mexico. For the standardization of the plant cover classes with the IPCC categories (2003) the classification and hierarchical structure of the INEGI's same mapping was used as the main guide. (INEGI, 2009). In a manner consistent with the inventory included in the Biennial Update Report (BUR) (INECC-CONAFOR, 2014) presented at the UNFCCC, the grouping proposal for the Land Use, Land-Use Change and Forestry (LULUCF) sector as mentioned above, includes 19 groups in forest land, 6 in meadows, 2 in agricultural land, 1 in wetlands, 1 in settlements and 1 in other lands. Figure 23 graphically presents the total grouping of classes of the INEGI Series in the IPCC categories.

<u>Classification and correspondence of the INEGI's Land Use and Vegetation with IPCC Categories</u>

As a result of a series of meetings between the INEGI, CONAFOR and INECC, the 217 plant cover classes of the INEGI series were grouped consistently into 19 general classes, 12 of which are considered forest and are subdivided into primary and secondary vegetation according to the degree of disturbance and level of stratification recorded, amounting to a total of 31 classes established for the National Greenhouse Gas Emissions Inventory (INEGEI). All located in the six categories of the IPCC (2003), according to the GBP (2003), this grouping essentially considered the same criteria used by the INEGI for what it defines as a "plant group" or a "vegetation group", although some adaptations are included in the proposal, among them, the separation of xeric shrubland, other special types and hydrophilic vegetation for inclusion in the Forest Lands and Meadows categories (as described by IPCC).

The criteria used to define the groups and the types of vegetation[107] in the forest land categories that were used in this report to estimate gross deforestation and degradation are:

- Vegetation group (INEGI), which refers to a higher hierarchical level than vegetation and agroecosystem types.
- Stage (primary and secondary):

[107] The description in the Guide to Interpreting the Mapping of Land Use and Vegetation (INEGI, 2009) was considered.

    - Primary vegetation: That in which vegetation presents no significant alteration or degradation is not that evident.
    - Secondary vegetation: When a type of vegetation is eliminated or altered by various natural human factors or the result is a plant community significantly different from the original one and with a heterogeneous floral structure and composition.
- INEGI's development phase (arboreal, shrubby and herbaceous).
- Separation of vegetation groups (as described by the INEGI) into subcategories that group types of vegetation that correspond to a dominance of woody elements (trees and shrubs) and non-woody (herbaceous) in their different stages of development (IPCC-INEGI).
- IPCC criteria (IPCC, 2003) for the Land Use, Land-Use Change and Forestry (LULUCF) categories.

The forest land category comprises all land with woody vegetation consistent with thresholds used to define forest lands in the National Greenhouse Gas Inventory (INEGEI), subdivided at national level, into cultivated and non-cultivated areas, and also by ecosystem type, as specified in the IPCC Guidelines. It also includes systems with vegetation currently below the threshold of the category of forest lands, including any land with an ecological capacity to reach the threshold. Table 52 shows the categories that are included in forest land.

Figure 23: Graphical representation of the INEGI series grouped into IPCC categories

Table 52. Categories that are included in forest land

Plant group proposal (INEGI-IPCC)	Type of vegetation (INEGI)
Coniferous Forest (Primary and Secondary Arboreal Vegetation)	Primary Oyamel (Sacred Fir) Forest, Arboreal Secondary Oyamel Forest, Primary Cypress Forest, Arboreal Secondary Cypress Forest, Primary Juniper Forest, Arboreal Secondary Juniper Forest, Primary Pine Forest, Arboreal Secondary Pine Forest, Primary Mixed Pine-Oak Forest, Arboreal Secondary Mixed Pine-Oak Forest, Primary Ayarín (Spruce-Fir) Forest, Arboreal Secondary Ayarín Forest, Primary Conifer Shrubland
Secondary Coniferous Forests (Secondary Shrub and Herbaceous)	Secondary Oyamel Shrubby Forest, Secondary Oyamel Herbaceous Forest, Secondary Cypress Shrubby Forest, Secondary Cypress Herbaceous Forest, Secondary Juniper Shrubby Forest, Secondary Juniper Herbaceous Forest, Secondary Pine Shrubby Forest, Secondary Pine Herbaceous Forest, Secondary Mixed Pine-Oak Shrubby Forest, Secondary Mixed Pine-Oak Shrubby Forest, Herbaceous Secondary Mixed Pine-Oak Forest, Secondary Ayarín Shrubby Forest, Secondary Ayarín Herbaceous Forest, Secondary Conifer Shrubby Shrubland, Secondary Conifer Herbaceous Shrubland
Primary Oak Forest	Primary Oak Forest, Arboreal Secondary Oak Forest, Primary Mixed Pine-Oak Forest, Arboreal Secondary Mixed Pine-Oak Forest
Secondary Oak Forest	Herbaceous Secondary Oak Forest, Shrubby Secondary Oak Forest, Secondary Shrubby Mixed Oak-Pine Forest, Herbaceous Secondary Mixed Oak-Pine Forest
Primary Mountain	Primary Mountain Cloud Forest, Arboreal Secondary Mountain Cloud Forest

Cloud Forest	
Secondary Mountain Cloud Forest	Shrubby Secondary Mountain Cloud Forest, Herbaceous Secondary Mountain Cloud Forest
Primary Evergreen Tropical Forest	High-Stature Primary Evergreen Tropical Forest, High-Stature Arboreal Secondary Evergreen Tropical Forest, High-Stature Primary Semi-Evergreen Tropical Forest, High-Stature Arboreal Secondary Semi-Evergreen Tropical Forest Low-Stature Primary Evergreen Tropical Forest, Low-Stature Arboreal Secondary Evergreen Tropical Forest, Low-Stature Primary Semi-Evergreen Thorny Tropical Forest, Low-Stature Arboreal Secondary Thorny Semi-Evergreen Tropical Forest Low-Stature Primary Semi-Evergreen Tropical Forest, Low-Stature Arboreal Secondary Semi-Evergreen Tropical Forest Medium-Stature Primary Evergreen Tropical Forest, Medium-Stature Arboreal Secondary Evergreen Tropical Forest Medium-Stature Primary Semi-Evergreen Tropical Forest, Medium-Stature Arboreal Secondary Semi-Evergreen Tropical Forest
Secondary Evergreen Tropical Forest	High-Stature Shrubby Secondary Evergreen Tropical Forest, High-Stature Herbaceous Secondary Evergreen Tropical Forest High-Stature Shrubby Secondary Semi-Evergreen Tropical Forest, High-Stature Herbaceous Secondary Semi-Evergreen Tropical Forest, Low-Stature Shrubby Secondary Evergreen Tropical Forest, Low-Stature Herbaceous Secondary Evergreen Tropical Forest, Low-Stature Shrubby Secondary Thorny Semi-Evergreen Tropical Forest, Low-Stature Herbaceous Secondary Thorny Semi-Evergreen Tropical Forest, Low-Stature Shrubby Secondary Semi-Evergreen Tropical Forest, Low-Stature Herbaceous Secondary Evergreen Tropical Forest, Medium-Stature Shrubby Secondary Evergreen Tropical Forest, Medium-Stature Herbaceous Secondary Evergreen Tropical Forest, Medium-Stature Shrubby Secondary Semi-Evergreen Tropical Forest, Medium-Stature Herbaceous Secondary Semi-Evergreen Tropical Forest
Primary Semi-Deciduous Tropical Forest	Low-Stature Primary Semi-Deciduous Tropical Forest, Low-Stature Arboreal Secondary Semi-Deciduous Tropical Forest, Medium-Stature Primary Semi-Deciduous Tropical Forest, Medium-Stature Arboreal Secondary Semi-Deciduous Tropical Forest
Secondary Semi-Deciduous Tropical Forest	Low-Stature Shrubby Secondary Semi-Deciduous Tropical Forest, Low-Stature Herbaceous Secondary Semi-Deciduous Tropical Forest, Medium-Stature Shrubby Secondary Semi-Deciduous Tropical Forest, Medium-Stature Herbaceous Secondary Semi-Deciduous Tropical Forest
Primary Deciduous Tropical Forest	Primary Subtropical Shrubland, Low-Stature Primary Deciduous Tropical Forest, Low-Stature Arboreal Secondary Deciduous Tropical Forest, Low-Stature Primary Thorny Deciduous Tropical Forest, Low-Stature Arboreal Secondary Thorny Deciduous Tropical Forest, Medium-Stature Primary Deciduous Tropical Forest, Medium-Stature Arboreal Secondary Deciduous Tropical Forest, Primary Tropical Mezquite Shrubland, Arboreal Secondary Tropical Mezquite Shrubland
Secondary Deciduous Tropical Forest	Low-Stature Shrubby Secondary Deciduous Tropical Forest, Low-Stature Herbaceous Secondary Deciduous Tropical Forest, Low-Stature Shrubby Secondary Thorny Deciduous Tropical Forest, Low-Stature Herbaceous Secondary Thorny Deciduous Tropical Forest, Medium-Stature Shrubby Secondary Deciduous Tropical Forest, Medium-Stature Herbaceous Secondary Deciduous Tropical Forest, Shrubby Secondary Tropical Mezquite Shrubland, Herbaceous Secondary Tropical Mezquite Shrubland
Primary Xeric Shrubland	Primary Succulent Shrubland, Primary Microphyllous Desert Shrubland, Primary Rosette-Like Desert Shrubland, Primary Tamaulipan Thorny Shrubland, Primary Xeric Mezquite Shrubland, Chaparral, Primary Coastal Rosette-Like Shrubland, Primary Sarcocaulous Shrubland, Primary Sarco-Succulent Shrubland, Primary Submountainous Shrubland, Arboreal Secondary Submountainous Shrubland, Primary Misty Sarco-Succulent Shrubland
Secondary Xeric Shrubland	Shrubby Secondary Succulent Shrubland, Herbaceous Secondary Succulent Shrubland, Shrubby Secondary Microphyllous Desert Shrubland, Herbaceous Secondary Microphyllous Desert Shrubland, Shrubby Secondary Rosette-Like Desert Shrubland, Herbaceous Secondary Rosette-Like Desert Shrubland, Thorny Shrubby Secondary Tamaulipan Shrubland, Thorny Herbaceous Secondary Tamaulipan Shrubland, Shrubby Secondary Xeric Mezquite Shrubland, Herbaceous Secondary Mezquite Shrubland, Shrubby Secondary Chaparral, Shrubby Secondary Coastal Rosette-Like Shrubland, Herbaceous Secondary Coastal Rosette-Like Shrubland, Shrubby Secondary Sarcocaulous Shrubland, Herbaceous Secondary Sarcocaulous Shrubland, Shrubby Secondary Sarco-Succulent Shrubland, Herbaceous Secondary Sarco-Succulent Shrubland, Shrubby Secondary Submountainous Shrubland, Herbaceous Secondary Submountainous Shrubland, Shrubby Secondary Misty Sarco-Succulent Shrubland, Herbaceous Secondary Misty Sarco-Succulent Shrubland
Primary Hydrophilous Vegetation	Primary Gallery Vegetation, Primary Gallery Forest, Arboreal Secondary Gallery Forest, Primary Peten* Vegetation, Arboreal Secondary Peten* Vegetation, Primary Gallery Tropical Forest, Arboreal Secondary Gallery Tropical Forest, Primary Mangrove Forest, Arboreal Secondary Mangrove Forest
Secondary Hydrophilous Vegetation	Shrubby Secondary Gallery Forest, Herbaceous Secondary Gallery Forest, Shrubby Secondary Peten Vegetation, Herbaceous Secondary Peten Vegetation, Shrubby Secondary Gallery Tropical Forest, Herbaceous Secondary Gallery Tropical Forest, Shrubby Secondary Gallery Vegetation, Herbaceous Secondary Gallery Vegetation, Shrubby Secondary Mangrove Forest, Herbaceous Secondary Mangrove Forest

Special Other Primary Types	Primary Mezquite Forest, Arboreal Secondary Mezquite Forest, Primary Natural Palm-Tree Forest, Arboreal Secondary Natural Palm Tree Forest, Induced Tree Plantation
Special Other Secondary Types	Shrubby Secondary Mezquite Forest, Herbaceous Secondary Mezquite Forest, Induced Palm-Tree Forest, Herbaceous Secondary Natural Palm-Tree Forest, Shrubby Secondary Natural Palm-Tree Forest

Below is a description of the different plant ecosystems grouped according to the classification proposed by Rzedowski (1978). This grouping is based on the ecological affinities of the different types of vegetation (INEGI 2009) that are included in the NNREF:

1. **Coniferous forest:** plant formations in temperate, humid and sub-humid zones comprising gymnosperms with perennial leaves. In Mexico they are basically found from sea level up to the arboreal vegetation limit (3,000 masl).
2. **Oak forest**: plant communities comprising the Quercus genus (encinos, oaks) that in Mexico, except in very arid conditions are basically found from sea level up to 2,800 masl. It is found very close to pine forests, forming a series of mixed forests with species of both genera.
3. **Mountain cloud forest:** This plant ecosystem is characterized by the presence of dense arboreal vegetation, with epiphytes and ferns that is principally located in the mountains, gullies and sites that offer favorable humidity conditions and frequent mists. In Mexico it is located between 600 and 3,200 masl.
4. **Evergreen tropical forest:** groups tropical plant formations that are characterized by more than 75% of their elements retaining their leaves during the driest time of the year.
5. **Semi-deciduous tropical forest:** plant formations, where 50 and 75% of their components lose their leaves in the driest time of the year.
6. **Deciduous tropical forest:** these plant formations of tropical and arid origin are characterized by more than 75% of the species that they comprise losing their leaves during the dry season.
7. **Xeric Shrubland:** this plant ecosystem is specific to arid and semi-arid areas of Mexico and basically comprises microphyllic and thorny shrubland communities.
8. **Hydrophilic vegetation:** This ecosystem mostly comprises plant communities that inhabit swampy terrain and floodplains with brackish or fresh shallow water.

The mapping information contained in the Land Use and Vegetation maps with a scale of 1:250,000 in its Series II, III, IV and V, prepared by the INEGI, were generated and are currently being distributed in vector format, where the Land Use and Vegetation units are represented by polygons.

It is important to note that each mapping series was based on the themed and spatial definition above, the minimum unit of its units that could be mapped was always the same as that in Series II (50 hectares), and identified based on a visual interpretation of change in the satellite images used and a field inspection using validation sites, by filling out forms for recording characteristics and conditions, as well as the botanical collection of examples.

The process for converting the mapping products from analog to digital form that the INEGI performs, involves having to consider that the mechanisms for collecting and analyzing digital information differ from traditional mechanisms, and although they can be displayed on graphic monitors, the analysis is mainly done by combining geometric, statistical analysis methods and by querying databases on subjects of the physical environment related to the distribution of Land Use and Vegetation.

Based on the data from each series, fields were generated to assign the categories and subcategories of the national land system applicable to the six LULUCF categories of the IPCC. Subsequently, the databases of the vector information were restructured, leaving only the information in the national land classification system applicable to the six LULUCF categories of the IPCC.

From the analysis of the information in vector format it was determined that for the *raster* format a cell size of 100 by 100 square meters (one hectare) would eliminate any discrepancy or offset problems between Series. For the conversion from vector format to *raster* the IPCC grouping was used as the base field.

All the series were spatially joined in raster format by means of their geometric overlapping using the COMBINE command in ArcGIS©, to generate a single file in raster format that integrates information from all of the series, from which the change matrix (Figure 24) was obtained through the spatial and chronological comparison of the series.

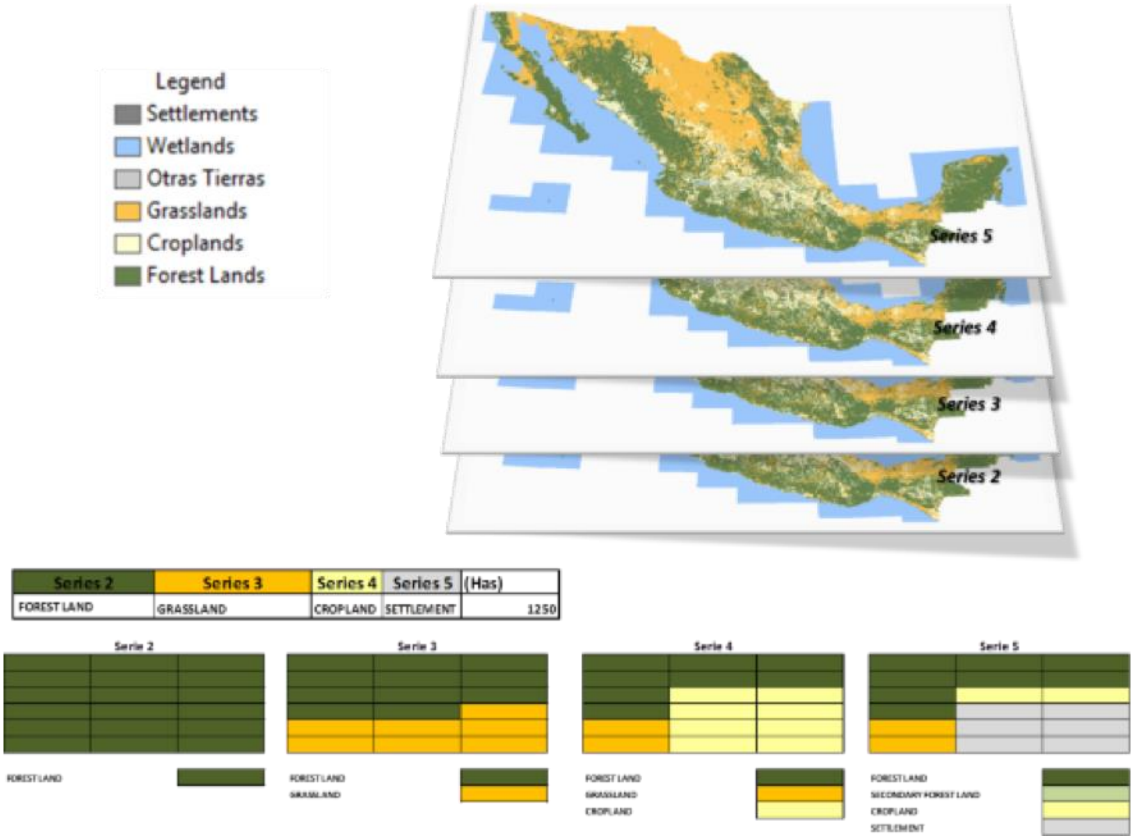


Figure 24: Image of the raster file and table of attributes of the combination of Series II to V.

As results, three change matrixes were obtained, recording three periods of comparison between Series.

- Period 1. Comparison between Land Use and Vegetation of Series II and III (1993-2002)
- Period 2. Comparison between Land Use and Vegetation of Series III and III (2002-2007)
- Period 3. Comparison between Land Use and Vegetation of Series IV and III (2007-2011)

The tabular information that resulted from the integration in reporting categories for INEGEI, from the LUV II, III, IV and V Series, were exported to MS Excel format, as this format and application allows you to generate dynamic tables to present the land-use and vegetation changes in aggregate form between series.

Figure 25 illustratively presents the area values of each category assigned, where you can identify areas whose primary condition, changed to secondary; recording a carbon loss in forest lands. Similarly, the different categories of forest lands that changed to non-forest lands by extending the agricultural, urban or other land border are presented, recording deforestation processes.

Contrasting with the processes previously recorded, there are areas whose secondary condition has changed to a primary condition, indicating forest land recovery processes, as well as non-forest land with changes to forest land in primary or secondary condition due to reforestation processes. This matrix arrangement shows areas not registering a change to their use along the cells in its diagonal (yellow cells).

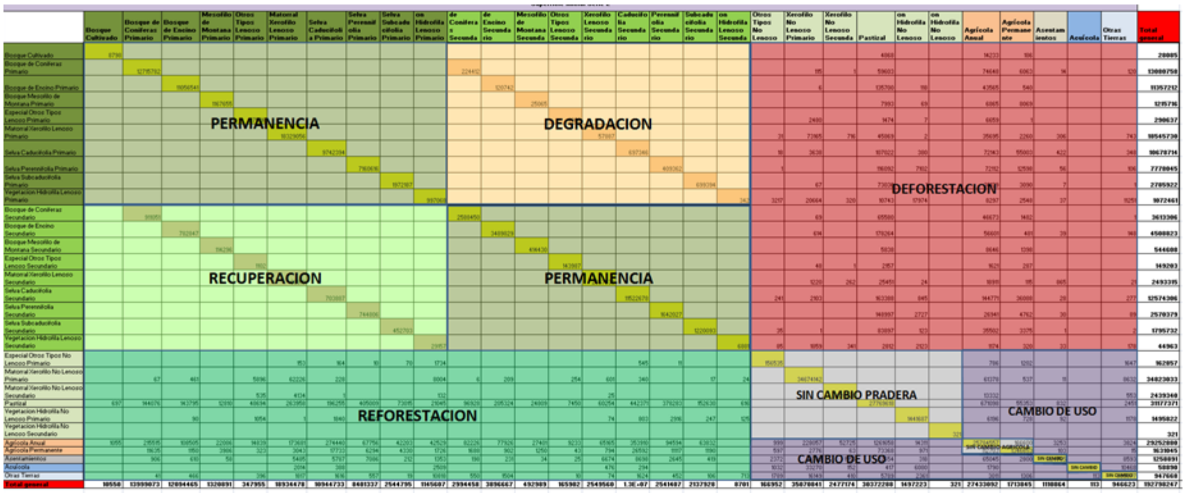


Figure 25: Example of change matrix to identify the different conditions that can be found

To achieve a scaled assessment at sub-national level, national information was taken as a basis and mapping information was extracted for each State included in the IRE corresponding to their state territorial extension, taking the definition established in the National Geostatistical Framework 2014 at State level as a basis. Change matrixes are prepared for each one corresponding to each State to quantify the Degradation and Deforestation area.

In this assessment, deforestation refers to all forest lands in a primary or secondary condition that changed to non-forest land and degradation, as well as any forest lands with a primary condition that were converted to forest land with a secondary condition.

8.3.2 Emission Factors: National Forestry and Soils Inventory (INFyS)

<u>8.3.2.1 General Description of the INFyS</u>

The Forest Inventory and Geomatics Department is responsible for managing and directing all the processes involved with the INFyS capturing data in the field, each of its cycles covers five years, where information is collected every year of the five-year period from approximately 20% of the total primary sampling units, also called Clusters.

The INFyS has been implemented on a cyclical basis and on a permanent basis since 2004 and its design is based on the stratified systematic sampling by clusters in two stages, which is governed by a network of points every 5, 10 and 20 kilometers depending on the type of vegetation (Velasco, 2005). Currently, the INFyS comprises 26,220 Primary Sampling Units (PSUs) clusters which in turn comprise four sub-plots or Secondary Sampling Units (SSUs), distributed in an inverted “Y” shape (Figure 26). In addition, each PSU theoretically represents a surface area of 1 ha and each SSU is sampled in an area of 400 m2.

Different dasometric variables were measured in the field inside each SSU of the INFyS, in order for the INFyS to fulfil the many purposes it was designed for. One of them is the estimate of the carbon of the aerial biomass for which the INFyS relies on data from diameters at breast height (DBH), heights and identification of species and genera. Therefore, with the purpose or organizing data and identifying possible errors in these variables (DBH and height), the dasometric information was ordered and the quality control of the information performed. To do this, first the information was stored in a database designed with a specific architecture for the purposes of automating the estimating and monitoring processes. This database was designed taking into account the principles to generate a normalized database, which avoids the duplication of information, ensures the integrity of the data, has indexed and debugged catalogs, with their corresponding primary keys. In addition to being based on an entity relationship model that allows the growth of structure and type of information that Mexico’s forestry and land inventory needs and allows updating over time, preserving historic information and adding information to subsequent inventories in each primary (PSU) and secondary (SSU) sampling unit. The RDBMS (Relational Database Management System) used was Microsoft SQL Server 2008.

The INFyS comprises a total of 26,220 primary sampling units (PSU), made up of 81,665 secondary sampling units (SSU) also known as Sites, whose sample design was established in the period 2004-2007. Taking account of all measurements up to the year 2013, a total of 2,761,931 woody individuals taller than 7.5 cm in normal diameter have been counted.

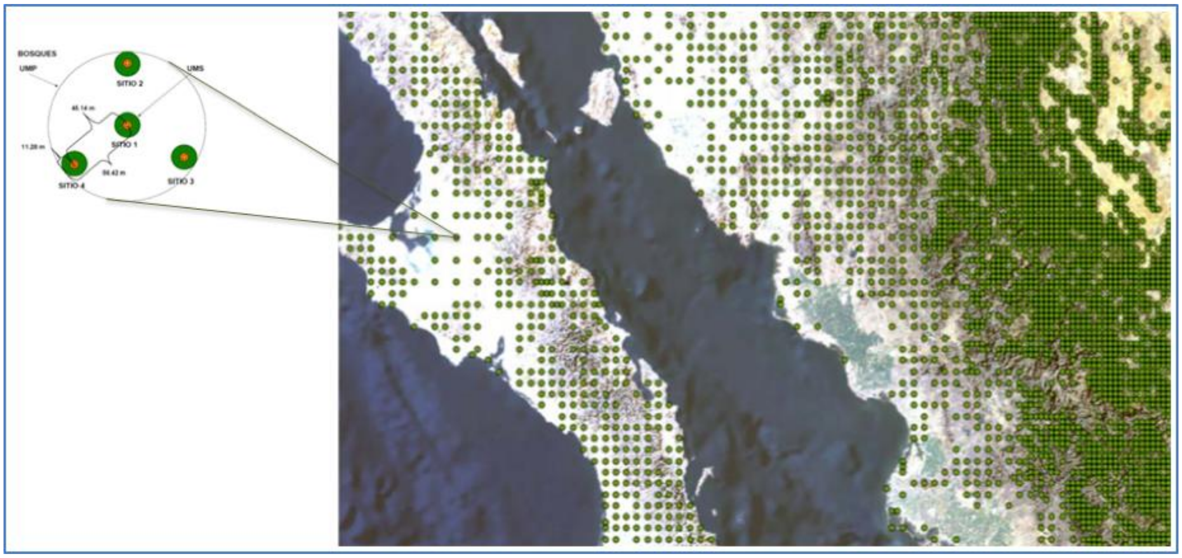


Figure 26: Example of the spatial distribution of the Primary and Secondary Sampling Units of the National Forestry and Land Inventory 2004-2009 and 2009-2014.

During the first cycle, it was necessary to develop a system of capturing information in Access 2000, based on the design of the original database, to facilitate entering the information from each section of the printed form of capture in the field. Different versions of the capture client were developed due to variations in the total data to collect over time (years and cycles).

The information gathered in the field and recorded in the forms was captured in separate files for each company contracted to gather the field data for the INFyS. Once the data has been received, reviewed and approved, the Forest Inventory and Geomatics Department of the National Forestry Commission integrates all the files with the data collected and stored in a single database (Access 2000), which was subsequently transformed into a SQL Server structure.

The process for recording information by means of the capture is responsibility of the suppliers or companies responsible for data collection in the field; the same process became ineffective over time due to the comprehensive review of the information, which increased its duration, coupled with the time that CONAFOR invested in integrating it into the corresponding annual database. In addition, the lack of standardization in the structure of the different annual databases, required a greater investment of time each time for its standardization.

Due to the process of adjustments and changes made in the evolution of the INFyS, the decision was made to create an inclusive database that concentrates the information received from all current and future INFyS cycles sampling in the field (described in the following subsections). As part of the process, the information contained in the databases was assessed and some shortcomings were found due to having separate information in different databases:

1. Non-standardized catalogs (different keys, tables with changes in structure and content).
2. Fields and tables with different names between databases.
3. Difficulty maintaining historic information.
4. Ambiguity in the information (binary fields with different meanings between DBs).
5. Queries that increase in size every cycle and hence the difficulty maintaining them.
6. Problems of compatibility between database character maps (collation).
7. Spelling differences between catalogs.

INFyS Quality Control Schemes

The National Forestry and Soils Inventory of Mexico, since its design, has implemented several controls and activities to assure the quality of the data collected.

Although these activities have evolved, there are three components that are consistent over time and that are described below:

I. ***Internal monitoring[108]:***

Data collection by the INFyS is done by CONAFOR suppliers that are hired through international public tenders. The tender documents set out the various requirements that the suppliers must meet. In the area of quality control requirements are established for the supplier to integrate a posts structure into its organizational chart with the purpose of ensuring data quality. These posts are described below:

a) Internal oversight team

This team is independent of the minimum number of teams requested per region, its tasks include the field inspection of the correct collecting of information, including the inspection of the physical evidence of the work done for sampling (rod, stakes, spray paint, aluminum plates, etc.). The Head of the Internal Oversight Team must have the same profile and meet the requirements as the Head of the Forest Inventory Sampling Team, as well as field auxiliaries. The Oversight Team shall include a Team Head and two field auxiliaries. At least one Oversight Team per group to participate is required.

The Internal Oversight Team's activity of each supplier is controlled by CONAFOR, which, in the first five working days of each month, informs the project manager which clusters or sampling plots will be monitored, which is performed in a standardized way following guidelines stablished in the Quality Assurance and Control System Manual of the INFyS. The results (forms, photographs and other products) of internal oversight are delivered in the month following delivery which is monitored.

b) Report Reviewers

Responsible for reviewing all the field reports (digital and printed), photographs and videos corresponding to a monthly delivery before and after (in the event that the products require corrections) having performed each monthly delivery. These staff will reinforce the quality control of the products by verifying, for example, the capture consistency between the printed form and the database and the consistency of the information gathered in the field. They will be responsible for operating the Quality Assurance and Control System (SACC). It is essential that each printed report contains the signature and full name of the reports reviewer on the last page. Report reviewers must have a professional title related to the following disciplines: forest engineering, environmental engineering, engineering or degree in ecology, rural development, engineer in agroecology, agricultural technician, forestry technician, biology or agronomist engineer. The must have at least two years of proven experience in forest inventories.

At least 2 report reviewers are required per group to participate and must only be dedicated to the group they are designated to in the proposal, they are not permitted to work on the review of more than one group, which is why in its technical proposal the company must ensure sufficient staff according to the regions (groups) it proposes working in.

Each monthly delivery of clusters made by a CONAFOR supplier should be subjected to a certain number of quality tests, the National Forest Monitoring System Department shall determine the number of tests to apply.

c) Design and operation of a quality system in each supplier company

Quality Assurance is about having and follow a set of planned and systematic actions, introduced within the company's Quality System. These actions must be demonstrable to provide sufficient confidence (both to the company and to CONAFOR) that the Quality System's requirements are met. In a generic way, it can be said that the purpose of the quality assurance activities is as follows:

- Establish adequate quality management controls.
- Document such controls.

[108] These provisions can be consulted in the most recent tender document (2016) https://www.dropbox.com/s/dct9h7446yurtad/lpn%202016%20Comentarios%20Nafin%20con%20ajustes.docx?dl=0

II. External oversight:

The tender documents state that, in addition to the Quality Assurance and Control System that a contracted company must implement (internal oversight), the National Forestry Commission may perform 10% of monitoring in the field (or more if the budgetary conditions permit) of the total of the clusters established by the companies responsible for sampling, through its own staff, the State agency responsible for the forest area or an external company[109]. Given the above, companies doing the sampling shall provide the facilities to the external company for visits and/or assessments of the activities of both office and in the field.

III. ***Office review***:

The tender documents state that once the clusters have been received by CONAFOR, it will have a period of time to verify that the products delivered comply with the specifications laid down in the contract.

The company awarded shall have a period of fifteen working days to present the products observed once again with the corresponding corrections. For the delivery of the corrected products, the company must apply the corresponding SACC tests again, and ensure that the products comply with the corrected technical specifications.

The technical area should verify that the products have actually been corrected and if no deficiencies are found the products shall be released and therefore subject to payment. In the event of finding flaws again, it will implement sanctions and penalties in the contract.

To carry out these reviews (internal oversight, external oversight and office review) the provisions of the Quality Assurance and Control System Manual are considered as a methodological guide, available at https://www.dropbox.com/s/gt2q7r2dmb7pgrr/ANEXO%20Sistema%20de%20Aseguramiento%20y%20Control%20de%20Calidad.pdf?dl=0 .
This manual describes and details the concepts, procedures and instruments to be applied to the quality assurance and control activities in the gathering of information in the field of forestry and land inventories that the National Forest Monitoring System Department of the National Forestry Commission (CONAFOR) performs. Its application is mandatory for companies providing information collection and capture services in the field and for companies providing external oversight service for CONAFOR in the field of Forest Inventories.

The central concept on which the Quality Assurance and Control System (SACC) of the National Forestry and Land Inventory (INFyS) of CONAFOR is based on is ***Proof of Quality***. Proof of quality is a specifically defined procedure, the purpose of which is to verify that INFyS data and products comply with the requirements set out in the Field Procedures Manual, Invitations to Tender and their Annexes, with the purpose of corroborating that the information complies with the attributes of truthfulness, accuracy and reliability. For each quality test, its legal basis, objectives, procedures for implementation and work formats are described.

8.3.2.2 Processing and management of information

I. General description of the construction of the database for estimates

To start with the INFyS second cycle of capture in 2009, as the initial design of the structure of the database was designed for a single moment of capture by each cluster, this did not allow new data to be saved and at the same time preserve the previous data in the same structure (historical data), which would cause a loss of information. Which is why separate databases were generated for each year of the second period.

Once the assessment of the original INFyS 2004 to 2007 databases and one for each year from 2009 until 2013 (INFyS 2009, INFyS 2010, INFyS 2011, INFyS 2012 and INFyS 2013) was performed, the need arose for a fully integrated database, that allows estimates of dasometric variables to be made and their derivatives over time. To this end, the process of migrating and standardizing the source databases in a single database, called the National Sample, was carried out (Figure 27).

[109] During the period 2004 to 2012, CONAFOR hired an external provider to carry out monitoring activities. The non-existence of this provider in certain years limited CONAFOR, through its staff, to performing external oversight activities.

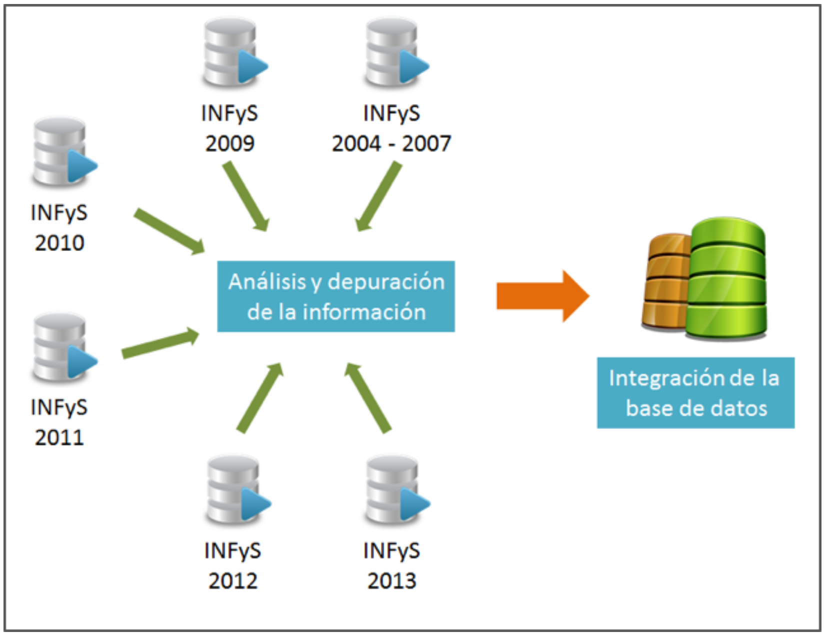


Figure 27: Schema for integrating INFyS databases.

The challenge was to develop a database structure that would firstly maintain the historical data of different years and/or cycles, as well as being able to contain new information captured (new records and amend existing ones) to achieve full historical and current data compatibility.
With the aim of maintaining the principle of compatibility, the possibility of future changes in the capture of information has been taken into account in the process of this redesign, which is why change protocols have been generated that allow document modifications to the storage structure of the database, with the aim of not losing the completeness of the historical information.

By analyzing the main opportunities to improve the INFyS database, it was agreed with the Database Deputy Manager, to design a new structure based mainly on that already existing and taking into account the lessons learned from its use and which will allow us to create standardized reports between the different cycles and years of capture, as well as a future vision for the development of a capture client that allows the integration of the information with better, standardized and centralized control, but mainly a design that establishes the foundations for future inventory cycles.

The important functionality and structure points of the new database for the INFyS are listed below in detail:

1. Capable of storing all collection cycles of the National Forestry and Land Inventory conserving historical values of each and every sampling unit.
2. Sufficiently flexible to adjust to changes that sections of the INFyS may undergo.
3. Able to perform basic queries and comparable with those already existing.
4. Allow a comparison between data from different periods (historical record), without the need to obtain partial results from different sources.
5. Follow the best database practices, such as those listed below:
    a. Balanced standardization
    b. Data integrity
    c. Indexing
    d. Entity-Relationship Schemas
    e. Separation of data (intensive/non-intensive)
    f. Handling of large volumes of information
    g. Comply as far as possible with Codd's twelve rules for relational databases
6. Ability to interact with other possible technologies and even other existing forest inventories at national and international level.
7. Its knowledge transfer keeps the learning curve as low as possible.

Talks were held with the Database Deputy Manager of INFyS during the conceptualization and design process of the new database structure in May and June 2012, with the aim of identifying the contents and roles that each table in the current database performs.

The main outcome of the above process was being able to identify 3 groups of tables based on the use or role that they perform within the data capture system in the different formats and which were as follows:

1. Tables that function as catalogs within the INFyS, and whose information does not change between cycles, and if there were changes to these table types, more data could be added, their main role is to help comply with one of the standardization rules of a database.
2. The central tables that are the base of the system, help to store the Primary Sampling Units (PSUs) and Secondary Sampling Units (SSUs) where samples of data are taken, taking into account that these same points are theoretically re-measured over a 5-year period (CONAFOR 2012).
3. And finally, having identified the group of these tables where the observations (variables) that are collected in each time period are stored, i.e. the tables that represent each section of the capture forms in the field.

II Debugging the Database

The following processes were carried out for the migration and debugging of the database:

a) Debugging catalogs

The standardization, unification and correction of catalogs is an important step toward good presentation and the correct interpretation of the information. During the project, all catalogs used by INFyS over the years were reviewed. Among the standardized catalogs, we can find the biological form, species, damaging agents, collection conditions, access roads, means of transport, etc. After the analysis, a series of tasks is carried out in order to promote proper use and understanding of the data used.

b) Standardization of catalog names.

1. Typing table names in lower case.
2. Avoiding the use of prepositions to join words of the table names.
3. Using underscores as an alternative to a space for names with more than one word.
4. Avoiding the use of abbreviations.
5. Not using accents.
6. Defining the most appropriate name with the information that it stores and its context.
7. Using words in the singular.

c) Standardization of field names.

1. Typing field names in lower case.
2. Using underscores instead of a space between words.
3. Avoiding the use of prepositions (for example the words "of", "for", "and" and "or").
4. Avoiding the use of abbreviations.
5. Not using accents.

d) Debugging the contents of the catalogs.

1. Revising and correcting spelling when necessary.
2. Unifying catalogs in cases which have undergone changes over time.
3. Unifying tables, in cases of multiple catalogs that refer to the same type of information.
4. Collating and adapting the catalog information for each year's inventory manuals.

III Data migration

After working with the results of the analysis, the new structure of the database was designed using the database engine Microsoft SQL Server 2008 R2. The justification for the choice of this database engine and its enhanced features, compared with the existing structure, is as follows:

1. The main reason is due to the institutional inertia to this Relational Database Management System (RDBMS) and therefore to reduce the learning curve for end users of the new structure, the same as

following a SQL standard and due to its recognition and stability over many years, backed by a company of international standing such as Microsoft and excellent help support and administrative tools.

2. Another reason was the possibility of creating logical groupings to relate the tables, taking as reference that mentioned above of the identification of the groups of tables based on their content and/or functionality within the system. The result is 3 “schemas”, which are described below:

    a. **Catalogs**. Set of information that relates to one or more table/s from a numerical identifier, this schema groups the existing INFyS catalogs such as those that were detected in the redesign according to the nature of the existing data.
    b. **System**. This “schema” groups tables that are the definition of the sampling units and their main characteristics, those that do not change over time and that are the basis of the data capture and design of the sampling grid, representing the backbone of the database design.
    c. **Satellites**. This group corresponds to tables that store characteristics/variables collected in the field and that are related to the sampling units in a certain period of time.

The migration of the data contained in the INFyS databases to the "National Sampling" database destination is carried out in parallel to the process of debugging catalogs. The migration and standardization process of the information was carried out by PMN IT staff, with advice from the IT technicians who maintains the databases at CONAFOR, and the support of forest inventory specialists from the PMN and CONAFOR, with the documentary support of sampling and re-sampling manuals from the INFyS years.
A series of SQL Server “store procedures” (pre-programed functions) were created that, according to the lessons learned by the INFyS, transformed and inserted the information of the original databases, into the destination database, under the new model of sampling units with hierarchy and chronology of the data collected.
Each variable or observation registered at INFyS was processed and inserted in its field and table as appropriate, within the proposed structure according to the schema that reflects the documented INFyS modules and the special features of each cycle and corresponding year.

IV Structure of the National Database

A structure based on data collected, hierarchy of sampling units and projects was designed, which allows the integration of other inventories and new variables, it is also compatible with structural modifications to the inventories during past cycles. The new structure can also receive new information, allowing subsequent changes, for example to sampling units, frequency of gathering information and historic information to be maintained. It was also necessary to standardize and debug information from some catalogs that changed over time and finally, all of the information in the INFyS databases which was the product of the observations made in the field was migrated.
The resulting database consists of three schemas, which separate the data blocks that construct the whole logic of information storage (Figure 28).

i. "Catalogs" schema

This schema contains all the elements or criteria which are known in advance, in order to refer to them without re-writing them, some tables or catalogs that the INFyS comprises list species, damaging agents, states, municipalities, life forms, basins, wood density, site conditions, means of transport types, access road types, etc.

ii. “System” schema

This schema includes the central tables of the database, it contains the tables that define and group the form of the sampling units, the spatial information and the chronology of the inventories.
The ***sampling_unit*** table contains information about the sampling units that make up the inventory/ies. This is where characteristics of the clusters, sites and sub-sites are stored, in addition to their form, hierarchy and inheritance between units. It is for this reason that the database can be adapted to changes in the structure or form of the monitoring sites.
The ***survey*** table records and manages the time of occurrence of the field visits, allowing the sampling sequence to be preserved and it can compare changes between surveying periods. It is the main database table that orders the information from the other information around it, the chronological record of the capture of information is taken, enabling consistent data and different periods to be kept in the same set.

iii. "Satellites" schema

The "Satellites" schema is where the results of the measurements and observations made in the field are recorded, it is here where almost all the data obtained from the inventory, such as tree measurements, repopulated measurements, cover and land characteristics, pests and diseases, environmental disturbances, access routes to the cluster, etc. are concentrated.
An observation recorded in a satellite table relates to a survey carried out at a given time and place (sampling unit). For example; measurements made to a tree are recorded in the satellite table called characteristic_tree, these measurements have been taken on a certain date (survey table) and this survey was carried out within a sampling unit. If you go back to take measurements at the same tree, new characteristics of the tree would be recorded in a new period (survey) for the same sampling unit.

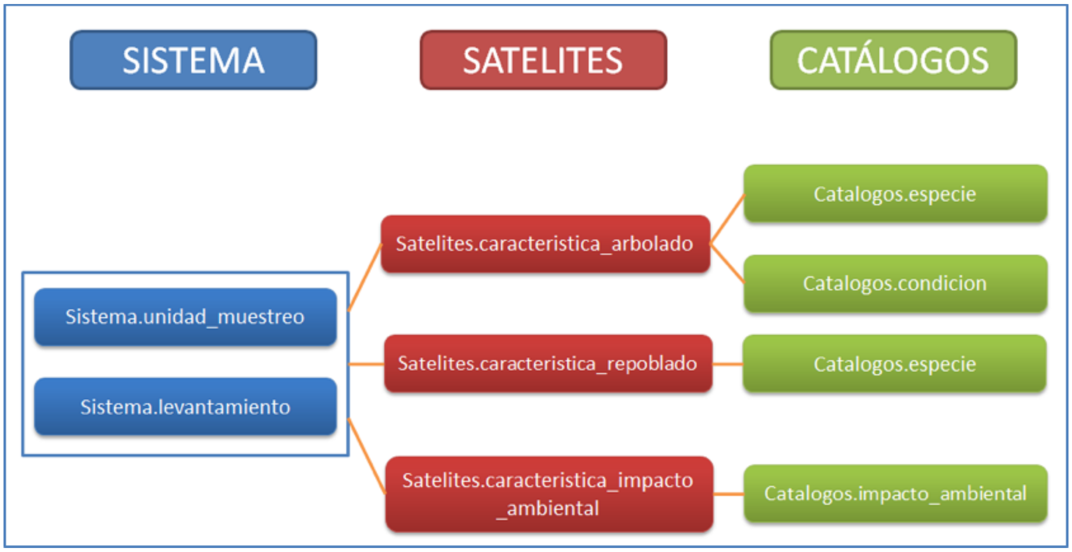


Figure 28: Schema of the structure of the new database with some table examples.

Some of the characteristics of the new structure are:

1. It can store different projects of the same type, which would enable us to make specific comparisons with data taken by different sources in different periods of time but which share a methodological and conceptual relationship. Some alternate INFyS projects that can be included in this structure can be monitoring, special sampling and state inventories (Figure 29).

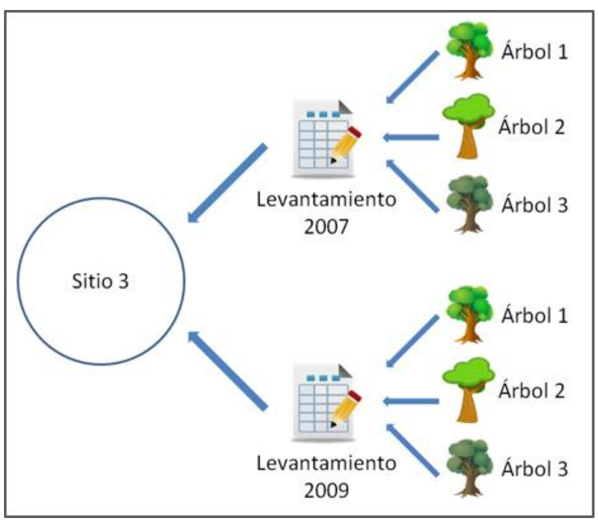


Figure 29: Diagram of the ability to integrate two surveys carried out at the same site in different years.

2. The modifications within the inventory such as new fields, modifications or exclusions of variables of the sections of the capture format may be more controlled and would always keep the compatibility of data, both historical and future. It is worth mentioning that it should be consider in each change, whether it is a change that affects the *physical integrity of the data* or the *logical integrity of data*, and generate a defined protocol of changes and with the tools or processes required to mitigate errors.

3. It is possible to obtain and/or generate queries of both cycles in a single view without using extra processes to combine the information of the different sources, so that the results are homogeneous and there is no need to do extra work to integrate these reports.
4. As a general rule, a database must always maintain referential integrity, in order to facilitate queries and maintain concise data, indexes have been generated in this new structure according to the frequency with which the information is used. This is important to facilitate the processing of the most common queries to which more specific filters are applied (separation of intensive/non-intensive data).
5. There are some data that have been debugged/consolidated without losing the original references obtained from the tables that are extracted (historical integrity); one example is the taxonomic catalog, because they have been eliminating redundant records, species name spelling mistakes, including synonyms and generation of relations with extra tables, which allows you to have a more complete taxonomic and approved catalog, with a unique index for each species.
6. The new database has clear table and field names, which allows time to read them to deduce the type of information stored in them, trying to avoid acronyms where possible.
7. All projects stored have the same general structure as the INFyS and therefore have the potential to share the use of the tools and/or algorithms such as the biomass and carbon estimation system at national level that is being developed alongside it.

Once the "National Sampling" database is integrated, the quality control of the data of the dasometric tree variables was carried out for each species, which consisted of identifying the diameter at breast height (DBH) and total height (HT) values that were outliers. To do this, DBH and HT were standardized in each species, and the values whose standardized value is greater than or less than 4.5 were revised. Values that exceeded that threshold were replaced by the average values of the variables analyzed for each species. After having ordered the databases and performed the quality control of the information, the carbon content was estimated at observation level (living tree) and at sampling unit level (underground biomass).

V INFyS databases at sub-national level

Based on the national information and sample design of the INFyS, we selected the Primary and Secondary Sampling Units that were within the state boundaries of each entity involved in the IRE to perform estimates at sub-national level.

With regard to the information available from the State Forest and Soils Inventories, there is currently a total of 136 extra clusters which are to be included in the IRE's region estimates.

The number of PSUs for each INEGEI vegetation category (32 classes) has been revised and their statistical sample representativeness assessed (at least 20 PSUs per category). For categories with less than 20 PSUs, the decision was made to supplement the information with PSUs of neighboring States that share the same INEGEI category and which were in the same eco-region, to ensure representativeness in the area.

8.3.2.2 Supplementary Information for the Estimation Process

I. Allometric Models

Allometric models (AMs) are mathematical equations that allow to estimate volume, biomass or carbon of an individual, depending on the size of some of its parts, such as trunk diameter at breast height (DBH) and/or total height, correlated with the total size of the individual.
With an AM database at national level it is important to adequately estimate the biomass and carbon in forests; especially in the context of assessing mitigation actions at national level, including the development and monitoring of policies related to climate change.
The establishment of the database depends largely on the basic information you have, as well as the results we hope to obtain with the analysis of this information; for example, Mexico has a National Forestry and Soils Inventory, which is used as a basis for estimating carbon stocks and changes in carbon stocks, as part of the MRV national system, this information is also used to make mitigation scenarios based on historical emissions, as well as to prepare the reports that the country has to deliver at international level (FRA, INEGEI-IPCC, etc.), they are also the basis for preparing biomass maps.
It is important to mention that the AMs existing at national and international level have been developed for different needs, based on different approaches and therefore quantifying different stocks and components,

usually developed at species level, at genus level, or a type of vegetation, some are even developed only for estimating the biomass of stems, other components such as branches, leaves or roots; while there are also those that estimate volume, biomass or carbon directly.
Given the variety of AMs and uses that may be present, it is extremely important to have a standardized database, in an accessible format, that can be used by various stakeholders.
It is therefore important that the databases have information (metadata) associated with the different models for correct use, especially when there is more than one model for a given species, genus or type of vegetation, so it is necessary to make use of the information to be able to assign the best model depending on the characteristics of the species; it is important to analyze the most important information that is required as it will be incorporated into the database and must be defined prior to starting to collect information.
Given the heterogeneity of both the basic information and the AM in itself, appropriate databases for the information needs identified need to be developed; these databases are based on the collection of information from various sources that have different quality levels, such as indexed journals, chapters of books, theses, technical reports, etc.

i. Procedure for collecting information to generate the allometric models

As a first effort, allometric models were obtained from existing bibliographic collections. These collections included 250 allometric models of biomass (219 per species and 31 per genus). 91 new allometric models have been added to this basic collection, updated to the year 2012, totaling 341 biomass allometric models, of which one model requires a basal area as its calibration parameter and another requires the total tree height and the remaining 339 only need the DBH.

At the moment there are 609 allometric equations in total and of these 126 were used for the estimates. Among these, 126 are specific allometric equations whose estimation models directly generate the Biomass estimate as a final result, so there is no need to use factors of wood expansion or density. However the total number of generic equations used in this estimation process is 2, and wood density needs to be applied to these, since its estimates result in total volume values per individual or observation.

There are national and international efforts to collect and publish this type of database, however to achieve standardization and incorporate additional information requires the participation of institutions involved in this issue to contribute their data and metadata to the stock of estimates.

ii. Process of assigning allometric models for estimates

For biomass and carbon estimates, an algorithm is required for AM selection that allows the estimate of aerial biomass at individual level and that will be the basis for the underground biomass estimate. The algorithm is divided into five steps and covered by a protocol to ensure process repeatability and consistency over time of the biomass estimates per individual in ecological, statistical and spatial terms. The final product of the application of the protocol is a carbon in the biomass estimate (serial and underground) for each individual in the forest inventory/ies of interest.

Step 1: Defines the group of individuals (living, dead and stumps) to estimate within a sampling unit (400 m2).

Step 2: Using the coordinates of the center of the site, two classes of cover are obtained to which the individuals belong, INEGI's ECOREGION 2008 and V Series class of cover.

Step 3: Using the allometric models database (Table 53), which includes allometric models of biomass classified by types of species, genus and vegetation, a biomass model is searched and selected to generate the least uncertainty, based on a series of systematic rules that allow you to sort and classify models based on its metadata and statistics generating a recursive algorithm, this "decision tree" bases its process on a Sensitivity Analysis of Allometric Models (ASMA) created specifically to statistically achieve the best selection of a biomass equation. The allometric models decision tree is presented in Figure 30.

Table 53: Allometric models database for calculating biomass

Metadata	All models	Species level	Genus level	Vegetation level
Number of allometric models	504	405	53	18

Year of publication	450	367	41	16
Minimum DBH	361	286	33	15
Maximum DBH	333	258	33	15
Climate	346	293	27	4
Minimum precipitation	144	123	19	1
Number of trees	437	359	40	16
r2	437	363	33	17
Geographic coordinates	402	314	48	14
Type of land	324	270	28	4
Average temperature	311	264	23	4
Minimum altitude	157	136	16	3
Maximum altitude	175	151	19	3
Standard error	53	43	9	0
Maximum precipitation	125	102	16	6
Average precipitation	289	237	28	4
Mean squared error	46	20	5	4
Average DBH	127	93	12	1
Minimum temperature	104	95	9	0
Maximum temperature	111	99	9	0
Average altitude	163	128	15	1
Average wood density	182	180	1	0
Carbon fraction	2	1	1	0
Natural disturbances	16	13	3	0
Square root of the mean squared error	3	2	1	0
Variance of biomass per tree	0	0	0	0
Average biomass per tree	0	0	0	0
Type of management	96	64	14	2

Tables 54 and 55 show the description of application of the allometric equations for the aerial biomass estimate for the INFyS 2004-2007 and 2009-2013 respectively as a result of the application of the decision tree in its version 20 (Figure 30) which includes the Sensitivity Analysis of Allometric Models (ASMA).

Step 4. The selected equation is performed for the biomass estimate and the result is converted to carbon by means of the carbon offsetting factors for Mexico.

Table 54: Implementation of the allometric equations for the aerial biomass estimate for the INFyS 2004-2007

Level	Equation application	No. equations	No. References	No. trees	% of total trees
1	Per species, [x]	53	30	110.913	9.3%
2	Per genus, [x]	9	6	217.387	18.3%
4	Per species, [x]	56	33	111.996	9.4%
5	Per genus, [x]	5	5	77.917	6.5%
6	Per vegetation, [x]	4	2	671.752	56.4%
7	Per species, [x]	11	14	115	<0.0%
8	Per genus, [x]	4	6	47	<0.0%
9	Per vegetation, [x]	3	4	139	<0.0%

Total	145	100	1,190,266	100%

Table 55: Implementation of the allometric equations for the aerial biomass estimate for the INFyS 2009-2013

Level	Equation application	No. equations	No. References	No. trees	% of total trees
1	Per species, [x]	57	31	110.825	8.6%
2	Per genus, [x]	9	6	213.649	16.5%
4	Per species, [x]	55	32	118.933	9.2%
5	Per genus, [x]	5	5	75.354	5.8%
6	Per vegetation, [x]	4	2	718.250	55.5%
7	Per species, [x]	69	23	54.872	4.2%
8	Per genus, [x]	5	7	3.043	0.2%
9	Per vegetation, [x]	3	4	292	0.0%
Total		207	110	1,295,218	100%

Table 56 shows the references of the allometric models used in the calculation of biomass, categorized by application level.

Table 56: Allometric Models Reference.

Level	Number of equations used	References
1	31	Acosta et al. 2002, Acosta et al. 2003, Acosta et al. 2011, Aguilar et al. 2009, Aguilar et al. 2012, Aguirre et al. 2011, Avendaño et al. 2006, Avendaño et al. 2007, Ayala et al. 2001, Bonilla et al. 2009, Castellanos et al. 1993, Díaz et al. 2005, Domínguez et al. 2005, Douterlungne et al. 2013, Gómez et al. 2008, Gómez et al. 2011, González et al. 2008, Guerrero et al. 2013, Jiménez et al. 2010, Juárez et al. 2008, Manzano et al. 2010, Méndez et al. 2011, Meráz et al. 2013, Návar et al. 2010, Pacheco et al. 2011, Pimienta et al. 2007, Rodríguez et al. 2007, Rojo et al. 2005, Tomas et al. 2013, Vigil et al. 2010
2	6	Acosta et al. 2002, Acosta et al. 2003, Aguilar et al. 2012, Aguirre et al. 2011, Ayala et al. 2001, Návar et al. 2010
4	32	Acosta et al. 2002, Acosta et al. 2003, Acosta et al. 2011, Aguilar et al. 2009, Aguilar et al. 2012, Aguirre et al. 2011, Aristizabal et al. 2002, Avendaño et al. 2006, Avendaño et al. 2007, Ayala et al. 2001, Bonilla et al. 2009, Díaz et al. 2005, Domínguez et al. 2005, Douterlungne et al. 2013, Gómez et al. 2008, González et al. 2008, Guerrero et al. 2013, Jiménez et al. 2010, Juárez et al. 2008, Manzano et al. 2010, Méndez et al. 2011, Meraz et al. 2013, Monroy et al. 2004, Návar et al. 2009, Návar et al. 2010, Palma et al. 2011, Pimienta et al. 2007, Rodríguez et al. 2007, Segura et al. 2006, Vigil et al. 2010
5	5	Acosta et al. 2002, Acosta et al. 2003, Ayala et al. 2001, Návar et al. 2010, Segura et al. 2006
6	2	Chave et al. 2005, Schlamadinger et al. 2003
7	23	Acosta et al. 2002, Acosta et al. 2003, Acosta et al. 2011, Avendaño et al. 2006, Avendaño et al. 2007, Cairns et al. 2003, Day et al. 1987, Douterlungne et al. 2013, Gómez et al. 2008, Juárez et al. 2008, Manzano et al. 2010, Martínez et al. 1992, Návar et al. 2004, Návar et al. 2009, Rodríguez et al. 2007, Rodríguez et al. 2008, Rodríguez et al. 2006, Rodríguez et al. 2009, Segura et al. 2006, Vigil et al. 2010
8	7	Acosta et al. 2002, Acosta et al. 2003, Ayala et al. 2001, Cairns et al. 2003, Rodríguez et al. 2007, Rodríguez et al. 2006, Segura et al. 2006
9	4	Chave et al. 2005, Rodríguez et al. 2007, Rodríguez et al. 2009, Schlamadinger et al. 2003

Step 5. Estimate of carbon in underground biomass (roots) alone was estimated at higher aggregation levels (SSU) under the conceptual approach proposed Cairns et al. (1997). With this method it is possible to indirectly obtain underground biomass as a fraction of aerial biomass. However, given the properties of the models proposed by Cairns et al. (1997), with the estimate of underground biomass alone it is only possible to get SSU or PSU levels (Mg C ha), so that there is no query of biomass estimate observation level (tree).
The allometric equations of Cairns et al. (1997) (equations 1 and 2) are used for underground biomass according to the aerial biomass and ecosystem type, using the equations:

$$(Y) = \exp(-1.0587 + 0.8836(\ln(C_{AB})) + 0.2840) \quad \text{(Eq. 1)}$$

$$(Y) = \exp\left(-1.0587 + 0.8836(\ln(C_{AB}))\right) \quad \text{(Eq. 2)}$$

Where: Y: carbon in underground biomass, [(Mg C) (ha)$^{-1}$]
C_{AB}: carbon in aerial biomass, [(Mg C) (ha)$^{-1}$]

NB: Equation 1 is applicable to temperate forests and Equation 2 is applicable to tropical forests (jungles) according to Cairns et al. (1997).

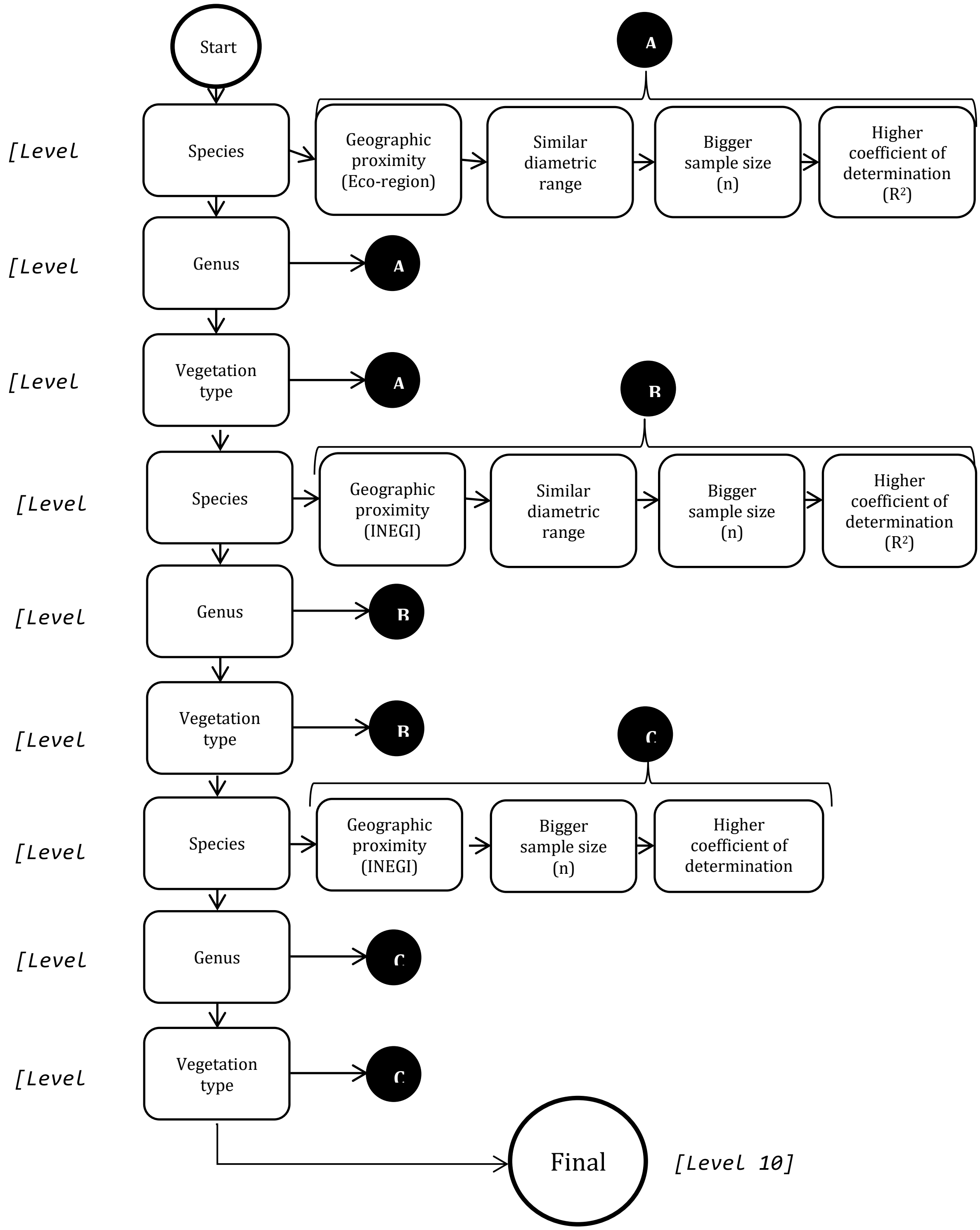


Figure 30: Decision tree for selection of allometric models of biomass. "A" is the standard estimation process. "B" corresponds to the estimation process using the class of cover from INEGI Series V. "C" corresponds to the estimation process outside the diametric ranges of applicability of the model.

From the biomass obtained at the level of each tree, a fraction of carbon was assigned in a differentiated way to each record (species, genus and plant group). In total, there are 56 fractions of carbon for species in the country found in the literature, as shown in Table 57.

Table 57: Fractions of carbon used for allometric models used for biomass estimation at tree level.

Species or type of vegetation	% C	Reference
Cloud forest	44.90	Figueroa-Navarro et al 2007
Mesophilic mountain forest	49.62	Figueroa et al. 2005
Pine forest	46.80	Figueroa et al. 2006
Abies vejarii	47.35	Jiménez-Pérez et al. 2008
Abies vejarii	47.35	Jiménez-Pérez et al. 2008
Spaeth's Alder	51.30	Figueroa et al. 2005
Brosimum alicastrum	45.08	Hernández and Pérez 2003
Caesalpinia platyloba	51.06	Hernández and Pérez 2003
Clethra sp	49.63	Figueroa et al. 2005
Cupressus arizonica	49.23	Jiménez-Pérez et al. 2008
Cupressus arizonica	49.23	Jiménez-Pérez et al. 2008
Dendropanax arboreus	47.00	Hernández and Pérez 2003
Inga sp	50.36	Figueroa et al. 2005
Juniperus flaccida	51.18	Jiménez-Pérez et al. 2008
Juniperus flaccida	51.18	Jiménez-Pérez et al. 2008
Juniperus monosperma	49.11	Jiménez-Pérez et al. 2008
Juniperus monosperma	49.11	Jiménez-Pérez et al. 2008
Liquidambar sp	49.67	Figueroa et al. 2005
Lysiloma bahamensis	47.09	Hernández and Pérez 2003
Manilkara zapota	47.89	Hernández and Pérez 2003
Metopium brownei	49.74	Hernández 2003
Picea mexicana	46.98	Jiménez-Pérez et al. 2008
Picea mexicana	46.98	Jiménez-Pérez et al. 2008
Pinus arizonica	49.36	Jiménez-Pérez et al. 2008
Pinus arizonica	49.36	Jiménez-Pérez et al. 2008
Pinus ayacahuite	48.86	Jiménez-Pérez et al. 2008
Pinus ayacahuite	48.86	Jiménez-Pérez et al. 2008
Pinus cembroides	50.25	Jiménez-Pérez et al. 2008
Pinus cembroides	50.25	Jiménez-Pérez et al. 2008
Pinus culminicola	46.13	Jiménez-Pérez et al. 2008
Pinus culminicola	46.13	Jiménez-Pérez et al. 2008
Pinus greggi	47.13	Jiménez-Pérez et al. 2008
Pinus greggi	47.13	Jiménez-Pérez et al. 2008
Pinus hartwegii	46.87	Jiménez-Pérez et al. 2008
Pinus hartwegii	46.87	Jiménez-Pérez et al. 2008
Pinus nelsonii	47.41	Jiménez-Pérez et al. 2008
Pinus nelsonii	47.41	Jiménez-Pérez et al. 2008
Pinus pseudostrobus	50.35	Aguirre and Jiménez, 2007
Pinus pseudostrobus	50.35	Jiménez-Pérez et al. 2008
Pinus pseudostrobus	50.35	Jiménez-Pérez et al. 2008
Pinus remota	45.67	Jiménez-Pérez et al. 2008
Pinus remota	45.67	Jiménez-Pérez et al. 2008
Pinus teocote	47.78	Aguirre and Jiménez, 2007
Pinus teocote	47.48	Jiménez-Pérez et al. 2008
Pinus teocote	47.48	Jiménez-Pérez et al. 2008
Piscidia communis	48.40	Hernández and Pérez 2003
Pseudotsuga menziesii	46.76	Jiménez-Pérez et al. 2008
Pseudotsuga menziesii	46.76	Jiménez-Pérez et al. 2008
Quercus spp	48.43	Aguirre and Jiménez, 2007

Quercus spp	47.26	Figueroa et al. 2005
Rapanea sp	49.49	Figueroa et al. 2005
Deciduous lowland	48.09	Jaramillo et al. 2003
Sickingia salvadorensis	49.91	Hernández 2003
Simarouba glauca	49.11	Hernández and Pérez 2003
Swartzia cubensis	51.00	Hernández and Pérez 2003
Swietenia macrophylla	48.51	Hernández and Pérez 2003
Average	48.37	

In the event of not having data for the registry at species, genus and/or type of vegetation level the average fraction of 0.48% was assigned to each individual.

iii. Allometric model quality control process for the estimates

It is important to mention that an immense control and quality assurance effort is required (Table 58), which is why information on the original data with which the allometric equations were constructed is performed, with the purpose of reconstructing the equations and identifying those that can be improved through analysis and better statistical adjustment by statistics.

Table 58: Composition of the AM database

	Tables	Fields	Description
Catalogues	10	87	Catalogs that characterize an allometric model and that are shared by one or more models, e.g. Authors, components (root, trunk, branches, leaves, fruits, complete tree), variables, units of measure, country, state, vegetation, etc.
Metadata model	10	128	Information on the model, formula, composition, description, statistics, result, units, vegetation associated, associated species, etc.
Link (Species DB)	3	27	The species database, which contains the unique identifier and is shared by the other dasometric information databases collected by the forest inventory; including synonyms, corrections, typographical errors, genera and families and varieties.
Web system (authentication)	8	46	Control of users, permissions, tasks for registering/deregistering, modifications of allometric models from a system that controls access and the restriction of public information from the database.

The main objective of the AM database is to interact its information with different inputs (data from the INFyS, diameter, height, species data of wood densities and carbon fractions); in such a way that allows us to exchange information and make use of equations to obtain best estimates taking account of metadata and the intrinsic characteristics of each AM and the individual to estimate.
AM databases are also required to be flexible enough to incorporate new data as they develop or are collected or improve that previously developed in such a way that whenever a new estimate needs to be generated it is done with the latest updated information, to do this a system has been designed that allows interaction with the database in a restricted way but online for the scientific and/or academic community to interact, improve and expand the AM databases online (www.mrv.mx/modelosalometricos).

iii. Final allometric models database (output)

The sets of existing equations were updated to 2014 in a second revision, by performing revision and collection work of new allometric models including 224 new biomass allometric models published in the scientific literature. In addition, 279 original equations were corrected by means of a comprehensive quality control process. 62 models were disabled for use, as they presented problems in the quality control of the information or because the model had an update by the same author with an associated publication. The 502 equations cover 397 species (6.4% of the total of 6,110 species registered in the CONAFOR Taxonomic Catalog [See "Database for Forest Monitoring" in Chapter 4. Inputs]). The biomass allometric models used from 5 to 1,501 trees in their construction, with an average of 57. The ranges of the applicability of the models were 0.6-22.3 cm, with an average of 6.4 cm, for the minimum diameter at 1.3 m above the ground (DBH) and 3.6-138 cm, with an average of 42.09, for the maximum DBH. In the past 2 years an allometric model management system has been developed, which can include new allometric equations that are developed in the future, and includes a database with 81 metadata that describes the characteristics of the allometric models in detail (Table 59). The biomass allometric models reference is available via the website *www.mrv.mx/modelosalometricos*.

Table 59: Allometric models used for biomass estimation

Species-Genus-Type of Vegetation	Allometric Model	Source
Acacia cochliacantha	(0.0841*d130^2.41)	Návar, 2009a
Alnus acuminata	(0.1649*d130^2.2755)	Acosta et al. 2011
Alnus acuminata	(Exp(-2.14)*d130^2.23)	Acosta, 2003
Alseis yucatanensis	(0.0301*(d130^2*Ht)^1)	Cairns, et al. 2003
Monoecious Aphananthe	(0.062394*d130^2.71448)	Rodríguez, et al. 2008
Bauhinia divaricata	(0.197575*d130^2.34002)	Rodríguez, et al. 2008
Brosimum alicastrum	(0.0336*(d130^2*Ht)^1)	Cairns, et al 2003.
Bursera penicillata	(0.37*d130^1.96)	Návar, 2009b
Bursera simaruba	(0.064808*d130^2.46998)	Rodríguez, et al. 2008
Carpinus caroliniana	(0.109343*d130^2.35954)	Rodríguez, 2007
Carya ovata	(0.061554*d130^2.53157)	Rodríguez, 2007
Casimiroa greggii	(0.078545*d130^2.58952)	Rodríguez, et al. 2008
Clethra pringlei	(0.067833*d130^2.50972)	Rodríguez, 2007
Coffea arabica	(10^-0.834*d130^2.223)	Segura, et al. 2006
Croton arboreus	(0.2385 + (0.058*d130^2*Ht))	Cairns, et al. 2003
Croton oerstedianus	(0,178 + (0.0638*d130^2*Ht))	Cairns, et al. 2003
Dendropanax arboreus	(0.037241*d130^2.99585)	Rodríguez, et al. 2008
Eugenia sp	(0.46 + (0.037*d130^2*Ht))	Cairns, et al. 2003
Ficus sp	(0.027059*d130^2.86357)	Rodríguez, 2007
Guazuma ulmifolia	(0.232435*d130^2.21906)	Rodríguez, et al. 2008
Harpalyce arborescens	(0.401524*d130^1.83808)	Rodríguez, et al. 2008
Inga sp	(10^-0.889*d130^2.317)	Segura, et al. 2006
Juniperus sp	(0.1229*d130^2.3964)	Návar, 2010
Laguncularia racemosa	(Exp(-1.5919)*d130^2.1924)	Day, et al. 1987
Liquidambar styraciflua	(0.180272*d130^2.27177)	Rodríguez, 2007
Liquidambar styraciflua	(Exp(-2.22)*d130^2.45)	Acosta, 2003
Manilkara zapota	(0.0447*(d130^2*Ht)^1)	Cairns, et al. 2003.
Myrsine coriacea	(Exp(-1.99)*d130^2.26)	Acosta, et al. 2002
Nectandra salicifolia	(0.004038*d130^3.35693)	Rodríguez, 2007
Pinus arizonica	(11.509+-3.1229*d130+0.31*d130^2+0.0004*d130^2*Ht)	Pimienta, et al. 2007
Pinus arizonica	(22.3476+-4,947*d130+0.4911*d130^2+0.0039*d130^2*Ht)	Pimienta, et al. 2007
Pinus arizonica	(Exp(-0.877)*d130^1.98)	Návar, 2010a
Pinus arizonica	(Exp(-2.523)*d130^2.437)	Návar, 2010a
Pinus arizonica	(Exp(-3.573)*d130^2.746)	Návar, 2010a
Pinus ayacahuite	(0.058*(d130^2*Ht)^0.919)	Ayala, 1998
Pinus ayacahuite	(Exp(-3.066)*d130^2.646)	Návar, 2010a
Pinus durangensis	(Exp(-2.084)*d130^2.323)	Návar, 2010a
Pinus durangensis	(Ex(-3.416)*d130^2,715)	Návar, 2010a

Pinus engelmannii	(0.1354*d130^2.3033)	Návar, J. 2009b
Pinus leiophylla	(Exp(-3.039)*d130^2.523)	Návar, 2010a
Pinus leiophylla	(Exp(-3.549)*d130^2.787)	Návar, 2010a
Pinus maximinoi	(0.0551 * (d130 * Ht) ^1.3895)	Mequeas-Gonzáles, 2008
Pinus oocarpa	(Exp(-3.065)*d130^2.625)	Návar, 2010a
Pinus patula	(Exp(-1.8621)*d130^2.27675)	Castellanos, et al., 1996
Pinus pseudostrobus	(0.35179*d130^2)	Aguirre and Jiménez 2011
Pinus pseudostrobus	(Exp(-3.1641)*d130^2.5996)	Rodríguez, et al. 2007
Pinus sp	(0.084*d130^2.475)	Ayala, et al. 2001
Pinus sp	(Exp(-2.818)*d130^2.574)	Návar, 2010a
Pinus teocote	(0.40196*d130^2)	Aguirre and Jiménez 2011
Pinus teocote	(Exp(-3.182)*d130^2.702)	Návar, 2010a
Piper amalago	(0.3627 + (0.0322*d130^2*Ht))	Cairns, et al. 2003
Piscidia piscipula	(0.064066*d130^2.62323)	Rodríguez, et al. 2008
Podocarpus matudae	(0.132107*d130^2.2217)	Rodríguez, 2007
Pouteria campechiana	(0.0358*(d130^2*Ht)^1)	Cairns, et al. 2003.
Pouteria reticulata	(0.0465*(d130^2*Ht)^1)	Cairns, et al. 2003.
Prunus pérsica	(Exp(-2.76)*d130^2.37)	Acosta, 2003
Psidium guajava	(0.246689*d130^2.24992)	Rodríguez, et al. 2008
Quercus canbyi	(0.092*d130^2.448)	Domínguez, 2005
Quercus canbyi	(Exp(-2.3112)*d130^2.4497)	Rodríguez, et al. 2007
Quercus crassifolia	(0.283*(d130^2*Ht)^0.807)	Ayala, 1998
Quercus laceyi	(Exp(-2.4344)*d130^2.5069)	Rodríguez, et al. 2007
Quercus peduncularis	(Exp(-2.27)*d130^2.39)	Acosta, 2003
Quercus rysophylla	(Exp(-2.2089)*d130^2.3736)	Rodríguez, et al. 2007
Quercus sideroxyla	(0.089*d130^2.5226)	Návar, 2009b
Quercus sideroxyla	(Exp(-2.592)*d130^2.585)	Návar, 2010a
Quercus sp	(0.45534*d130^2)	Aguirre and Jiménez 2011
Quercus sp	(4371.4*Exp(-70.972/d130) + 1.3)	Aguirre et al. 2007
Quercus sp	(Exp(-2.874)*d130^2.631)	Návar, 2010a
Quercus xalapensis	(0.308451*d130^2.1323)	Rodríguez, 2007
Rhizophora mangle	(Exp(-1.5605)*d130^2.5072)	Day, et al. 1987
Ternstroemia sylvatica	(0.035689*d130^2.56487)	Rodríguez, 2007
Ternstroemia sylvatica	(0.132193*d130^2.49568)	Rodríguez et al. 2009
Tilia americana	(0.048454*d130^2.58164)	Rodríguez, et al. 2008
Trichilia havanensis	(0.130169*d130^2.34924)	Rodríguez, et al. 2008
Wimmeria concolor	(0.346847*d130^1.99059)	Rodríguez et al. 2009
Coniferous forest	(0.887+ ((10486 * d130^2.84) / (d130^2.84 + 376907)))	Schlamadinger, et al. 2003
Oak forest	(0.5+ ((25000 * d130^2.5) / (d130^2.5 + 246872)))	Schlamadinger, et al. 2003
Pine forest	(Exp(0.685)*Ht^1.218)	Návar, 2010b
Mountain cloud forest, Evergreen tropical forest, Semi-deciduous tropical forest, Hydrophilic vegetation	(Exp(-2.4099)*(d130^2*Ht*P*1)^0.9522*1)	Brown, et al. 1989

Mountain cloud forest, Evergreen tropical forest, Semi-deciduous tropical forest, Hydrophilic vegetation	(P * Exp(-1.499 + 2.148*ln(d130)+ 0.2079*ln(d130)^2 + -0.0281*ln(d130)^3))	Chave, et al. 2005
Evergreen tropical forest	(P * Exp(-1.239 + 1.98*ln(d130)+ 0,207*ln(d130)^2 + -0.0281*ln(d130)^3))	Chave, et al. 2005
Dry tropical forests (deciduous tropical forest)	(10^-0.8092*(GE*AB130*Ht)^0.8247)	Martínez-Yrizar, et al. 1992
Hydrophilic vegetation	(P * Exp(-1.349 + 1.98*ln(d130)+ 0,207*ln(d130)^2 + -0.0281*ln(d130)^3))	Chave, et al. 2005

The allometric models database is the source for searching for the biomass estimation decision tree on an individual level, the decision tree is designed in such a way that each time you include an allometric equation that best fits the individual you want to estimate, it will choose the best equation, this includes using local equations at species level first, where they exist, and lastly type of vegetation level equations, as recommended in the IPCC's Good Practice Guide in paragraph 4.3.3.5.1 Biomass on the ground. In this way, it provides a self-improvable and self-scalable estimate system depending on the quality and quantity of information available for each individual. This will allow the new models that are constructed by various initiatives (academic institutions, government and civil society) to be included in the estimation process at national level.

II. Wood densities

In Mexico, there is scientific literature and technical reports that present wood density values for forest species. The most comprehensive compilation, and that available is the reported by Zanne et al. (2009), which applies to 214 species in Mexico. Additionally, in the INEGEI 1990-2006, averages of 11 wood density values are presented for some species by type of vegetation reported (de Jong et al. 2009). The values of wood density have been collated in order to complement the estimates of biomass in those observations calculated using general allometric equations and whose result is directed at estimates of volume. Similarly to wood density, information for 61 carbon fractions in the country is collected and applied for the final estimate of carbon content in each of the observations. The average of 0.48 is used as a default value for the country.

With the objective of assessing the wood density values of a greater number of species identified in the INFyS, a collaboration agreement was signed with the National Autonomous University of Mexico (UNAM) for the taxonomic determination of 14,035 collections from 3,165 clusters from all over Mexico. 13,337 (95%) INFyS 2013 collections and 697 (5%) of special collections 2009-2011. 700 determinations were checked at species or genus level with molecular methods.

In total, 1,268 species were found in 453 genera and 130 families of plants. Oaxaca provided 45% of the species. Half of the collections are in four families Fagaceae (Quercus), Pinaceae (mostly Pinus), Burseraceae (Bursera), and Leguminosae. While on the one hand, Pinus Leiophylla was collected 197 times, there are 504 species that were only collected once.

The density of the wood chips from 3,663 trees and 719 species were measured, to calculate basic density (i.e., ground without water divided between volume of fresh wood). The density varies from a minimum of 0.047 g/cm^3 (a sample of *Jacaratia dolichaula*, Caricaceae) to a maximum of 0.869 g/cm^3 (*Prosopis glandulosa*, *Leguminosae-Mimosoideae*). The average is 0.507 g/cm^3, and the median 0.5 g/cm^3.

The chip density variance components were statistically analyzed. Approximately two thirds of the variation in density was found between species, and a third between trees of the same species.

i. Procedure for obtaining samples for determining wood density

The preparation of two training manuals began at the end of 2012, which were delivered to CONAFOR in PDF format on February 21, 2013, and annexed to the tender by CONAFOR:

- Manual to perform the botanical collections of the National Forestry and Soils Inventory.
- Manual to take wood chips with the Pressler drill in the National Forestry and Soils Inventory.

Subsequently, there were three training events (formally called "Criteria Approval Workshops"), where the procedures for climbing trees with safety equipment, collecting herbarium specimens, pressing and drying them, taking tissue samples for genetic analysis, taking samples of bark and wood for specimens, removing and saving chips with the Pressler drill (and its maintenance), as well as collecting the appropriate information for the databases and the labels of herbarium specimens were explained in the classroom and in the field.

- April 10 to 12, 2013 in San Miguel Regla, Hidalgo (teams from DIAAPROY, S.A. de C.V.)
- April 16 to 20, 2013 in Guzmán, Jalisco (teams from INYDES, S.A. de C.V.)

- April 26 to 30, 2013 in Chetumal, Quintana Roo (teams from AMAREF, S.A. de C.V.)

The plants collected and sent to the herbarium of the UNAM already dry were received inside sheets of paper (usually newspaper), and with their respective annotated collection key. When the same collection had multiple duplicates they came in packets and together with the remaining collections of their respective clusters. Almost all the material collected, including fruits, chips and samples in silica gel was delivered in cardboard boxes.
The division of the clusters between companies in the regular collection 2013, with INYDES in charge of more than half in the north of Mexico. Calculating the average number of collections per cluster, the biggest number was made by DIAAPROY, with an average of 7.5 collections per cluster. Followed by INYDES (4.3) and finally AMAREF (2.3). In the south-east of Mexico (AMAREF is in charge here), it would have been desirable to have a greater number of collections, given the great diversity of trees (Table 60).

Table 60: Number of collections per company

COMPANY	NUMBER OF COLLECTIONS 2013	NUMBER OF CLUSTERS 2013	AVERAGE COLLECTIONS PER CLUSTER
AMAREF	1,544 (11.6%)	674 (22.9%)	2.3
DIAAPROY	4,932 (37.0%)	660 (22.4%)	7.5
INYDES	6,861 (51.4%)	1,607 (54.6%)	4.3
TOTAL	13,337 (100%)	2,941 (100%)	4.5

- More than 4,000 wood density determinations in chips;
- More than 1,500 genetic barcode sequences with an indication of the species;

ii. Description of the calculation in the laboratory of wood density

The physical density is the mass divided by the volume of a substance. In the literature there are two related variables to express wood density, absolute density (here in g/cm^3), and the relative density or specific gravity of the wood (no dimension). The specific gravity is the relationship between absolute density and the density of water.
In this assessment the density is assessed, calling it simply "wood density", as it is a more intuitive concept, the variation of the specific gravity by the temperature is very low, you can easily convert the density into specific gravity, and there is no reason to report the specific gravity.
The protocol used to determine specific gravity in chips collected for the INFyS is a modification of that established for chips taken with a Pressler drill by standard ASTM D2395-93, “Standard Test Methods for Specific Gravity of Wood and Wood-Based Materials”, of the American Society for Testing and Materials (ASTM 2009). The method is similar to the empirical method to estimate the basic density in small samples of wood of Valencia and Vargas (1997).
What is ideally measured in order to calculate carbon content in living trees is the basic density, defined as (Mass without water) / (Volume of fresh wood). For basic density (or gravity), the volume is measured in a sample of wood immediately after being removed from the tree (Williamson and Wiemann 2010, Shmulsky and Jones 2011). This volume is not what we have, because a contraction occurs in the volume of wood to reduce its water content in a fresh state to the state of the environment. In the case of the inventory samples, chips are processed later in the laboratory for their measurement, depending on shape and fragility. To take account of this contraction, you can use Simpson’s formula (1993) to convert the specific gravity with moisture into basic specific gravity. When considering an environment of 20°C, and then dividing all the specific gravities, the following formula is derived (Equation 3) for basic density

$$\text{Basic density} = \frac{DWW}{1+0.265*\frac{(30-\%Moisture)}{30}*DWW/0.9982} \qquad \text{(Eq. 3)}$$

Where: DWW = density without water

0.265 = empirical coefficient between basic specific gravity and full contraction of the wood, when the moisture in the wood is less than 30% to 0%; it applies approximately for different species of flowering plants and gymnosperms (Simpson 1993, on the subject of Stamm 1964).

%Moisture = Moisture eliminated in percent

0.9982 = density of water in g/cm^3 at a temperature of 20°C.

iii. Quality Control

The original databases were delivered in Excel by each company with each physical collection delivery. However, the columns of information were not always consistent. Furthermore, they were not cumulative for the deliveries.

Finally, there were inconsistencies in how to present dates, type names, etc. Therefore, continuous work had to be done to collect, debug, and complement the information in a single Excel base. In addition, the new information, generated at the UNAM had to be added. To avoid chaos by different people changing the base at the same time, only two people developed the base: The biologist Walter Parra conducted the verification and capture of taxonomic determinations, and Dr. Martin Ricker developed the database in all other respects.

iv. Database Structure

A database was compiled in cumulative form from 2013 until the end of the project (May 2015). The information was gathered with the collection data sent by the companies, and the data generated at the UNAM, in particular taxonomic determinations and wood chip densities. The database contains 13,337 data records with 72 columns.

v. Storage

The information on wood densities is stored in the SQL Server 2012 database manager, it is integrated with the information in the allometric models and carbon database for Mexico, in the database called "ypsilon", which is the input for the Model Library published on the MRV portal. The density is a constant value related to a species. The densities are divided into densities of anhydrous weight on green volume and anhydrous weight on dry volume.

The database contains the catalog, biomass and Dbo schemas, which group the tables according to their logical relationship:

a. **Catalogs**. Set of information that relates to one or more tables from a numerical identifier, this schema groups the existing INFyS catalogs as those that were detected in the redesign according to the nature of the existing data, such as; species, genera, strata and municipalities
b. **Biomass**. Schema that contains the information corresponding to the calculations of the models included. For example, it contains the formulas, wood densities, models and other determining variables in the calculations.
c. **Dbo**. This group includes the tables that operate the Model Library web application where the results of the calculations are published.

<u>8.3.2.3 Estimates at observation level</u>

I. Methods at observation level

i. Carbon in aerial biomass

The calculation of carbon in living biomass at tree level is performed on the basis of the records of stems of woody plants (trees and shrubs), collected during the first (2004-2007) and second cycle (2009-2014) INFyS cycle carried out by CONAFOR (2012). In the estimate of the first cycle, dasometric data are used measured in 18,780 Primary Sampling Units (PSUs), which included 70,868 Secondary Sampling Units (SSUs) with dasometric data from 1,137,872 records of living woody plants (trees and shrubs) and 68,300 standing dead woody plants (trees and shrubs).

To estimate the biomass contained in each living woody plant an algorithm assigning allometric models is applied, which allowed the best allometric model to be selected for each tree from 504 models available in the country. The decision tree, which is based on the Sensitivity Analysis of Allometric Models (ASMA), allows the most appropriate model to be identified based on ecological, spatial and statistical criteria. In this way, in the first cycle of inventories it used 83 allometric models (at species, genus or vegetation type level) and for the second cycle it used 502. The database summarizes the compilation of the allometric models that is used to make the estimate in section 8.3.2.2.

It is worth mentioning that records belonging to the families *Agavaceae, Cyatheaceae, Cactaceae, Nolinaceae, Cyclanthaceae, Arecaceae, Poaceae, Cycadaceae, Nolinaceae* and the following species: *Euphorbia canariensis and Fouquieria columnaris* were excluded. There are no precise models for biomass estimation for these families and species and they were excluded as a conservative measure. This represents an exclusion of 2.2% of the records in the INFyS.

ii. Carbon in underground biomass

Carbon in underground biomass (roots) alone was estimated at higher aggregation levels (SSU) under the conceptual approach proposed Cairns et al. (1997). However, given the properties of these models, with the estimate of underground biomass it is only possible to get it to SSU or PSU levels, so NO estimates of biomass at observation level (tree) were made.

II. Characteristics of the database at observation level

The databases at observation level contain the structure that is presented in the following table:

Table 61: Structure of the query at observation level database

Section	Field name	Type of field/Units	Definition
IPCC store	Level 1 (IPCC) Store	Nominal	Living Biomass
	Level 2 (IPCC) Store 3 of 5 carbon stores	Nominal	1) Biomass on the ground (>= 7.5 cm DN in 400 m2), 2) biomass below the ground (from BSS in 400 m2),
	Level 3 (IPCC) Store	Nominal	1) Biomass on the ground, 2) Biomass below the ground,
INFyS-CONAFOR	Cluster ID	Numeric	Cluster number according to the INFyS
	INFyS section	Nominal	Tree/Major Vegetation. The living records are recorded for all ecosystems,
	Site ID	Numeric	The site identifier according to INFyS (4 sites maximum)
	Register	Numeric	Record number. Refers to the branch or stem.
	Tree number	Numeric	Tree number. The recent versions of the INFyS included these variables
	Original scientific name	Nominal	Scientific name as it appears in the INFyS
FRyCSS-CC	Family	Nominal	Name of the botanical family
	Scientific name refined	Nominal: Binomial or trinomial more infra-specific category, separated by a space	Scientific name refined, i.e. using the accepted name
INFyS-CONAFOR	Condition	Nominal	Living
	Normal diameter	Numeric/centimeters	Normal diameter as it appears in the INFyS
FRyCSS-CC	Normal diameter refined	Numeric/centimeters	Normal diameter after the standardization process
INFyS-CONAFOR	Total height	Numeric/meters	Total height as it appears in the INFyS
FRyCSS-CC	Total height refined	Numeric/meters	Total height after the standardization process
FRyCSS-INT	Biomass estimation (yes/no)	Nominal (yes/no)	Indicates whether the observation calculated biomass.
	Calculation version	Numeric	Calculation version of the estimation process
	Calculation date	Date/dd-mm-yyyy	Date of drafting the estimate
FRyCSS-EXT	MODEL above the ground	Nominal	Allometric model for biomass,
	Reference model for above ground	Nominal	Model source
	MODEL type	Nominal	Type of model used to estimate the biomass: by species, by genus, by vegetation type.
	Does the model use height? (Yes/No)	Nominal (yes/no)	Binary variable (yes/no) in the event that the model uses height

	Does the model use diameter? (Yes/No)	Nominal (yes/no)	Binary variable (yes/no) in the event that the model uses diameter
	Wood density value	Numeric/ g/cm3	Wood density value expressed in dry weight/green volume, necessary for the allometric model for vegetation type
	Reference for the wood density value	Nominal	Source of the wood density value
FRyCSS-INT	Estimated diameter at the base	Numeric/centimeters	Diameter calculated at the base from a regression with the normal diameter (1.3 m)
FRyCSS-ESTIMATE	Biomass calculated for ABOVE the ground	Numeric/kilograms	BIOMASS ESTIMATE ABOVE THE GROUND
FRyCSS-EXT	Carbon Fraction	Numeric	Fraction used to transform biomass to carbon
	Type of carbon fraction used	Nominal	Refers to the type of fraction used to transform biomass into carbon: specific or generated from known values
	Reference for carbon fraction	Nominal	Source of the carbon fraction
FRyCSS-ESTIMATE	Carbon calculated for ABOVE the ground	Numeric/kilograms	CARBON ESTIMATE ABOVE THE GROUND
FRyCSS-EXT	Model for BELOW the ground	Nominal	Type of model used to estimate the biomass or carbon below the ground
	Reference model for BELOW ground	Nominal	Source of the model used to estimate biomass below ground
FRyCSS-ESTIMATE	Biomass calculated for BELOW the ground	Numeric/kilograms	BIOMASS ESTIMATE BELOW THE GROUND
	Carbon calculated for BELOW the ground	Numeric/kilograms	CARBON ESTIMATE BELOW THE GROUND

8.3.2.4 Estimates at Sampling Unit Level (Living Trees).

I. Methods

i. Carbon in aerial biomass

The sampling unit considered for carbon in living trees is the SSU and to estimate it, first we started from the estimate of carbon in the living biomass at tree level. Then the carbon in the living biomass was calculated at SSU level, which was done by adding the carbon in all the trees of each SSU (Figure 31).

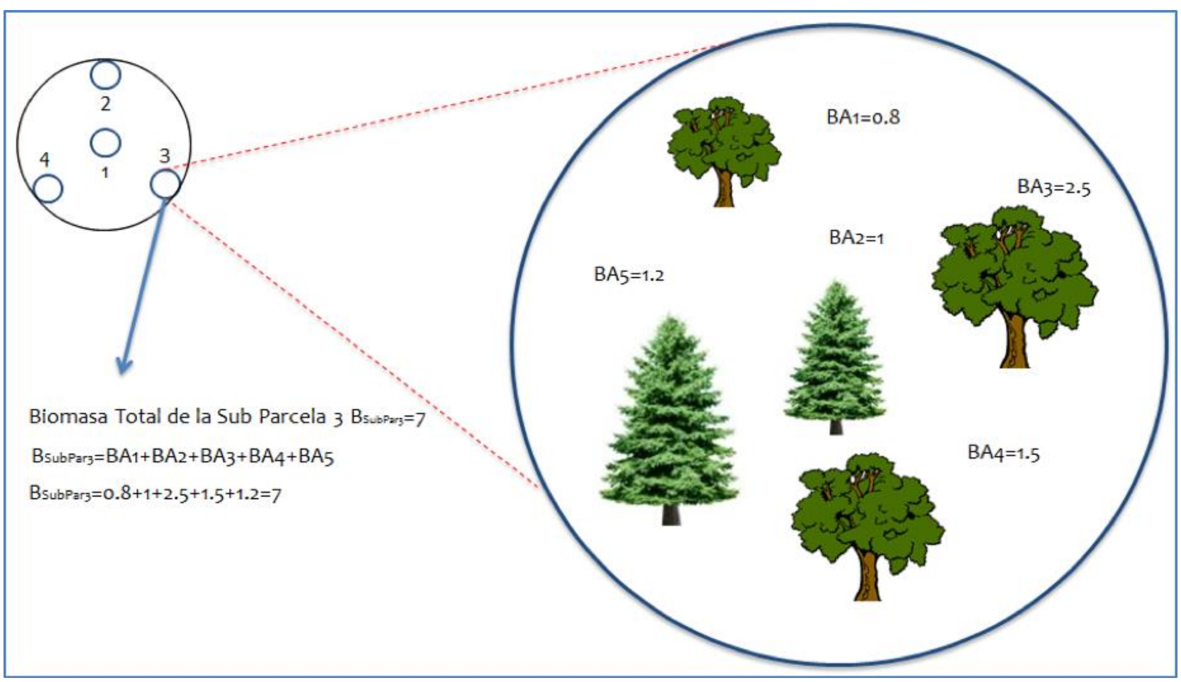


Figure 31: Example of aggregation of the carbon estimates at sub-plot level.

ii. Carbon in underground biomass

The sampling unit considered for underground biomass was the SSU. To quantify it, we used the allometric equations of Cairns et al. (1997) as a function of the biomass above the ground and per ecosystem type, using equations 11 and 12:

Y= exp [(-1.0587) + (0.8836* ln (BA)) + 0.2840] (Eq. 4)

Y= exp [(-1.0587) + (0.8836* ln (BA))] (Eq. 5)

Where:

Y = biomass below ground (roots), (tonnes of dry matter per ha),

BA = biomass above ground, (tonnes of dry matter per ha).

Equation 4 was applied to temperate forests and equation 5 to tropical forests (jungles).

The underground biomass estimates obtained with the models proposed by Cairns et al. (1997) reported their results at the level of tonnes of dry matter per hectare. To report these estimates at the level of SSU, the estimates were weighted by the inverse of the Expansion Factor (ExF). The ExF is obtained by dividing the area represented in the PSU between the actual area sampled (10,000/ [0.04*Number of SSU collected per PSU]).

A carbon fraction was assigned to the biomass obtained at SSU level in a differentiated way for each record (species, genus and plant group) of 56 carbon fractions for species in the country found in the literature.

II. Characteristics of the Sampling Level Database

The databases at observation level contain the structure that is presented below:

Table 62: Structure of the query at observation level database

Section	Field name	Type of field/Unit	Definition
IPCC store	Level 1 (IPCC) Store	Nominal	Living Biomass
	Level 2 (IPCC) Store 3 of 5 carbon stores	Nominal	1) Biomass on the ground (>= 7.5 cm DN in 400 m2), 2) Biomass below the ground (from BSS in 400 m2),
INFyS-CONAFOR	Cluster ID	Numeric	Cluster identifier according to the INFyS
INFyS-CONAFOR WEALTH	INFyS section	Nominal	Tree/Major Vegetation. The living records are recorded for all ecosystems, standing dead and stump records are only recorded for Forests and Tropical Forests
	Site ID	Numeric	The site identifier according to INFyS (4 sites maximum)
	TOTAL STEMS	Numeric	Frequency of total records included in the table of trees or major vegetation.
	Trees (individuals) TOTALS	Numeric	Frequency of total trees or individuals, regardless of the number of records
	Wealth of Families (considering stems)	Numeric	Number of families. Considers the debugging of names.
WEALTH STEMS	Wealth of Species (considering stems)	Numeric	Number of species. Considers the debugging of names.
	LIVING stems	Numeric	Frequency of TOTAL LIVING records, regardless of its use for the estimate.
DIAMETER BASAL AREA	Average Normal Diameter for LIVING Stems	Numeric/centimeters	Average normal diameter for LIVING records
BASAL AREA TOTAL HEIGHT	Basal area of LIVING	Numeric/centimeters square	Basal area of LIVING records
BASAL AREA TOTAL HEIGHT TOTAL HEIGHT BIOMASS and CARBON estimate.	Mean TOTAL HEIGHT of LIVING stems	Numeric/meters	Average TOTAL HEIGHT of LIVING records

Special non-woody* groups are excluded TOTAL HEIGHT BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded			
BASAL AREA TOTAL HEIGHT TOTAL HEIGHT BIOMASS and CARBON estimate. Special non-woody* groups are excluded	Calculation Version	Numeric	Calculation version of the estimation process
TOTAL HEIGHT BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded TOTAL HEIGHT BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded	Calculation date	Date/dd-mm-yyyy	Date of drafting the estimate
TOTAL HEIGHT BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded	TOTAL Stems for Est	Numeric	Sum of Stems for estimate (living). The following taxa are excluded: *Special non-woody groups: Agavaceae (examples Dracaena, Dasylirion, Furcraea, Nolina, Yucca), Cyatheaceae (examples Cyathea, Alsophila), Cactaceae, Nolinaceae (Beaucarnea, Nolina, Dasylirion), Cyclanthaceae, Arecaceae (all palms), Poaceae (examples Bambusa, Otatea, Guadua), Cycadaceae, Euphorbia canariensis, Fouquieria columnaris.
TOTAL HEIGHT BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded	Stems of LIVING for Est	Numeric	Frequency of TOTAL LIVING records used for the estimate
	Average Normal Diameter of LIVING Stems for Est	Numeric/centimeters	Average normal diameter of LIVING records used for the estimate
BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded	Basal area of LIVING for Est	Numeric/centimeters square	Basal area of LIVING records used for the estimate.
BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded BIOMASS and CARBON estimate. Special non-woody* groups are excluded	Average TOTAL HEIGHT of LIVING stems for Est	Numeric/meters	Average TOTAL HEIGHT of LIVING records used for the estimate.
BIOMASS and CARBON estimate. Special non-woody* groups are excluded			
BIOMASS and CARBON estimate. Special non-woody* groups are excluded	Biomass ROOTS (LIVING only)	Numeric/tonnes	Biomass of roots estimation from living stems

	Carbon LIVING	Numeric/tonnes	Estimate of Carbon in living stems
	Carbon ROOTS (LIVING only)	Numeric/tonnes	Estimate of carbon in roots from living stems

8.3.2.5 Estimates at Class Level

Aerial biomass

I. Emission factors for living trees of "Forest land" that changed to "Other Land" (deforestation)

i. Inputs

For the estimate of the EFs used to obtain the emissions of "Forest Land" that changed to "Other Land" the densities of carbon in the biomass area were calculated for each of the classes defined. It is worth mentioning that, we estimated the carbon densities as Emission Factors (EFs) under the assumption that in the processes of changing land use the entire carbon store is lost from the aerial biomass of the class analyzed.

The carbon densities from the aerial biomass by class of cover are based on two basic inputs: on the one hand, of the estimate of carbon at sub-plot level and by another of the classes of cover previously defined. The carbon estimate at SSU level was estimated using the dasometric data from the first cycle (2004-2007) of the INFyS and processes for estimating aerial biomass. On the other hand, the SSU were grouped into 24 classes for the map of vegetation types from INEGI Series IV (2007).

ii. Methodology

In the process of estimating the EFs, the carbon data of 82,698 SSU of the 104,880 SSU that the inventory has were used, which is why only a subset of SSU, whose class of cover belonged to "Forest Land/Meadows" and whose field survey definition was "initial/replacement or monitoring" was used. The definition of forest land/pasture complies with the land classification of the IPCC. (Table 63). On the other hand, within the subset of PSU that belonged to "Forest Land/Meadows" those that were surveyed in the coordinates planned (Classification=Initial) or those that were surveyed in sites close to the planned (Classification=Replacement) were selected; in addition, in the case of the SSU belonging to "Meadows" but that were not surveyed in the field (Classification=Monitors) a zero carbon in the aerial biomass value was assigned and added to the accounting of SSU used for the EFs estimate.

Table 63: Table of correspondence between the land use classes and the IPCC classes

Land Use Class	Key Land Use Class	IPCC class
Human Settlements	AH	Settlements
Aquaculture	AQUA	Wetlands
Body of Water	H2O	Wetlands
Not Applicable	NA	Not Applicable
Empty	null	null
Other Lands	OT	Other Lands
Primary Special Other Non-Woody Types	SOnWT/P	Meadows
Secondary Special Other Non-Woody Types	SOnWT/S	Meadows
Primary Xeric Non-Woody Shrubland	XnWS/P	Meadows
Secondary Xeric Non-Woody Shrubland	XnWS/S	Meadows
Pasture	P	Meadows
Primary Hydrophilic Non-Woody Vegetation	HnWV/P	Meadows
Secondary Hydrophilic Non-Woody Vegetation	HnWV/S	Meadows
Agriculture	AGR	Agricultural Land
Primary Coniferous Forest	COF/P	Forest Land

Secondary Coniferous Forest	COF/S	Forest Land
Primary Oak Forest	OF/P	Forest Land
Secondary Oak Forest	OF/S	Forest Land
Primary Cloud Forest	MF/P	Forest Land
Secondary Cloud Forest	MF/S	Forest Land
Primary Special Other Woody Types	SOWT/P	Forest Land
Secondary Special Other Woody Types	SOWT/S	Forest Land
Primary Xeric Woody Shrubland	XWS/P	Forest Land
Secondary Xeric Woody Shrubland	XWS/S	Forest Land
Primary Deciduous Tropical Forest	DR/P	Forest Land
Secondary Deciduous Tropical Forest	DR/S	Forest Land
Primary Evergreen Tropical Forest	ER/P	Forest Land
Secondary Evergreen Tropical Forest	ER/S	Forest Land
Primary Semi-Deciduous Tropical Forest	SDR/P	Forest Land
Secondary Semi-Deciduous Tropical Forest	SDR/S	Forest Land
Primary Hydrophilic Woody Vegetation	HWV/P	Forest Land
Secondary Hydrophilic Woody Vegetation	HWV/S	Forest Land

With the subset of plots previously defined and with the variable of *carbon in aerial biomass* at SSU level, we proceeded to obtain the estimators of the EFs and their uncertainties. To do this, we used the estimator of "Reason" proposed by Velasco-Bautista *et al.* (2003) to obtain unbiased estimators of forestry variables from the sample design of the INFyS which is a stratified systematic sampling per clusters in two stages. The expression of this estimator is shown in Equation 6:

$$\widehat{R}_k = \frac{\sum_{i=1}^{n_k} y_{ik}}{\sum_{i=1}^{n_k} a_{ik}} \qquad \text{(Eq. 6)}$$

Where:

$\widehat{R}_k$ =Estimator of carbon store of class k
y_{ik} =Total carbon store in the SSU i of class k
a_{ik} =Area sampled in the SSU i (400 m^2) of class k
n_k =Total number of SSU in class k

The IPCC Guidelines 2006 were followed to estimate the uncertainty. In such a way that in Equation 7, the expression used to estimate then is shown:

$$U_k = \frac{{IC_k}/{2}}{\bar{R}_k} \times 100 \qquad \text{(Eq. 7)}$$

Where:

U_k: Uncertainty of the carbon estimator of class k
$\overline{R}_k$: Carbon estimator of class k
CI_k: Carbon estimator interval $\overline{R}_k$ of class k
In which the CI_k is a function of the variance of $\widehat{R}_k$:

$$\widehat{R}_k - 1.96\sqrt{\hat{V}(\widehat{R}_k)} \leq R_k \leq \widehat{R}_k + 1.96\sqrt{\hat{V}(\widehat{R}_k)}$$

And $\hat{V}(\widehat{R}_k)$ is defined as shown in Equation 8 (Velasco-Bautista *et al.*, 2003):

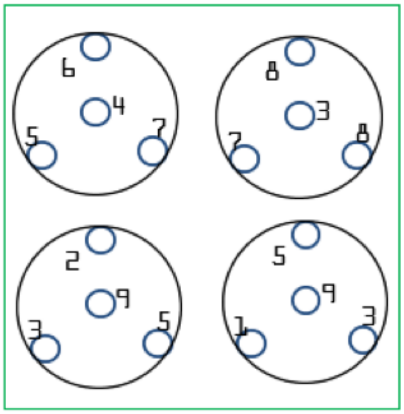
$$\hat{V}(\widehat{R}_k) = \left(\frac{1}{n_k\,(n_k-1)\bar{a}^2}\right)\left(\sum_{i=1}^{n_k} y_{ik}^2 - 2\,\widehat{R}_k \sum_{i=1}^{n_k} y_{ik}a_{ik} + \widehat{R}_k^{\,2} \sum_{i=1}^{n_k} a_{ik}^2\right) \qquad \text{Eq (8)}$$

Where:

$\widehat{R}_k$, y_{ik}, a_{ik} Y n_k have been previously defined

$$\bar{a} = \frac{\sum_{i=1}^{n} a_i}{n}$$

An example of the process of estimating the reason estimators is shown in Figure 32



$$\hat{R} = \frac{\sum_{i=1}^{n} y_i}{\sum_{i=1}^{n} a_i} \qquad \text{Eq 1}$$

Dónde:

$\hat{R}$ =Estimador de razón a nivel de estrato

y_i =carbono total a nivel de sub-parcela (o UMS) i

a_i =área de muestreo a nivel de sub-parcela (o UMS) i (400m2)

n =número de parcelas a nivel de estrato

$$\hat{R} = \frac{5+6+4+7+7+8+3+8+3+2+9+5+1+5+9+3}{0.04 \times 16}$$

$$\hat{R} = \frac{85}{0.64} = 132.8$$

$$U_{\hat{R}_k} = \frac{IC_{\hat{R}_k}/_2}{\hat{R}_k} \times 100 \qquad \text{Eq 2}$$

$$\hat{V}(\hat{R}) = \left(\frac{1}{n\,(n-1)\bar{a}^2}\right)\left(\sum_{i=1}^{n} y_i^2 - 2\,\hat{R}\sum_{i=1}^{n} y_i a_i + \hat{R}^2 \sum_{i=1}^{n} a_i^2\right) \qquad \text{Eq 3}$$

Figure 32: Example of estimate of emission factors for deforestation

All the management of the databases and estimation processes were programed and executed in the statistical software R.

II Emission factors of "Forest Land" converted to "Degraded Forest Land"

i. Inputs

For the EFs of "Forest land converted to degraded forest land" three estimation schemas were used:

- The first was based on a modeling approach with which we sought to estimate rates of carbon decrease in both temperate forests and tropical forests.

- The second approach, simply consisted of assuming that 1/20 of the average carbon density of forests is lost annually.

- Finally, the third approach consisted of obtaining the reason for change estimator in the stores for plots that are losing their carbon stores.

The same inputs are used for the three estimate schemas, which consisted of estimates of aerial biomass at SSU level for each cycle of the INFYS with their respective surveying dates of the information of each plot.

ii. Methodology

To implement the modeling approach, first it were identified the sub-set of plots that were measured in the same place in both the first and second cycle of INFyS (initial) and whose change to carbon stores was negative but with an annualized rate of loss of less than 20% (this with the purpose of eliminating unreal lost values).

In this sub-set, carbon was estimated at plot level for Time 1 and Time 2, after the gross change in the carbon stores was obtained and the time difference between re-measurements calculated. It is worth mentioning that the plots were re-measured in different periods of time, ranging from 1-8 years, which is due to a logistical

inventory problem (as theoretically the re-measurement period for all plots of the INFyS is 5 years), so we took advantage of this planning error to identify carbon loss rates in different re-measurement periods.
On the sub-set of plots defined in the previous paragraph, those plots whose gross changes were identified in the stores were negative, i.e. plots between re-measurement periods of lost carbon. The idea behind this approach to modeling, is to identify the rate of decrease in the carbon stores of forests, using only plots that are losing carbon in different re-measurement periods.
Therefore, using the approach of repeated measures (because there is a plot sub-set that has been measured in both cycles of the INFyS), linear models of mixed effects (LMMEs) were adjusted to obtain the average loss rates of changes to stores.

The conceptual basis of this approach to modeling, starts with the assumption that you have a super-population in which each pair of points re-measured has its own slope and intercept then a sample is taken from this super-population and you try to estimate the average slope with this.

Therefore, taking into account that the carbon estimates at plot level between two cycles of the INFyS are repeated measures and that we are interested in obtaining an average loss rate, it is necessary to adjust the LMME, in which the model that has to be adjusted has random intercepts, i.e. as shown in equation 9:

$$y_{ij} = a + bx_{ij} + z_i + e_{ij} \quad \text{Eq. (9)}$$

Where:
It is the response variable to plot i, measured at the same time j (j=1.2). Usually it is assumed and they are independent.

Usually $\zeta_i \sim N(0,\sigma_1^2),\ \varepsilon_{ij} \sim N(0,\sigma^2)$

Note that the model of the above equation is equivalent to the model for equation 10:

$$y_{ij} = a_i + bx_{ij} + e_{ij} \quad \text{Eq. (10)}$$

Where: $a_i = a + z_i \sim N(a, s_1^2)$

Note that in the model (2) a_i it is a random term, and represents an intercept in the regression model, it is therefore necessary for the model (2) or in an equivalent way the model (1) are called random intercepts.
Note that by assuming random intercepts, it is recognized that each regression line associated with each plot can have different intercepts which allows a better fit of the data and the it leads to a correlation between the observations y_{ij}'s, which is desirable as you have measures repeated over time (measurements on the same plots over time).
Also, note that the parameter b indicates the reason for the change of biomass in the general population of sampled plots during the study periods.
In this way, we can obtain models that predict the increase in carbon stores for us or during the analysis period for each type of forest.

Prediction intervals
Prediction of future observations, only the fixed part of the model (equation 11) is considered.

$$v(y - y_f) = [x_f'(x'x)^{-1} + 1]\sigma^2 \quad \text{Eq. (11)}$$

a) Uniform degradation approach

On the other hand, the uniform degradation approach simply consisted of assuming that 1/20 of average forest carbon density is lost annually. That is, the EFs that were obtained under this approach are the result of the simple division of the carbon densities of each vegetation type between a factor of 20, which was recommended by the FAO expert in GHG inventories Mr. Sandro Federici.

Although this estimation schema allows for obtaining estimates simply and directly on the basis of carbon densities; we know that it is difficult to assert that all forests in the country are capable of degrading in a 20-year period. However, this approach is used as a first approach to cope with the problem of a lack of information.

b) Reason for decreases estimators approach

To implement this estimation approach, plots were used that:

- Were measures in the same place between the first and second INFyS cycle.
- Their Changes in the stores were negative, i.e. that lost carbon between the two INFyS re-measurement periods.
- Their annualized carbon decreases were less than 20%

On this subset of plots, the carbon was calculated at Time 1 and Time 2, and then the *annualized decrease of changes in carbon stores* was obtained, which is the result of dividing the gross decreases in carbon stores between the net re-measurement time. Finally, the annualized decreases at stratum level were obtained by assessing the reason estimators in the variable *annualized decrease changes in carbon stores*. While with this method it is possible to estimate the EFs with a robust estimator, the definition of its domain is weak because it does not have a defined spatial representation, or an associated class.

iii. Results

The results of the modeling approach are displayed graphically in Figure 33, in which you can clearly see that in the various vegetation types, the models show carbon losses as time passes.

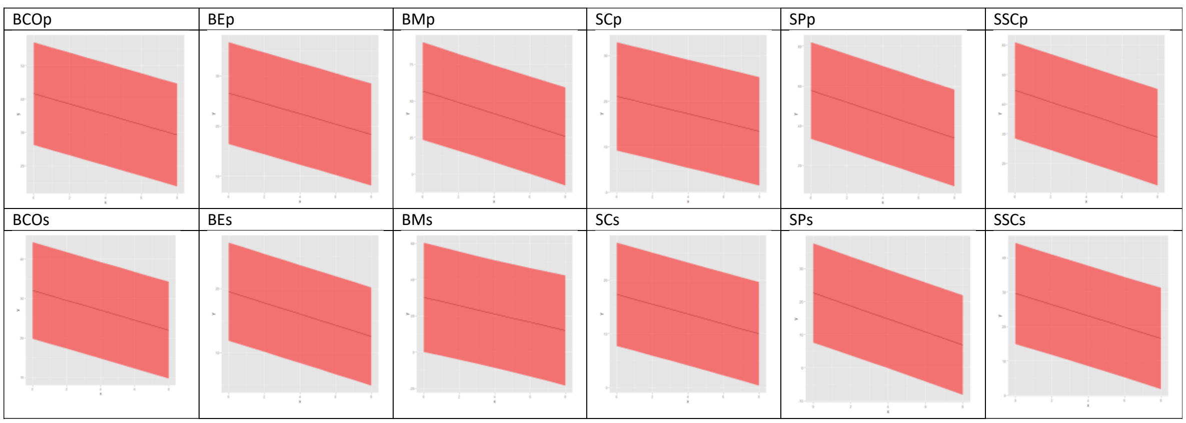


Figure 33: Rate of decrease in carbon densities by adjusting mixed effect models in the repeated measures of the carbon stores at plot level for different vegetation types.

<u>Underground biomass.</u>

I. Emission factors for underground biomass of "Forest Land" that changed to "Other Land" (Deforestation)

The estimate of the EFs that were used to obtain the emissions of "Forest Land that changed to Other Lands" associated with underground biomass were obtained from the same spatial inputs, field data and methods used in aerial biomass for this sub-category.

In practice, the EFs of underground biomass carbon at class level were obtained using the reason estimators assessed in total carbon for underground biomass at SSU level. This last variable was obtained as a fraction of underground biomass at SSU level, following that recommended by Cairns et al. (1997).

II. Emission factors for underground biomass in "Forest Land" converted to "Degraded Forest Land"

The EFs that were used to obtain the emissions of "*Forest Land" converted to "Degraded Forest Land"* associated with underground biomass, were estimated from the same spatial inputs, field data and methods used in the aerial biomass for the sub-category of "Forest Land converted to *"Degraded Forest Land*"

Specifically, the EFs of changes to carbon from underground biomass at class level were obtained using the reason estimators assessed in the difference of the total carbon store of underground biomass at SSU level between the two cycles of the INFyS. This last variable was obtained as a fraction of the change to underground biomass at SSU level, following that recommended by Cairns et al. (1997).

The Good Practice Guidance for Land Use, Land-Use Change and Forestry of 2003, Chapters 2 and 3 were mainly used. And the 2006 IPCC guidelines for national greenhouse gas inventories for the uncertainty estimate.

Estimates of annual emissions were made for each of the five States representing the sum of the emissions from deforestation and degradation (including by forest fires of fire-sensitive ecosystems[110]). The historical average of the years included within the historical period is presented (simple average). No adjustments have been made.

8.3.3 Estimate of emissions from degradation caused by fires in fire-sensitive ecosystems

The surface area affected by fires was analyzed using the official data from the CONAFOR Gerencia del Manejo del Fuego (Fire Containment Management) for the period 1995 to 2013, as well as spatially georeferenced information from the areas affected by forest fires over the 2009-2013 period, allowing the spatial distribution behavior in the affected areas to be estimated for the whole period. The areas with fire-sensitive types of vegetation, determined by the Official Mexican Standard NOM-015-SEMARNAT/SAGARPA, were assessed. The input factors and available mass were determined using information specific to the country and the combustion and emission factors were collated from the existing bibliography. The estimate was based on the methodology recommended by the general equation featuring in the IPCC 2003 guidelines and applied for the INEGI 1990-2013.

The estimate of emissions due to fires is divided into two large groups, the first part relate to CO_2 emissions due to the loss of biomass from fires on forestlands, and the second part are emissions of gases other than CO_2 resulting from in situ combustion of biomass.

The general calculation of greenhouse gas emissions from forest fires was made using the general equation corresponding to the IPCC guidelines in the LULUCF sector which is as follows (IPCC, 2003):

$$Lfire = A \bullet B \bullet C \bullet D \bullet 10^{-6}$$

Where:
Lfire = Quantity of greenhouse gases due to forest fires, in megagrams.
A = Area burned, hectares.
B = “Available” fuel mass , kg of dry material ha^{-1}.
C = Combustion factor (fraction of biomass consumed), without dimensions.
D = Emission factor .

Area burned in fires (A)

The analysis of the surface area affected by fires was carried out using CONAFOR official data. The areas affected by fires which were fought will be recorded in these reports. This form of report does not include fires which occurred and were not put out, therefore it may lead us to underestimate this type of disturbance. The affected areas are split up according to federal body, year and layer of affected vegetation, classified as tree canopy cover, bush and herbaceous forest.

Table 64 Official information about Forest fires in sensitive ecosystems in Campeche

Ecosystems sensitive to fire CAMPECHE				
Year	SUM_ARBOREO (TREE)	SUM_ARBUSTIVO (BUSH)	SUM_HERBACEO (HERBACEOUS)	SUM_TOTAL (ha)
2001	451.00	411.53	105.25	967.78
2002	442.00	-	-	442.00
2003	25,541.00	-	13.85	25,554.85
2004	2,128.00	-	90.04	2,218.04
2005	1,831.50	-	-	1,831.50
2006	2,641.00	-	2.77	2,643.77
2007	154.00	-	52.27	206.27

[110] Fires in fire-sensitive ecosystems are those described in Official Mexican Standard NOM-015-SEMARNAT/SAGARPA-2007

2008	1,024.00	-	20.33	1,044.33
2009	4,008.50	-	105.35	4,113.85
2010	213.00	4.99	58.72	276.72
2011	2,554.80	59.86	11.37	2,626.02

Table 65 Official information about Forest fires in sensitive ecosystems in Chiapas

Ecosystems sensitive to fire CHIAPAS				
Year	SUM_ARBOREO (TREE)	SUM_ARBUSTIVO (BUSH)	SUM_HERBACEO (HERBACEOUS)	SUM_TOTAL (ha)
2001	8,008.52	2,647.15	-	10,655.67
2002	1,773.28	2,988.06	-	4,761.34
2003	14,325.62	14,183.35	-	28,508.98
2004	544.39	1,295.97	-	1,840.36
2005	2,645.64	3,109.64	-	5,755.28
2006	559.34	1,171.36	-	1,730.69
2007	1,198.81	1,775.62	8,268.90	11,243.34
2008	297.06	1,264.63	6,981.99	8,543.67
2009	869.82	3,106.53	6,200.03	10,176.38
2010	653.94	770.58	5,449.99	6,874.51
2011	716.09	1,680.08	37.09	2,433.26

Table 66 Official information about Forest fires in sensitive ecosystems in Jalisco

Ecosystems sensitive to fire JALISCO				
Year	SUM_ARBOREO (TREE)	SUM_ARBUSTIVO (BUSH)	SUM_HERBACEO (HERBACEOUS)	SUM_TOTAL (ha)
2001	1,014.33	10,802.90	-	11,817.24
2002	353.53	4,418.98	1.10	4,773.60
2003	660.57	4,329.96	0.82	4,991.35
2004	390.84	2,143.02	0.64	2,534.49
2005	1,308.30	6,575.65	5.22	7,889.17
2006	1,225.11	6,656.95	0.89	7,882.96
2007	1,051.97	3,630.08	1.75	4,683.80
2008	1,062.86	5,466.40	3.19	6,532.46
2009	459.92	2,696.96	1.02	3,157.90
2010	404.34	1,496.04	0.77	1,901.15
2011	2,101.59	6,922.93	1.47	9,025.98

Table 67 Official information about Forest fires in sensitive ecosystems in Quintana Roo

Ecosystems sensitive to fire QUINTANA ROO				
Year	SUM_ARBOREO (TREE)	SUM_ARBUSTIVO (BUSH)	SUM_HERBACEO (HERBACEOUS)	SUM_TOTAL (ha)
2001	178.00	375.00	428.51	981.51
2002	127.50	667.00	110.94	905.44
2003	2,173.50	4,203.50	329.44	6,706.44

2004	81.00	236.25	126.93	444.18
2005	2,150.75	3,113.95	480.59	5,745.29
2006	18,960.50	29,632.00	4,869.85	53,462.35
2007	177.50	539.20	1.16	717.86
2008	8,429.00	4,341.00	143.37	12,913.37
2009	13,407.50	23,325.50	159.16	36,892.16
2010	1,401.00	4,255.50	2.32	5,658.82
2011	4,957.50	73,985.00	1.63	78,944.13

Table 68 Official information about Forest fires in sensitive ecosystems in Yucatán

Ecosystems sensitive to fire YUCATÁN				
Year	SUM_ARBOREO (TREE)	SUM_ARBUSTIVO (BUSH)	SUM_HERBACEO (HERBACEOUS)	SUM_TOTAL (ha)
2001	231.00	442.00	20.68	693.68
2002	436.00	1,041.05	102.09	1,579.14
2003	7,616.00	3,733.04	446.45	11,795.49
2004	709.00	1,428.50	252.40	2,389.90
2005	192.50	1,967.60	906.66	3,066.76
2006	2,881.00	4,893.00	677.11	8,451.11
2007	175.00	1,042.50	1,207.54	2,425.04
2008	1,766.00	3,164.65	546.95	5,477.60
2009	9,298.43	5,633.20	439.38	15,371.01
2010	395.20	1,843.10	1,012.57	3,250.87
2011	2,524.00	4,621.00	5.02	7,150.02

We should mention that the type of report produced by CONAFOR refers to the stratum as an indicator of the dominant life form in the type of forest vegetation where the fire occurred. This means that if a fire occurred which affected a wooded layer, this would have happened in a wood where there were predominantly trees, but in general the fires which occur are still of a superficial type (99.9%), mainly affecting everything in the dead material and the herbaceous-bushy stratum (Estrada, 2006).

One limitation of this historical register of surfaces affected by fires is the lack of a consistent georeference throughout the period, since these factors differ depending on the federal body and the reporting years. In general, in the first years of the period analyzed there is a lack of spatial information, which has kept improving up to the reports for more recent years. Owing to the fact that the affected surface is a very important input for calculating emissions, an inference was produced using the information available about the types of forest vegetation affected per state, the surface area per type of forest vegetation contained in each state and the stratum affected by fires in the CONAFOR report.

First of all the INEGI subcategories will be approved at national level per dominant stratum depending on the development phase of the vegetation in order to correspond with the way of reporting on areas of fires affected per stratum (trees, bushes and herbaceous plants). By allocating the primary subcategories of forestlands to the fires affecting woodland strata. And, more specifically, by dividing up the secondary subcategories of forestlands into bushy and herbaceous strata according to the original data from the INEGI mapping, in order to allocate a stratum affected by fire as shown in Table 69.

Table 69. Strata reporting effects of fires and their correspondence with the approved INEGI subcategories per vegetation development phase.

Estrato CONAFOR	Tipos de Cobertura INEGEI	Clave
Arbolado + Renuevo	Bosque Cultivado	BC
	Bosque de Coníferas Primario	BCO/P
	Bosque de Encino Primario	BE/P
	Bosque Mesófilo Primario	BM/P
	Especial Otros Tipos Leñoso Primario	EOTL/P
	Selva Caducifolia Primaria	SC/P
	Selva Perenifolia Primaria	SP/P
	Selva Subcaducifolia Primaria	SSC/P
Arbustivo	Bosque de Coníferas Secundario	BCO/S
	Bosque de Encino Secundario	BE/S
	Bosque Mesófilo Secundario	BM/S
	Especial Otros Tipos Leñoso Secundario	EOTL/S
	Matorral Xerófilo Leñoso Primario	MXL/P
	Matorral Xerófilo Leñoso Secundario	MXL/S
	Matorral Xerófilo No Leñoso Primario	MXnL/P
	Selva Caducifolia Secundaria	SC/S
	Selva Perenifolia Secundaria	SP/S
	Selva Subcaducifolia Secundaria	SSC/S
	Especial Otros Tipos No Leñoso Primario	EOTnL/P
Herbáceo	Matorral Xerófilo No Leñoso Secundario	MXnL/S
	Pastizal	P
	Bosque de Coníferas Herbáceo	BCO/h
	Boque de Encino Herbáceo	BE/h
	Bosque Mesófilo Herbáceo	BM/h
	Selva Caducifolia Herbácea	SC/h
	Selva Perenifolia Herbácea	SP/h
	Selva Subcaducifolia Herbácea	SSC/h

Having approved the INEGI subcategories with the extensions of strata for reporting fires, the special data generated by the Fire Containment Management (CONAFOR 2014) were used, in which quality control was carried when georeferencing the fires for the period 2005 – 2013 (period considered to be the most reliable in terms of collecting spatial data), and it was possible to locate 45, 433 events of the 79,465 registered between 1995 and 2013 (57%).

Registrations of fires were used as an indicator to weight the occurrence of fires in each subcategory per state, where fires may occur, since it is not possible for the combustion process to take place in all the types of vegetation grouped together within the INEGEI categories, or for them to be sensitive to fire in accordance with the NOM-015-SEMARNAT/SAGARPA. This is because some ecosystems may be curbed by the high humidity contained in fuels, or they may be very dry ecosystems which do not produce sufficient biomass to maintain a forest fire (Jardel *et al.* 2009).

Having selected the INEGEI subcategories per state, from the information about land use and vegetation for each of the series assessed, the surface areas per INEGEI subcategory selected and per development phase of the vegetation for each state were quantified, in order to determine their contribution in each stratum affected by fires. The surfaces and their relative areas (%) were obtained in compliance with the corresponding period of time for each INEGI Series. Consequently, the areas affected by fire from 1995-2002 were allocated to the relative area of the surface per state obtained for each of the subcategories in series II, those from 2003-2007 for series III, those from 2008-2011 for series IV and those from 2012-2013 for series V.

In order to distribute the annual surface area affected by fires in each state and stratum, in accordance with the surface area per type of vegetation registered in each series, the surface affected in each stratum per annum was multiplied by the percentages (relative area) of each INEGEI subcategory in each stratum. The result is a proportional annual surface area affected by fires per type of vegetation and state.

Fuel mass available (B)

In order to quantify the available fuel we will concentrate on the concept of the "fuel bed" which is a unit of plant material representative of one or several combustion environments (Riccardi *et al.* 2007). In order to characterize and quantify the biomass and necromass of these strata per type of vegetation, the methods proposed in the Forest Fuels Classification and Characterization System (FCCS) will mainly be used (Ottmar et al. 2007, Riccardi et al. 2007) and those of the US Environmental Protection Agency (EPA 2002). The FCCS quantifies the biomass in the strata, separating these layers into categories or components and creating prototype fuel beds. The categories which were included and which constitute the combustion environment for the surface fires are: the fermentation horizon (Oe and Oi horizons, according to the USDA soil classification), surface dead leaves (Oi layer, according to the USDA soil classification), fine woody debris (MLC) (>7.62 cm), coarse woody debris (>7.62 cm), herbaceous plants and bushes.

In accordance with the categories referred to above, the fuel (biomass and necromass) will be quantified mainly using the photoseries tool for quantifying forest fuels applicable for ecosystems on national territory (Alvarado *et. Al,* 2008, Ottmar 2007, Ottmar 2000) which are used as the main source in the FCCS system. Owing to the fact that only some types of vegetation are characterized by photoseries, mainly ecosystems of a temporate type, an exhaustive search was carried out in scientific literature and unpublished literature (theses, reports and congress records) which contained information about different types of vegetation and components of fuels in various states of the Mexican Republic, and states sharing borders with the US with which we share forest ecosystems and thus cover the maximum information available.

The review of the literature available obtained 186 prototype fuel beds for different types of vegetation in Mexico. (see table 70) In order to make some general observations on national level, the prototype fuel beds will be added together in accordance with the methods suggested by Hardy *et al.* 2000 in order to establish fuel conditions (CFC) which represent each INEGEI subcategory.

Table 70 Types of vegetation and Class of Fuel Condition (CFC) which represent it (n= number of sites which represent the CFC).

INEGEI subcategory (CFC)	Type of INEGI vegetation	Source	n
Coniferous forest	Pine forest	Alvarado et. al 2008, Alvarado (unpublished data), Estrada 2006, Navarrete 2006, Ordoñez et al. 2008, Ottmar et al. 2000, Ottmar et al. 2007, Pérez 2005, Stephens 2004, Villers-Ruiz et al. 2001	36
	Pine-Oak forest	Alvarado et al. 2008, Camp et al. 2006, Estrada 2006, Fulé y Covington 1994, Navarrete 2006, Ordoñez et al. 2008, Pérez 2005, Rodríguez y Sierra 1995, Villers-Ruiz et al. 2001	7
	Oyamel forest	Alvarado et al. 2008, Estrada 2006, Navarrete 2006, Ordoñez et al. 2008, Pérez 2005, Rodríguez y Sierra 1995	19
	Juniper forest	Ottmar et al. 2000	9
Oak forest	Oak forest	Alvarado et al. 2008, Estrada 2006, Fulé y Covington 1994, Morales et al. 2000, Navarrete 2006, Ordoñez et al. 2008, Ottmar et al. 2000, Ottmar et al. 2007, Pérez 2005, Rodríguez y Sierra 1995, Villers-Ruiz et al. 2001	14
	Pine-Oak forest	Villers et al. 2001, Alvarado et al. 2008, Ottmar et al. 2007, Estrada 2006	16
Mesophilic mountain forest	Mesophilic mountain forest	Alvarado et. al 2008, Asbjornsen et al. 2005	5
Evergreen tropical forest	Evergreen tropical forest	Hughes et al. 2000, Hughes et al. 1999	22
Semi-deciduous tropical forest	Medium-stature semi-deciduous tropical forest	CONAFOR-USFS 2006, Harmond et al. 1995, Jaramillo et al. 2003, Whigham et al. 1991,	14
	Semi-deciduous low-stature tropical forest	CONAFOR-USFS 2006	2
Deciduous tropical forest and Other special types (mezquite forest)	Deciduous lowland	Jaramillo et al. 2003, Romero-Duque, 2008	13

	Subtropical shrubland	Pérez 2005, Navarrete 2006, Ordoñez et al. 2008	1
Xeric Shrubland	Chaparral	Ottmar et al. 2000	16
	Semi-mountainous shrubland	Alvarado et. al 2008, Rodríguez y Sierra 1995	3
	Xeric Shrubland (miscellaneous)	INE, 2006	5

Owing to the fact that there is little work to represent the heterogeneity of the ecosystems in Mexico and the number of observations varies in terms of each category of CFC (in some cases there are over 20 observations and in other cases only 3), the quantity of fuel available was obtained using the median as the measurement of the central trend, which is the most appropriate when there is little data or abnormal distributions, in order to avoid very extreme values, and if distribution is normal it must be equal to the average (Zar, 1999) as shown in Table 71.

Table 71 Median of the quantity of biomass (Mg m. s. ha-1) in each CFC category and the fuel category.

F= Fermentation Layer, Ho and MLC-P= Dead Leaves and Small Fallen Wood Material, MLC-G= Large Fallen Wood Material Her= Herbaceous, Arb= Bushy.

	Categories Mg m. s. ha-1										
CFC	F	n	Ho and MLC-P	n	MLC-G	n	Her	n	Bushy	n	Total
Coniferous Forest	13.39	35	10.04	69	9.59	67	0.20	47	0.37	47	33.60
Bushy coniferous forest	13.39	35	10.04	69			0.20	47	0.37	47	24.00
Herbaceous coniferous forest			10.04	69			0.20	47			10.24
Oak Forest	14.21	14	7.62	27	0.33	27	0.46	20	0.71	20	23.32
Bushy oak forest	14.21	14	7.62	27			0.46	20	0.71	20	22.99
Herbaceous oak forest			7.62	27			0.46	20			8.08
Mesophilic mountain forest	11.93	5	2.02	5	6.94	1	0.15	1	0.19	1	21.23
Mesophilic bushy mountain forest	11.93	5	2.02	5			0.15	1	0.19	1	14.29
Mesophilic herbaceous mountain forest			2.02	5			0.15	1			2.17
Evergreen tropical forest	SD		5.75	14	9.1	15	7.5	7	5	15	27.35
Evergreen tropical forest bushy	SD		5.75	14			7.5	7	5	15	18.25
Evergreen tropical forest Herbaceous			5.75	14			7.5	7			13.25
Semi-deciduous tropical forest	SD		9.18	16	31.25	16	7.1	15	2.1	17	49.63
Bushy Semi-Deciduous Tropical Forest	SD		9.18	16			7.1	15	2.1	17	18.38
Herbaceous Semi-Deciduous Tropical Forest	SD		9.18	16			7.1	15			11.28
Deciduous tropical forest/Other special woody types	SD		12.57	13	10.5	13	3.64	8	2.45	4	29.16
Deciduous tropical forest/Other special bushy woody types			12.57	13			3.64	8	2.45	4	18.66
Deciduous tropical forest/Other special herbaceous woody types			12.57	13			3.64	8			
Xereic woody and non-woody shrubland	2.97	2	5.78	6			1.44	3	26.34	24	36.53

In a review of the literature available, the tropical forests did not register developed layers of fermentation therefore they are not considered to be an important constituent contributing to surface fires, nevertheless the other categories were represented. In the case of scrubland and pastureland it is considered that all the fuel categories contribute to surface fires.

Consumption Factors or proportion of biomass consumed (C)

The Consumption Factors were taken as the default values used in the CONSUME 3 software, and were developed in accordance with experimental empirical models in dry temperate forest ecosystems in the west of the United States which estimate the total consumption in the three combustion phases (Prichard *et al.* 2009).

The resulting Consumption Factors for each INEGEI subcategory of temperate forest, are general and obtained per stratum and fuel category, in order to be applied as appropriate for each INEGEI subcategory and its vegetation development phase as shown in Table 72.

Table 72 Factors of consumption per INEGEI subcategory and fuel group obtained from CONSUME 3.

INEGEI Subcategory	Fermentation horizon	Leaves and FDW <7.62 cm	FWM >7.62cm	Herbs	Bushes
Coniferous Forest	0.79	0.93	0.55	0.93	0.89
Oak Forest	0.61	0.93	0.55	0.93	0.90
Mesophilic mountain forest	0.45	0.93	0.55	0.93	0.89
Xeric Shrubland	NA	0.93	0.55	0.93	0.89

With regard to tropical forests, information is scarce or non-existent in relation to consumption factors and for Mexico only Kauffman *et al. (*2003) register values for lowland deciduous tropical forests in fires from the conversion of land use, which were used for dry tropical forests as they are the sole source. In the other groups of fuel from tropical forests the values for the proportion of biomass consumed provided by the IPCC guidelines in its LULUCF section (IPCC, 2003) will be used, as shown in Table 73.

Table 73 Factors for consumption by CFC and fuel group obtained from the IPCC 2003 and Kauffman et al. 2003 for tropical forests and certain types of scrubland.

Fuel condition class	Fermentation horizon	Leaves and FDW<7.62 cm	FDW>7.62cm	Herbs	Bushes
Evergreen Tropical Forest111	0.50	0.50	0.50	0.50	0.50
Semi-deciduous tropical forest7	0.50	0.50	0.50	0.50	0.50
Deciduous tropical forest and Other Special Lands112	NA	0.89	0.71	1	0.78

The Consumption Factors were allocated to each surface in the INEGEI subcategory and its phase of vegetation development, according to the combustion environment involved and corresponding to its available mass depending on the component.

Emission Factors (D)

For this report the EF of Andreae and Merlet (2001) were selected, which include a comprehensive and updated review of all the publications about EF from CO_2 and CH4, CO, N2O and NOx trace gases in forests, and provide general values in categories similar to those proposed by the IPCC for the USCUSS sector, which are extratropical forests (including temperate, boreal forests and shrubland in the temporate area); and tropical (Table 74). The emission factors for extratropical forests were applied to the subcategories of conifer forest, pine forest, mesophilic mountain forest and xeric shrubland; EF from tropical forests to perennial tropical forests, semi-deciduous lowland tropical forest and deciduous forest.

[111] IPCC 2003
[112] Kauffman *et al.* 2003

Table 74 Emission factors per type of vegetation and chemical species (Andreae y Merlet 2001).

Vegetation type	CO_2	CH4	CO	N2O	NOx
Extratropical forests	1569	4.7	107	0.26	3
Tropical forests	1580	6.8	104	0.2	1.6

8.4. Activity data and emission factors used to calculate the average annual historical emissions during the reference period

8.4.1 Activity data

Please provide an overview of the activity data that are available and of those that were used in calculating the average annual historical emissions over the Reference Period in a way that is sufficiently detailed to enable the reconstruction of the average annual historical emissions over the Reference Period. Use the table provided (copy table for each parameter). Attach any spreadsheets, spatial information, maps and/or synthesized data.

If different data sources exist for the same parameter, please list these under the 'Sources of data'. In this case, discuss the differences and provide justification why one specific dataset has been selected over the others.

Refer to ***criterion 6, 7, 8 and 9*** *of the Methodological Framework*

Description of the parameter including the period of time covered (e.g. change of forest cover between 2000 - 2005 or transitions between categories of forests X and Y between 2003-2006):	The main input that is used to develop the activity data are INEGI's land use and vegetation series. These were used by classifying all types of vegetation that fall within the ranges described in the definition of a forest, for each series (Series II, III, IV and V), as forestland.
Explanation for why sources and sinks used the parameter (e.g. Deforestation or Forest Degradation):	For deforestation: The maps were superimposed in chronological order to identify all the changes in each type of vegetation including forestland to other types of use. For degradation: All changes were identified within the category of forestlands that remain forestland, the types of vegetation from primary and secondary arboreal to secondary herbaceous and secondary shrub. The information was put in matrices and analyzed according to the period of time between the series analyzed. (From Series II to III, nine years; from Series III-IV, 5 years; and from Series IV to V, 4 years) In the case of degradation by forest fires, official statistics provided by the Fire Management Department of the National Forestry Commission were used.
Unit of data (e.g. ha/yr):	ha/year
Value for the parameter:	**Fire**

	Jalisco		Quintana Roo	
	CO_2 fires (Sensitive)	Fire CO_2 eq (CH_4, N_2O) (Sensitive)	CO_2 fires (Sensitive)	Fire CO_2 eq (CH_4, N_2O) (Sensitive)
2001	301.7	46.2	14.3	2.2
2002	119.9	18.4	15.0	2.3

2003	127.4	19.5	136.6	21.0
2004	65.1	9.9	7.4	1.1
2005	203.3	31.1	121.	18.7
2006	202.6	31.0	1,111.4	171.2
2007	121.2	18.4	12.9	2.0
2008	166.8	25.4	311.1	47.9
2009	80.3	12.2	731.0	112.6
2010	49.0	7.4	102.4	15.7
2011	242.0	37.0	1,212.1	186.7

	Campeche		Chiapas	
	CO_2 fires (Sensitive)	Fire CO_2 eq (CH_4, N_2O) (Sensitive)	CO_2 fires (Sensitive)	Fire CO_2 eq (CH_4, N_2O) (Sensitive)
2001	23.5	3.6	175.3	26.4
2002	11.4	1.7	96.8	14.6
2003	660.8	101.8	612.2	92.5
2004	55.9	8.6	36.1	5.4
2005	47.3	7.3	121.4	18.3
2006	68.3	10.5	34.4	5.1
2007	4.5	0.7	213.1	32.4
2008	26.7	4.1	157.4	24.0
2009	104.8	16.1	189.5	28.7
2010	6.2	0.96	130.1	19.8
2011	66.8	10.3	47.7	7.1

	Yucatán	
	CO_2 fires (Sensitive)	Fire CO_2 eq (CH_4, N_2O) (Sensitive)
2001	16.9	2.6
2002	36.8	5.6
2003	362.0	55.7
2004	56.7	8.7
2005	58.1	8.9
2006	208.0	32.0
2007	47.9	7.3
2008	132.5	20.4
2009	457.7	70.5
2010	66.5	10.2
2011	183.1	28.2

Total Area/Annualized Area

Campeche:

Deforestation

Series II (1995) to Series III (2002) period 325,271/36,141.2

Series III (2002) to Series IV (2007) period 223,711/44,742

	Series IV (2007) to Series V (2011) period 117,098/29,274.5 **Degradation** Series II to Series III period 241,282/26,809.11 Series III to Series IV period 58,901/11,780.2 Series IV to Series V period 56,534/14,133 ***<u>Chiapas:</u>*** **Deforestation:** Series II to Series III period 587,557/65,284.11 Series III to Series IV period 329,700/65,940 Series IV to Series V period 74,519/18,629 **Degradation** Series II to Series III period 512,955/56,995 Series III to Series IV period 78,641/15,728 Series IV to Series V period 7,980/1,995 ***<u>Jalisco:</u>*** **Deforestation:** Series II to Series III period 254,490/28,277 Series III to Series IV period 243,089/48,617.8 Series IV to Series V period 24,452/6,133 **Degradation** Series II to Series III period 462,122/51,346.89 Series III to Series IV period 30,565/6,113 Series IV to Series V period 849/212 ***<u>Yucatán</u>*** Deforestation: Series II to Series III period 241,259/26,806.5 Series III to Series IV period 163,858/32,771.6 Series IV to Series V period 148,089/37,022.2 **Degradation** Series II to Series III period 254,808,00/28.312 Series III to Series IV period 109,063.00/21,812.6 Series IV to Series V period 36,889.00/9,222.25 ***<u>Quintana Roo</u>*** **Deforestation:** Series II to Series III period 101,269/11,252.1 Series III to Series IV period 96,093/19.218 Series IV to Series V period 76,764/19,191 **Degradation** Series II to Series III period 275,005/30,556.11 Series III to Series IV period 167,650/33,530 Series IV to Series V period 44,948/11,237
Source of the data (e.g. official statistics) or description of the method for developing the data, including the (pre-) methods of processing the data derived from remote sensing images	INEGI’s Land Use and Vegetation Series. The main features of the Series are described in the table below.

(including the type of sensors and the details of the images used):	
Scale (local, regional, national or international):	Data have been used for national coverage performing an extraction for each State included.
Discussion on the key uncertainties for this parameter	It is used data developed with a scale for use at national level and that have not been designed to detect changes, the scale is 1:250,000 for the national level, while the current data do not meet the monitoring needs, an initiative is currently being developed to improve activity data, the Activity Data Monitoring System (MADMex) which will produce maps of cover and historical changes to cover on a scale of 1:100,000 and annual cover and change of cover maps 1:20,000. This system is specific to monitoring deforestation at national and sub-national levels.
Estimate of the accuracy, and/or level of confidence. Explanation of the assumptions and methodology for the estimation.	INEGI's Series are an official product and do not have an estimate of uncertainty. However, the data are considered to have a degree of accuracy as INEGI performs validation and verification processes with a review in the field in order to corroborate and correct certain types of vegetation photointepreted in the office. In the estimates that were carried out for the state reference level an uncertainty from activity data is not considered; however, this is a point of improvement, so CONAFOR performed a precision assessment for the AD using the coverage change maps and overlaying the INEGI Series: **Proposal for assessing uncertainty of the AD used for the IRE** In order to assess the accuracy and calculate the uncertainty of the AD generated from the INEGI Series, a Stratified Random Sampling (SRS) design was implemented. This method was used for each of the periods analyzed, i.e., for the changes generated between Series II - Series III (1993-2002), Series III - Series IV (2002-2007) and Series IV - Series V (2007-2011). Since, as has been mentioned earlier in the section about Activity Data, the information from the INEGI land-use and vegetation Series on a scale of 1:250,000 were converted from a vector format into a raster format with cell size of one hectare (100x100 m) in order to eliminate any possible errors in change of plant cover and land use due to differences in interpretation implicit in the process of digitalization and superimposition, this is why the same cell size was defined as a unit of analysis or Minimum Unit of Detection (UMD). This design has the particularity of being flexible in the distribution of samples in areas of change (Olofsson, 2013), it directly uses the Minimum Mappable Unit (MMU) which allows for the sampling of small changes and is relatively easy to implement. The effect of the costs is omitted in this proposal. Estimating the sample size In an SRS design, prior to calculating the sample size, it was necessary to define the variable of interest, the strata used, UMD, and a priori parameter information in order to estimate variance and make assumptions related to accuracy and confidence. On another note, the strata analyzed were the result of the geometric merging of the INEGI series across the three periods. The table below shows the strata and total surface area of the IRE states that were analyzed: Summary of Transition Surfaces to calculate the sample size for Campeche

CAMPECHE Superficies de transición Ha.			
ESTRATO	SII Vs. SIII	SIII Vs. SIV	SIV Vs. SV
DEFORESTACION	325,286.00	223,285.00	117,018.00
DEGRADACION	241,345.00	58,900.00	56,549.00
NO APLICA	372,291.00	480,006.00	504,244.00
PERDIDA PRADERA	30,466.00	8,641.00	11,622.00
PERMANENCIA	3,470,931.00	3,636,530.00	3,868,042.00
PERMANENCIA PRADERA	704,209.00	851,046.00	918,859.00
RECUPERACION	352,099.00	326,572.00	114,797.00
RECUPERACION PRADERA	49,312.00	7,240.00	4,596.00
REFORESTACION	181,746.00	135,465.00	131,958.00
TOTAL	5,727,685.00	5,727,685.00	5,727,685.00

Summary of Transition Surfaces to calculate the sample size for Chiapas

CHIAPAS Superficies de transición Ha.			
ESTRATO	SII Vs. SIII	SIII Vs. SIV	SIV Vs. SV
DEFORESTACION	587,516.00	329,699.00	74,495.00
DEGRADACION	512,901.00	78,642.00	7,980.00
NO APLICA	1,291,778.00	1,439,295.00	1,583,760.00
PERDIDA PRADERA	87,568.00	58,376.00	42,477.00
PERMANENCIA	3,072,629.00	3,358,121.00	3,639,828.00
PERMANENCIA PRADERA	1,459,559.00	1,754,665.00	1,979,582.00
RECUPERACION	64,871.00	116,849.00	7,594.00
RECUPERACION PRADERA	51,395.00	49,195.00	4,477.00
REFORESTACION	232,910.00	176,285.00	20,934.00
TOTAL	7,361,127.00	7,361,127.00	7,361,127.00

Summary of Transition Surfaces to calculate the sample size for Jalisco

JALISCO Superficies de transición Ha.			
ESTRATO	SII Vs. SIII	SIII Vs. SIV	SIV Vs. SV
DEFORESTACION	254,477.00	243,091.00	24,449.00
DEGRADACION	509,549.00	30,563.00	849.00
NO APLICA	1,904,283.00	2,013,138.00	2,415,862.00
PERDIDA PRADERA	81,424.00	261,473.00	20,647.00
PERMANENCIA	3,550,610.00	4,027,402.00	4,134,722.00
PERMANENCIA PRADERA	1,133,692.00	1,079,792.00	1,173,158.00
RECUPERACION	83,917.00	30,410.00	4,064.00
RECUPERACION PRADERA	91,277.00	35,041.00	6,734.00
REFORESTACION	187,390.00	75,709.00	16,134.00
TOTAL	7,796,619.00	7,796,619.00	7,796,619.00

Summary of Transition Surfaces to calculate the sample size for Quintana Roo

QUINTANA ROO Superficies de transición Ha.			
ESTRATO	SII Vs. SIII	SIII Vs. SIV	SIV Vs. SV
DEFORESTACION	101,263.00	96,103.00	76,500.00
DEGRADACION	274,987.00	167,651.00	44,944.00
NO APLICA	270,989.00	312,247.00	345,532.00
PERDIDA PRADERA	8,486.00	2,145.00	5,484.00
PERMANENCIA	3,271,626.00	3,306,522.00	3,348,494.00
PERMANENCIA PRADERA	280,602.00	314,294.00	312,869.00
RECUPERACION	207,219.00	220,840.00	258,754.00
RECUPERACION PRADERA	3,189.00	2,081.00	3,427.00
REFORESTACION	37,284.00	33,762.00	59,641.00
TOTAL	4,455,645.00	4,455,645.00	4,455,645.00

In the SRS, the sampling unit (population analysis unit) was defined as the UMD.

The SRS requires a priori information about the accuracy of the user (Ui) at the stratum level, but in our caseconservative values of 0.5 were used for all strata. Finally, in this protocol we adjusted the confidence of the sample to 95% ($\propto = 0.95$) and the total omission accuracy ($S(O)$) will have an error estimate of 0.02%.

Sample size

We will calculate the sample size conceptually followed the SRS design and is oriented to the proposal of Olofsson et al. (2013). The steps taken are described below:

1.- The structure of the matrix of confusion for the change maps obtained with the series of INEGI was conceptually defined, which must include the areas in hectares or total number of cells of each stratum and their weights (Wi) with respect to the total (see table below). The conceptual matrix and its classes it that which we can handle as the most grouped level, i.e. with stable forest and non-forest classes as well as those area of forest considered as deforestation or degradation, it should be noted that we can disaggregate further the transitions of change and stable areas to establish a greater number of classes, however this will impact on the sample size and therefore the final implementation costs.

	Strata	A1	A2	A3	A4	Total	Am, i(ha)	W_i
Map classes	A1	n11	n12	n13	n14	n1+	A1	A1/AT
	A2	n21	n22	n23	n24	n2+	A2	A2/AT
	A3	n31	n32	n33	n34	n3+	A3	A3/AT
	A4	n41	n42	n43	n44	n4+	A4	A4/AT
	Total	n+1	n+2	n+3	n+4	n	AT	

2.- After, an omission accuracy value (Ui) will be assigned per stratum.

3.- Finally, the standard deviation of the omission accuracy (Si) will be calculated for each stratum:

$$S_i = \sqrt{U_i(1 - U_i)}$$

Once Si has been calculated, the confidence level will be adjusted for the total accuracy estimate to 95% and an error of 2% (S(O)=0.02).

Finally, the total sample size will be calculated in SRS (Cochran, 1975):

$$n = \frac{(\sum W_i S_i)^2}{S(O)^2 + \left({}^{1}/_{N}\right) \sum W_i {S_i}^2}$$

Where:

W_i = Weight of each class with respect to the total of the analysis area.
S_i = Standard deviation for the omission accuracy of each stratum (previously defined)
U_i= Accuracy of the omission of each stratum i (0.5)
N = Total Area or total number of cells
$S(O)$ Total standard error

Allocation of sample size per stratum

The sample distribution method within the strata directly influences the estimates of the overall accuracy, omission and areas of change. In this sense, making an optimal Neyman assignment has been proposed to distribute the samples in the strata.

$$\boldsymbol{n_i} = n\frac{N_i\sqrt{Q_i(1-Q_i)}}{\sum N_i\sqrt{Q_i(1-Q_i)}}$$

Where:

$\boldsymbol{n_i}$ = Sample size of the stratum i
N_i= Area of the stratum i
n = Total sample size
Q_i= Accuracy of the user (0.5)

The following tables show the sample sizes for the change maps SII-SIII, SIII-SIV and SIV-SV.

Sample sizes by state and stratum for the coverage change maps Series II – Series III

	Estratos ↓ \ Estados →	Tamaño muestra (puntos)				
		Campeche	Chiapas	Jalisco	Quintana Roo	Yucatán
Serie II vs Serie III (1993 - 2002)	DEFORESTACIÓN	50	50	50	50	50
	DEGRADACIÓN	50	50	50	50	50
	NO APLICA	50	74	101	50	50
	PÉRDIDA PRADERAS	50	50	50	50	50
	PERMANENCIA	255	176	189	304	201
	PERMANENCIA PRADERA	52	83	60	50	59
	RECUPERACIÓN	50	50	50	50	86
	RECUPERACIÓN PRADERA	50	50	50	50	50
	REFORESTACIÓN	50	50	50	50	50
	TOTAL	657	633	651	704	646

Sample sizes by state and stratum for the coverage change maps Series III – Series IV

	Estratos ↓ \ Estados →	Tamaño muestra (puntos)				
		Campeche	Chiapas	Jalisco	Quintana Roo	Yucatán
Serie III vs Serie IV (2002 - 2007)	DEFORESTACIÓN	50	50	50	50	50
	DEGRADACIÓN	50	50	50	50	50
	NO APLICA	50	80	106	50	50
	PÉRDIDA PRADERAS	50	50	50	50	50
	PERMANENCIA	262	187	211	306	253
	PERMANENCIA PRADERA	61	98	57	50	68
	RECUPERACIÓN	50	50	50	50	50
	RECUPERACIÓN PRADERA	50	50	50	50	50
	REFORESTACIÓN	50	50	50	50	50
	TOTAL	674	666	673	706	671

Sample sizes by state and stratum for the coverage change maps Series IV – Series V

	Estratos ↓ \ Estados →	Tamaño muestra (puntos)				
		Campeche	Chiapas	Jalisco	Quintana Roo	Yucatán
Serie IV vs Serie V (2007 – 2011)	DEFORESTACIÓN	50	50	50	50	50
	DEGRADACIÓN	50	50	50	50	50
	NO APLICA	50	87	124	50	50
	PÉRDIDA PRADERAS	50	50	50	50	50
	PERMANENCIA	275	199	213	308	230
	PERMANENCIA PRADERA	65	108	60	50	71
	RECUPERACIÓN	50	50	50	50	64
	RECUPERACIÓN PRADERA	50	50	50	50	50
	REFORESTACIÓN	50	50	50	50	50
	TOTAL	691	693	697	708	664

In the case of the areas of change due to the fact that they are small zones in relation to the total area, the sample size is very small, however between 50 and 100 samples can be adjusted in these areas and this will not affect the overall calculations of accuracy due to the fact that estimators of the random sample stratified are not distorted on increasing the sample size in small strata; on the other hand, these have a favourable effect on reducing the standard error of overall accuracy and user accuracy.

Response design

One of the most renowned experts in Mexico performed the visual interpretation of the samples, basing the interpretation on the satellite images that were used to build the INEGI maps.

Accuracy estimators, adjustment of areas and calculation of uncertainties

Finally, once the points were interpreted, the confusion matrices were constructed and the AD uncertainties estimated, using the methodology proposed in Olofsson et al. (2014).

1.- After calculating the sample size previously exposed and after the respective analysis and interpretation of images of equal resolution compared with those used as an input for generating the Series (Landsat with spatial resolution of 30 x 30 m), the confusion matrix was filled in for the count of samples correctly and incorrectly classified per stratum (see the following table):

Example of the confusion matrix.

Class	1	2	…	q	Total
1	n_{11}	n_{12}	…	n_{1q}	$n_{1\cdot}$
2	n_{21}	n_{22}	…	n_{2q}	$n_{2\cdot}$
⋮	⋮	⋮	⋱	⋮	⋮
q	n_{q1}	n_{q2}	…	n_{qq}	$n_{q\cdot}$
Total	$n_{\cdot 1}$	$n_{\cdot 2}$	…	$n_{\cdot q}$	n

2.- The matrix of the area proportions (see the table below), of the boxes ij (row i, column j) of the confusion matrix shown was obtained, with: $\hat{p}_{ij} = W_i \frac{n_{ij}}{n_{i.}}$.

Example of the confusion matrix of proportions

Class	1	2	…	q	Total
1	$\hat{p}_{11}$	$\hat{p}_{12}$	…	$\hat{p}_{1q}$	$\hat{p}_{1\cdot}$
2	$\hat{p}_{21}$	$\hat{p}_{22}$	…	$\hat{p}_{2q}$	$\hat{p}_{2\cdot}$
⋮	⋮	⋮	⋱	⋮	⋮
q	$\hat{p}_{q1}$	$\hat{p}_{q2}$	…	$\hat{p}_{qq}$	$\hat{p}_{q\cdot}$
Total	$\hat{p}_{\cdot 1}$	$\hat{p}_{\cdot 2}$	…	$\hat{p}_{\cdot q}$	1

With the information obtained in the previous table we proceeded to calculate themed accuracy with:

Accuracy of the user: $\widehat{U}_i = \frac{\hat{p}_{ii}}{\hat{p}_{.i}}$

Accuracy of the producer: $\widehat{P}_i = \frac{\hat{p}_{jj}}{\hat{p}_{j.}}$

Total Accuracy: $\widehat{O} = \sum_{i=1}^{q} \hat{p}_{ii}$

3.- From the calculation of the table, the unbiased estimators for areas ($\widehat{A}_j$) were obtained for each stratum j:

$$\widehat{A}_j = A_{tot} \times \hat{p}_{.j}$$

Where:

$$\hat{p}_{.j} = \sum_{i=1}^{j} W_i \frac{n_{ij}}{n_{i.}}$$

4.- Finally, we estimated the standard error of the adjusted area ($\widehat{A}_j$), half of the confidence intervals of $\widehat{A}_j$ and the uncertainty of $\widehat{A}_j$:

Standard error of the area adjusted:

$$S(\widehat{A}_j) = A_{tot} \times S(\hat{p}_{.j})$$

Where:

$$S(\hat{p}_{\cdot j}) = \sqrt{\sum_{i=1}^{q} W_i^2 \frac{\frac{n_{ij}}{n_{i.}}\left(1-\frac{n_{ij}}{n_{i.}}\right)}{n_{i.}-1}}.$$

Half of the confidence interval:

$$CI_{1/2} = 1.96 \times S(\hat{A}_j)$$

Uncertainty in the adjusted area:

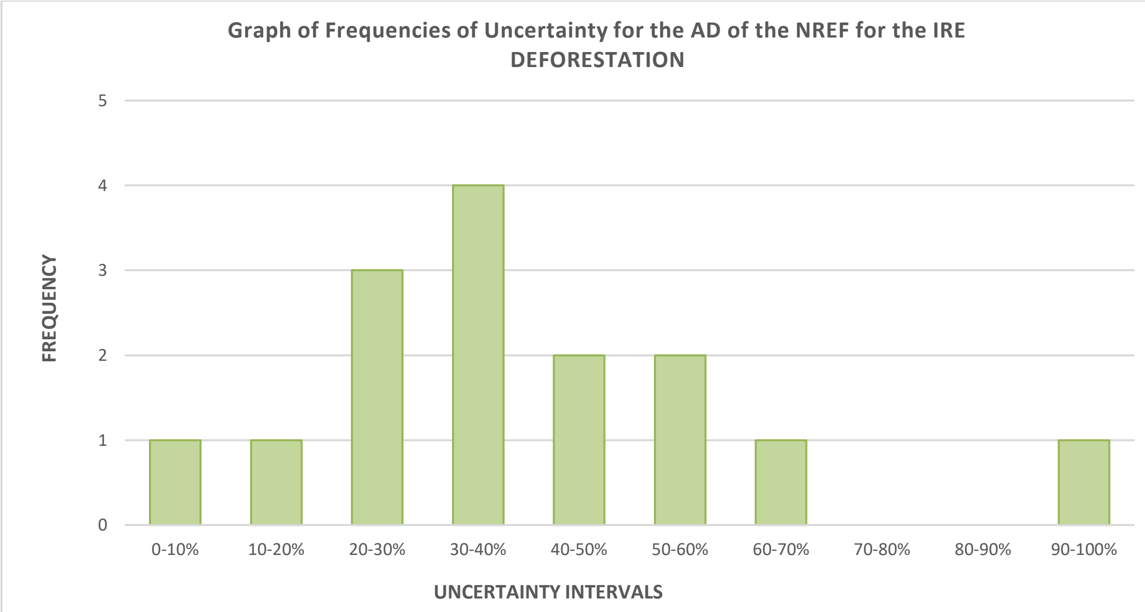
$$U_j = {CI_{1/2}}/{\hat{A}_j}$$

The detailed methodological description of the estimation of uncertainty for the Activity Data is described greater detail in the document titled, "Estimating the Uncertainties of the Activity Data for Mexico's Emissions Reduction Initiative Reference Levels."

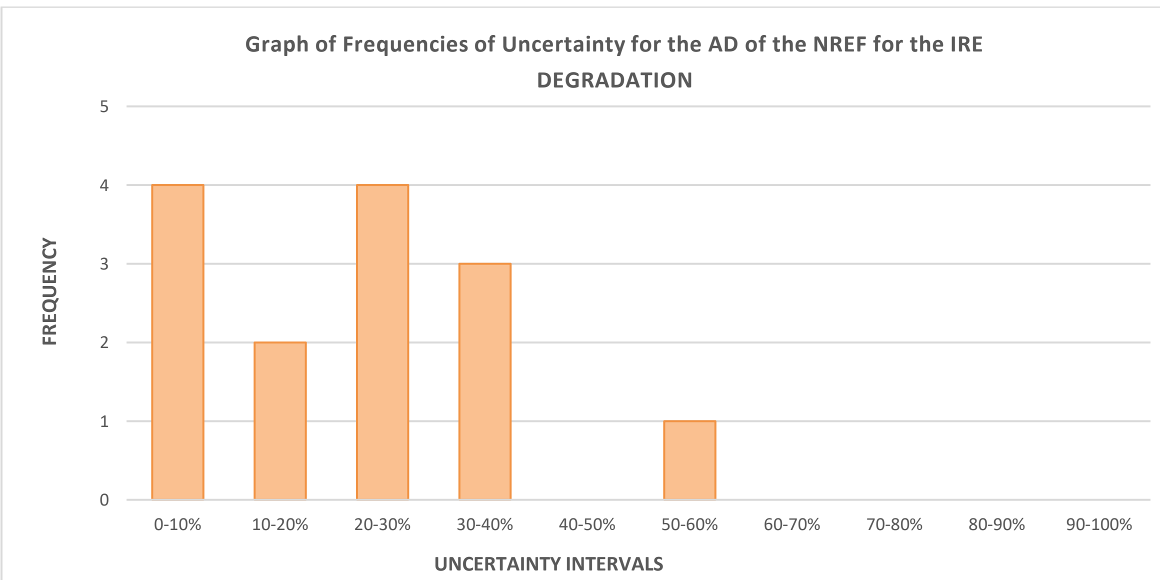
After calculating the sample sizes, visually interpreting the samples, building the error matrices, and following the procedure outlined above, the following results were obtained. These results are summarized in the table below, containing the AD uncertainties for each state and the change map by type of transition.

CLASS	CAMPECHE			CHIAPAS			JALISCO			Q. ROO			YUCATÁN		
	Map 1	Map 2	Map 3	Map 1	Map 2	Map 3	Map 1	Map 2	Map 3	Map 1	Map 2	Map 3	Map 1	Map 2	Map 3
	SII - SIII	SIII - SIV	SIV - SV	SII - SIII	SIII - SIV	SIV - SV	SII - SIII	SIII - SIV	SIV - SV	SII - SIII	SIII - SIV	SIV - SV	SII - SIII	SIII - SIV	SIV - SV
DEFORESTATION	24	4	7	22	49	28	52	61	100	55	34	36	45	32	39
DEGRADATION	30	0	9	21	29	33	18	65	166	9	6	36	10	14	34
PRAIRIE LOSS	56	100	0	38	44	42	50	63	39	32	30	18	34	28	47
PERSISTENCE	6	2	1	5	4	3	5	3	3	2	1	2	3	2	2
PRAIRIE PERSISTENCE	18	8	5	5	5	3	9	9	9	11	9	11	5	4	3
RECOVERY	25	13	20	21	33	34	81	104	47	16	6	14	3	3	6
PRAIRIE RECOVERY	56	126	0	51	65	53	80	112	111	76	50	65	25	159	88
REFORESTATION	30	5	17	29	52	54	145	NA	185	46	98	50	21	56	63
NOT APPLICABLE	15	19	8	11	9	8	12	8	10	8	8	10	17	24	32

Pursuant to these results, it emerges that most of the uncertainties for the deforestation transition fluctuate in the interval of 20 to 40%, as shown in the following bar chart.



Moreover, the same results table shows that most of the uncertainties for the degradation transition fluctuate in the interval of 10 to 40%, as shown in the following bar chart:



Once the uncertainty of the Activity Data has been calculated, this information will be incorporated in the total propagation of uncertainties, so now there are algorithms (software in the statistical package R, scripts developed by CONAFOR) in order to propagate them. These algorithms are based on Method 1 and on the Method of Digital Simulation known as the IPCC Monte Carlo Method. These algorithms were developed using the experience gained on constructing the national Forest Emissions Reference Level, and their target is the INEGEI report at the 6th National Communication.

8.4.2 Emission Factors

Please provide an overview of the emission factors that are available and of those that were used in calculating the average annual historical emissions over the Reference Period in a way that is sufficiently detailed to enable the reconstruction of the average annual historical emissions over the Reference Period. Use the table provided (copy table for each parameter). Attach any spreadsheets, spatial information, maps and/or synthesized data used in the *development of the parameter and if applicable, a summary of assumptions, methods and results of any underlying studies.*

If different data sources exist for the same parameter, please list these under the 'Sources of data'. In this case, discuss the differences and provide justification why one specific dataset has been selected over the others.

*Refer to **criterion 6, 7, 8 and 9** of the Methodological Framework*

The detailed methodological description of Emission Factors is described in section 8.3.2
Below are the Emission Factors by deforestation and degradation to each IRE State.

Campeche

Emission Factors due to deforestation

		EF of DEFORESTATION - CARBON IN AERIAL BIOMASS			EF of DEFORESTATION - CARBON IN UNDERGROUND BIOMASS			TOTAL (Aerial+underground biomass)
Type of National Vegetation	Type of National Vegetation (Initials)	EF of living trees (Ton/ha)	Uncertainty (%)	Source of the data	EF of living trees (ton/ha)	Uncertainty (%)	Source of the data	ton/ha
Primary Oak Forest	OF/P	20.0	3	NATIONAL	5.0	3	NATIONAL	24,999
Primary Deciduous Tropical Forest	DR/P	21.7	22	Campeche	5.3	21	Campeche	27,025
Primary Evergreen Tropical Forest	ER/P	37.2	5	Campeche	8.9	5	Campeche	46,036
Primary Semi-Deciduous Tropical Forest	SDR/P	28.2	7	Campeche	6.9	7	Campeche	35,100
Primary Hydrophilic Woody Vegetation	HWV/P	22.1	30	Campeche	5.3	29	Campeche	27,369
Secondary Oak Forest	OF/S	14.4	5	NATIONAL	3.7	5	NATIONAL	18,050
Secondary Special Other Woody Types	SOWT/S	5.7	43	NATIONAL	1.5	41	NATIONAL	7,168
Secondary Deciduous Tropical Forest	DR/S	5.5	40	Yucatán	1.5	37	Yucatán	6,979
Secondary Evergreen Tropical Forest	ER/S	22.2	23	Campeche	5.4	22	Campeche	27,627
Secondary Semi-Deciduous Tropical Forest	SDR/S	24.2	28	Campeche	5.9	26	Campeche	30,178
Secondary Hydrophilic Woody Vegetation	HWV/S	5.2	57	NATIONAL	1.4	55	NATIONAL	6,599

Emission Factors due to degradation

		Series 2 to Series 3				Series 3 to Series 4				Series 4 to Series 5				
Final land use		EF Aerial Biomass		EF Underground Biomass		EF Aerial Biomass		EF Underground Biomass		EF Aerial Biomass		EF Underground Biomass		Data source
Forest land/Subcategory of Report		EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	
Primary Oak Forest	OF/P	1.7	84.0	0.4	79.5	3.2	71.4	0.8	64.6	4.2	68.0	1.0	67.8	NATIONAL
Primary Deciduous Tropical Forest	DR/P	2.	124.6	0.6	112.0	3.	108.9	1.0	92.9	5.	104.6	1.2	97.0	Campeche

		3				9				0				
Primary Evergreen Tropical Forest	ER/P	2.5	124.4	0.6	112.3	5.3	90.9	1.4	77.0	7.2	83.5	1.6	83.6	Campeche
Primary Semi-Deciduous Tropical Forest	SDR/P	2.2	104.4	0.5	92.2	4.3	79.6	1.1	66.3	5.7	73.7	1.3	71.3	Campeche
Primary Hydrophilic Woody Vegetation	HWV/P	2.3	174.4	0.5	151.4	3.9	135.3	1.0	110.8	5.0	125.9	1.2	118.7	Campeche

Chiapas

Emission Factors due to deforestation

		EF of DEFORESTATION - CARBON IN AERIAL BIOMASS			EF of DEFORESTATION - CARBON IN UNDERGROUND BIOMASS			Total (Aerial+underground biomass)
Type of National Vegetation	Type of National Vegetation (Initials)	EF of living trees (Ton/ha)	Uncertainty (%)	Source of the data	EF of living trees (ton/ha)	Uncertainty (%)	Source of the data	(ton C/ha)
Primary Coniferous Forest	COF/P	30.7	13	Chiapas	7.3	12	Chiapas	38,038
Primary Oak Forest	OF/P	26.2	21	Chiapas	6.5	20	Chiapas	32,738
Primary Mountain Mesophilic Forest	MF/P	27.6	22	Chiapas	6.8	21	Chiapas	34,334
Primary Deciduous Tropical Forest	DR/P	10.7	17	Oaxaca	2.8	16	Oaxaca	13,450
Primary Evergreen Tropical Forest	ER/P	32.8	14	Chiapas	7.7	13	Chiapas	40,546
Primary Semi-Deciduous Tropical Forest	SDR/P	20.3	43	Oaxaca	5.0	40	Oaxaca	25,238
Primary Hydrophilic Woody Vegetation	HWV/P	33.4	40	Chiapas	7.9	38	Chiapas	41,304
Secondary Coniferous Forest	COF/S	22.2	18	Chiapas	5.4	17	Chiapas	27,589
Secondary Oak Forest	OF/S	20.3	28	Chiapas	5.1	26	Chiapas	25,395
Secondary Mountain Cloud Forest	MF/S	18.9	40	Chiapas	4.7	38	Chiapas	23,608
Secondary Special Other Woody Types	SOWT/S	5.7	43	NATIONAL	1.5	41	NATIONAL	7,168
Secondary Deciduous Tropical Forest	DR/S	11.2	46	Chiapas	2.8	44	Chiapas	14,054
Secondary Evergreen Tropical Forest	ER/S	14.1	26	Chiapas	3.5	25	Chiapas	17,622
Secondary Semi-Deciduous Tropical Forest	SDR/S	11.4	23	Oaxaca	2.9	22	Oaxaca	14,351
Secondary Hydrophilic Woody Vegetation	HWV/S	5.2	57	NATIONAL	1.4	55	NATIONAL	6,599

Emission Factors due to degradation

		Series 2 to Series 3				Series 3 to Series 4				Series 4 to Series 5				
Final land use		EF Aerial Biomass		EF Underground Biomass		EF Aerial Biomass		EF Underground Biomass		EF Aerial Biomass		EF Underground Biomass		Data source
Forest land/Subcategory of Report		EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	
Primary Coniferous Forest	COF/P	2.	73.3	0.7	65.9	5.	61.9	1.2	58.2	6.		1.6	56.1	Chiapas

		8				1				6				
Primary Oak Forest	OF/P	2.5	84.0	0.6	79.5	4.4	68.0	1.1	67.8	5.8	71	1.4	64.6	Chiapas
Primary Mountain Mesophilic Forest	MF/P	1.4	119.2	0.4	103.0	3.5	85.2	0.9	80.2	4.9		1.2	74.7	Chiapas
Primary Deciduous Tropical Forest	DR/P	0.9	124.6	0.2	112.0	1.7	104.6	0.5	97.0	2.3	109	0.6	92.9	Oaxaca
Primary Evergreen Tropical Forest	ER/P	2.0	124.4	0.5	112.3	4.4	83.5	1.0	83.6	6.1	91	1.4	77.0	Chiapas
Primary Semi-Deciduous Tropical Forest	SDR/P	1.2	104.4	0.3	92.2	2.7	73.7	0.7	71.3	3.7	80	0.9	66.3	Oaxaca
Primary Hydrophilic Woody Vegetation	HWV/P	3.7	174.4	0.9	151.4	6.2	125.9	1.5	118.7	7.8	135	1.9	110.8	Chiapas

Jalisco

Emission Factors due to deforestation

		AERIAL BIOMASS			ROOT BIOMASS		
Type of National Vegetation	Type of National Vegetation (Initials)	EF of living trees (ton/ha/year)	Uncertainty (%)	Source of the data	EF of living trees (ton/ha/year)	Uncertainty (%)	Source of the data
Primary Coniferous Forest	COF/P	37.63	7	Jalisco	8,905	7	Jalisco
Primary Oak Forest	OF/P	24.58	8	Jalisco	6,145	7	Jalisco
Primary Mountain Mesophilic Forest	MF/P	37.39	10	NATIONAL	8,933	10	NATIONAL
Primary Special Other Woody Types	SOWT/P	8.639893652	64.71205816	NATIONAL	2.110175463	61.52896612	NATIONAL
Primary Xeric Woody Shrubland	XWS/P	1.72	11	NATIONAL	0,475	10	NATIONAL
Primary Deciduous Tropical Forest	DR/P	15.04	20	Jalisco	3,763	18	Jalisco
Primary Evergreen Tropical Forest	ER/P						
Primary Semi-Deciduous Tropical Forest	SDR/P	27.05	17	Jalisco	6,667	16	Jalisco
Primary Hydrophilic Woody Vegetation	HWV/P	9.91	23	NATIONAL	2,427	22	NATIONAL
Secondary Coniferous Forest	COF/S	25.87	16	Jalisco	6,223	16	Jalisco
Secondary Oak Forest	OF/S	19.79	11	Jalisco	5,031	11	Jalisco
Secondary Mountain Cloud Forest	MF/S	17.83	20	NATIONAL	4,399	19	NATIONAL
Secondary Special Other Woody Types	SOWT/S	5.67	43	NATIONAL	1,494	41	NATIONAL
Secondary Xeric Woody Shrubland	XWS/S	1.32	29	NATIONAL	0,368	27	NATIONAL
Secondary Deciduous Tropical Forest	DR/S	9.18	18	Jalisco	2,359	17	Jalisco
Secondary Evergreen Tropical Forest	ER/S						
Secondary Semi-Deciduous Tropical Forest	SDR/S	18.37	22	Jalisco	4,584	20	Jalisco
Secondary Hydrophilic Woody Vegetation	HWV/S	5.24	57	NATIONAL	1,354	55	NATIONAL
Secondary Hydrophilic	HnWV/S						

Non-Woody Vegetation							

Emission Factors due to degradation

			Series 2 to Series 3				Series 3 to Series 4				Series 4 to Series 5			
Final land use			EF Aerial Biomass		EF Underground Biomass		EF Aerial Biomass		EF Underground Biomass		EF Aerial Biomass		EF Underground Biomass	
Forest land/Subcategory of Report			EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)
Primary Coniferous Forest	COF/P		3.6	73.3	0.9	65.9	6.4	64.4	1.6	56.1	8.3	61.9	1.9	58.2
Primary Oak Forest	OF/P	OF/P	2.3	84.0	0.6	79.5	4.1	71.4	1.1	64.6	5.4	68.0	1.3	67.8
Primary Mountain Mesophilic Forest	MF/P		2.7	119.2	0.6	103.0	5.5	91.7	1.4	74.7	7.3	85.2	1.6	80.2
Primary Xeric Woody Shrubland	XWS/P		0.1	514.1	0.0	477.6	0.2	355.8	0.1	298.6	0.3	322.7	0.1	329.4
Primary Deciduous Tropical Forest	DR/P	DR/P	1.5	124.6	0.4	112.0	2.6	108.9	0.7	92.9	3.3	104.6	0.8	97.0
Primary Semi-Deciduous Tropical Forest	SDR/P	SDR/P	2.0	104.4	0.5	92.2	4.1	79.6	1.1	66.3	5.4	73.7	1.3	71.3
Primary Hydrophilic Woody Vegetation	HWV/P	HWV/P	0.7	174.4	0.2	151.4	1.5	135.3	0.4	110.8	2.0	125.9	0.5	118.7

Quintana Roo

Emission Factors due to deforestation

		EF of DEFORESTATION - CARBON IN AERIAL BIOMASS			EF of DEFORESTATION - CARBON IN UNDERGROUND BIOMASS			Total (Aerial+underground biomass)
Type of National Vegetation	Type of National Vegetation (Initials)	EF of living trees (Ton/ha)	Uncertainty (%)	Source of the data	EF of living trees (ton/ha)	Uncertainty (%)	Source of the data	ton/ha
Primary Special Other Woody Types	SOWT/P	8.6	65	NATIONAL	2.1	62	NATIONAL	10,750
Primary Deciduous Tropical Forest	DR/P	10.7	25	Yucatán	2.7	23	Yucatán	13,442
Primary Evergreen Tropical Forest	ER/P	39.9	4	Quintana Roo	9.5	4	Quintana Roo	49,371
Primary Semi-Deciduous Tropical Forest	SDR/P	33.1	14	Quintana Roo	8.0	13	Quintana Roo	41,057
Primary Hydrophilic Woody Vegetation	HWV/P	1.3	69	Quintana Roo	0.4	68	Quintana Roo	1,717
Secondary Special Other Woody Types	SOWT/S	5.7	43	NATIONAL	1.5	41	NATIONAL	7,168
Secondary Evergreen Tropical Forest	ER/S	19.8	15	Quintana Roo	4.8	15	Quintana Roo	24,612

Secondary Semi-Deciduous Tropical Forest	SDR/S	7.8	47	Quintana Roo	2.0	44	Quintana Roo	9,786
Secondary Hydrophilic Woody Vegetation	HWV/S	5.2	57	NATIONAL	1.4	55	NATIONAL	6,599

Emission Factors due to degradation

			Series 2 to Series 3				Series 3 to Series 4				Series 4 to Series 5			
Final land use			EF Aerial Biomass		EF Underground Biomass		EF Aerial Biomass		EF Underground Biomass		EF Aerial Biomass		EF Underground Biomass	
Forest land/Subcategory of Report			EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)
Primary Deciduous Tropical Forest	DR/P	DR/P	0.9	124.6	0.2	112.0	1.7	108.9	0.5	92.9	2.2	108.9	0.6	92.9
Primary Evergreen Tropical Forest	ER/P	ER/P	2.8	124.4	0.7	112.3	5.8	90.9	1.5	77.0	7.3	90.9	1.9	77.0
Primary Semi-Deciduous Tropical Forest	SDR/P	SDR/P	2.8	104.4	0.7	92.2	5.3	79.6	1.3	66.3	6.6	79.6	1.7	66.3

Yucatán

Emission Factors of deforestation

		EF of DEFORESTATION - CARBON IN AERIAL BIOMASS			EF of DEFORESTATION - CARBON IN UNDERGROUND BIOMASS			Total (Aerial+underground biomass)
Type of National Vegetation	Type of National Vegetation (Initials)	EF of living trees (Ton/ha)	Uncertainty (%)	Source of the data	EF of living trees (ton/ha)	Uncertainty (%)	Source of the data	ton/ha
Primary Deciduous Tropical Forest	DR/P	10.7	25	Yucatán	2.7	23	Yucatán	13,442
Primary Evergreen Tropical Forest	ER/P	24.1	28	Yucatán	5.9	26	Yucatán	29,949
Primary Semi-Deciduous Tropical Forest	SDR/P	19.2	8	Yucatán	4.8	8	Yucatán	23,948
Primary Hydrophilic Woody Vegetation	HWV/P	22.1	30	Campeche	5.3	29	Campeche	27,369
Secondary Special Other Woody Types	SOWT/S	5.7	43	NATIONAL	1.5	41	NATIONAL	7,168
Secondary Deciduous Tropical Forest	DR/S	5.5	40	Yucatán	1.5	37	Yucatán	6,979
Secondary Evergreen Tropical Forest	ER/S	19.8	15	Quintana Roo	4.8	15	Quintana Roo	24,612
Secondary Semi-Deciduous Tropical Forest	SDR/S	9.2	15	Yucatán	2.4	14	Yucatán	11,600
Secondary Hydrophilic Woody Vegetation	HWV/S	5.2	57	NATIONAL	1.4	55	NATIONAL	6,599

Emission Factors due to degradation

			Series 2 to Series 3				Series 3 to Series 4				Series 4 to Series 5				
Final land use			EF Aerial Biomass		EF Underground Biomass		EF Aerial Biomass		EF Underground Biomass		EF Aerial Biomass		EF Underground Biomass		Data source
Forest land/Subcategory of Report			EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	EF (ton C)	Uncertainty (%)	
Primary Deciduous Tropical Forest	DR/P	DR/P	0.9	124.6	0.2	112.0	1.7	108.9	0.5	92.9	2.3	104.6	0.5	97.0	Yucatán
Primary Evergreen Tropical Forest	ER/P	ER/P	0.9	124.4	0.2	112.3	2.7	90.9	0.8	77.0	3.9	83.5	0.9	83.6	Yucatán
Primary Semi-Deciduous Tropical Forest	SDR/P	SDR/P	1.1	104.4	0.3	92.2	2.5	79.6	0.7	66.3	3.5	73.7	0.8	71.3	Yucatán
Primary Hydrophilic Woody Vegetation	HWV/P	HWV/P	2.3	174.4	0.5	151.4	3.9	135.3	1.0	110.8	5.0	125.9	1.2	118.7	Campeche

<table>
<tr><td>Description of the parameter including, if applicable, the classification of vegetation types</td><td>The Emission Factors were estimated in the five States separated between primary and secondary, from the data of the National Forest and Soils Inventory by estimating the carbon content that exists per hectare according the type of vegetation that was selected to represent the forest lands according to the classification used in the national FREL.
The following vegetation types were defined:
<table>
<tr><th>Forest land/Subcategory of Report</th><th></th></tr>
<tr><td>Primary Coniferous Forest</td><td>COF/P</td></tr>
<tr><td>Primary Oak Forest</td><td>OF/P</td></tr>
<tr><td>Primary Mountain Mesophilic Forest</td><td>MF/P</td></tr>
<tr><td>Primary Special Other Woody Types</td><td>SOWT/P</td></tr>
<tr><td>Primary Xeric Woody Shrubland</td><td>XWS/P</td></tr>
<tr><td>Primary Deciduous Tropical Forest</td><td>DR/P</td></tr>
<tr><td>Primary Evergreen Tropical Forest</td><td>ER/P</td></tr>
<tr><td>Primary Semi-Deciduous Tropical Forest</td><td>SDR/P</td></tr>
<tr><td>Primary Hydrophilic Woody Vegetation</td><td>HWV/P</td></tr>
<tr><td>Secondary Coniferous Forest</td><td>COF/S</td></tr>
<tr><td>Secondary Oak Forest</td><td>OF/S</td></tr>
<tr><td>Secondary Mountain Cloud Forest</td><td>MF/S</td></tr>
<tr><td>Secondary Special Other Woody Types</td><td>SOWT/S</td></tr>
<tr><td>Secondary Xeric Woody Shrubland</td><td>XWS/S</td></tr>
<tr><td>Secondary Deciduous Tropical Forest</td><td>DR/S</td></tr>
<tr><td>Secondary Evergreen Tropical Forest</td><td>ER/S</td></tr>
<tr><td>Secondary Semi-Deciduous Tropical Forest</td><td>SDR/S</td></tr>
<tr><td>Secondary Hydrophilic Woody Vegetation</td><td>HWV/S</td></tr>
</table></td></tr>
<tr><td>Unit (e.g. t CO_2/ha):</td><td>ton C/ha</td></tr>
<tr><td>Parameter value:</td><td>Emission Factors for degradation and deforestation used in each State</td></tr>
</table>

Source of the data (e.g. Official statistics, IPCC, scientific literature) or description of the assumptions, methods and results of studies used to determine this parameter:	The main sources of information are: (a)The INFYS is the main input; it comprises 26,220 plots systematically distributed throughout the country in 5x5 km areas in forests and rainforests, 10x10 km in semi-arid communities and 20x20 km in arid communities. Each plot comprises four sub-plots with an area of 0.04 hectares that is the area where the field dasometric information is collected (CONAFOR, 2012). b) Databases of allometric equations[113] c) Carbon fraction databases. d) Official information on forest fires
Scale (local, regional, national or international):	Emission factors were calculated for each of the states, in cases where the sample was less than 15 sampling sites, the EF of a neighboring State has been used or failing that the national EF. The upper table indicates that factors have been taken from another state or at national level.
Uncertainties associated with this parameter	The uncertainties associated with the emission factors were calculated for each one, the upper table shows the EFs and their associated uncertainties[114].
Estimate of the accuracy, and/or level of confidence. Explanation of the assumptions and methodology for the estimation	The table for deforestation and degradation includes the uncertainty estimate for each emission factor The propagation of uncertainties was carried out on the basis of the combination of uncertainties of annual variations of Carbon from each transition grouped by the transition from "Forest Land" to "Other Uses". To combine the uncertainties of annual variations of Carbon at transition level, first the uncertainties of each variation were estimated by subcategory (Carbon from aerial woody biomass and in roots). To do this, the EFs and their respective uncertainties estimated in the Emission Factors section were taken as inputs, which are reported for the vegetation types (classes) defined in the Activity Data (AD) section. The propagation method used is the analytical method (Method 1: Error propagation) of the IPCC (2006) because it is a method that is easy to deploy and is suitable for the information on EFs currently available. It is worth mentioning that there is currently no Activity Data uncertainty, which is one of reasons why Method 1 of the IPCC was used. Consequently, the entire propagation of uncertainties at all levels was carried out by consecutively implementing the combination of uncertainties for the addition and subtraction as indicated by the IPCC in one of the combination options of Method 1.

8.5. Adjustments to the average annual historical emissions during the reference period (if applicable)

No change will be made.

8.6. Estimated Reference Level of the Emissions Reduction Initiative (IRE)

It was used the good practice guidance for land use, land-use change and forestry 2003, Chapters 2 and 3 mainly. And the 2006 IPCC guidelines for national greenhouse gas inventories for the estimation of uncertainty.

Estimates of annual emissions were made for each of the five States representing the sum of the emissions from deforestation and degradation (including by forest fires of fire-sensitive ecosystems[115]). The historical average of the years included within the historical period is presented (simple average). No adjustments have been made.

[113] See equations in the models library: http://goo.gl/T6lcQJ

[114] For more information about processes, methodologies and the development of tools for estimating the annual emission factors of GHG and uncertainties, EF assignment by type of dynamic, propagation of uncertainties in the land use, land-use change and forestry (LULUCF) sector, in accordance with the decisions of the UNFCCC, following the methodological guidelines of the Intergovernmental Panel on Climate Change (IPCC, 2003) see the Protocol for estimating Carbon Stocks in Forest Biomass in Annex 8.

[115] Fires in fire-sensitive ecosystems are those described in Official Mexican Standard NOM-015-SEMARNAT/SAGARPA-2007

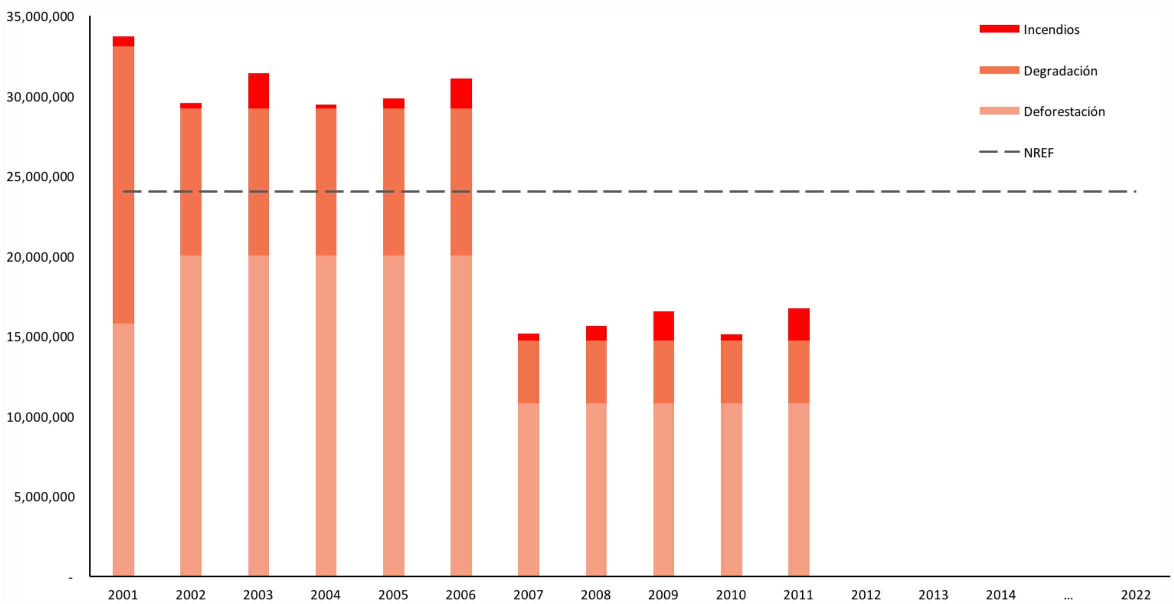


Figure 34: Forest Emissions Reference Level of the Emissions Reduction Initiative

Tabla 75. Forest Emissions Reference Level of the Emissions Reduction Initiative

Year	Emissions due to deforestation in tCO_2e	Uncertainty (%)	Emissions due to degradation in tCO_2e	Uncertainty (%)	Emissions due to fires in tCO_2e CO_2, CH4, N2O	Total emissions in tCO_2e	Uncertainty (%)
2001	15,773,769	2	17,299,310	28	613,020	33,686,099	15
2002	20,040,957	2	9,163,773	37	322,885	29,527,614	12
2003	20,040,957	2	9,163,773	37	2,190,077	31,394,806	12
2004	20,040,957	2	9,163,773	37	255,365	29,460,095	12
2005	20,040,957	2	9,163,773	37	636,498	29,841,228	12
2006	20,040,957	2	9,163,773	37	1,874,909	31,079,638	12
2007	10,774,240	2	3,932,061	32	460,792	15,167,093	9
2008	10,774,240	2	3,932,061	32	916,627	15,622,928	9
2009	10,774,240	2	3,932,061	32	1,803,823	16,510,124	9
2010	10,774,240	2	3,932,061	32	408,721	15,115,022	9
2011	10,774,240	2	3,932,061	32	2,021,387	16,727,688	9
Promedio	15,440,886	1	7,525,317	11	1,045,828	**24,012,031**	**4**

The Reference Level for the Emissions Reduction Initiative is 24,012,031 tCO_2e with an uncertainty of 4%.

Update of the forest emission reference levels based on the adjusted areas obtained in estimating the Activity Data uncertainties

As a result of estimating the AD uncertainties for the IRE NREFs, the following unbiased AD areas were obtained. As such, CONAFOR proceeded to recalculate the NREFs for each state based on these unbiased areas found in this analysis. In addition to this improvement, the institution also has a strategy to improve the spatial resolution of the ADs using the software program MAD-Mex, so the NREFs were subsequently recalculated using this new approach. Accordingly, in order to achieve the two objectives, the following table summarizes the timeline of steps to perform, first for the NREFs based on the adjusted areas resulting fro, the assessment of thematic precision on the coverage change maps obtained by overlaying the INEGI maps and, second, the recalculation of the NREFs using the AD obtained with MADMex:

Activities	**2016**	**2017**												**2018**					
	Dec	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**
Evaluation of thematic precision of the AD (using INEGI) of the NREs for the IRE states	**X**	**X**	**X**	**X**	**X**														
Feedback from the World Bank on the evaluation of thematic precision of the AD (using INEGI) of the NREs for the IRE states							**X**	**X**	**X**										
Recalculate the IEEGEI and NRE for the five IRE states based on the unbiased areas and the AD uncertainties (using INEGI) resulting from the evaluation of the thematic precision.										**X**	**X**	**X**							
Recalculate the reduction of emissions for the five IRE states												**X**	**X**						
Develop coverage change maps (2000-2003 and 2003-2011) with MADMex													**X**	**X**					
Evaluate the thematic precisión of the coverage change maps (2000-2003 and 2003-2011) developed with MAD-Mex														**X**	**X**	**X**	**X**		
Feedback from the World Bank on the evaluation of the thematic precision of the AD (using MAD-Mex) of the NREs for the IRE states																	**X**	**X**	**X**
Recalculate the IEEGEI and NRE for the five IRE states based on the unbiased areas and the AD uncertainties (Using MAD-Mex) resulting from the evaluation of the thematic precision.																**X**	**X**	**X**	**X**

To recalculate the NREFs using the AD generated by MAD-Mex, there are a series of steps that must be taken to operate the tool. These steps are described in the timeline below:

Activities	2016					2017												2018			
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Develop the reference maps for the IRE states	X	X	X	X	X	X	X	X	X												
Manage and hire MAD-Mex software developers					X	X	X														
Improve MAD-Mex (Add the Landsat 8 sensor)								X	X	X	X	X	X	X							
Establish definitions I (scale, minimum sampling unit, thematic resolution, time series, training areas, pilot areas)									X	X	X										
Capacity-building in using, administering, and developing MAD-Mex (follow-up on improvement products, Python workshop, stay for developers at CONAFOR)											X	X	X	X	X	X	X				
Establish definitions ll (definitions as to changing soil use, degradation, and design of responses for evaluating the thematic precision)														X	X						
Validate a layer of coverage changes (based on the official Series VI and the change map of Series VI developed by CONAFOR)															X	X					
Calibrate MAD-MEX based on the definitions of coverage change established by CONAFOR															X	X	X				
Develop the coverage change maps (2000-2003 and 2003-2011) with MADMex calibrated for each of the five IRE states																	X	X			
Evaluate the thematic precision of the coverage change maps (2000-2003 and 2003-2011) for each of the five IRE states																		X	X	X	X

8.7. Relationship between the Reference Level, the Forest Reference Emission Level/Forest Reference Level (FREL/FRL), and the existing or under development national greenhouse gases inventory

Please explain how the development of the Reference Level can inform or is informed by the development of a national FREL/FRL, and explains the relationship between the Reference Level and any intended submission of a FREL/FRL to the UNFCCC. In addition, please explain what steps are intended for the Reference Level to achieve consistency with the country's existing or emerging greenhouse gas inventory.

Refer to ***criterion 10, indicators 10.2 and 10.3*** *of the Methodological Framework*

The reference level presented by Mexico to the UNFCCC in December 2014, that has been adjusted in accordance with UNFCCC reviewer changes in 2015, and published in November 2015,[116] was calculated on the basis of National Greenhouse Gas Emissions Inventory estimations produced for the Land Use, Land-Use Change and Forestry (LULUCF) sector of the Biennial Update Report (BUR). The methodology used for calculating the state reference levels was the same, but also takes state Emission Factors into consideration, and enables calculations to be more representative of the real situation at state level. See section 9 for more details.

It is important to mention that all state authorities establish their State GHG Inventories[117] utilizing the same method presented, in order to maintain National and Sub-national consistency.

9. Approach for Measurement, Monitoring and Reporting

9.1. Approach for Measurement, Monitoring and Reporting, for the estimation of emissions occurring under the Emissions Reduction Initiative (IRE) within the area under calculation

Please provide a systematic and step-by-step description of the measurement and monitoring approach for estimating the emissions occurring under the proposed ER Program. Be specific and complete, so that future measurement and monitoring can be carried out in a transparent way, using the same standards for measurement, and subjected to verification.

As part of the description, provide an explanation how the proposed measurement, monitoring and reporting approach is consistent with the most recent Intergovernmental Panel on Climate Change guidance and guidelines. Where appropriate, describe in the "Source of data or measurement/ calculation methods" the role of communities in monitoring and reporting of the parameter.

Describe how the proposed measurement, monitoring and reporting approach is consistent with the method for establishing the Reference Level as described in section 8.

Using the table provided, clearly describe all the data and parameters to be monitored (copy table for each parameter).

Refer to ***criterion 5, 6, 7, 8, 9, 14 and 16*** *of the Methodological Framework*

Parameter	GHG emissions from deforestation and forest degradation
Description:	Analysis was carried out for each of the states included in the Emissions Reduction Initiative. This analysis utilized the same methodological approach for measurement, monitoring and reporting, as used in the country's National Monitoring, Reporting, and Verification System. Mexico uses a combination of forestry inventory-taking processes based on measurements taken in the field and remote detection procedures for estimating anthropogenic emissions occurring at source, the absorption through sinks of greenhouse gases originating from forests, forest carbon stocks, and changes that occur to forest areas.

[116] See revised recommendations of the UNFCCC and National Forest Reference Emission Level at: http://goo.gl/Jpfx1Q

[117] Art. 8 of the General Law on Climate Change (GLCC) establishes that state authorities must generate their own State GHG Inventories.

Parameter	GHG emissions from deforestation and forest degradation
Unit:	CO_2e
Source of data or measurement/calculation methods and procedures to be applied (e.g. field measurements, remote sensing data, national data, official statistics, IPCC Guidelines, commercial and scientific literature), including the spatial level of the data (local, regional, national, international) and if and how the data or methods will be approved during the Term of the ERPA	Emission Factors: National Forest and Soils Inventory (INFYS): The first (2004–2009) and second (2009–2013) cycles were used. There is a total of 6,028 clusters[118] in the states taking part in this initiative where over 100 variables are collected[119]. Mexico has a Protocol for Estimating Carbon Stocks in the Forest Biomass, which clearly describes how the system for estimating emission factors works and indicates its results. This assessment system utilizes INFyS data, in addition to data taken from allometric equations, wood densities and carbon fractions, which is fully integrated into the assessment through use of an algorithm (decision tree). Activity Data: Official information will be used, i.e. a series of cartographic data on soil and vegetation use, which will then be prepared by the (INEGI) based on the visual interpretation of satellite images. This data contains more than 200 different soil usage and vegetation type classes, has a resolution of 1:250,000, and a time consideration of around 5 years. It is important to note that products included in INEGI data have a discrepancy of two years in relation to the year in which such data was reported. Part of the SNMRV will involve the development of cartographic data comparable to the data series in question, taking place at least twice during the active life of the project.
Frequency of monitoring/recording:	INFyS data is recorded at national level every 5 years (20% of the sample recorded each year). The INEGI Land use and Vegetation Series are generated every five years, with the time period for monitoring this data alongside official data, and used for the FREL, occurring every five years. The type of processing through which series of INEGI data are produced, is offset by about two years, from the year that the data is produced (the dates on which the satellite images are taken) and the actual year of publication. As part of the SMRV historical and updated activity data are being prepared with better spatial resolution (1:20,000 and 1:100,000) and temporal resolution (annual and biennial) which can be used to update the FREL. It will also be used for a monitoring process to be conducted at least every two years for activity data; this type of information will be offset by at least one year from the date represented and the date of publication.
Monitoring Equipment:	INFyS data collection requires specific forest inventory equipment (diameter tapes, calipers, inclinometers, compasses, etc.). Tools are used for compiling databases and making statistical packages for the processing of information, and for the subsequent generation of Emission Factors. Landsat and SPOT satellite images are used for the production of Activity Data, making it possible to segment and classify data through visual analysis, and through use of Geographic Information Systems tools for subsequent processing. If data which is more frequent and of better resolution are employed the MAD-Mex system will be used. This carries out segmentation, automated classification and visual post processing.
Procedures for Quality Assurance/Quality Control to be applied:	For quality control of Emission Factors: Quality control of the dasometric variables using statistical techniques for identification of atypical data that could be the result of a capture, measurement or out-of-range error. Refine the contents of the allometric models database in order to have more reliable equations. The choice of allometric models shall take place on the basis of ecological and statistical models, by means of a decision tree that incorporates all model parameters and therefore improves the choice of best selection. Control of Activity Data: Section 8.3 describes how the INEGI series are compiled, whereby a visual interpretation is produced, polygons are generated manually, and field revision takes place, in addition to using the methodology for estimating the quality of the Activity Data products. It is worth emphasizing that both the BUR (Biennial Update Report) and its INEGI were subjected to a FAO external QA process, a process with ICA, and that the national FREL was subjected to a Technical Evaluation process. The report relating to this has already been published and the information it contains is the same as that used here.
Identify the principal sources of uncertainty for this particular parameter.	Having identified the principal sources of uncertainty, the degree of uncertainty shall be identified through an error propagation process. The main sources of uncertainty at national level are: the allometric models, sampling error, measuring errors, and spatial inputs. (See Annex 8)
Process for the management and reduction of the uncertainty associated with this parameter	Re-engineering of the INFyS occurred in relation to Emission Factors, with new collections also being taken. The assessment process has improved, with data quality control also having taken place and the spread of uncertainty being measured through robust statistical methods. In terms of Activity Data, cartographic products are being improved through inclusion of Mexico's activity data monitoring system (MADMex), in which a change detection algorithm has been implemented that will be able to reduce errors associated with the use of classified maps, which propagate when combined.

[118] These clusters belong to a certain type of forest land and/or pastures in accordance with the definitions of the IPCC (Intergovernmental Panel on Climate Change) for the first cycle of the INFyS. Zero values are not taken into consideration.

[119] This includes: ecological data, information involving geographic description, diversity of species, dasonomic variables in the tree, shrub and herb layer, as well as qualitative information about the conditions of the site, such as orographic features, altitude, slope, physiography, land use, soil depth, presence of erosion-degradation, and the extent of their effects.

CONAFOR will use the National Monitoring, Reporting, and Verification (MRV) System for REDD+, which is used to measure and monitor emissions and reductions in emissions that occur in the framework of the IRE. This system has been put together in accordance with current capacities and data available in Mexico[120]. The composition of this system has been the responsibility of national institutions, coordinated by the National Forest Commission (CONAFOR), -within the Department of the National Forest Monitoring System- in close collaboration with CONABIO, INECC, and INEGI, which have validated system processes and products, ensuring its robustness and sustainability over time, in accordance with IPCC methodological principles and criteria. The National Monitoring, Reporting, and Verification System (SNMRV), entered into operation in July 2015, and is a robust and transparent system, as well as being sufficiently flexible, while enabling continuous improvement. An example of this, is the capacity of the SNMRV to be able to monitor deforestation and degradation through currently available inputs, in addition to being able to improve accuracy in the immediate future, so that Mexico, in addition to being able to measure degradation, can measure and monitor these processes on a more detailed scale. The intention, over the medium-term, is to incorporate all activities into the REDD+ system and, over the long-term, to include all carbon stocks.

The system is a central element to provide official information and report the emissions of forest ecosystems in the Land Use, Land-Use Change and Forestry (LULUCF) sector, as well as assess the results of mitigation actions in the REDD+ National Strategy from deforestation and forest degradation. In the same vein and to maintain consistency in all forestry sector reports, the SMRV will be used at national and sub-national levels, in particular for the IRE.

The design of the SMRV has taken as its basis the guidelines of the UNFCCC and uses a combination of data from the national forestry inventory of Mexico to determine the carbon in forests (Emission Factors) and remote sensing satellite systems (activity data) (decision 4/CP15).

Mexico built its SMRV with existing systems in the country (Figure 35) that provide current and historic information from the forestry sector and its different types of forests (decision 11/CP.19). To generate activity data, the mapping information on Land Use and Vegetation scale 1:250,000 of the National Institute of Statistics and Geography (INEGI) is used, with its mapping Series II, III, IV and V, which have national cover and are generated from Series III at least every 5 years (there is only one 9-year period from Series II to III) which includes a period of time from 1993 to 2011. To obtain emission factors, information from the National Forestry and Soils Inventory (INFyS) of the National Forestry Commission (CONAFOR) is used which is carried out every five years and that to date has two inventory cycles, the first cycle includes (2004-2007) and the second cycle (2009 to 2013) the third cycle of the inventory is currently in progress. The information recorded in the INFyS, includes ecological data, the geographical location of the sampling sites, species diversity, dasonomic variables in the arboreal, shrub and herbaceous strata, in addition to qualitative information on site conditions, such as geographic features, altitude, slopes, physiography, land use, soil depth, presence of erosion-degradation, and the degree of involvement of these conditions.

The INFyS comprises a total of 26,220 primary sampling units (PSUS) that comprise 81,665 secondary sampling units (SSUS) established in the period 2004-2007.

[120] The Government of Norway through the Project for Strengthening the REDD+ system and South-South Cooperation supported its construction and consolidation.

Figure 35: Monitoring, Reporting and Verification System based on existing information systems in the country. Activity data (INEGI mapping series), emission factors (INFyS) and reporting of emissions from the LULUCF sector carried out by CONAFOR and INECC for the INEGEI.

The national mapping performed by the INEGI such as INFyS information is classified in the country as "information of national interest" and these inputs are subject to the Federal Law on Transparency and Access to Public Information, which is why they can be requested by any citizen in Mexico. Therefore, the national reports in the forest sector have been constructed in the country with this same information base.

The most recent guidelines and directives of the Intergovernmental Panel on Climate Change (IPCC 2006 and GPG-LULUCF 2003) have been used as a guide to the process of estimating emissions by the SNMRV to provide transparent and consistent data and information over time (decision 11/CP.19).

The National Monitoring, Reporting, and Verification System (SNMRV) entered into official operation in July 2015. With the information generated from the SMRV, the first Biannual Update Report to the UNFCCC for the Land Use, Land-Use Change and Forestry sector was carried out in conjunction with the National Institute of Ecology and Climate Change (INECC) (http://unfccc.int/essential_background/library/items/3599.php?rec=j&priref=7805#beg). Additionally the BUR, in its section on INEGEI for the LULUCF sector voluntarily underwent a quality assurance process by the central offices of the Food and Agriculture Organization (FAO) which provided a series of recommendations for improvement, to be taken into account in subsequent GHG inventories; the BUR also underwent the International Consultation and Analysis (ICA) process including Technical Analysis (TA) by a Team of Technical Experts (TTE) belonging to the roster of experts of the UNFCCC. For the BUR, most of the LULUCF classes and transitions were estimated as shown in table 76.

Table 76. Categories and deposits quantified in the BUR

Category of Initial Land Use	Category of Final Land Use	Deposit	Activities disaggregated to the FREL
Forest Land	Forest Land	Living biomass - aerial and roots-; mineral soils	Degradation (TF-TFd) Degradation due to fires
Converted land	Forest Land	Living biomass - aerial and roots-; mineral soils	
Pasture	Pasture	Living biomass - aerial and roots-; mineral soils	
Converted land	Pasture	Living biomass - aerial and roots- and mineral soils	Deforestation (TF-P)
Agriculture	Agriculture	Living biomass and mineral soils	
Converted land	Agriculture	Living biomass and mineral soils	Deforestation (TF-TA)
Wetlands	Wetlands	Not reported	
Converted land	Wetlands	Not reported	
Settlements	Settlements	Not reported	
Converted land	Settlements	Living biomass	Deforestation (TF-A)
Converted land	Other land	Living biomass and mineral soils	Deforestation (TF-OT)

Based on the estimates in the BUR by the Monitoring, Reporting, and Verification System (SMRV), Mexico also obtained the Forest Emissions Reference Level in 2014 that includes average emissions due to gross deforestation, which correspond to trees (biomass above ground and biomass below ground in roots), in forest land that changed to any other land use as part of the INEGEI, for the historical period from 2000 to 2010 (http://redd.unfccc.int/submissions.html?country=mex).

In this exercise, transitions of emission sources and absorptions of disaggregated forest land corresponding to the permanence of forest land, deforestation, degradation, restoration and reforestation were obtained in disaggregated form. The reference level only presents emissions due to gross deforestation but it also contains an annex of emissions due to degradation, the report had a Technical Evaluation process according to the guidelines and procedures of the UNFCCC, with an advisory team comprising two experts on the subject (http://redd.unfccc.int/submissions.html?country=mex). There needs to be complete consistency between the two reports to perform the estimates in a disaggregated way in the INEGEI and use this information to develop the FREL, facilitating compliance with UNFCCC requirements.

In the same way for the IRE, the information used by the Monitoring, Reporting, and Verification System (SMRV) to obtain the reference level is used and the same National Monitoring, Reporting, and Verification System (SNMRV) is used for its monitoring. Performing an adjustment in the calculation of the activity data of the INEGI series and a new emission factors estimate from the data in the INFyS, performing the same procedure to estimate emissions (Figure 36).

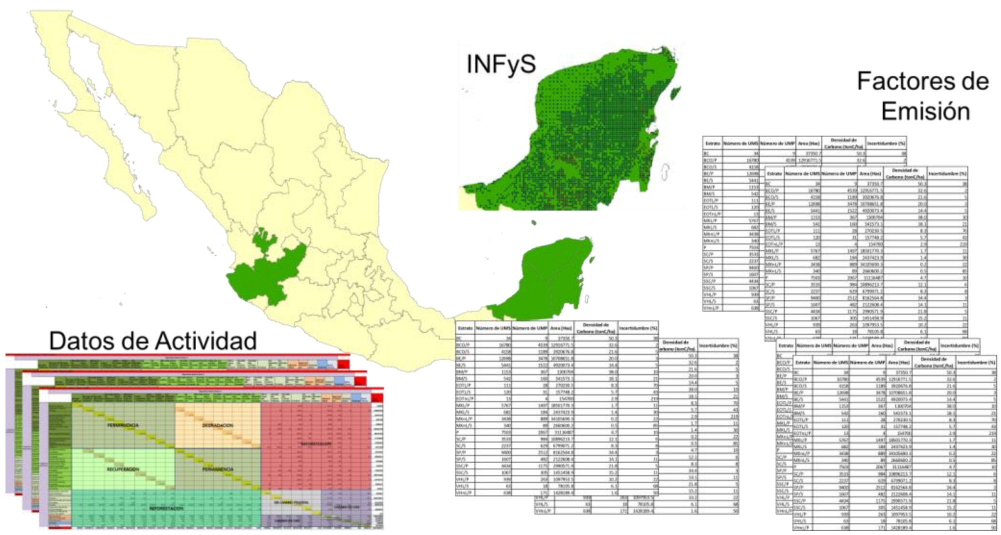


Figure 36: Consistency in the adjustment of methods for the construction of reference levels of the IRE and their monitoring.

The methods for obtaining the reference level of the IRE are described in section 8.3.

9.1.1 Methods and standards for the generation, storage, collection and reporting of data from the monitored parameters

Mexico uses a combination of forestry inventory-taking processes based on measurements taken in the field and remote detection procedures for estimating anthropogenic emissions occurring at source, the absorption through sinks of greenhouse gases originating from forests, forest carbon stocks, and changes that occur to forest areas.

The following diagram shows how the process for estimating content and changes in relation to carbon content in forests is integrated

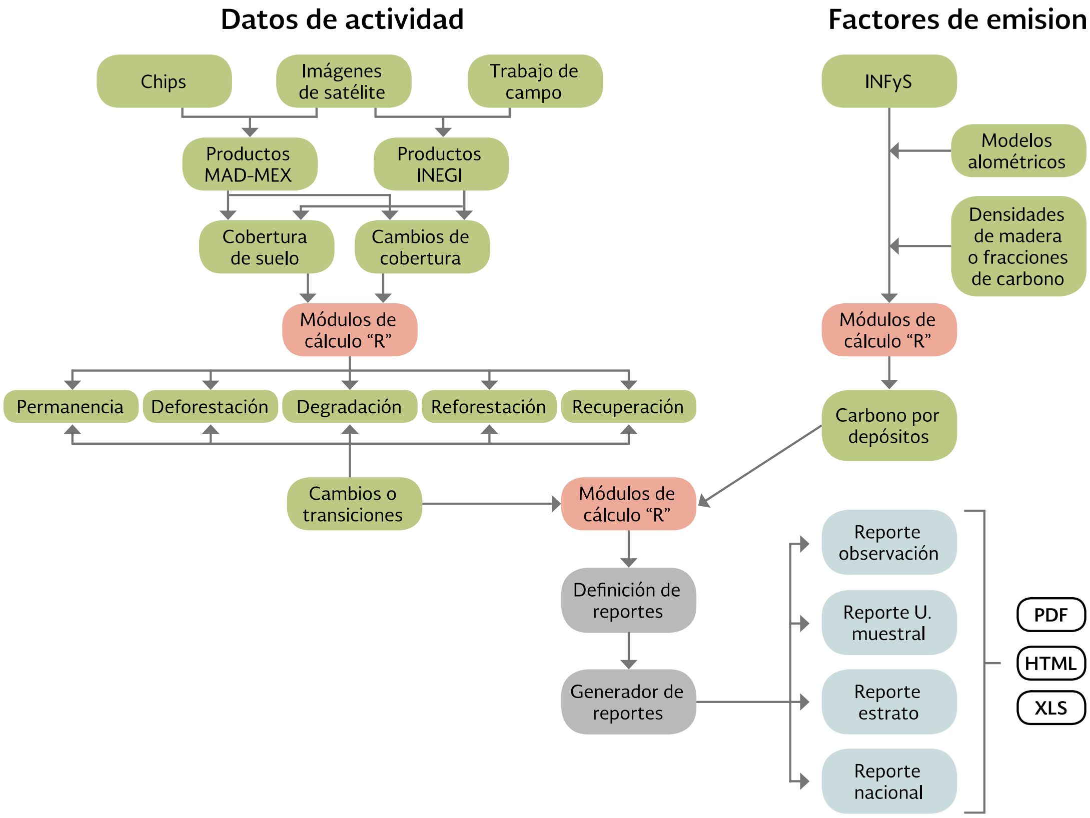


Figure 37: Integration and process for estimating Emission Factors and Activity Data

Details on the utilization of Emission Factors (EF) and Activity Data (AD) are described in section 8.
It is worth noting that in terms of processing data on Emission Factors, Activity Data and emissions estimations, further protocols and tools have been designed to enable implementation in a systematic and repeatable way, with the possibility of making enhancements in accordance with changes in inputs. In the event of a change in inputs by improving the SMRV, the reference level will be recalculated and monitoring will be carried out in a manner consistent with them, in addition to documenting the changes made to the system. An example would be the inclusion of activity data (MAD-Mex system) with higher spatial and temporal resolution. For now, the system envisages the possibility of including different inputs in a flexible way (Figure 37).

The procedure mentioned above has been implemented in a "manual" way, however, since 2015, an integrated measurement and monitoring system has been used for the automated estimation of emissions and removals associated with the Land Use, Land-Use Change and Forestry (LULUCF) sector, which integrates Emission Factors and Activity Data components, which will make it possible to avoid human errors in the event of repeating the estimates in the future.

Similarly to this methodological improvement, improvements are also expected in the inputs that are used as part of the MRV system, which can be divided into Activity Data and Emission Factors. It is important to mention that these proposals are at different stages with respect to their implementation, while in the case of EFs, additional data are already being collected in the third cycle of the INFyS, in the case of AD the MAD-Mex system has already been developed and implemented, however it is in a process of improvement before the information can be used.

9.1.2.1 Possible Improvements in Emission Factors

One of the major improvements in terms of Emission Factors is having information for all stocks according to the IPCC, for this a series of recommendations has been developed on the inclusion of some variables during the collection of information from the third cycle of the INFyS.

To date, the INFyS has two cycles of collecting information in the field (2004-2007 and 2009-2013), during which it has undergone continuous improvement processes with the purpose of comprehensively recording the characteristics of forest land, adding some variables of interest for carbon estimates during the second cycle.

During the third cycle of the INFyS (started in 2015), a series of improvements have been implemented with the objective of suitably assessing biomass and carbon deposits that could not be measured in previous cycles. The efforts are aimed at supplementing the information of Standing Dead Trees, Stumps, Fallen Woody Material, Dead Leaves and Fermentation Layer, as well as the deposits of carbon in organic soil matter. The result of the re-engineering efforts of the INFyS can be consulted at https://www.dropbox.com/sh/kcdi3tdafptr6fi/AACAdEwQ7gtKSuqQlhT7whQFa?dl=0. The methodological procedures that can be implemented for each stock are described below.

Standing dead trees and stumps

For the biomass and carbon estimate in standing dead trees, the estimate is derived from data in the INFyS and simple models of conical volume. The INFyS has sufficient dasometric information for the estimate of this stock since in the inventory, standing dead trees have data such as the DBH, height and in some cases the species or genus, also, it is possible to identify the PSU and SSU each record belongs to, which the information necessary for the estimates at class of cover level is complemented by. To obtain its estimate at SSU level, the carbon from the dead organic matter of the standing dead trees located within the SSU was added up in a similar way to that used for aerial biomass.

To obtain the biomass of each standing dead tree, firstly the volume is estimated from the cone volume equation ($V = (\pi \times r^3 \times H)/3 \;=\; (H \times DB^3)/24\pi^2$) and this volume is then weighted by the corresponding wood density. Therefore, for each standing dead tree recorded in the INFyS, the equation of volume of a cone was assessed depending on the corresponding Diameter at the Base (DB) and Height (H). The height is a variable recorded in the field which is why for estimation purpose it is taken directly from the databases; however, DB is a variable that has to obtained indirectly according to the DBH because is not a variable recorded in the INFyS. To obtain the DB the DBH and DB data of a sub-sample of the INFyS is used, as well as linear regression models. The sub-sample of the INFyS, which is an area in which an intensive sampling of variables is carried out and that is located at the center of the first SSU, has information on DBH and DB of living trees; so the relationship between DBH and DB is identified with this information through linear regression models developed at the level of each INEGI vegetation type. The DBH vs. DB models by vegetation type are displayed in Table 77, which although developed to identify the relationship between both diameters for living trees, it is assumed that this relationship is also valid in standing dead trees.

Table 77. Models used to estimate the Diameter at Base (DB) depending on the Diameter at Breast Height (DBH) with data of the sub-sample of the National Forestry and Land Inventory 2004-2007.

Stratum	Adjustment model	R2
Coniferous Forest		
Oak Forest	$\mathrm{DB} = 0.0005\ \mathrm{DBH}^2 + 1.0383\ \mathrm{DBH} + 3.5632$	0.89
Mesophilic mountain forest	$\mathrm{DB} = 1.1087\ \mathrm{DBH} + 1.6469$	0.95
Xeric Shrubland	$\mathrm{DB} = 1.0956\ \mathrm{DBH} + 2{,}632$	0.78
Deciduous Tropical Forest	$\mathrm{DB} = 0.000005\ \mathrm{DBH}^2 + 1.0946\ \mathrm{DBH} + 2.0015$	0.84
Semi-Deciduous Tropical Forest	$\mathrm{DB} = 1.1694\ \mathrm{DBH}$	0.93
Evergreen Tropical Forest	$\mathrm{DB} = -0.0002\ \mathrm{DBH}^2 + 1.1601\ \mathrm{DBH} + 0.3276$	0.95
Hydrophilic Vegetation	$\mathrm{DB} = -0.0001\ \mathrm{DBH}^2 + 1{,}089\ \mathrm{DBH} + 1.7866$	0.87

Having obtained the volume of standing dead trees from the equation of volume of the cone assessed in H and in estimated DB, the biomass is estimated, to do this, the estimated volume of standing dead trees is weighted by its respective wood density. It is worth mentioning that in those standing dead trees to those whose species and/or genus have been identified, their respective wood densities are assigned, when available; if the species or genus have not been identified, a wood density is assigned for the type of vegetation. This density is obtained by averaging the wood densities of the species that make up each type of vegetation. Finally, the carbon from the standing dead trees is obtained by weighting the biomass estimated by the carbon fraction (0.48).

The carbon stored in stumps is obtained using the INFyS dasometric information and simple volume models for cylinders. In the second INFyS sampling cycle, the frequency, height, diameter were measured, and in some cases the species/genus of the stumps were identified, this information is enough to calculate the volume of the stumps for the period 2009-2013 and they were used in the same way for the following cycles.

Specifically, the dead organic matter (DOM) of the stumps is estimated by weighting the volumes of the stumps by their respective wood density. The estimate of the volume of the stumps is approximated with the calculation of the volume of a cylinder (Equation 12) assessed in the diameter and height of each stump recorded in the INFyS.

$$(V = {}^{(d^2 \times h)}/_{4\pi}) \qquad \text{(Eq. 12)}$$

Where: V = Volume (m3)
d = Diameter (m)
h = Height (m)

It is worth mentioning that when there is no height data, a default value of 30 cm is assigned. After estimating the volume of each stump, estimate the DOM by weighting the estimated volume by the carbon density. The assignment of the carbon density is done according to the type of species/genus if they have been identified, otherwise the density assigned is the average density for the type of vegetation of the stump. The estimates of the DOM of stumps for the second cycle of the INFyS are available online. To obtain its estimate at SSU level, the carbon from the Dead Organic Matter of the stumps located within the SSU was added up similarly to how it was for aerial biomass.

FWM

The carbon in Fallen Woody Material can only be estimated at PSU level, as its calculation comes from the prediction of a model which records its results per hectare as an area unit. Its estimation process measures diameters, degrees of putrefaction and frequencies of FWM found in transects of 5 and 15 m depending on the diameter of the FWM. The information available for quantifying the FWM of the INFyS has two features in their form of collection in the field that are based on the diameter of the material found along the transect. For FWM with a diameter larger than 7.5 cm the diameter, frequency and degree of putrefaction is measured; while for FWM that is less than 7.5 cm only its frequency per transect is recorded Table 78.

Table 78. Fuel classification by size and response time or delay.

Category	Diameter (cm)	Response Time
Thin	< 0.06	1 hour
Regular	0.06 – 2.5	10 hours
Medium	2.6 – 7.6	100 hours
Thick	>7.6	1,000 hours

It is necessary to take into account the difference between the two forms of collecting information as this involves some changes in the processes of estimating the carbon stored in the FWM.

Method for estimating the dead organic matter of FWM at PSU level
As suggested by Morfin (2012), by using data from the INFyS it is possible to estimate the dead organic matter (DOM) of FWM with a diameter larger than 7.5 cm (1,000 hours) by following Van Wagner's equation (1982) (Equation 13):

$$C = \frac{k \times GE \times \sum_1^n d_i^2 \times c}{L} \qquad \text{(Eq. 13)}$$

Where:
C: Dead organic matter of FWM (Mg ha^{-1})
k: Constant equivalent (1.234)
GE: Specific gravity
d_i: Diameter of each piece intersected i
n: Number of parts intersected along the transect
L: Transect length
c: Correction factors for the slope on a horizontal basis

Where: $c = \sqrt{1 + \left(\frac{\%\, slope}{100}\right)^2}$

Similarly, it is possible to estimate the dead organic matter of FWM with a diameter smaller than 7.5 cm (1, 10 and 100 hours) from equation 14:

$$C = \frac{k \times GE \times dcp \times f \times c}{L} \qquad \text{(Eq. 14)}$$

Where:
C: Fuel load (Mg ha^{-1})
k: Constant equivalent (1.234)
GE: Specific gravity
dcp: Mean square diameter of the parts (cm) of each category (1h, 10h or 100h).
f: Frequency of the particles intersected (1h, 10h or 100h)
c: Correction factors of the slope on a horizontal basis (previously defined)
L: Transect length (m)

The dcp FWM with diameters of less than 7.5 cm are obtained with information from the sub-sample and are estimated by type of vegetation by averaging the squares of the diameters of the FWM. This approach is used because the INFyS does not measure the diameters of parts smaller than 7.5 cm.
After defining the carbon estimators stored in the FWM, the estimates at PSU level for each diametric range (1h, 10h, 100h or 1,000h) are performed. To do this, add up all the transects of each PSU and its FWM is considered part of a single line, so the *transect length* (for the estimate) is the sum of all the transects of the PSU. Once it is added the information at PSU level, estimate the DOM of the FWM by diametric range using the corresponding estimators previously shown.

Estimation of uncertainties of the dead matter of the FWM at PSU level
To estimate the uncertainties of the models proposed by Van Wagner (1982) it is necessary to trace the conceptual bases of sampling of lines of intersection. In accordance with (De Vries, 1986), an unbiased estimator of the total of any quantifiable property of an element sampled in **a transect** (only one line of sampling) is given by equation 15:

$$\hat{x} = \frac{\pi}{2\,L} \sum_1^n \frac{x_i}{l_i} \qquad \text{(Eq. 15)}$$

Where:
$\hat{x}$: Value of the total of any quantifiable property of an element sampled in a transect
L: Transect length
x_i: Quantifiable property of an element sampled in a transect
l_i: Length of the element sampled in a transect
n: Number of elements sampled in the transect

If our quantifiable element of interest is the volume (v_i) then it is explained in equation 16:

$$x_i = v_i = \frac{\pi \times d_i^2}{4} \times l_i \qquad \text{(Eq. 16)}$$

So when replacing equation 16 (x_i) when equation 15 we get equation 17:

$$\widehat{Vtot} = \frac{\pi}{2\,L} \sum_1^n \frac{\left(\frac{\pi \times d_i^2}{4} \times l_i\right)}{l_i} \qquad \text{(Eq. 17)}$$

Which is simplified in equation 18:

$$\widehat{Vtot} = \left(\frac{\pi^2}{8\,L}\right) \sum_1^n d_i^2 = \frac{1{,}234\ \sum_1^n d_i^2}{L} \qquad \text{(Eq. 18)}$$

That when weighted by the specific gravity (GE) and the correction factors of the slope on a horizontal basis (c) we get the expression proposed by Van Wagner (1982) for the FWM with diameters larger than 7.5 cm.

Following this same reasoning, De Vries (1986) defines the variance for the estimator of the total ($\hat{x}$) of any quantifiable property of an element sampled in **a transect** (only for one line of sampling) and it is provided by equation 19:

$$Var\hat{x} = \left(\frac{\pi}{2\,L}\right)^2 \sum_1^n \left(\frac{x_i}{l_i}\right)^2 \qquad \text{(Eq. 19)}$$

Where our quantifiable element of interest is the volume (v_i) defined in Eq. 19, so that when replacing this expression in equation 20, we get:

$$Var\hat{x} = \left(\frac{\pi}{2\,L}\right)^2 \sum_1^n \left(\frac{\left(\frac{\pi \times d_i^2}{4} \times l_i\right)}{l_i}\right)^2 \qquad \text{(Eq. 20)}$$

Which is simplified in equation 21:

$$Var\,\widehat{Vtot} = \frac{\pi^4}{64\,L^2} \sum (d_i^2)^2 \qquad \text{(Eq. 21)}$$

Therefore, on the basis of Eq. 21 it is possible to obtain the variance of the estimator of the total volume per unit of area for a transect (for FWM with diameters greater than 7.5 cm). To obtain the variance of the estimator of the DOM of the FWM it will only be necessary to weight it using equation 21 by the square of GE and c (due to the properties of the variance in the case of constants).

In the case of diameters that are less than 7.5 cm, equation 21 changes to equation 22:

$$Var\,\widehat{Vtot} = \frac{\pi^4 n}{64\,L^2} \left(\sum (d_i^2)^2 / n\right) = \frac{\pi^4 n}{64\,L^2} d \qquad \text{(Eq. 22)}$$

Where d is the average of the diameters to the fourth power reported in the sub-sample.

Therefore, on the basis of Eq. 22 it is possible to obtain the variance of the estimator of the total volume per unit of area for a transect (for FWM with diameters less than 7.5 cm). To obtain the variance of the estimator of the biomass of the FWM with diameters less than 7.5, it will only be necessary to weight Eq. 22 by the square of GE and c (due to the properties of the variance in the case of constants).

Dead leaves and fermentation layer

The samples of dead leaves and fermentation layer collected in the second and third cycles of the INFyS will be used in order to estimate the carbon stored in the deposit of dead leaves. 8 samples consisting of dead leaves and fermentation layer were collected per PSU (Primary Sampling Unit). The following measurements were taken in the field from each of these samples: 1.- Thickness of dead leaf (Eho) (mm), 2.- Fermentation layer (Efe) (mm), 3.- Total weight of dead leaf (Wth) (gr) and 4.- Total weight of Fermentation Layer (Wtf) (gr). If the quantity of dead leaves or fermentation layer is considerable, and the sample bag is not large enough for all the material collected, the material is collected over a waterproof tarpaulin and mixed together in order to obtain a representative subsample, sufficient to fill the bag measuring 20x30 cm. The weight of the subsample of dead leaves (Wmh) and fermentation layer (Wmf) is recorded in this way, so that once the values of the subsamples are reported, the weights can be calculated for the whole sample.

This information can be used to estimate the apparent density of the dead leaves (Dah) as well as that of the fermentation layer (Daf). In order to estimate the apparent densities, first of all the constant dry weight of the dead leaves (Wsh) and that of the fermentation layer (Wsf) must be obtained, bearing in mind the weight of the sample. These weights are obtained by drying the samples (Wth and Wtf) in a drying oven until their weight remains constant. The constant dry weight of the dead leaves (Wfh) and the fermentation layer (Wff) can then be recorded, bearing in mind the total weight (Equations 23 and 24):

Wfh = Wth * (Wsh / Wmh) (Eq. 23)
Wff = Wtf * (Wsf / Wmf) (Eq. 24)

The apparent density of the dead leaves and fermentation layer is then estimated, (Equations 25 and 26):
Dah = (Wfh) / ((Eho/10) * 900)) (Eq. 25)
Daf = (Wff) / ((Efe/10) * 900)) (Eq. 26)

The total carbon in the deposit of dead leaves in the field sample is the result of the sum of the apparent density of the dead leaves and the fermentation layer weighted by the fraction of carbon (0.48).

Organic carbon in the soil

The carbon stocks in the organic material in the soil are recorded in tonnes of organic carbon per hectare at a soil depth of 30 centimeters. *Equation 3.2.16* indicated in the Guidelines for Good Practices (IPCC [Intergovernmental Panel on Climate Change], 2003) for the LUCF (Land-Use Change and Forestry) sector (Equation 27) are used for both profiling and boring.

$$COS = \sum_{horizon=1}^{horizon=n} COS_{horizon} = \sum_{horizon=1}^{horizon=n} ([COS] * Apparent\ density\ * Depth\ d * (1 - frag) * 10)_{horizon}$$
(Eq. 27)
Where:
COS, is the content of organic carbon in the soil, representative of the vegetation subcategory (Tonnes of C / ha^{-1}).
$COS_{horizon}$ or also COS_{bore}, is the content of organic carbon in the soil for a horizon, layer or soil bore (Tonnes of C / ha^{-1}).
[COS], is the concentration of organic carbon in the soil for a given mass of soil obtained by laboratory analysis (gr / $Kg_{(Soil)}$).
Apparent density, also known as AD, is the mass of soil per sample volume ($Tonne_{(Soil)}$ / M3) (equivalent to $Mg.m^{-3}$).
Depth, of the horizon, layer or bore (m).
Frag, is the percentage value of large fragments /100, without dimensions. These fragments are referred to as large because they cannot pass through a number 10 sieve or mesh (10 threads per inch with the actual space between threads being 2.00 millimeters).

In other words, this formula indicates that the total content of COS is obtained by adding the weighted content of COS of each soil layer, horizon or bore, which in turn is calculated by multiplying the concentration of COS (gr/$Kg_{(soil)}$) of each soil horizon or bore by the corresponding depth and apparent density ($Mg.m^{-3}$), making adjustments in order to discount the weight of soil corresponding to the large fragments (internal stoniness).

The unit for sampling carbon from organic material in the soil is the hectare. In this particular case, the sampling unit is neither the SSU (secondary Sampling Unit) nor the PSU (Primary Sampling Unit) because the inputs used to calculate it for the national report come from a variety of stocks with different characteristics. Consequently, carbon stocks are reported in tonnes of organic carbon per hectare at a soil depth of 30 centimeters. For this calculation we need to know the following information beforehand: the concentration of organic carbon in the soil for a mass of soil, apparent density and the percentage value of large fragments of the field sample. In order to collect the third cycle of the INFyS, the samples collected in the field record the soil parameters more accurately and there is a network of national laboratories for detailed analytical determinations and for calibrating NIR (Near-Infrared) equipment.

9.1.2.2 Possible Improvement of Activity Data

In the same way as improvements have been proposed for estimating emission Factors, improvements have been considered for estimating Activity Data. In this case there is an option which has been developed as part of implementing the MRV systems and which it is feasible to implement within the framework of the IRE

Use of Mexico's Activity Data Monitoring System (MAD-Mex)
As mentioned in section 8.2, the CONAFOR is developing an initiative in order to support the CONABIO and INEGI in order to improve national spatial-and-temporal-resolution mapping. The intention of Mexico's Activity Data Monitoring System (MAD-Mex) is to produce national mapping from automated land-cover classifications and the mapping and detection of changes in forest cover using Landsat 5 and 7 satellite images for the reference years established: 1993, 1995, 2000, 2005 and 2010. Likewise this mapping can be extended to any subsequent year with Landsat 7 and/or 8 images. In addition since 2011 and on an annual basis, CONAFOR acquires and processes RapidEye images in order to generate coverage maps and detect changes so that problem-free monitoring and mapping can be carried out for the states in the IRE throughout the duration of the IRE, in addition to changing from a MMU (Minimum Mappable Unit) of 50 ha to one of 1 ha on maps of forest cover. Below is a description of the main processes implemented in connection with the improvements required for using MAD-Mex.

Coverage maps taken from automated classifications (Base line-reference map)

Landsat and RapidEye inputs for processing

Landsat satellite images

All the Landsat TM and ETM+ Landsat images available for Mexico in one year with cloud cover of less than 10% are used for the classification process. Complete coverage of the whole country is achieved with 135 scenes (path/row) and each scene can have multiple images, for example, for the year 2000 each scene has from between 4 and 37 images, approximately. The largest amount of images per scene is found in the north, whereas fewer images are available in the south due to the extensive cloud cover present and the lack of cover from Landsat 5 images.

Digital Elevation Model

A national digital elevation model (DEM) was provided by the INEGI. Its final version 2.0 was produced in the year 2010 and data is available continuously for the entire country as sets of raster data with píxel size of approximately 30 metres. In addition to the actual elevation values, values for slope and aspect are obtained which are also included in the classification process.

Training data

Classification is directed at objects, and training data is based on INEGI maps. In order to generate training data an analysis of Series II to V was carried out, based on a geometric cross. Those polygons presenting the same type of cover or land use in all three series were selected in order to be used for training data. Finally, all the persistent objects were re-labelled in the land cover classes of the classification system generated by the Technical Group for Land Cover (32 classes).

Work flow of the Classification Process

Temporal resolution of Landsat data per scene differs throughout Mexico, so each of these scenes is processed individually, and subsequently the results are used to create the national continuum of 135 scenes. The process includes an automated work flow with interconnected steps, starting with identifying the initial scene according to time criteria, maximum cloud cover and processing level (Landsat Level 1T). Subsequent processes include the pre-processing of Landsat images with the masking of clouds and shadows and “no data” or pixels without any information, generation of vegetation indices, segmentation of images, extraction of statistics and reduction of dimensionality per class, classification of objects and elimination of atypical values, training for the classifier, classification and, finally, validation of the results.

Data management

The data management system contains a spatial database. The database is designed to administer the Landsat World Referencing System (WRS2) in order to store only polígons for each TM and ETM+ path/row . In addition, each of the 48326 Landsat5 TM scenes (acquired between November 1982 and November 2011) and the 25881 Landsat7 ETM + scenes (acquired between June 1999 and December 2012) together with their metadata for the whole of national territory are stored in the database with each body (scene) referring to its respective polygon WRS2. The databases also store the INEGI USV series, the persistent areas resulting from this and all the *in-situ* samples available.

Scene Identification

The initial scene is identified as a REST service which carries out a function where the database can be consulted in order to select all the Landsat TM and ETM+ images available in the time range defined and which does not exceed cloud cover of 10% for a specific WRS path/row. The result is an xml representation of all the scenes registered and identified in the database.

Pre-processing

The pre-processing of each Landsat L1T,TM and ETM+ image identified, includes radiometric calibration, calculation of reflectance of the surface are at the top of atmosphere (TOA) and also the masking of clouds, shadows and snow. The Landsat Ecosystem Disturbance Adaptive Processing System (LEDAPS) carries out the pre-processing of all the scenes (Feng *et al*, 2012; Masek *et al*, 2012, 2006).

Masking data

The algorithm FMask (Zhu y Woodcock, 2012) is implemented in order to generate masks in the various scenes for clouds, shadows of clouds, water, snow and no data pixels. In addition, a mask for the country was introduced based on the set of vectorial data for the Mexican administrative areas taken from the scale 1:50,000 topographic map: 50.000.

Generating functions

Surface reflectance from the satellite images was used to calculate the Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI), Simple Ratio Index (SR), and the Atmospherically Resistant Vegetation Index (ARVI). Based on the TOA reflectance values 6 Tasseled Caps (TC1-TC6) were also calculated, using the conversion coefficients described in literature (Crist, 1985; Huang et al., 2002).

For each of the TC and the resulting vegetation indices the respective masks of clouds, cloud shadow and no-data were generated, and in this case they were re-labelled as "no data". The masked images for each function were *stacked in* multi-temporal images resulting in 10 *stacks* of images from the 6 TC components and 4 for the vegetation indices.

The simple metrics are calculated for the pixels in the *stacks* of multi-temporal characteristics as the minimum, maximum, range, mean and standard deviation. In this way, the pixels previously masked as "no data" were excluded from the statistical calculation. Clouds are eliminated in this way. However, on doing this, it is assumed that the quantity of unmasked pixels in the multi-temporal images is still sufficient to calculate the metrics representative of the pixels.
As a result we have images with their metrics in the 5 bands, for the 6 TCs free of clouds and the 4 vegetation indices.

Image segmentation

Segmentation takes place on the NDVI. multi-temporal metric images. We apply the Berkeley Image Segmentation software (*cf*; Clinton et al, 2010) with a set of experimentally derived segmentation parameters which produce over-segmentation and very small objects. As a result we obtain a Shapefile of polygons with unique object identifiers and an image with pixels with the same digital value as the identifier of the vector polygon.

Extraction of characteristics and reduction of dimensionality

After applying the segmentation process, we have objects and simple statistical descriptors. Multi-temporal metrics are extracted (TC1-TC6, NDVI, EVI, SR, ARVI), which are minimum, maximum, mean, variance and standard deviation. Each vector object is now described by its identifier and the 175 characteristics (7 images from the metrics multiplied by the 5 multi-temporal characteristics of the bands multiplied by the 5 characteristics of the object) extracted by the previous process.

The analysis of the main components was then applied to the characteristics of the previously extracted objects in order to eliminate redundant information in the metrics, by reducing the space of the characteristics to a dimension in which unique and statistically significant characteristics are condensed. Only the main constituents which in the sum of total variance are above 95% were kept.

Subsequently information taken from the MED is incorporated,i.e. raster images of slope and aspect after extracting them from their descriptive statistics (minimum, maximum, average, variance and standard deviation) for each image object.

Elimination of atypical values

We apply an iterative cut of the histogram for the first 3 characteristics (main components) preserved following analysis of main components. The iterative cut concept was used by Radoux and Defourny in order to detect object-based forest changes (Radoux and Defourny, 2010, 2008). Atypical values were excluded on the basis of probability density and the new parameters for distribution were reprocessed until all the objects were above the threshold. The subsequent training of the classifier only used those objects retained after eliminating the atypical values.

Classification

The classification of objects uses the decision tree algorithm C5.0 (Hodge and Austin, 2004; Quinlan, 1992). For each of the 135 different Landsat scenes (path/row) for Mexico, C5.0 generated 10 decision trees based on training object samples and these were applied to all the respective object samples of the images. The results of the classification were then converted once again into the vector representation of polygons and stored in the database management system. The figure below shows the work flow carried out in the MADMex system for processing and classifying the Landsat satellite images. The figure below shows the work flow in an automated way.

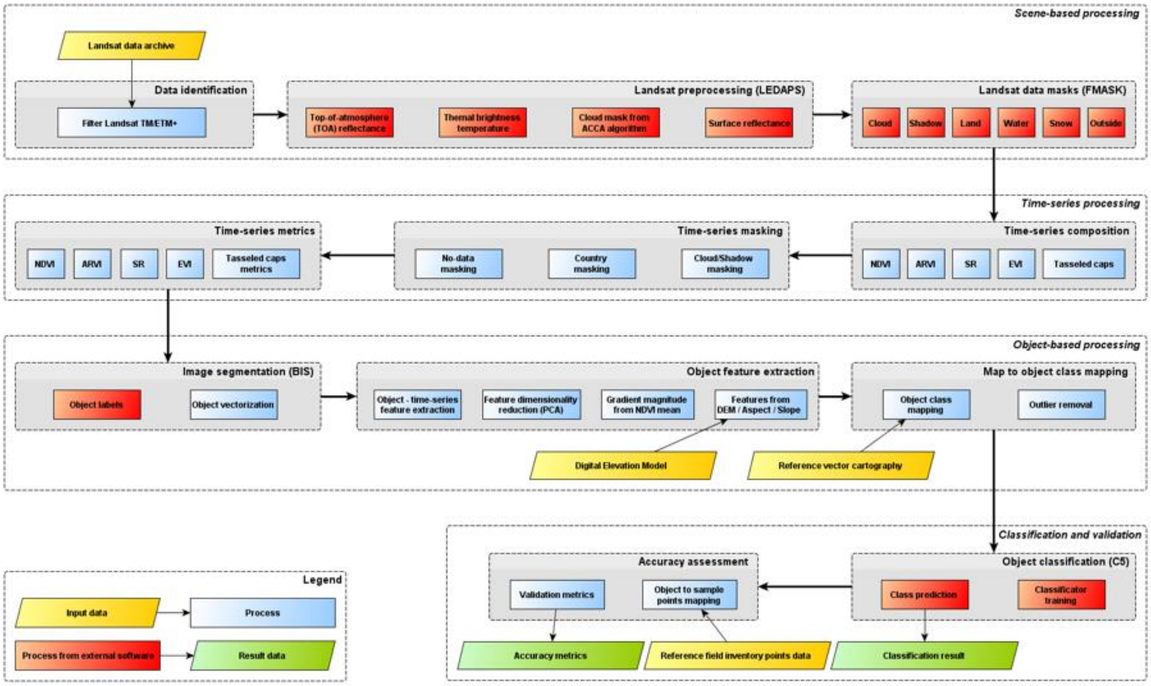


Figure 38. Work flow and automated process for Landsat image classification

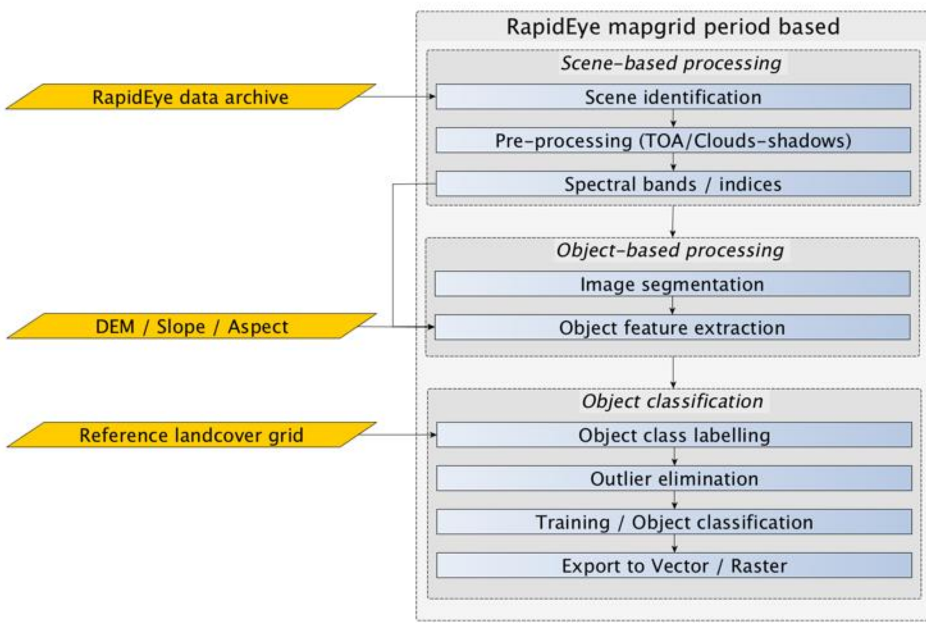


Figure 39. Work flow and automated process for RapidEye image classification

Visual Review

The Land Cover Working Group is constantly reviewing segmentation and classification. This activity is part of quality control and also involves sending comments and suggestions for improving the entire process. This process entails making a direct comparison between the segmentation and classification polygons and the Landsat satellite images. In this way we can be aware of how the classifications are working.

Processing RapidEye images

The land cover classification approach explained in the previous section was adapted in order to be implemented on the RapideEye images, bearing in mind that these classifications will be made for each year from 2011 and that there will only be two images per scene, one in the dry season and the other in the wet season.

Another process which has not been investigated in much depth in RapidEye is atmospheric correction, since only the conversion of reflectance values and the whole methodological process of the Landsat classification approach in RapidEye is carried out.

Unlike the Landsat images which are cost-free, the CONAFOR, CONABIO and the INEGI currently have a contract with the Blackbridge company in order to acquire 2 covers of RapidEye images at national level per annum. The products received need to have the characteristics specified in said contract, so the comprehensive quality control process described below has been set up.

RapidEye quality control process

The date of acquiring the first cover is during the dry season between January and April, while the second cover is acquired after the rains, between August and November. Complete national cover includes 3,988 different scenes, with 500 metres of overlapping between scenes.

According to the contract, the satellite data delivered must be checked within the first four weeks after their delivery date. Various conditions must be fulfilled by the data.

Complete "wall to wall" cover of Mexico including its biggest islands, twice a year in specific seasons

- Dry season (1 January-30 April)
- Rainy season (1 August-30 November)

• Cloud cover

- Maximum 10%
- In the event of non-compliance with the percentage of clouds three more images of the same scene must be delivered during the same season in order to generate a set

• Angle of Acquisition

- 80% of all the images from one season < 16°
- All images < 20°

• Relative accuracy between different images

- Maximum RMS 2 pixels in internal and interannual comparisons

Individual covers are delivered for the two divisions of the country, the northern part and the southern part. The first one includes the Mexican states of Baja California, Baja California Sur, Chihuahua, Nuevo León, Sinaloa, Zacatecas, Tamaulipas, Aguascalientes, Guanajuato, Distrito Federal, Nayarit and San Luis Potosí. The second one consists of the states of Jalisco, Aguascalientes, Guanajuato, Querétaro, Hidalgo, Veracruz, Puebla, Tlaxcala, Michoacán, Colima, Guerrero, Chiapas, Tabasco, Campeche, Yucatán and Quintana Roo.

Cloud cover

As the RapidEye algorithm for cloud detection is insufficient, all cloud cover values are checked manually by the CONABIO and the CONAFOR.

Angle of Acquisition

The angle of acquisition can be checked automatically by verifying the image metadata.

Figure 40 shows the work flow for the RapidEye images quality control.

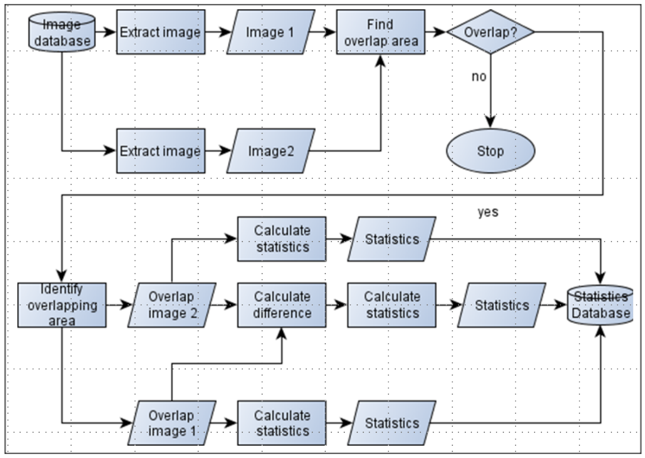


Figure 40 Work flow for the Rapideye images quality control

On a random basis, pairs of individual images (at least 10% of all the images) are checked automatically. In order to cover each eco-region in Mexico, specific static mosaics are designed which must then be reviewed. Over 200 mosaics are distributed throughout the country.

The core of the automatic process for checking relative accuracy is an approach involving cross correlation between each píxel and complying with two restrictions:

1. Threshold for registration in the Kernel. This guarantees exclusive use of structured regions.

2. Threshold for the coefficient for determining the cross correlation process. This guarantees the unique use of similar regions, without different pixel spectra due to the change of land cover or different image geometries.

The cross correlation approach, resulting in euclidian distances and followed by statistical analysis. Here, the occurrence of each distance is analyzed for all the pixels used. If the occurrence of distances of under two pixels is significantly greater than the others, the relative distance of the two input images are defined as being within the contract threshold.

The relative accuracy between both images is checked manually. Consequently, control points on the ground are used to calculate the distance between the images, so if an image fails with a co-registration of over 2 pixels, the image is returned to the supplier, who must apply for a new image with the correct characteristics for each delivery.

All the processes for assessing the quality of the RapidEye image are programmed in Python script for generating automated reports.

Bitemporal detection of changes in Landsat and RapidEye images

Changes in the MADMex system are detected on the basis of the bitemporal comparison of images, both for the reference periods in the Landsat processing (1993-2010) and for the RapidEye annual processing (2011-2014). The bitemporal changes are detected by means of implementing the iMAD (Multivariate Alteration Detection transformation) algorithm in the Python script, followed by postprocessing based on the MAF (Maximum Autocorrelation Factor transformation) algorithm.

iMAD is invariant to linear scaling of input data. Consequently, iMAD is unresponsive to differences in the configuration of sensor gain, for example, and its deviation from zero, or to linear graphs for radiometric and atmospheric correction. On the other hand, the angle of acquisition of the images may cause shadows to be created when obstacles such as mountains are interposed between a satellite and its target. There are numerous techniques for correcting these effects, referred to as topographical. As digital models of elevation are used to correct these effects, this process is therefore subject to the resolution and precision of the model used. Given the low sensitivity of the method for detecting changes selected here, and without an adequate digital model of elevation, a topographical correction is considered to be an undesirable conversion of the data.

The algorithms described above produce information about change (and sometimes its extent) so that post-analysis will be required in order to determine the nature of the change investigated.

Two multispectral images of N bands must be taken into consideration in this bitemporal search to detect changes. These will be represented by the random vectors G1 and G2. They capture the same place, but at different moments in time. Information about the respective N bands of each image can be concentrated using linear combinations which will form in turn two new images consisting of a single band with the changes reflected.

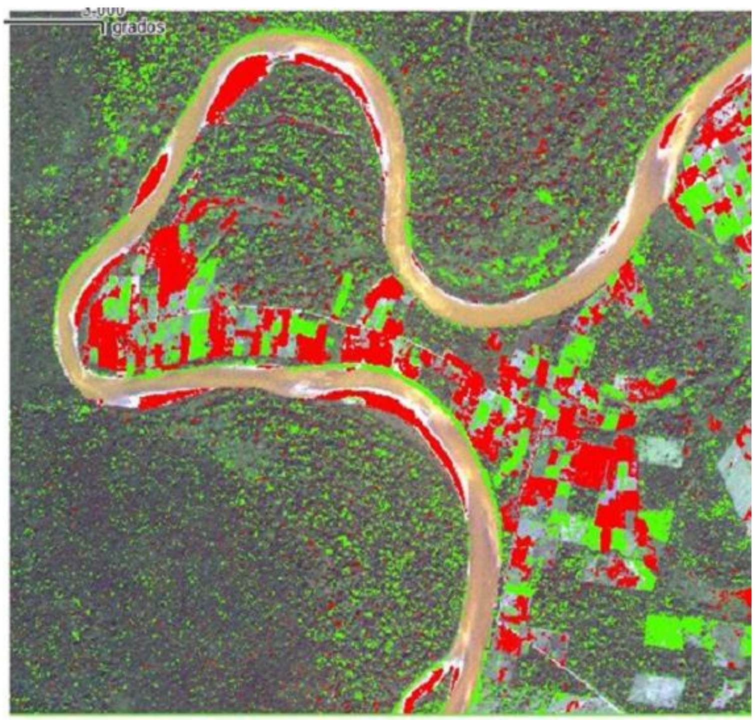


Figure 41. Negative change and positive change determined with the iMAD-MAF algorithm

Visual interpretation of MAD-Mex products

The final part of the production cycle of any Satellite System needs to take into consideration an image photo interpretation phase in order to improve the coverage maps or change of cover produced by the automatized phase. With the MAD-Mex System this final phase needs to be implemented in order to increase the accuracy of the mapping products and reduce uncertainties at the time of generating the estimated emissions and removals from the forest sector. A budget for this activity will need to be anticipated or appropriate inter-institutional agreements must be obtained with INEGI and CONABIO in order to fulfil the complete production cycle.

Accuracy assessment

In the case of the MAD-Mex system, the aim is to assess the accuracy of the land cover classifications and assess the accuracy of the maps of estimated changes using the iMAD-MAF algorithm, the method is similar to the one proposed for assessing the change maps described in section 8.4.1.

The sampling costs are assumed to be constant independently of the types analyzed, although accuracy may be assessed in the office by using satellite images of better or equal resolution as inputs.

The sample design proposed is Stratified Random Sampling (MAE). This design is flexible with regard to the distribution of samples in zones where change occurs (Olofsson, 2013). It makes direct use of the Minimum Mappable Unit (MMU) which is able to show small changes and is relatively easy to use.

The accuracy of the maps generated (coverage maps and change maps) will be assessed, as will the uncertainties calculated, in order to model the total uncertainty of all sources included in the estimates for emissions and removals from the LULUCF sector of any report in accordance with national requirements.

The figure below shows the following cases in the development of the MadMex System:

Sensor	Producto	Actividades	Octubre	Noviembre	Diciembre	Enero	ebrero	Marzo	Abril	Mayo	Junio	Julio	Agosto	iembre	ctubre	iembre	iembre	Enero	Febrero	Marzo	Abril	Mayo
RapidEye	Mapa de cobertura	2015 para los 3 estados de la península de Yucatán																				
		Evaluación de la exactitud temática de 1 mapa de cobertura 2015 para los 3 estados de la península de Yucatán (procesado MAD-Mex)																				
		Evaluación de la exactitud temática de 1 mapa de cobertura 2015 para los 3 estados de la península de Yucatán (post-procesado)																				
		Diagnóstico de la calidad de 1 mapa de cobertura 2015 para los 3 estados de la península de Yucatán (procesados y post-procesados 2015)																				
		Contratación de empresas para el post-procesamiento de 1 Mapa de cobertura 2015 a nivel nacional (elaboración de TDR, contratación administrativa y seguimiento técnico-talleres de homologación de criterios)																				
		2015 a nivel nacional (iniciando con los dos estados faltantes de la IRE)																				
		de cobertura 2015 a nivel nacional (procesado MAD-Mex) iniciando con los dos estados faltantes de la IRE																				
		Evaluación de la exactitud temática de 1 mapa de cobertura 2015 a nivel nacional (post-procesado) - iniciando con los dos estados																				
RapidEye	Mapas de cobertura	Generación de mapas de cobertura RapidEye para el periodo histórico 2011-2014 (usando el Mapa de referencia RapidEye 2015 como área de entrenamiento, en forma restrospectiva y consecutiva) (4 mapas a nivel nacional) 1:20,000 - iniciando con los dos estados faltantes de la IRE																				
		Generación de mapas de cobertura RapidEye 2016 (usando el Mapa de referencia RapidEye 2015 como área de entrenamiento) a nivel nacional 1:20,000 - iniciando con los dos estados faltantes de la IRE																				
Rapid Eye	Mapas de cambios	Mejoras en los algoritmos de post-procesamiento de mapas de cambio																				
		Generación del mapa de cambios 2014-2015 RapidEye 1:20,000 (podría ser en cluster CONABIO) Nacional - iniciando con los estados																				
		Evaluación de la exactitud temática del mapa de cambios 2014-2015 RapidEye 1:20,000 (procesado MAD-Mex) Nacional - iniciando con																				
		Contratación de empresas para la evaluación del post-procesamiento automatizado del mapa de cambios 2014-2015 (elaboración de TDR, contratación administrativa y seguimiento técnico-talleres de homologación de criterios) Nacional																				
		Diagnóstico de la calidad del mapa de cambios 2014-2015 RapidEye 1:20,000 (procesado y post-procesado) Nacional - iniciando con los estados																				
		Mejora de los algoritmos y procesos del Sistema MAD-Mex para elevar la exactitud temática de los Mapas de Cambios (con base al diagnóstico)																				
		Evaluación de la exactitud temática del mapa de cambios 2014-2015 RapidEye 1:20,000 (procesado MAD-Mex) Nacional - iniciando con																				
		Diagnóstico de la calidad del mapa de cambios 2014-2015 RapidEye 1:20,000 (procesado y post-procesado) Nacional - iniciando con los estados																				
		Generación, post-procesamiento y evaluación temática de mapas de cambio RapidEye 1:20,000 (2011-2012, 2012-2013 y 2013-2014) Nacional - iniciando con los estados de la IRE																				

Figure 42. Critical route of the MADMex System

9.1.2 System for Monitoring Forest Fires

Mexico has an advanced system for monitoring forest fires with an existing capacity to address the problem this phenomenon represents in the country.

The Fire Containment Management (CONAFOR) hosts within its structure the National Forestry Corporation Department for Forest Fire Control (CENCIF) which coordinates the activities of detection, monitoring, follow-up and assessment of forest fires. It also receives and organizes statistical information and issues daily reports, with the participation of the Regional Fire Containment Centres (CRMF) and State Centres for the Control of Forest Fires (CECIF). This helps with taking decisions during the season for forest fires, generating the following products:

1) ***<u>Early Warning</u>:*** This report is a compilation of the information produced by various governmental civil, national and international organisations and authorities. It is published on their Internet sites and is therefore available to the general public (It uses the most cutting-edge satellite teledetection technology to keep under observation roughly 200 million hectares forming national territory. In this way it can identify areas at high risk of forest fires, receive satellite information generated by the governments of Mexico, Unites States and Canada, as well as weather forecasts from the National Meteorological Service, information which is updated by the National Water Commission, the University of Colima and the National Commission for Biodiversity. This

information is completed with data from 154 observation towers supported by an infrastructure of 2, 691 radiocommunication units operated by team leaders who coordinate the 32 state centres for fire control. There are also 120 climate stations which the National Water Commission has distributed strategically throughout the country).
Its aim is to incorporate in one single document a quick overview of the current and forecast weather conditions, and the fire danger indices monitoring the country on a daily basis. It is designed simply to provide a reference framework for the technical-operational staff and for decisions to be taken on the subject of prevention, availability of resources and strategies for fighting forest fires.

Table 79 Content of information needed to construct the early warning system

Input	Input
Main Weather Systems	Probabilistic Multimodal Temperature Forecast
Index for the propagation of Forest Fires	Forecast of Relevant Winds and Weather Systems
Map of Relative Humidity under current conditions	Rain registered per Federal Entity
Daily Precipitation forecast	Monitor of Monthly Drought
7-Day Precipitation Forecast	Hot Spots Detected by 3 hour GOES Satellites. 24 hour GOES 24 hour AVHRR and 24 hour MODIS
Extended Precipitation forecast	
Probabilistic Multimodal Rain Forecast	Satellite Image
Map of Temperature under current conditions	Hot Spots
7-Day Temperature Forecast	Vegetation Abnormalities
Extended Temperature forecast	

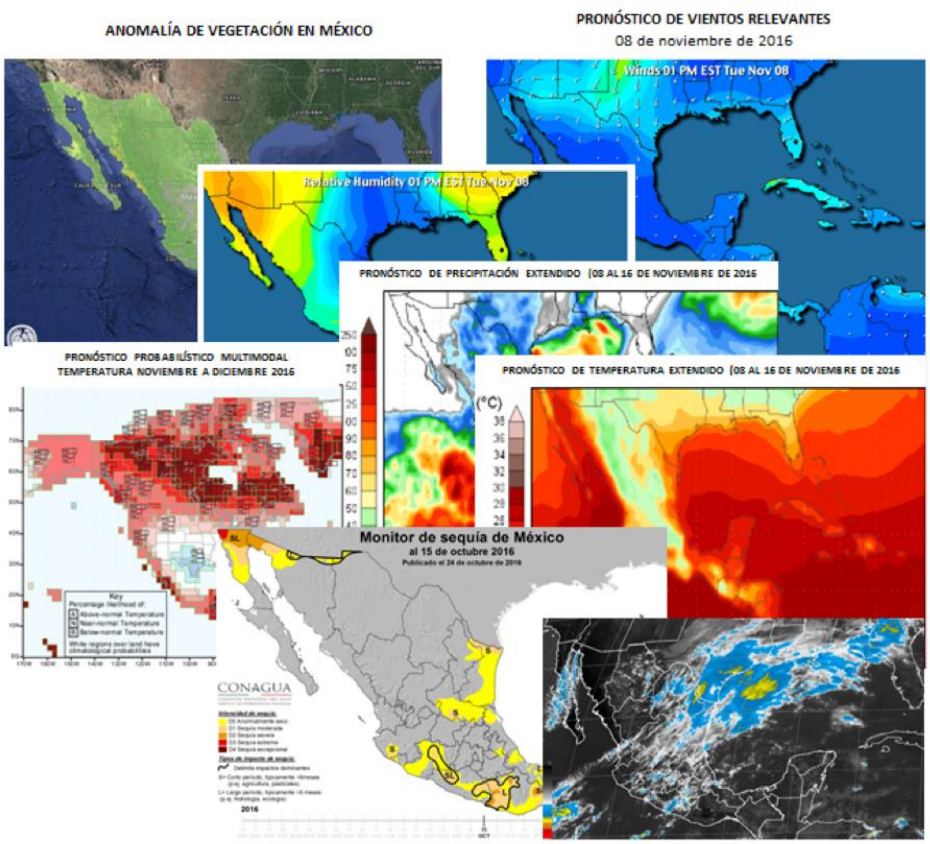


Figure 43 Series of inputs for putting together the daily report on the Early Warning System

2) ***Probability of Propagation of Forest Fires-*** Using the weather information gathered in the way described in the previous paragraph, CENCIF recommends the action to take in relation to protection against forest fires under the expected conditions.

3) Current situation of Hot Spots: The hot spots and plumes of smoke detected by the TERRA, AQUA, SUOMI, NOAA-15 and NOAA-17 Satellites for the remote detection and monitoring of forest fires are collated. Once they have been filtered and broken down (hot spots from other sources such as urban areas, industrial areas, among others) the information provided by the satellites is channelled to the CECIFs to be verified in the field, tackling the forest fire if necessary.

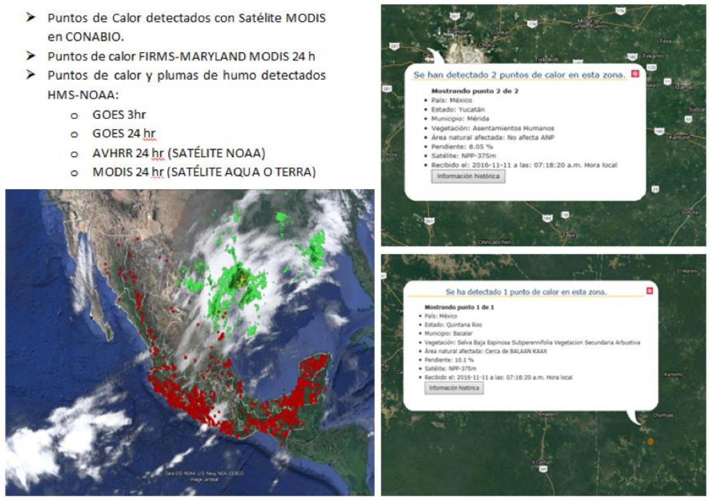


Figure 44 Hot Spot

4) ***Daily report on forest fires***: This report gathers together and publishes information about the forest fire situation each day, after processing the flow of statistical information generated by the occurrence of forest fires, and provided by the CRMF, the CECIF and the National Centre for the Control of Forest Fires (CENCIF),

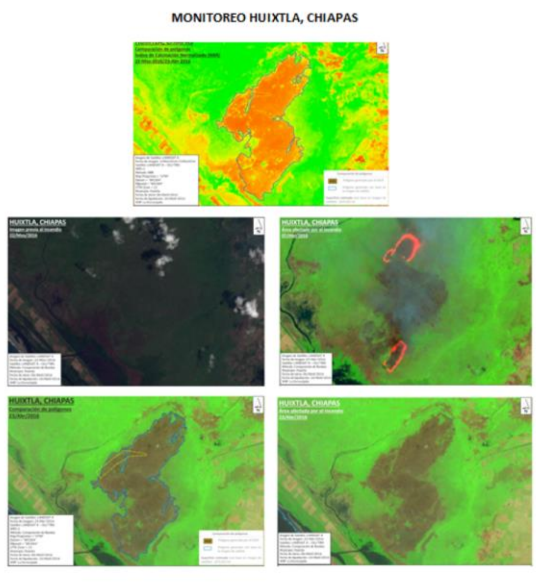


Figure 45 Monitoring fires

The above products provide the inputs for the Daily Situation Analysis meeting, which takes place throughout the year, and much more intensely in the critical season for forest fires (March-June), to allow correct and well-founded decisions to be taken, based on the weather conditions forecast, availability of human and material resources, as well as the current situation of forest fires in the country.

Once the forest fires have ended, the CENCIF receives, reviews and validates the report on forest fires and affected polygons of forest land, thus helping to comply with the General Sustainable Forest Development Act and its Regulations with the participation of the Departments and Entities within their areas of competence. These inputs are provided by the CECIFs for each of the 32 Federal Entities in the country.

The historical databases of national statistical information on forest fires are available on http://www.conafor.gob.mx/web/temas-forestales/incendios/

The input factors and available mass were determined using information specific to the country and the combustion and emission factors were collated from the existing literature.
Punto de Calor Monitoreo de incendios
These statistics are kept in a database which is used as a basis for estimating GHG emissions.

9.2. Organizational Structure for Measurement, Monitoring and Reporting

Please describe the organization of the measurement, monitoring and reporting including:

SECTION A. Organizational structure, responsibilities and competencies;
SECTION B. Methods and standards for generating, recording, storing, aggregating, collating and reporting data on monitored parameters.
SECTION C. Whether and how the measurement, monitoring and reporting system builds upon existing systems, as appropriate

Mexico will use the National Monitoring, Report and Verification System (SNMRV) in order to measure, monitor and report on GHG emissions derived from implementing the IRE.

9.2.1 Organizational Structure for Measurement, Monitoring and Reporting

Mexico has a robust and well harmonized legal framework with regard to the National Monitoring, Reporting and Verification System (SNMRV). The two most relevant laws in terms of the MRV mandate are:

General Law on Climate Change

Article 31. The national policy for mitigating Climate Change must include the diagnosis, planning, **measurement, monitoring, reporting, verification and evaluation of national emissions**, using tools such as planning, policy and the economic instruments indicated in this law.
Article 47. The Commission [Intersecretarial Commission for Climate Change] shall carry out the following functions:
(…)
XII. promote the consolidation of national capacities for **monitoring, reporting and verification, on the subject of mitigating or absorbing emissions**;

The LGCC also considers that the instruments for planning the national policy on Climate Change (in particular the National Program and the Programs of the States) must include measuring, reporting and verification of the adaptation and mitigation measures (Art. 62, Sect. IX and Art. 72, Sect. IV).

General Law on Sustainable Forestry Development

Art. 45. The National Forest and Soils Inventory shall be updated every five years at least and must contain the following information:(…)
IX. The information, based on the **National System for Monitoring, Registration and Verification**, concerns the reduction of emissions resulting from activities associated with preventing and combating deforestation and degradation of the forest ecosystems,
Art 57 bis establishes that the annual satellite study on the forest cover index must be produced and included in the environmental information system.

Decree reforming the LGDFS published in the DOF (Official Journal of the Federation) on June 4, 2012

Art. Second Temporary. Within no longer than three years after this Decree has come into effect the Head of the **Federal Executive shall implement a national system of monitoring, registration and verification**, in order to assess and standardize the reduction of emissions from action associated with preventing and combating deforestation and degradation of forest ecosystems (REDD+), to which reference is made in section IX of article 45 of this Decree.

Law of the National System of Statistical and Geographic Information- regulates the characteristics which the geographical information and the official mapping products for the country must have.

9.2.2 Programmatic Framework of the MRV System

The country also has a reliable programmatic framework relating to the MRV, consisting of a series of instruments for planning the national policy associated with Climate Change. These planning instruments are fully harmonized with the legal framework, since they are derived from the legal mandates. Below is a summary of the content of the main planning instruments which are relevant for the MRV System:

National Strategy for Climate Change
Pillar 5. To implement mechanisms for Measuring, Reporting and Verification, as well as Monitoring and Assessment.
Line of action P5.9 To develop a national system for reliable and transparent forest monitoring for monitoring, reporting and verifying mitigation activities within the forestry sector.

Special Program for Climate Change 2014-2018 (PECC)
Objective 2. Conserve, restore and sustainably manage ecosystems, guaranteeing the appropriate environmental services to mitigate and adapt to climate change.
Strategy 2.4. To develop instruments to promote sustainability and the reduction of emissions from agricultural, forestry and fishing activities and reduce the vulnerability of the ecosystem.
Line of Action 2.4.4. To develop the components established on an international basis for activities for reducing emissions caused by deforestation and forest degradation within the REDD+ mechanism

Sectoral Program for the Environment and Natural Resources 2013-2018
Objective 2. To increase the resilience to the effects of climate change and reduce the emissions from compounds and greenhouse gases.
Strategy 2.2. To consolidate the National Climate Change System (SINACC) and its instruments in transversal, inclusive ways, harmonized with the international agenda.
Line of action 2.2.3. To implement the National Strategy for Reducing Emissions through Deforestation and Degradation of woods and forests (ENAREDD+).

REDD+ National Strategy (ENAREDD+)
The design of the ENAREDD+ in Mexico considers that the following components are fully associated with the MRV System:
V.4. Reference Level
V.5. Monitoring, Reporting and Verification. (MRV)

National Forestry Program 2014– 2018 (PRONAFOR)
Objective 5. To promote and encourage an institutional framework to facilitate sustainable forest development
Strategy 5.5. To promote the reduction of GHG emissions caused by deforestation and degradation of forests.
Line of action 5.5.3. To implement a national system for monitoring, reporting and verification of GHG emissions associated with deforestation and forest degradation.

National Forestry Commission (CONAFOR) Annual Work Program
The CONAFOR Annual Work Program 2016, and in particular the department of the National System for Forest Monitoring, includes 6 indicators for following-up the activities associated with implementing the MRV System in the CONAFOR:

> **5.5.3.1.-**National Inventory of Greenhouse Gas Emissions produced for the LULUCF sector (as part of National Communications)
> **5.5.3.2.-**Updated sub-national reference level
> **5.5.3.3.-**Index for improving activity data calculated from the MRV National System
> **5.5.3.4.-**Index for improving emission factors (national and sub-national) calculated from the MRV system
> **5.5.3.5.-**Improved Platform of Estimates of Forest Emissions/Absorptions of Greenhouse Gases
> **5.5.3.6.-**Calculated index of continuous improvement of the INFyS

9.2.3 Institutionalization of the SNMRV in the National Forestry Commission

CONAFOR has made progress in defining functions and adjusting its internal structure. These changes are reflected in the transformation of Forest Inventory and Geomatics Department into the Department of the National System of Forest Monitoring[121] , which adds to its new functions the responsibility of accepting and maintaining the SMRVS, whose task is to measure and monitor the reduction of emissions resulting from the prevention and combating of deforestation and degradation of forest ecosystems, including complying with the undertakings associated with reporting and producing national and international reports.

The institutionalized operation of the National Forest Monitoring, Reporting and Verification System (SNMRV) requires a set of profiles with specific technical capacities associated with each of its components. These technical capacities have been consolidated throughout the phases for designing, illustrating and implementing the System over the last four years, as part of the Project entitled "Reinforcing REDD+ and South-South Cooperation". This was funded with resources from the Norwegian Government and implemented by CONAFOR with the technical-administrative support of UNDP and FAO, in close collaboration with other agencies such as CONABIO, INECC and INEGI. Therefore – and on an equal footing with adjustments made at institutional level, the Mexican government shall maintain these technical capacities, developed up to now through the Specialized Technical Unit in Monitoring, Reporting and Verification (UTEMRV), to be run by CONAFOR from 2016 onwards, with technical help provided by the Food and Agriculture Organization of the United Nations (FAO)[122].

9.2.4 Inter-institutional Coordination

As previously mentioned, the information from the various pillars that comprise the SNMRV comes from different institutions. Consequently, Mexico relies on inter-institutional arrangements that reinforce and coordinate the operations of the SNMRV. Furthermore, a legal mandate has been established for the SNMRV and its principal pillars, thus ensuring the long-term sustainability of the system. Table 80 details the institutions responsible within the government.

Table 80 Responsible entities and legal mandates for the sustainability of the pillars of the National Forest Monitoring, Registration and Verification System in Mexico.

	Responsible Entity within the Government	Legal Mandate	Product
Activity data	National Institute of Statistics and Geography	Law of the National Statistical and Geographical Information System	Land Use and Vegetation Series
Emission factors	National Forestry Commission	General Law on Sustainable Forestry Development	National Forest and Soil Inventory
Inventories of GHG	National Institute of Ecology and Climate Change	General Law on Climate Change	INEGEIs
Reports (GHG emissions reference level)	National Forestry Commission	PRONAFOR REDD+ National Strategy General Law on Sustainable Forestry Development	Forest Emissions Reference Level of Mexico
Reports (Forest Resources Assessment)	National Forestry Commission	International Commitment (FAO, UN)	FRA, NREF
Reports (BUR INEGEI)	National Institute of Ecology and Climate Change	General Law on Climate Change	INEGEIs
National System for Monitoring, Reporting and Verification	National Forestry Commission	General Law on Sustainable Forestry Development	NREF, Technical Annex of the BUR on REDD+

[121] El The Agreement amending the Organic Statute of the National Forestry Commission was published in the Official Journal of the Federation on January21, 2016: http://goo.gl/Mea5Ir

[122] Given that the FAO has been a strategic partner in the technical-scientific aspect of SNMRV development, and given the experience that FAO has in designing and implementing forest monitoring systems under the framework of the UN-REDD+ Programme, this institution is considered to be the most suitable choice for continuing to provide technical assistance to CONAFOR through this unit.

9.3. Relationship and consistency of the National Monitoring, Registration and Verification System

Please discuss if the approach for measurement, monitoring and reporting is consistent with standard technical procedures in the country and how the approach fits into the existing or emerging National Forest Monitoring System. If applicable, provide a rationale for alternative technical design.

*Refer to **criterion 15** of the Methodological Framework*

As stated in sections 9.1 and 9.2, Mexico will use the National Monitoring, Report and Verification System, (SNMRV) in order to measure, monitor and report on GHG emissions obtained from implementing the Emissions Reduction initiative (IRE) to ensure complete consistency.

9.4. Community Monitoring

The need to develop and strengthen capacities at community level in order to improve the management of its land was identified via the participatory process for developing the investment programs and from feedback from the IRE document.

This requirement is directly linked to the community monitoring approach promoted in Mexico over the last few years: in order to reinforce the capacities of the communities and ejidos when monitoring their natural resources according to the criteria which these communities have set and identified for themselves.

For example, in 2013 and 2014, the CONAFOR worked on implementing the *Initiative for Reinforcing Capacities for Community Monitoring in Mexico*[123] with the technical support of the Project for Reinforcing REDD+ and the South-South Cooperation, the Latin America Investment Facility (LAIF) Project, as well as the Alianza Mexico REDD+ (Mexico Alliance for Reducing Emissions from Deforestation and Forest Degradation). The aim of the collaboration was to develop skills together with five pilot ejidos and communities, to allow them to follow-up and gain a better knowledge of their natural resources; so that they can use these to make decisions and implement good management practices over their land.

See below for a list of the 5 ejidos in which the work was carried out, 3 of which are in States in which the IRE will be implemented:

- Barranca del Calabozo, in Jalisco
- The Unión de Comunidades Productoras Forestales Zapoteco-Chinanteca [The Zapoteco-Chinanteca Union of Forest Production Communities] (UZACHI), in Oaxaca
- Felipe Carrillo Puerto, in Quintana Roo
- La Trinidad, in Chihuahua
- San Agustín, in the Biocultural State Reserve of Puuc in Yucatán

Amongst the natural resources that the communities have decided to monitor are: water, wildlife, such as birds, or mammals, because they are elements used to generate income through eco-tourism or hunting, including self-consumption. They will also monitor their forests, thus allowing them to get to know the state of their resources and decide on how they should be managed. In some cases community monitoring is linked to certification procedures ([Forest Stewardship Council - FSC], sustainable tourism, etc.).

There are some experiences where the ejidos and communities are interested in monitor the carbon contained in their forests and the increase in carbon content. They can then use this information to design forest carbon projects.

[123] For more detailed information see: Booklet on Strengthening capacities for community monitoring in the woods of Mexico in http://goo.gl/qVWNOZ, Tryptic of community monitoring in http://goo.gl/bbmkOT, Initiative for Strengthening Capacities for Community Monitoring in Mexico http://goo.gl/uPSqn3

In addition, as part of the Project for Strengthening REDD+ and South South Cooperation, the expertise of the members of the ejido and of a community at the intensive community monitoring site in Felipe Carrillo Puerto have been reinforced (Community protection brigade).

With this in mind, the opportunities and challenges for integrating community monitoring in the MRV system[124] have been analyzed, and at the moment, it is not considered to link the community monitoring activities carried out on a national basis to the MRV system. Nevertheless, as stated in various sections of this document, the communities have been fully involved in designing this initiative and they will continue to be involved in its implementation.

Finally the effort made with reinforcing capacities within the states via the Technical Groups for Measurement, Reporting and Verification (GTMRV) should be emphasized. Opportunities[125] can be explored in the future in order to integrate information acquired from community monitoring.

10. Displacement

10.1. Identification of the risk of displacement

Using the table below and building on the analysis in sections 4.1, 4.2, 4.3 and 4.4, please asses the risk for Displacement of emissions from the ER Program Accounting Area to areas outside the Accounting Area as a result of the proposed ER Program Measures.

*Refer to **criterion 17, indicator 17.1** of the Methodological Framework*

With regard to the main causes of deforestation and degradation identified in section 4.1, it was analyzed the risk of displacement of emissions (or "leakage")[126] which the investment Programs could generate at state level. It is important to take into account that monitoring of emissions and accounting for emissions reductions under the Emissions Reduction Initiative will be taking place at state level. This means that in situations where emissions displacement occurs in land areas beyond the areas of intervention, this movement will only be classified as a leakage if state boundaries are crossed. The following table details the risk category of movement caused by deforestation, including a brief explanation for this.

Table 81 Category of risk of displacement of the main drivers of deforestation and degradation in the IRE.

Causes of deforestation and degradation	Risk of displacement (high, medium, low)	Risk analysis explanation/justification
Extensive livestock farming (relevant in Chiapas, Campeche, Quintana Roo, Yucatán, Jalisco)	Low	See section 10.2 By not limiting activity, the need for displacement beyond of the accounting unit would not be necessary (state authority).
Traditional agriculture – Reduction/elimination of the fallow cycle (relevant in Chiapas, Quintana Roo, Yucatán, Jalisco)	Low	See section 10.2
Cash crops (soya, fruit, etc.) (relevant in Campeche, Yucatán)	Medium	The combined effect of all measures that comprise the Emissions Reduction Initiative (including improvements in governance at state level, coordination in providing sectoral support, etc.) could limit the zones available under the Accounting Area in terms of the expansion of these types of crops, and cause emissions displacement beyond this area. This risk is particularly apparent when the crops are cultivated in large tracts of land through

[124]http://www.alianzamredd.org/uploads/ckfinder_files/files/4_1_2_7%20%20WhitePaper%20Community%20based%20monitoring%20Balderas%20vf%202013.pdf

[125] This may include: developing tools to allow or facilitate the exchange of information in a systematic way, thus guaranteeing the quality of the information and ensuring that this can be incorporated at national level. It must be borne in mind that community monitoring is voluntary, so the information produced will be very diverse and ways or methodologies will have to be identified for integrating this information with the national system.

[126] Emissions movement (or "loss") is a process by which actions for reduction of emissions resulting from deforestation and degradation in the area in which such emissions occur (normally referred to as the area of implementation or intervention), leads to an increase in emissions beyond this area.

Causes of deforestation and degradation	Risk of displacement (high, medium, low)	Risk analysis explanation/justification
		relatively significant private capital with high mobility. The level of risk is considered medium, due to this type of stakeholder not being predominant in the Accounting Area.
Deforestation and forest degradation due to coffee crops (relevant in Chiapas, Jalisco)	Low	See section 10.2
Degradation due to timber extraction (for firewood, construction, coal, illegal usage, consumption and markets) (relevant in Chiapas, Yucatán, Jalisco)	Low	See section 10.2

10.2. Design elements of the Emissions Reduction Initiative for preventing and minimizing potential displacement

Please identify possible risk mitigation strategies associated with each of the risks identified in section 10.1 above. Describe the strategy to mitigate and/or minimize, to the extent possible, potential Displacement, prioritizing the key sources of Displacement risk and justifying how this strategy can impact the Displacement risk ratings.

*Refer to **criterion 17, indicator 17.2** of the Methodological Framework*

The REDD+ scheme adopted by Mexico is based on the promotion of sustainable rural development through interventions integrated at territorial level. The investment programs applicable in the Early Action Areas reflect this approach by including a series of measures for addressing the causes of deforestation and forest degradation in a collective and coordinated manner at local level, by combining resources from different sources supporting the rural sector. This enables the communities and ejidos participating in such programs to be recognized as stakeholders, with a diversity of activities and sources of income and/or production.

One of the fundamental conditions established by the CONAFOR for the design of the investment programs consists of not allowing these programs to result in any form of reduction to the livelihoods and/or production levels of its participants. In fact, the proposed interventions largely consist of measures that combine productive intensification with conservation, based on activities traditionally developed by the participants.

Additionally, under the proposed scheme, even in the event that some measures could individually imply a reduction in the generation of goods and income, these should be offset by the benefits produced through the other measures included in the investment program, at individual, ejidos or community level.

Another relevant element of the design process of the investment program is that such elements arise from participatory consultation with local stakeholders, consisting of parties who propose and select the measures to be implemented in the communities and ejidos. This means, on the one hand, that right from the start participants are aware of the amount of effort and resources required, in addition to understanding the potential benefits, and that the proposed measures are acceptable in principle to everyone taking part in the programs.

The investment program design characteristics are key to reducing the risk of emissions displacement, which as a general rule occurs as a result of i) the reduction in production, income or livelihood of the program participants; ii) significant reduction in the ability of program participants to supply their products to the appropriate markets; iii) rejection, on the part of program participants, of proposed mitigation measures.

Consequently, in the instance of the approach proposed by Mexico for the individual evaluation of the measures designed to address each one of the causes of deforestation and/or forest degradation, as specified in section 10.1, is unsuitable due to its failure to capture the effect of the investment programs on participants, and its inability to provide incentive for displacement for participants to continue their traditional activities in other areas. As can be seen based on previous arguments, the investment programs included in the IRE have sufficient elements to suggest that the risk of emissions displacement, due to its implementation, will be low.

The profile of the participants in the investment programs provides additional arguments to support this perception of risk. The communities and ejido members are usually rooted to these lands. Therefore the potential displacement is likely to be reduced and it is likely that for such displacement to occur, it will have to take place within the territory of the state in which the investment programs are developed, all such emissions are therefore being captured by the monitoring system and being included in the accounting system of emissions for that state. The potential for mobility is further reduced when it is taken into consideration that the only areas available for the displacement of activities are representative of an economic cost (i.e. an income) or a legal problem (i.e. invasion of abandoned or foreign lands) for the participants in the investment programs.

Finally, the risk of emission displacement through the development of IRE activities shall be reduced even more through the specific measures identified for each investment program, while also taking into account the particular context through which they are undertaken.

11. Reversals

11.1. Identification of the risk of reversals

Please provide an assessment of the anthropogenic and natural risks of Reversal that might affect ERs during the Term of the ERPA and as feasible, the potential risk of Reversals after the end of the Term of the ERPA.

*Refer to **criterion 18, indicator 18.1** of the Methodological Framework*

In order to evaluate the risk of reversals (non-permanence)[127] the tool for evaluating reversals contained in the document of the buffer guidelines generated by the Carbon Fund, was used as an overall guide[128]. With the aim of avoiding a subjective evaluation as far as possible, a number of specific indicators have been proposed for this initiative for each one of the risk factors included in the Tool developed by the Carbon Fund[129].

The risk factors analyzed are:

Risk Factor A: Lack of comprehensive and sustained support of the relevant stakeholders, which has been evaluated using the following indicators:

- Participation of the relevant stakeholders in the design of the Emissions Reduction Initiative (IRE)
- Existence of accessible and effective mechanisms for dealing with complaints
- Existence of effective legal instruments and frameworks for the resolution of disputes related to land ownership
- Maintenance or improvement of the income and/or production levels of the participants over the long term.
- Existence of adequate benefit sharing mechanisms

Risk Factor B: Lack of institutional capacities and/or ineffective vertical/inter-sectoral coordination, which has been evaluated by the following indicators:

- Lack of institutional capacities and/or ineffective vertical/inter-sectoral coordination.
- Experience in the development of policies and programs.
- Experience in inter-sectoral cooperation
- Experience in collaborating between different government levels.

[127] In accordance with the special report on Land Use, Land-Use Change and Forestry (LULUCF) produced by the Intergovernmental Panel on Climate Change (IPCC), the permanence of the benefits of the mitigation activities carried out in this sector refers to the "longevity of a carbon contingent and the stability of its content, while bearing in mind the type of management and changes to the environment in which such activities take place". This report further indicates that this potential reversibility is a typical feature of LULUCF activities, unlike those carried out in other sectors. This possible reversibility and non-permanence of stored carbon requires special consideration in the carbon accounting system for REDD+ activities, which seek payment for results, for example, by calculating any further reductions in carbon, irrespective of the cause. Cause
See: Summary for Land Use, Land-Use Change and Forestry (LULUCF) policy-makers, and special report from Workgroup III of the IPCC. At: https://goo.gl/XDcJr0).

[128] See *"Draft ER Programme Buffer Guidelines – Version October 2 2015"*, which should be used by the countries electing to use the buffer reserve managed by the Carbon Fund, as used in Mexico.

[129] See Annex 11, which describes the methodology used for analysing the reversal risk of the Emissions Reduction Initiative.

Risk Factor C: Lack of long-term effectiveness in addressing the underlying causes

- Experiences of disassociation of deforestation and forest degradation in relation to economic activities.
- Existence of a legal and regulatory context that is conducive to REDD+ goals.

Risk Factor D: Exposure and vulnerability to natural phenomena

- Propensity and vulnerability to forest fires
- Propensity and vulnerability to tropical cyclones

Below are the Tool application results for the Reversals Evaluation for the Emissions Reduction Initiative. To this end, the situation regarding each one of the risk factors contained in the Tool is documented, using the examples of the risk indicators proposed, as a guide and, as required, offering additional indicators that contribute to improving the overall evaluation of the analyzed risk factor. Characterization of the risk for each indicator is based on approach described in the previous paragraph.

Risk Factor A –Lack of comprehensive and sustained support on the part of the relevant stakeholders

1. **Participation of the relevant stakeholders in the design of the Emissions Reduction Initiative (IRE):** The risk factor is considered low due to the investment programs have been developed through a participative process, and the design of the Emissions Reduction Initiative have relied on the active participation and feedback of all relevant stakeholders, in accordance with the description set out in section 5, including expectation that those involved in the putting together of the Investment Programs are committed to ensuring their success.
2. **Existence of accessible and effective mechanisms for dealing with complaints:** The risk factor in relation to the Feedback and Grievance Mechanism (*Mecanismo de Atención Ciudadana*) (MAC) is medium. This is due in part, as described in section 14.3, even though the instruments that comprise the mechanism operate adequately and attend to a significant number of complaints and reports on an annual basis, to the non-existence of data for demonstrating that such instruments are widely known and used by the stakeholders interacting with CONAFOR (e.g. beneficiaries and other potential parties affected by its programs). Finally, an additional limitation is that the MAC is limited to CONAFOR programs and activities, and not those of other government agencies to be involved in the investment programs under the IRE, and which adhere to the full territorial approach on which the Mexico REDD+ approach is based.
3. **Existence of effective legal instruments and frameworks for the resolution of disputes related to land ownership:** The perceived level of risk for this indicator is low. As explained in section 4.4, this is due to the existence and operation of agrarian courts, which have been running since 1995, and their continuous efforts in resolving disputes related to land tenure, and the supplementary support of the COSEMER (Social Conflicts in Rural Areas) Program for facilitating the solution to such disputes. Interviewed state experts confirmed that these courts are known for their involvement in rural activities and also stated that although such activities do not always coincide with resolutions and sometimes it takes too long to resolve such conflicts, there is still a general perception that the justice systems exists and functions.
4. **Maintenance or improvement of the income and/or production levels of the participants over the long term:** The general principal proposed by Mexico is that the activities included in the Investment Programs ensure at least the level of incomes/production achieved through previous practices, in addition to the concept that the activities from the first phase do not depend on performance-based payments (PBP), resulting in this having a low risk level. Notwithstanding – and on the assumption that it is not fully clear how this principal will operate in practice (e.g. it is not yet known how the benefits and/or economic impacts associated with changes in practices will be analyzed, and therefore no analysis that demonstrates the expected behavior of participant income over time is available) – the risk at this moment is therefore considered low.
5. **Existence of adequate benefit sharing mechanisms:** The general guidelines of benefit sharing are described in section 15, and as stated in this section, the mechanism for the local distribution of benefits under the IRE has still not been defined. However, if the Benefit Sharing Plan of the IRE were to be prepared through a participative process at local level with inclusion of the owners and inhabitants of forest land, using a methodology containing the feedback of civil society, experts and state governments, as discussed so far, the risk associated with this indicator would be considered low.

Table 82 below summarizes the assessment of Risk Factor A, in accordance with the analysis presented in this section.

Table 82 Summary of the risk assessment of Risk Factor A

Indicator	Risk level
1. Participation of the relevant stakeholders in the design of the Emissions Reduction Initiatives (IRE):	Low
2. Existence of accessible and effective mechanisms for dealing with complaints	Medium
3. Existence of effective legal instruments and frameworks for the resolution of disputes related to land ownership	Low
4. Maintenance or improvement of the income and/or production levels of the participants over the long term	Medium
5. Existence of adequate benefit sharing mechanisms	Low
Overall risk level of Risk Factor A	Low

Risk Factor B: Lack of institutional capacities and/or ineffective vertical/inter-sectoral coordination

As mentioned in section 6.1, the REDD+ intervention model is based on inter-sectoral coordination, the harmonization of public policies and the joint participation of local stakeholders in the territory in question. These local stakeholders are provided with guidelines and coordination on the part of state governments and the federal government, who offer various types of support such as subsidies, technical assistance, capacity building, support for organizational and institutional strengthening, etc. It is important to highlight the involvement of the Public Agents for Territorial Development (APDT) in promoting, among other factors, the integration of support and related programs provided by other institutions at territorial level, in addition to facilitating inter-governmental collaboration through participation in intermunicipal boards at multiple government levels, by providing continuity in implementing regional REDD+ strategies and sustainable forest management throughout political transitions and changes in government. In order to assess this risk factor, it is necessary to take the capacities and experience of the APDT into account in relation to the central role of the system, while also recognizing that the successful implementation of the IRE shall depend on appropriate individual and collective performance by all of the aforementioned stakeholders.

Annex 9 presents a table-format summary of the principal characteristics of each of the APDTs participating in the IRE, to facilitate reading of the indicators proposed for this risk factor.

Assessment of this risk factor includes the following indicators:

- **Existence of institutional capacities for development or ER programs over the long term:** To facilitate the permanence of emissions reductions generated by the Investment Programs, key stakeholders must be capable of undertaking the necessary roles for the implementation and operation of such programs, and continue to implement them over a sufficient time period to ensure there are suitable mitigation benefits over the long-term (e.g. 10–20 years). The situation in relation to these capacities will be evaluated by analyzing the institutional capacity of the APDT, while also taking into account the intervention schedule and the context in which they operate[130]. Specifically, their institutional administrative capacity needs to be analyzed, i.e. the technical-bureaucratic abilities it requires to achieve its aims. Emphasis should also be put on the availability of the financial resources it needs to carry out its functions; establishment and legal authority making its continuance relatively secure as well as sufficient powers to carry out these functions, plus the technical skills of its personnel in relation to implementing the Investment Programs. The following sub-indicators shall be used, accordingly:
  1. ***Sub-indicator 1, Financial Capacity*:** As detailed in section 6.1, only the intermunicipal boards of the state of Jalisco have ensured sufficient resources to operate until 2018, signifying that the effective operation of the APDTs is not guaranteed. For this reason, it is considered high risk.
  2. ***Sub-indicator 2, Legal Capacity:*** This risk is considered low due to the APDT participating in the IRE, being legally constituted and having all the necessary powers for adequate implementation of the Investment Programs.
  3. ***Sub-indicator 3, Technical Capacity:*** The majority of the APDT that participate in the Emissions Reduction Initiative have sufficient personal capacity to support implementation of the initiative and the development of the activities proposed in the investment programs. However, the continuity of the aforementioned personnel[131] during the initiative implementation period will not be feasible if sufficient financial resources cannot be attained. For this reason, the risk is medium.

- **Experience in the development of policies and programs:** The risk level for this indicator is medium, due to the fact that only seven[132] of the eleven investment programs are being coordinated by APDTs with more than 5 years of experience in the development of activities similar to those implemented in the Emissions Reduction Initiative.
- **Experience in inter-sectoral cooperation:** Due to implementation of REDD+ activities going beyond the boundaries of the forest industry, it is essential for smooth cooperation to exist between all stakeholders, institutions and programs (including support programs) involved in different sectors. The more experience available in this respect, the more likely the Emissions Reduction Initiative will be successful over the long term. In this respect, the current risk level is medium, due to the existence of previous instruments and experiences of inter-sectoral cooperation, developed by the APDT and participating in the IRE. For example, technical support provided by the Mesoamerican Biological Corridor (CBM) within the territories under its jurisdiction, has triggered public policy alignment processes, based on ecosystems connectivity logic maintaining the natural vocation of the territories and generating interest in local development.
- **Experience in collaboration between different government levels:** This indicator is based on the idea that the attainment and maintenance of long-term IRE maintenance benefits is more feasible when the stakeholders at different government levels, involved in such programs have prior experience in successful collaboration projects. In this respect, the APDT rely on sufficient room for collaboration between different government levels. For example, the Advisory Council of the intermunicipal boards comprises the presidents of the associated municipalities, representatives of the federal and state government involved in the environment and agricultural industry, from the academia sector and civil

[130] As detailed in literature (e.g. in the article “Una ruta metodológica para evaluar la capacidad institucional” (A methodological pathway for evaluating institutional capacity) by Angélica Rosas Huerta, published in the “Política y Cultura” (Policy and Culture) magazine no. 30, January 2008), should analysis be required as to the institutional capacity of a local government in addressing a particular public problem, it should first of all be recognised that this capacity is specifically expressed in a local government scenario, but is also associated with other spheres of government and State powers. This means that the capacity shall be in the hands of government agencies that occupy the local Executive apparatus. However, this cannot be merely explained in a “what happens behind closed doors” context, or on the basis of having limited ties with legislative and judicial powers. In addition to these considerations, it is necessary to recognise that the institutional capacity and the public sector are immersed in a reality that is distinguished by a specific socio-historic context characterised by a particular economic, political and social system, with certain relationships and social stakeholders, in addition to being part of an international environment.

[131] Note that it is not necessary for a single person to remain in this position during the entire program implementation period, but it is enough for this position to be covered by a person who meets the specified profile.

[132]CONABIO, JIRA and JIRCO Intermunicipal Environmental Boards)

society organizations. The risk level is therefore considered **low** due to collaboration taking place between the different government levels involved in the Emissions Reduction Initiative.

Table 83 Summary of the risk assessment of Risk Factor B

Indicator	Risk level
1. Existence of institutional capacities for development of ER programs over the long term	Medium
2. Experience in the development of policies and programs	Medium
3. Experience in inter-sectoral cooperation	Medium
4. Maintenance or improvement of collaboration experience levels between different levels of government.	Low
Overall risk level of Risk Factor B	Medium

Risk Factor C: Lack of long-term effectiveness in addressing the underlying causes

Assessment of this risk factor includes the following indicators:

1. **Experiences of disassociation of deforestation and forest degradation in relation to economic activities.** This risk associated with this indicator is medium in all states participating in the IRE. As evidenced in the background information presented in Annex 9 (being non-exhaustive and therefore involving a possible underestimation of the number of successful cases), several examples can be found of dissociation between production and deforestation through a variety of interventions (Protected National Areas and/or community forest management and/or Payment for Environmental Services). In many instances, these interventions are maintained over the long term (more than ten years).
2. **Existence of a legal and regulatory context which is conducive to REDD+ goals:** Risk in relation to this indicator is medium for all participant states in the Emissions Reduction Initiative. As described in section 4.5, even though occurring at national level and in each of the states (with different levels of advancement between each one) legal frameworks have been established to promote REDD+ objectives, it has been documented for years that over-regulation introduced through the LGDFS and the imposition of bureaucratic and costly procedures has culminated in a decrease in the granting of logging permits (timber and non-timber), falling from a peak of 5,567 in 2001, to 1,711 in 2005, and therefore negatively affecting community forest management[133]. Furthermore, lack of human and financial resources, among other factors, has led the agency responsible for law enforcement – the Federal Attorney for Environmental Protection (PROFEPA) – to concentrate its efforts on legal forest operations, and therefore pay little attention to combating the illegal markets that mainly operate in the urban wood distribution centers[134]. This, in turn, could lead to the growth in illegal deforestation throughout the country.

Table 84 summarizes the assessment of Risk Factor C as a reflection of the indicator analyses detailed above.

Table 84 Summary of the risk assessment of Risk Factor C

Indicator	Risk level
1. Experiences of disassociation of deforestation and forest degradation in relation to economic activities	Medium
2. Existence of a legal and regulatory context which is conducive to REDD+ goals	Medium
Overall risk level of Risk Factor C	Medium

Risk Factor D: Exposure and vulnerability to natural phenomena

Below is an evaluation of risk of reversals due to natural phenomena, for each one of the states involved in the Emissions Reduction Initiative. Note that evaluation of reversals depends on the scope of the reference level (e.g. on activities, reservoirs and other sources included) so that, and as described in section 7.1, all states participating in the Emissions Reduction Initiative take deforestation and forest degradation equally into their

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133 For example, see: CCMSS (2015), "Forest over-regulation – An obstacle to the sustainable development of Mexico", Eugenio Fernández Vázquez and Noé Mendoza. Source: the Mexican Civil Council for Sustainable Forestry; and Reforestamos México (2015), "Access costs and legality for sustainable forest management in the Mexican Republic", in the press.

134 Source: CCMSS (2013), Informative note 33. "A new approach for combating illegal logging and timber trade in Mexico", the Mexican Civil Council for Sustainable Forestry.

evaluations, with fires and tropical cyclones both being included, i.e. events that result more in degradation than deforestation, and both being potential sources of reversals.

Section 3.2 documents the current situation of the IRE states, particularly in relation to their forests, and concerning the frequency and impact of fires and tropical cyclones on these states. Additionally, Annex 9 describes the institutional capacities available for confronting such situations.

This is followed by risk level analysis for each of the states, in accordance with the proposed risk indicators detailed in Annex 10 on the adopted Methodology for the assessment of IRE reversals, by which it should be noted that the soundness of this assessment is limited to historical information specifically connected with forest fires, over a total period of 19 years (1995–2013).

1. **Campeche**. The risk of reversals caused by fire in Campeche is considered low, due to the areas affected in the state on a yearly basis not having exceeded the 0.6% of the forest area during this period, and the accumulated burned areas throughout this period (1.27%) not being significant within a risk assessment matrix context. In contrast, the risk associated with tropical cyclones in the state is high, on the basis that, and in accordance with incidences recorded from 1970–2011, category 4–5 hurricanes occurred once every twenty years on average. In this respect, the average risk of the state in relation to natural phenomena is medium.

2. **Chiapas.** With respect to forest fires, and in accordance with the proposed matrix for this risk reversal assessment, corresponding risk is considered low, on the basis that during the historical period covered by the series of available data, the area affected by fires in the state did not surpass 2.68% of the state's forested area. In fact, the accumulated area affected by forest fires represented only 6.7% of the average forest area of the state from the 1995–2013 period. In terms of risk of reversal due to tropical cyclones, this is also considered low due to the state not having been susceptible to hurricanes greater than category 1 since 1851. Consequently, the overall risk of reversals in the state, due to natural phenomena, is low.

3. **Jalisco.** The risk of reversals due to forest fires in Jalisco is low. During the 1995–2013 historical period, the surface area affected never surpassed 0.4% of the state's forested area, with the accumulated area affected during the period representing only 3.8% of the aforementioned area. The risk level in terms of category 2 hurricanes is low, being presented once every six years on average during the period covered by the series of historical data, and medium risk in terms of category 4 hurricanes, which only occurred once during the aforementioned period. The overall risk of reversals in the state due to natural phenomena is low.

4. **Quintana Roo**. The risk of reversals due to forest fires in Quintana Roo is low. For the 1995–2013 historical period, the highest proportion of burned areas in relation to the state's forested area was 2.12% in 2011. In fact, and even taking into account that the accumulated area of the forests affected by fire during the period is around 8%, the State still obtains a low risk rating (i.e. ≤ 10%). In turn, the risk of reversals by hurricanes in the state is medium for category 3 hurricanes (on the basis of having occurred once every ten years between 1970 and 2011), and high for category 4 and 5 hurricanes (having an average occurrence of approximately once every 12 years during this period). Subsequently, the risk associated with tropical cyclones is high. The overall risk of reversals in Quintana Roo due to natural phenomena is medium.

5. **Yucatán**. The risk of reversals due to forest fires in Yucatán is low on the basis that during the period for which data is available (1995–2013), the area affected by forest fires did not surpass 0.64%. The state has a high level or risk in terms of category 4 and 5 hurricanes, and medium for category 3 hurricanes. The overall risk of reversals in Yucatán associated with natural phenomena is medium.

Table 85 summarizes the assessment of Risk Factor D, based on the previously presented details.

Table 85 Summary of the risk assessment of Risk Factor D

State	Risk level
Campeche	Medium
Chiapas	Low

Jalisco	Low
Quintana Roo	Medium
Yucatán	Medium
Overall risk level of Risk Factor D	Medium

11.2. Design elements of the Emissions Reduction Initiative for preventing and mitigating reversals

Please identify possible risk mitigation strategies associated with each of the risks identified in section 11.1 above. Describe how the ER Program design and implementation will contribute to the mitigation of significant risks of Reversal, and will address the long term sustainability of its Emission Reductions, both during the Term of the ERPA and beyond the Term of the ERPA.

*Refer to **criterion 18, indicator 18.2** of the Methodological Framework*

Risk factors	Risk indicators	Mitigation measures
A. Lack of comprehensive and sustained support from relevant stakeholders	Participation of the relevant stakeholders in the design of the emissions reduction programs Existence of accessible and effective mechanisms for dealing with complaints Existence of effective legal instruments and frameworks for the resolution of disputes related to land ownership Maintenance or improvement of the income and/or production levels of the participants over the long term Existence of adequate benefit distribution mechanisms	Consolidation of the citizen councils of the intermunicipal boards Consolidation of the REDD+ Technical Advisory Councils (CTC) in each state participating in the Emissions Reduction Initiative Creation and/or consolidation of State Financing mechanisms (Funds, Trusts, etc.) for the adequate benefit sharing. Integration of the various subsidy programs into the basic land units (ejidos, communities and smallholdings) including groups of people without land ownership rights, based on planning instruments occurring in a participatory manner (OTC and P-Predial). Promoting the implementation of complaints mechanisms within the agricultural sector agencies at State and Federal level. Development of value chains and market access, enabling economic sustainability of the productive activities promoted in the investment programs.
B. Lack of institutional capacities and/or ineffective vertical/inter-sectoral coordination	Institutional capacities and/or ineffective vertical/inter-sectoral coordination Experience in the development of policies and programs Experience in inter-sectoral cooperation Experience in collaboration between different government levels	The political commitment of Mexico in reducing deforestation, equally expressed in legislation and in National Programs. State-Federation collaboration agreement for the implementation of the Emissions Reduction Initiative in which the various agencies from both government tiers are involved. Consolidation of the citizen councils of the intermunicipal boards (APDT) Collaboration agreement between the State Government and the Federal Government, and the intermunicipal boards (APDT) for implementation of the Investment Programs. Continuous training of the executive directorships of the Intermunicipal Boards and technical personnel from the APDT. Training of operational personnel from the various state and federal agencies involved in the implementation of the IRE.
C. Lack of long-term effectiveness in addressing the underlying causes	Experiences of disassociation of deforestation and forest degradation in relation to economic activities Existence of a legal and regulatory context which is conducive to REDD+ goals	Defining of eligibility zones for the application of subsidies and credits for agricultural activities. Preparation and implementation of Ecological Planning, at local and regional level. Preparation and implementation of Community Land Planning and Integrated Development Land Program (P-Predial)

D. Exposure and vulnerability to natural phenomena	Propensity and vulnerability to forest fires Propensity and vulnerability to tropical cyclones	Preparation of Fire management plans in the IRE intervention zones. Establishment of emergency response mechanisms for the management of forests affected by hurricanes

As expressed in section 11.1, and as summarized in the previous table, reversals can be caused by human activity (or non-activity) or be caused by natural causes. In the first instance, reversals are the product of a loss or failure after a period of successful implementation, in one of the links pertaining to the complex chain of activities and stakeholders involved, having previously managed to maintain forest cover and reduce emissions associated with such failure or loss.

The previously presented reversal risk assessment demonstrates that, in the instance of the IRE, the most vulnerable links belonging to this chain are principally related to the reduction of the operational capacities of the implementing entities and their vertical and inter-sectoral coordination abilities. Risks therefore arise – from doubts concerning the institutional, technical and economic capabilities of the APDT, to concerns that all government tiers involved in the scheme will understand and support it from a political and economic perspective. Consequently, a critical part of a strategy for reducing the possibility of reversals lies in ensuring sufficient and sustained support for the establishment, consolidation and strengthening of the APDT, in addition to ensuring their operation over the long-term.

On the other hand, it is necessary to strengthen organized civil society so that it can operate as local development agents capable of contributing synergistically with the APDT in the process of giving appropriate support and advice during the local development process proposed in this initiative.

A latent risk associated with the previous point involves the institutional capacities of the ejidos and communities in maintaining long-term agreements for the management of their common resources when faced by phenomena such as migration and weakening of capital, with it therefore being indispensable that during the IRE implementation process, strong emphasis is given to the application of instruments that strengthen community and inter-community organization.

Another identified and relatively high risk is related to the uncertainty over the maintenance or improvement of the income of IRE participants. In addition to the need to carefully study the effect of the proposed measures on the income of participants, and to ensure that these incomes will not be diminished, it is fundamental that during the first years of implementation, at the least, government support is guaranteed for those depending on the activities included in the investment programs, and are also maintained for a sufficient enough time for the proposed model to fully consolidate. In this respect, it will also be important for the investment programs to evolve over time so that they are less dependent on subsidies.

As has been already stated, in general terms, any type of strategy designed for ensuring the permanence of the emissions reductions achieved under the IRE takes a series of measures into account for ensuring the success of the proposed model and, therefore, shall be very similar to a guide on good practices for the successful design and implementation of the initiative.

In this respect, it shall be necessary to establish formats and deadlines for assessing the implementation of the Emissions Reduction Initiative and, as required, carry out all relevant modifications. These assessments or evaluations must be accompanied by reviews on the risk of reversals, utilizing the method applied in this study or another applicable method, so that i) it is possible to propose new methods to avoid reversals; and ii) the percentage of emissions reductions is periodically adjusted in terms of what should be allocated to the investment reserve to accurately reflect the current level of risk.

11.3. Reversals management mechanism

Selection of the reversals management mechanism

Please select one of the options identified in the Methodological Framework to account for Reversals from ERs that have been transferred to the Carbon Fund during the Term of the ERPA.

*Refer to **criterion 19** of the Methodological Framework*

Reversals management mechanism	Selected (Yes/No)
Option 1: The Emissions Reduction Initiative has its own reversals management mechanism that is substantially equivalent to the reversals management mitigation mechanism, providing the buffer reserve administered by the Carbon Fund.	No
Option 2: The emissions reductions generated through the Emissions Reduction Initiative are deposited in the buffer reserve managed by the Carbon Fund, and based on the assessment tool designed by the Carbon Fund.	Yes

Option 2, explanation of Reversals Management Mechanism

If option 2 has been selected above, please provide a summary of the Reversal risk assessment and the resulting number of ERs from the ER Program that will be deposited in the ER Program CF Buffer (full risk assessment should be annexed to the ER-PD).

*Refer to **criterion 19** of the Methodological Framework*

21% of the emissions reductions generated by the Emissions Reduction Initiative will be deposited in the buffer reserve administered by the Carbon Fund.

This value was obtained utilizing discount percentages based on the degree of risk (low, medium, high) while also taking into account, within this analysis, the indicators described in section 11.1. Table 86 presents the percentage to be split off for the reserve.

Table 86 Percentage of emissions reductions to be split off in the buffer reserve

Risk factors	Risk indicators	Default percentage	Allowance	Resulting percentage
Default risk	Not applicable, fixed minimum amount	10%	Not applicable	10%
A. Lack of comprehensive and sustained support from relevant stakeholders	Participation of the relevant stakeholders in the design of the Emissions Reduction programs. Existence of accessible and effective mechanisms for dealing with complaints. Existence of effective legal instruments and frameworks for the resolution of disputes related to land ownership Maintenance or improvement of the income and/or production levels of the participants over the long-term. Existence of adequate benefit distribution mechanisms.	10%	The risk is considered low: 10% allowance	0%
B. Lack of institutional capacities and/or ineffective vertical/inter-sectoral coordination	Lack of institutional capacities and/or ineffective vertical/inter-sectoral coordination Experience in the development of policies and programs. Experience in inter-sectoral cooperation Experience in collaborating between different government levels.	10%	The risk is considered medium: 5% allowance	5%
C. Lack of long-term effectiveness in addressing the underlying causes	Experiences of disassociation of deforestation and forest degradation in relation to economic activities. Existence of a legal and regulatory context which is conducive to REDD+ goals.	5%	The risk is considered medium: 2% allowance	3%

Risk factors	Risk indicators	Default percentage	Allowance	Resulting percentage
D. Exposure and vulnerability to natural phenomena	Propensity and vulnerability to forest fires Propensity and vulnerability to tropical cyclones	5%	The risk is considered medium: 2% allowance	3%
Percentage to separate for the reserve: 10 + (Result A + Result B + Result C + Result D) = 10+(0+5+3+3) = 21%				

11.4. Monitoring and reporting of the principal emissions that could lead to ER reversals

Please describe the monitoring mechanism that will be put in place to monitor and report major emissions in the Accounting Area or changes in ER Program circumstances that could lead to Reversals of ERs transferred to the Carbon Fund during the Term of the ERPA.

*Refer to **criterion 21** of the Methodological Framework*

As described in Section 9, the National Forest Monitoring, Reporting and Verification System (SNMRV) is capable of detecting significant reversals in accordance with the emissions included in the reference level[135]. In the event that reversals are detected, CONAFOR shall notify the Carbon Fund within a time period of no greater than ninety days, after having acquired knowledge of the facts.

12. Uncertainty associated with the emissions reduction calculation

12.1. Identification and evaluation of the sources of uncertainty

Please systematically identify and assess sources of uncertainty associated with calculation methods that contribute to the uncertainty of the estimates of emissions and removals and assess their relative contribution to the overall uncertainty of the emissions and removals.

*Refer to **criterion 7** of the Methodological Framework*

The propagation of uncertainties was a process parallel to that of estimating total emissions/absorptions. Consequently, the process described below for propagating them started with estimating the uncertainties of the EF and the conceptual development for calculating the uncertainties of the AD (given that at the moment it is not possible to obtain it), subsequently, the process proceeded to obtain the emissions/absorptions in the coverage classes with the respective propagation of uncertainties of EF using the analytical method and the Monte Carlo method. Finally, the emissions/absorptions in the coverage classes were added at sector level and the uncertainties were propagated for addition and subtraction using both of the IPCC methods.

In accordance with the IPCC Good Practice Guidance (2006) for the estimation of GHG emissions/removals, it is necessary to perform quantification on all sources of uncertainty. In terms of the forest industry, estimation of Greenhouse Gases starts with the approach of weighting Activity Data (AD) by Emission Factors (EF), where both components are subject to various sources of uncertainty. These EF are mainly obtained from estimates of the aboveground biomass, and in accordance with Chave (2004) this carbon reservoir is subject to four sources of uncertainty which derive from errors in: measurement, allometric models, the area sampled and the sampling error; however, in the case of this initiative, only the uncertainty of the EF associated with the sampling error was estimated due to the fact that this was the source of error which could be quantified most reliably. Nevertheless, it should be mentioned that the organization has made significant efforts in order to quantify the uncertainties resulting from measurement and the allometric models.

[135]As mentioned in section 7.1, the Forest Reference Emission Level (FREL) was established using the best possible official information. Activity Data and Emission Factors will be improved over the short and medium term. Emissions reversals which can be observed using the INEGI Series can now be detected.

For example, improvement processes are taken into consideration in order to estimate the uncertainties of the measurement errors information generated in blind checks and the information collected in these reviews was compared with the sample's respective information; given that it is not possible to analyze the differences from tree to tree due to the fact that we do not have the id of each of the registers taken from the sample and its corresponding blind checking, in order to compare both data sets, recourse was made to using linear models with mixed effects in order to isolate the different sources of variability (between conglomerates, re-measuring periods, types of vegetation, etc.) which was able to isolate the error associated with measuring; the dimensions of these were obtained from this analysis; however, the estimates obtained are recent and were not incorporated in this study. On the other hand, where there were uncertainties in allometric models, a significant effort was also made with their estimation and in order to do this, two approaches were used. The first was to reconstruct the allometric models in order to obtain the statisticians capable of obtaining the confidence intervals of the allometric models and where it was not possible to reconstruct them, recourse was made to obtaining the confidence intervals for the model forecasts using simulation methods involving the reconstruction of covariance matrices and meta pseudo-populations. As with the estimates of the measurement errors, estimates of the uncertainties of the allometric models were obtained from recent studies and were not included in the results shown in this report.

Once the uncertainty of EF (associated with sampling error) was estimated for all coverage classes and for the various deforestation and degradation activities, the emissions at coverage class level were estimated, weighting each of the EF by their respective AD and simultaneously propagating uncertainties through weighting using the analytical method and the IPCC Monte Carlo method. However, this did represent a challenge since each change polygon had to be allocated a specific type of EF depending on the state, coverage class and type of activity as shown in figure 46, and at the same time the uncertainties had to be propagated through multiplication with both methods. Consequently, an algorithm was developed in the statistical software R in order to standardize and automate this process. This also allowed the processes for estimating and propagating uncertainties to be documented. Although at the time of developing these estimates it was not possible to obtain the AD uncertainties, it is already considered to be incorporated in the algorithm in R , as part of the estimating processes. So once this has been estimated, it could be incorporated in the propagation processes.

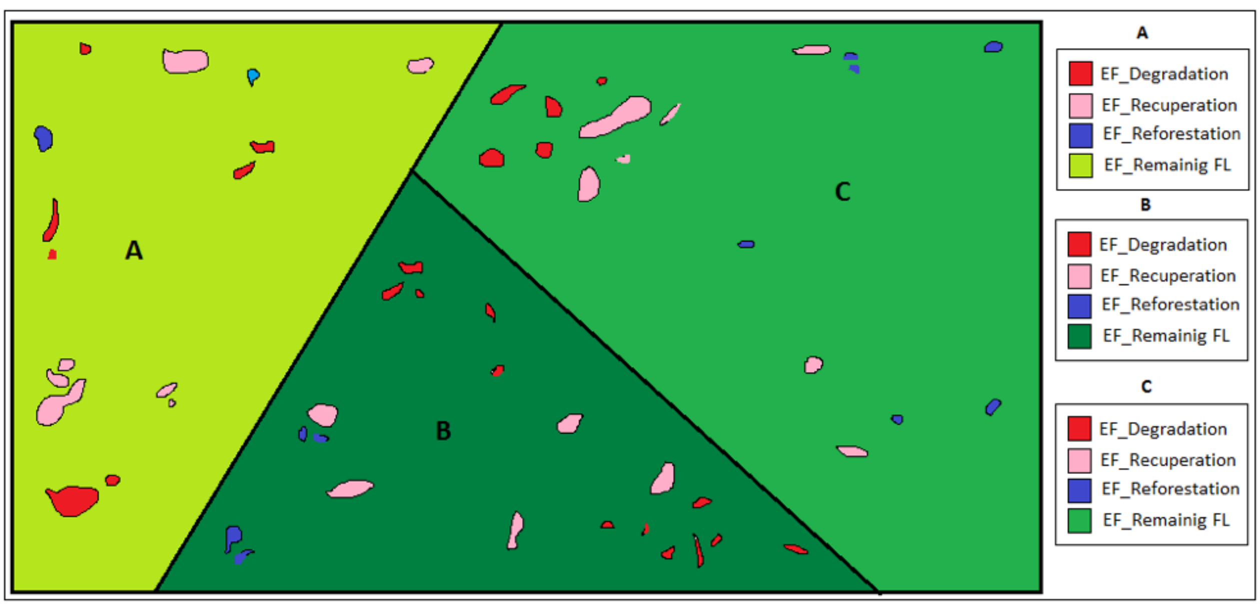

Figure 46. Graphic example of identifying Activity Data in order to allocate their respective Emission Factors per coverage type

Finally, after having obtained the estimated emissions and their propagation of uncertainties at vegetation class level, the following step was to obtain the total emissions with their respective propagation of uncertainties for the whole sector. This means adding together the various emissions of each class and reservoir (aerial and underground biomass) and propagating uncertainties by addition and subtraction using the analytical method and the IPCC Monte Carlo method. In a similar way to the method indicated above, this process was standardized and automated in R and the process takes into consideration integrating the AD uncertainties.

With regard to the methods of propagation, it is advisable to mention that the analytical method was used simultaneously for the operations of multiplication and addition as shown in table 87. On the other hand, the Monte Carlo method was implemented by using probability density functions (PDF) which were normal for the EF parameter as input data and taking into consideration the amplitude corresponding to its uncertainty. In the case of the AD, a normal PDF (probability density function) was also taken into consideration, using as a measurement of locality and amplitude the adjusted areas and their uncertainties ensuing from validating the maps.

Table 87 Implementation of the analytical method

Transition 1 (FL-OU)						
Class/ Component	Emission Factor	Uncertainty of EF (UEF)	AD	Uncertainty of AD (UAD)	Emission (at component level)	Uncertainty of E (UE)
A	EF1A	UEF1A	AD1A	UAD1A	E1A=EF1A*AD1A	$U_{E1A} = \sqrt{{U_{EF1A}}^2 + {U_{AD1A}}^2}$
B	EF1B	UEF1B	AD1B	UAD1B	E1B=EF1B*AD1B	$U_{E1B} = \sqrt{{U_{EF1B}}^2 + {U_{AD1B}}^2}$
C	EF1C	UEF1C	AD1C	UADF1C	E1C=EF1C*AD1C	$U_{E1C} = \sqrt{{U_{EF1C}}^2 + {U_{AD1C}}^2}$
Total emission / Propagated uncertainty of Transition 1					E1=E1A+E1B+E1C	$U_{E1} = \frac{\sqrt{(E_{1A}\times U_{E1A})^2+(E_{1B}\times U_{E1B})^2+(E_{1C}\times U_{E1C})^2}}{\lvert E_{1A}+E_{1B}+E_{1C}\rvert}$

Lastly, it can be seen from the tables for estimating emissions/absorptions and propagation of uncertainties that the values of uncertainties obtained using the analytical method and the Monte Carlo method are similar and this is due to the fact that for uncertainties of below one hundred per cent with symmetrical parameters, the analytical method is expected to offer good results, comparable with those obtained using the Monte Carlo simulation.

Secondly, as part of the final analysis of the relative contribution of each variable to the total uncertainty of emissions reductions, an analysis of sensitivity can be carried out to determine which stratum provides the most uncertainty (associated with the uncertainty of the EFs – sampling error), for degradation and deforestation, separately. This analysis will require restructuring of the algorithms which have already been designed to estimate and propagate EF uncertainties

12.2. Quantifying the uncertainty in the Reference Level calculation

Please describe how the uncertainty of the estimate of Emission Reductions will be quantified and reported at the time of measurement, monitoring and reporting. If applicable describe the different approaches for separately reporting uncertainty of Emissions Reductions associated with deforestation, forest degradation and enhancements.

*Refer to **criterion 9, indicator 9.3** of the Methodological Framework*

The ability to obtain uncertainties from each of the estimation components is based on the quality and quantity of inputs. In the particular instance of emissions reductions, the Emission Factors (EF) shall be obtained from INFyS data and the allometric models available at national level. Consequently, EF uncertainties were obtained from INFyS sampling errors. On the other hand, the Activity Data shall be obtained from the INEGI series of data and, due to these special products not relying on official validation, it will therefore be assumed that they are credible and not a quantification of uncertainty. (See Section 8.4.1.).

The uncertainty quantified to date, including in the reference level, only includes the sampling error for developing Emission Factors and is reported in terms of percentage and with a confidence level of 95%in accordance with the provisions of the IPCC Good Practice Guidance (2006) and on the basis of the theory that normal distribution of emission estimates and activity data takes place.

The calculation for estimating degradation and deforestation is based on consistent methods in relation to available data, and on each method being reported in an independent manner, while remaining in compliance with the respective calculation of uncertainty and its propagation.

The following tables outline the Propagation of Uncertainty in relation to the analytical method and the Monte Carlo method, for aboveground biomass and roots.

Table 88 Propagation of Uncertainty in relation to the analytical method and the Monte Carlo method, for aboveground biomass in Campeche.

Dynamic	Area	Emissions/Removals (TonC)	Uncertainty Analytical Method (%)	Uncertainty of Monte Carlo Method - low, (%)	Uncertainty of Monte Carlo Method - upp, (%)
TF-OU	11,066	-287,950	7	7	7
TF-PRA	18,208	-604,434	5	5	5
TF-TFd	14,134	-374,702	62	61	61

Table 89 Propagation of Uncertainty in relation to the analytical method and the Monte Carlo method, for roots in Campeche.

Dynamic	Area	Emissions/Removals (TonC)	Uncertainty Analytical Method (%)	Uncertainty of Monte Carlo Method - low, (%)	Uncertainty of Monte Carlo Method - upp, (%)
TF-OU	11,066	-70,318	6	6	6
TF-PRA	18,208	-144,934	5	5	5
TF-TFd	14,134	-91,178	57	57	57

Table 90 Propagation of Uncertainty in relation to the analytical method and the Monte Carlo method, for aboveground biomass in Chiapas.

Dynamic	Area	Emissions/Removals (TonC)	Uncertainty Analytical Method (%)	Uncertainty of Monte Carlo Method - low, (%)	Uncertainty of Monte Carlo Method - upp, (%)
TF-OU	7,647	-138,535	12	12	12
TF-PRA	10,983	-269,324	10	10	10
TF-TFd	1,995	-47,507	58	58	58

Table 91 Propagation of Uncertainty in relation to the analytical method and the Monte Carlo method, for roots in Chiapas.

Dynamic	Area	Emissions/Removals (TonC)	Uncertainty Analytical Method (%)	Uncertainty of Monte Carlo Method - low, (%)	Uncertainty of Monte Carlo Method - upp, (%)
TF-OU	7,647	-33,997	11	11	11
TF-PRA	10,983	-64,506	9	9	9
TF-TFd	1,995	-11,356	53	53	52

Table 92 Propagation of Uncertainty in relation to the analytical method and the Monte Carlo method, for aboveground biomass in Jalisco.

Dynamic	Area	Emissions/Removals (TonC)	Uncertainty Analytical Method (%)	Uncertainty of Monte Carlo Method - low, (%)	Uncertainty of Monte Carlo Method - upp, (%)
TF-OU	3,441	-53,346	7	7	7
TF-PRA	2,672	-43,107	7	7	7
TF-TFd	212	-3,293	53	53	53

Table 93 Propagation of Uncertainty in relation to the analytical method and the Monte Carlo method, for roots in Jalisco.

Dynamic	Area	Emissions/Removals (TonC)	Uncertainty Analytical Method (%)	Uncertainty of Monte Carlo Method - low, (%)	Uncertainty of Monte Carlo Method - upp, (%)
TF-OU	3,441	-13,367	7	6	7
TF-PRA	2,672	-10,798	7	7	7
TF-TFd	212	-821	49	49	50

Table 94 Propagation of Uncertainty in relation to the analytical method and the Monte Carlo method, for aboveground biomass in Quintana Roo.

Dynamic	Area	Emissions/Removals (TonC)	Uncertainty Analytical Method (%)	Uncertainty of Monte Carlo Method - low, (%)	Uncertainty of Monte Carlo Method - upp, (%)
TF-OU	10,198	-255,146	6	6	6
TF-PRA	8,993	-266,656	5	5	5
TF-TFd	11,237	-342,951	69	70	68

Table 95 Propagation of Uncertainty in relation to the analytical method and the Monte Carlo method, for roots in Quintana Roo.

Dynamic	Area	Emissions/Removals (TonC)	Uncertainty Analytical Method (%)	Uncertainty of Monte Carlo Method - low, (%)	Uncertainty of Monte Carlo Method - upp, (%)
TF-OU	10,198	-61,746	6	6	6
TF-PRA	8,993	-64,081	5	5	5
TF-TFd	11,237	-82,531	64	64	63

Table 96 Propagation of Uncertainty in relation to the analytical method and the Monte Carlo method, for aboveground biomass in Yucatán.

Dynamic	Area	Emissions/Removals (TonC)	Uncertainty Analytical Method (%)	Uncertainty of Monte Carlo Method - low, (%)	Uncertainty of Monte Carlo Method - upp, (%)
TF-OU	61,608	-786,366	19	19	18
TF-PRA	12,045	-236,679	23	23	22
TF-TFd	3,945	-66,469	91	90	89

Table 97 Propagation of Uncertainty in relation to the analytical method and the Monte Carlo method, for roots in Yucatán.

Dynamic	Area	Emissions/Removals (TonC)	Uncertainty Analytical Method (%)	Uncertainty of Monte Carlo Method - low, (%)	Uncertainty of Monte Carlo Method - upp, (%)
TF-OU	61,608	-192,681	18	17	18
TF-PRA	12,045	-58,098	21	21	21
TF-TFd	3,945	-16,189	79	79	80

Propagation of uncertainties of the FREL

The expected emissions reductions (ex-ante) are a percentage which is expected to be reduced in comparison with the RL (Reference Level) which is the result of average emissions for the historical period 2001-2011; so, in order to be able to obtain its uncertainty, recourse will have to be made to the properties of variance; since in reality this average is the result of adding together the emissions during the historical period and dividing this figure by the number of years in this period. That is to say, this average is the result of dividing a total between a constant, so we can estimate the uncertainty by breaking down the average into two processes. First of all this concerns estimating the uncertainty of the denominator (which is a sum) and then applying the properties of the variance when we multiply a variable (which in this case would be the sum) by a constant (which would be the numerator). In the calculation of the expected reduction of emissions it is assumed that the uncertainty is the same in the historical period and is only obtained according to the reduction of 20% which is proportional to the area (annual constant) where the reductions of emissions occur.

We know that the expected emissions derive from the average of the emissions in the historical period:

$$\bar{E} = \frac{\sum E_i}{n} = \frac{1}{n} \times \sum E_i \qquad \text{Eq 28}$$

Where:

$\bar{E}$: Average emissions in the historical period

E_i: Emission for year i, i (2001-2011)

n: Number of years

Of the basic properties of the variance we know that if : is a constant and *and* is a variable, then the variance of the product $c \times y$ is:

$$Var(c \times y) = c^2 \times var(y) \qquad \text{Eq 29}$$

From Eq 28 it can be seen that $\frac{1}{n}$ is a constant and $\sum \ E_i$ is a variable; therefore, taking into account equation 29, we can estimate the variance of $\bar{E}$ in accordance with equation 30:

$$Var\left(\frac{1}{n} \times \sum E_i\right) = \left(\frac{1}{n}\right)^2 \times var\left(\sum E_i\right) \qquad \text{Eq 30}$$

In this way, the estimation uncertainty of the ex-ante is reduced to estimating the uncertainty of the total emissions during the period of analysis.

In order to obtain the uncertainty of the total emissions the uncertainty of each one of the emissions was propagated by using the IPCC (2006) analytical method as shown in the following equation:

$$U_{total} = \frac{\sqrt{(U_1 * E_1)^2 + (U_2 * E_2)^2 + \cdots + (U_n * E_n)^2}}{|E_1 + E_2 + \cdots + E_n|}$$

Where:

Utotal: Total uncertainty.
Ui: Uncertainty of the emission i of each state, with i=2001…2011
Ei: Emission for year i for each state.

The emissions Ei are the result of the emissions caused by deforestation and degradation in each state, so in order to estimate the uncertainties Ui of these emissions Ei, recourse also has to be made to propagating them by using the equation of propagation by the addition and subtraction of the IPCC (2006) as shown in the following equation:

$$U_i = \frac{\sqrt{(U_{\text{Defo}} * E_{\text{Defo}})^2 + \left(U_{\text{Degra}} * E_{\text{Degrada}}\right)^2}}{\left|E_{\text{Defo}} + E_{\text{Degrada}}\right|}$$

Where:

Ui: Uncertainty of the emission i of each state, with i=2001…2011
UDefo: Uncertainty of the emission through deforestation of the state analyzed
UDegra: Uncertainty of the emission through degradation of the state analyzed
EDefo: Emission through deforestation of the state analyzed
EDegra: Emission through degradation of the state analyzed

Finally, the analytical method was used because the IPCC (2006) indicates that this is appropriate for use when the uncertainties at issue are relatively small and the distribution of the parameters analyzed have symmetrical performances.

Finally, it should be pointed out that in October and November 2016 an analysis of sensitivity of uncertainties will be carried out, taking the following steps:

1- The algorithm in the statistical software R will be changed in order to generate the reports on the emissions (and their respective uncertainties) resulting from **deforestation** on the basis of the type of vegetation; since at the moment the algorithm generates a report on the emissions grouped together under the heading of all emissions from “Forestlands which are converted to another type of use” (for each state) with their respective propagation of uncertainties.
2- The algorithm in the statistical software R will be changed in order to generate the reports on the emissions (and their respective uncertainties) resulting from **degradation** on the basis of the type of vegetation; since at the moment the algorithm generates a report on the emissions grouped together under the heading of all emissions from “Forestlands which are converted to Degraded Forest Lands” (for each state) with their respective propagation of uncertainties.
3- **An algorithm will be developed** in the statistical software R in order to carry out the analysis of sensitivity of uncertainty based on the “Analysis of the contribution of variance per category” methodology which can be found in chapter 3 of Volume 1 of the IPCC Guides to Good Practice 2006.
4- Using the algorithm indicated in point 3, an analysis of sensitivity of the uncertainties of the emissions associated with **deforestation** will be carried out in each state, using as input the emissions caused by deforestation and their uncertainties on the basis of the type of vegetation.
5- Using the algorithm indicated in point 3, an analysis of sensitivity of the uncertainties of the emissions associated with **degradation** will be carried out in each state, using as input the emissions caused by degradation and their uncertainties on the basis of the type of vegetation.

6- The emissions on account of deforestation and degradation on the basis of the type of vegetation will be added together for each state and their uncertainties will be propagated.

7- Using the total emissions and their uncertainties (obtained in point 6) and the algorithm indicated in point 3, an analysis of sensitivity of the uncertainties of the **total emissions** will be carried out for each state on the basis of the type of vegetation.

13. Calculation of the reduction of emissions

13.1. Ex-ante estimation of Emissions Reductions

Using the table below, please provide a simplified ex-ante estimation of the expected Emission Reductions of the ER Program within the Accounting Area based on the approach outlined in the FCPF Carbon Fund Methodological Framework. Where the calculation requires monitored data that is not available yet, use best estimates based on expected impacts of the ER Program and data that might be available from other actions (either in the country or in other countries). List all assumptions, and provide the values used for each parameter and the sources for these data.

Refer to ***criterion 22*** *of the Methodological Framework*

For the calculation of ex-ante estimations, an estimation of potential emissions in the areas of intervention and in relation to historic emissions (2001–2011) shall occur for each State and on the basis of the amount of forest covered by investment programs, subsequently assuming a 20% annual reduction in these emissions based on the following assumptions:

- These areas of intervention have emissions that are proportional to those of the state authority to which they belong, and in accordance with the quantity of forest contained in INEGI Series V.
- The emissions will be reduced by 80%[136] over the next four years of the IRE, at a rate of 20% per year, maintained at 80% by year 5.
- Only emissions reductions through deforestation and degradation will be reduced, not emissions reductions from degradation caused by fire for the calculation ex-ante [137]. It is worth clarifying that the IRE does indeed contemplate having emissions reductions on account of fires as mentioned in section 8. These reductions will be monitored, quantified and reported while the IRE is being implemented.
- It is assumed that the uncertainty is the same during the historical period and is only obtained according to the reduction of 20% which is proportional to the area (annual constant) where the reductions of emissions occur.

The total uncertainty for the expected reductions is 4% as can be seen in table 98 therefore no adjustment is made to the expected reductions of emissions.

Table 98 Reduction of Ex-ante Emissions in the IRE region

Year of the ERPA period	Reference Level (tCO_2-e/yr)	Estimation of expected emissions under the ER Program (tCO_2-e/yr)	Estimation of expected set-aside to reflect the level of uncertainty associated with the estimation of ERs during the Term of the ERPA (tCO_2-e/yr)	Estimated Emission Reductions (tCO_2-e/yr)	Estimated Emission Reductions (tCO_2-e/yr) set aside buffer	Estimated Emission Reductions (tCO_2-e/yr) available to be transferred
1	24,012,031	21,866,044	0	2,145,987	450,657	1,695,330
2	24,012,031	19,720,057	0	4,291,974	901,314	3,390,659
3	24,012,031	17,574,070	0	6,437,961	1,351,972	5,085,989
4	24,012,031	15,428,083	0	8,583,947	1,802,629	6,781,318
5	24,012,031	15,428,083	0	8,583,947	1,802,629	6,781,318

[136] 80% is assumed because it is not realistic to have 100% reduction of emissions.

[137] This assumption is a conservative measures due to the fact that if an extreme weather phenomenon occurs it would be difficult to manage and there would be no reduction in emissions.

It is relevant to note that any updates made to the Reference Levels will require changing the estimated emissions reduction potential. Accordingly, once the Reference Levels have been updated based on the estimate of Activity Data uncertainties (unbiased areas), the ex-ante estimate of Emission Reductions will also be updated. Similarly, we will look into more robust methods for this estimate, using emissions forecasts.

14. Safeguards

14.1. Description of how the Emissions Reduction Initiative complies with the social and environmental safeguards of the World Bank, and promotes and supports UNFCCC safeguards in relation to REDD+

Please describe how the ER Program, through its design and implementation, meets relevant World Bank social and environmental safeguards, and promotes and supports the safeguards included in UNFCCC guidance related to REDD+, by paying particular attention to Decision 1/CP.16 and its Appendix I as adopted by the UNFCCC

Please list and briefly describe the Safeguards Plan(s) that have been developed and how said Plan(s) will be implemented in the course of the ER Program.

*Refer to **criterion 24, indicator 24.2** of the Methodological Framework*

14.1.1 Tackling the REDD+ safeguards of the United Nations Framework Convention on Climate Change (UNFCCC) and compliance with the social and environmental safeguards of the World Bank

In accordance with the information established in the most recent version of the REDD+ National Strategy (ENAREDD+) [138], safeguards in Mexico are understood to be principles, conditions or social and environmental criteria that guide the design and implementation of policies, programs and other activities. Mexico has acknowledged express recognition of REDD+ safeguards established under the United Nations Framework Convention on Climate Change (UNFCC), and the ENAREDD+ includes the development of a National Safeguards System (SNS) and a Safeguards Information System(SIS). [139]

SNS refers to the system or structure which will define the way in which compliance with the REDD+ safeguards will be guaranteed in Mexico and to which activities they will be applied. This takes into consideration the system of governance in the country which includes laws and institutions for its implementation and the aspects of compliance which include mechanisms for conflict solving, attention to complaints, reporting, and feedback of information. The SNS consists of three elements: the legal, institutional and compliance framework (see Figure 47).

For its part the SIS functions like a mirror of the SNS, through which Mexico will report to the national stakeholders, the international community, and donors the way in which the REDD+ Safeguards are being fulfilled. The SIS is being constructed from existing systems and mechanisms for reporting at national level which are able to present integral information and follow up safeguards compliance.

It has been acknowledged that possessing this information system does not necessarily guarantee compliance with safeguards, and this is why it is necessary to have the National Safeguards System (SNS).

[138] ENAREDD+ is currently undergoing a national public consultation process, which can be found in documented form at the following link: http://goo.gl/vTUq2l
[139] See http://goo.gl/wZ8HK2

Figure 47 Interaction between the Safeguards Information System and the National Safeguards System

For the IRE to be correctly implemented within the REDD+ framework at national level, the development of the National Safeguards System (SNS) for implementing the REDD+ safeguards, must be consistent, so that the various international initiatives can be used to support the National Safeguards System. The design of the architecture of the SIS and the SNS, as well as some of the key institutional arrangements for their implementation, are in a developmental phase. In the course of this phase definitions have been produced about the national approach for implementing safeguards to ensure this consistency between the various initiatives which implement REDD+ activities in the country, including international initiatives, such as the Forest Carbon Partnership Facility (FCPF). The systems, processes and tools which make up both systems and which have been in operation for some time have also been identified.

The advances are described below:

2013

- An analysis of the relevant legal framework was performed[140], concluding that Mexico relies on laws and regulations based on a robust and well thought-out legal framework, which establishes the foundations to define, regulate and put the UNFCCC's REDD+ safeguards into practice (including the safeguards of other multilateral or bilateral initiatives such as the operational policies of the World Bank). Furthermore, 29 international instruments, of which Mexico is a part (including conventions, treaties and declarations) were identified as being relevant and applicable to the REDD+ safeguards.

2014

- An analysis of the information systems and reports existing at federal level was carried out, with an emphasis on the reporting mechanism referred to in the second paragraph of article 6 of the Planning Law [141] with the aim of standardizing the information reported at federal level by the policy instruments thematically associated with the REDD+ safeguards.
- A Panel about the construction of the National Safeguards System (SNS) and the Safeguards Information System (SIS) in Mexico was established with the aim of creating an area for dialogue with forestry organizations, public stakeholders, universities and federal and state government authorities.
- Two institutional dialogues were set up in order to begin discussions with relevant bodies in terms of reporting REDD+ safeguards, sharing experiences and exploring systems which could be used for the SIS.

2015

- Another institutional dialogue was set up
- The Relevant Information Systems were identified as well as the mechanisms for Reporting to relevant International Agreements or Conventions.
- An Internal Workshop on the basic Definitions of the SIS was set up in CONAFOR.

2016

[140] For analysis of the relevant legal framework applicable to Mexico, in relation to the safeguards, seehttp://goo.gl/eCmgm5

[141] Art. 6 of the Planning Law: "...The Executive will send the Permanent Commission of the Congress of the Union the report on the activities and results of carrying out the plan and the programs to which the previous paragraph refers, including a specific section containing everything relating to fulfilling the provisions of article 2 of the Constitution on the subject of indigenous rights and culture..."

- The relevant legal, institutional and compliance framework applicable to the REDD+ safeguards in 4 IRE states (Chiapas, Yucatán, Quintana Roo, Campeche) was analyzed.
- A pilot project is carried out to define a feedback and complaints mechanism for REDD+.
- REDD+ safeguards are being interpreted within a national context and circumstances (associated with the relevant legal framework). This will be used to define the elements of the REDD+ safeguards in Mexico and as a key input for designing the national safeguards system, the safeguards information system, and the subsequent preparation of information summaries to be presented to the UNFCCC.

Taking into account all the advances in the development of the SNS and SIS, it is acknowledged that the national and international legal framework applicable to Mexico is the basis for guaranteeing compliance with the REDD+ safeguards of the UNFCCC and, therefore, the safeguards of other multilateral or bilateral initiatives which implement REDD+ activities and measures. An analysis was carried out for this purpose in order to find out about the relationship (in terms of content and implementation) between the REDD+ safeguards of the UNFCCC, the national and international legal framework, and the operational policies of the World Bank. The summary of the results of this analysis shows that the UNFCCC safeguards are completely compatible with the operational policies of the World Bank. This information can be consulted in Annex 11.

Mexico has made significant advances in terms of fulfilling the safeguards of the World Bank. Over the last few years projects funded by the World Bank in which the operational policies of the Bank are applied have been successfully implemented in Mexico. Implementation of these projects has generated significant inputs for ensuring compliance with safeguards when conducting activities within the country.

The Forest and Climate Change Project (PBCC) deals with activities within the forest sector, co-funded by the BIRF (International Bank for Reconstruction and Development), the Forest Investment Program (FIP) and the Mexican Government. The PBCC is a project within the forest sector which is aimed at supporting ejidos and communities in Mexico to manage their forest in a sustainable way, develop their social organization and generate additional income from forest products and services, via a variety of CONAFOR support programs. The operational policies of the World Bank which apply to the Project are 4.01. Environmental Assessment, 4.04. Natural Habitats, 4.09. Pest Management, 4.10. Indigenous Peoples, 4.11. Physical Cultural Resources, 4.12. Involuntary Resettlements, and 4.36. Forest.

Accordingly, CONAFOR generated safeguard instruments [142] and developed principles and procedures to ensure that the social and environmental perspective was integrated in forestry activities carried out within the territory and in the way in which subsidies are granted. The table below shows a summary of how the OP are fulfilled in the forest sector's activities by applying CONAFOR principles, procedures and instruments. Detailed information can be consulted in Annex 12. This information is relevant for the IRE as it includes mainly forest activities in its Investment Programs.

Table 99 CONAFOR measures for complying with the WB Operational Policies

WB operational policy	Compliance measures
4.01. Environmental Assessment	Compliance with this is ensured since the Operational Rules and Terms of Reference governing the CONAFOR programs include measures to prevent damage and criteria for checking their compliance. Accordingly CONAFOR: • within the Forestry, Supply and Transformation component, only provides assistance for requests which have authorization for use issued by the Secretariat of Environment and Natural Resources (SEMARNAT). • No support will be provided for the Timber Forest Management Program or for the Unified Technical Document, unless the management Programs contain practices for conserving biodiversity. • With regard to assistance with forest, supply and transformation, ensure that the support requested falls within the management plan authorized by the SEMARNAT.

[142] Social assessment reports were produced (available at: http://goo.gl/lTQMMf) and environmental assessment reports (available at: http://goo.gl/PfJHiG) with this resulting in an environmental management framework (available at: http://goo.gl/lxqHhY), as well as other instruments for dealing with specific operational policies.

	• In terms of support for Coastal basins, provide in-the-field supervision to ensure that work has been carried out in accordance with technical criteria and good practices of reforestation and soil conservation. • With regard to support for subsidizing machinery, priority is given to those which cause the least contamination and whose installation and correct operation is supervised by the CONAFOR before the support is finalized. • The General Assembly is acknowledged as being the determining body in terms of taking decisions.
4.04 Natural Habitats	The Forests and Climate Change Project (PBCC) establishes that the critical natural habitats are the Natural Protected Areas in the country. The CONAFOR provides support by safeguarding the resources of the ecosystem present in these areas since they have high added value and are considered to comprise the natural heritage. The CONAFOR only provides assistance within Natural Protected Areas when the proposed activities are permitted within the Program for Managing the Natural Protected Area in question.
4.09. Pest Management,	This Safeguard is fulfilled by applying physical or mechanical treatments or through biological means. In addition, Art. 119 of the LGDFS gives the CONAFOR a mandate to establish means of assessment and timely warning of the state of health of forest lands, to support the investigations needed to solve pest-related problems, to circulate preventive measures and manage them, as well as issue official regulations to control and combat these problems.
4.10. Indigenous Peoples	In order to comply with this safeguard an Indigenous Peoples Planning Framework was produced[143] as well as a General Plan for Indigenous Peoples (PGPI)[144]. The PGPI establishes the procedures and mechanisms that the CONAFOR must adopt in its processes for managing and assisting indigenous peoples in order to prevent or mitigate possible adverse effects resulting from project activities. It also promotes action allowing access and full participation of indigenous peoples. Form this General Plan are derived the Specific Plans for Indigenous Peoples for the states of Campeche, Quintana Roo and Yucatán.
4.11. Physical Cultural Resources	As a result of the nature of the PBCC these physical cultural resources are very likely to be found in forest areas, and some of the objects identified may be pre-Hispanic structures, certain statues or items created prior to the settlement, constructions or even shaft tombs, sacred sites, protected land, etc. In order to comply with this policy the CONAFOR made contact with the National Institute of Anthropology and History (INAH) a federal government agency dedicated to the preservation, protection and dissemination of the archaeological, anthropological and historical heritage of the Mexican nation. In addition, some other areas of opportunity have been noted in the framework of the biological diversity Agreement, such as studies that are being developed to locate sacred sites.
4.12. Involuntary Resettlement	A Procedural Framework for Involuntary Restrictions on accessing Natural Resources has been generated in order to comply with this safeguard[145]. In addition, Article 19 of the Operating Rules establishes that: “In addition, the ejido or community must present the deed by means of which the assembly of those living in ejidos or communities decided to request assistance from the CONAFOR” and in the Environmental Management Framework [146] a questionnaire was created to check the voluntary donations or sales of land in the ejidos and communities that receive Environmental Services subsidies.
4.36. Forest	In order to avoid potential damage caused by managing forest, the CONAFOR encourages the certification of forestry management through its subsidies.
Gender	Although the WB does not have a specific policy for gender, it is considered relevant. The CONAFOR develops activities which increase the visibility of women’s involvement in the forestry sector and strengthen this participation. These activities include: the inclusion of gender as a priority topic in the General Plan for Indigenous Peoples (PGPI) training workshops, applying the gender equality approach when organizing workshops to provide differentiated assistance for technical-operational staff from the CONAFOR state offices, and organization of the panel entitled: “Impact of public policy on the Life of Women living in the Forest” within the framework of the International Woman’s Day 2016, as well as the

[143] Available at http://goo.gl/U1C1oh

[144] Available athttp://goo.gl/sMZdvI

[145] Available at: http://goo.gl/WFv6gL

[146] Available at: http://goo.gl/XYjKa5

	Gender and Forestry Development Workshop for forest fire protection personnel and the inclusion of Priority Criteria for women in the CONAFOR Operating Regulations.

Within the framework of the REDD+ readiness process funded by the FCPF, since 2010 Mexico has been conducting an Strategic Social and Environmental Assessment (SESA) which has focused on the participative construction of the ENAREDD+ and has included as its principal elements the development of a stakeholders' map, the analysis of strategic options, the process of national consultation and the analysis of the risks of implementing the Strategy.

The principal result of SESA is the Environmental and Social Management Framework (ESMF) which is the instrument containing the principles, guidelines and procedures for tackling/avoiding/minimizing negative risks/impacts and boosting the social and environmental benefits of implementing the ENAREDD+ and the IRE. This is all driven by a vision for complying with the safeguards of the UNFCCC and the World Bank.

It also provides clarity about the institutional arrangements needed to promote compliance with the safeguards applicable to the Investment Programs of the states. In this regard, chapter 5.2 of the ESMF includes the guidelines, procedures and institutional arrangements that will be applied to comply with each of the REDD + safeguards. These will also be applied to avoid and mitigate negative impacts, as well as to enhance the benefits derived from the implementation of the REDD+ Strategy and the IRE.

The ESMF includes measures and procedures to tackle the safeguards associated with Indigenous Peoples and Involuntary Resettlement (ESMF section 7 and 8), and the definition and scope of the State Safeguard Plans (see section 14.1.2).

The ESMF was prepared with the elements from the SESA Draft Report [147], taking into consideration the analyses carried out to define the architecture of the National Safeguard System (SNS) and in accordance with the procedures for implementing the Operational Policies of the WB. One input for ESMF was the preliminary identification of the possible risks associated with activities involved in the Investment Programs and the measures to deal with these. This information was obtained at local level in a participatory way and can be found in Annex 13. Feedback was sent back to the ESMF via a National Workshop a National Workshop carried out on 3 and 4 November 2016 and is available.

14.1.2 IRE safeguard Plans

Both the IRE and the ENAREDD+ use a multisectoral approach. This is why compliance with the IRE safeguards falls within the Environmental and Social Management Framework (ESMF) as this is the national instrument for identifying the risks and benefits resulting from implementing the REDD+ and it will provide principles, measures and procedures for tackling /avoiding/minimizing said negative risks/impacts identified and for boosting the social and environmental benefits. The risks, benefits and principles, measures and procedures which are identified as being applicable to the ENAREDD+ and the IRE are consequently applicable to the Investment Programs.

The ESMF is the instrument responsible for harmonizing the IRE State Safeguards Plans since this Framework, include the the definition and scope of the state safeguard plans, defining them as the operational instrument for risk management which the states will use to determine the procedures and measures to:

1. Reduce and mitigate risks and boost the benefits associated with the REDD+ activities to be developed within their territory and associated with the activities in the IP polygons within their territory and registered in the IRE
2. Minimizing structural gaps (legal and institutional) and risks identified during the development of the ENAREDD+ and the REDD+ State Strategies in each state.
3. Specifically tackling the safeguards associated with Indigenous Peoples (MMPI) and Involuntary Resettlement (MPRI) in order to comply with the Operational Procedures of the World Bank.

The State Safeguard Plans acknowledge the approach for integral management of the territory which characterizes implementation of REDD+ in Mexico:

[147] Available at: https://goo.gl/k10B6S

- On the one hand, the integral scope of the ENAREDD+ and the respective REDD+ State Strategies result in a need to strengthen legal, institutional and compliance frameworks associated with complying with safeguards in each State involved in the IRE, independently of the territorial scope of the Investment Programs.

  The PSEs must contribute both to implementing the SNS, which will act as a support system or structure guaranteeing compliance with the REDD+ in Mexico, and to the state information to be included in the SIS, via which it will outline to national stakeholders, the international community and the donors the way in which the REDD+ Safeguards are being tackled and fulfilled[148]

- On the other hand, the PES must take into consideration the various Investment Programs to be implemented in each IRE state, and these must also identify the specific risks and benefits associated with the special characteristics of the activities, as well as the territory in which they will be carried out.

In this way, the PES must take into consideration both the national and the state context, observing the legal, institutional and compliance frameworks at both government levels; as well as fulfilment of the safeguards in the polygons of IRE activity.

It is important to underline that the PES are an integral part of the ESMF of the IRE, therefore they establish and include the principles, measures and procedures established in the ESMF. In addition, the following specific principles must be taken into consideration for constructing the PES:

- Ensuring understanding and application of the interpretation of the REDD+ National Safeguards
- Guaranteeing application of the legal, institutional and compliance frameworks within the state context (use the document entitled "Structuring of the National Safeguards System in Mexico" as a reference).
- Be participatory and inclusive, taking into consideration the opinions and recommendations of experts, local stakeholders and indigenous peoples.
- Provide clarity to those responsible for implementing these plans by allocating roles and responsibilities to ensure compliance with the safeguards within the State.
- Possess established procedures for dealing with any complaint, conflict or non-conformity associated with the Investment Programs' activities.
- Be flexible and allow improvements to take place as time goes by

In order to facilitate understanding about the inputs needed to construct the IRE State Safeguards Plans, these have been divided into two categories: 1) those associated with implementing the REDD+ National Strategy (ENAREDD+) and the REDD+ State Strategies; 2) those associated directly with the IRE.

Category 1:

- The REDD+ National Interpretation of Safeguards;
- The sections of Safeguards of the REDD+ State Strategies
- The results of the legal, institutional and compliance framework analysis carried out at state level and of the pilot project for defining a feedback and grievance redress mechanism for REDD+ (if applicable);
- Information about the policy programs and instruments which operate at state level and are associated with the IRE
- The analysis of the way in which these frameworks are associated with the SNS (use the document entitled "Structuring of the National Safeguards System in Mexico" as a reference);
- The analysis of the reporting needs of the SNS and the SIS (use the document entitled "Reporting needs of the SNS and the SIS").

Category 2:

[148] See document containing the initial considerations of the SIS https://www.gob.mx/cms/uploads/attachment/file/148744/Anexo_3_Consideraciones_Iniciales_del_Sistema_de_Informacion_de_Salvaguardas.pdf

- The analysis of the risks and benefits associated with the IRE which were produced within the framework of the SESA process, including the risks identified in each Investment Programme (Annex 13. Environmental and social risk matrix of the IPs)
- The mitigation measures described in chapter 5 of the ESMF and which apply to IRE activities
- The experiences implementing the Operational Policies of the World Bank.

A Safeguards Plan will be developed for each of the IRE States, with this process being led by the State Governments in coordination with the Federal Government and will be adjusted in accordance with each State particularities. In relation to the development of these Plans, they will be produced involving key stakeholders such as representatives of indigenous peoples in order to ensure their viability and mitigation of risks. The plans will also integrate the gender perspective, as well as taking into consideration local experiences in terms of governance. It is important to point out that the Safeguards Plans will be compiled in a participatory way, taking into consideration the opinions and recommendations of the key stakeholders as well as those of the indigenous peoples, women and young people.

The Plans will remain valid while the IRE is being implemented and will be updated regularly (preferably on an annual basis) in order to incorporate the measures and procedures needed to ensure compliance with safeguards while the various stages of activities involved in the Investment Programs are implemented. All parties implementing activities involving Indigenous.

The PES must identify the implementation and coordination mechanisms it aims to use in order to apply the methods and procedures for mitigating the risks identified. These mechanisms can also be classified into categories: 1) related to the implementation of the REDD + Strategy and the State REDD+Strategies; 2) those directly linked to the IRE:

Category 1:

- Describe the actions which are intended to be carried out at state level in order to comply with the applicable legal framework described in the document entitled: "Structuring of the National Safeguards System in Mexico" in order to guarantee compliance with the applicable federal and state laws.
- Include measures for tackling all the UNFCCC social and environmental safeguards, taking into consideration their national interpretation, and the BM (including those associated with Indigenous Peoples and Involuntary Resettlement)
- Take up the institutional arrangements of the ESMF for promoting compliance with the safeguards applicable to the Investment Plans in the State, and in particular describe the role of the state institutions in complying with the applicable laws, as well as the action to take in order to deal with possible institutional gaps which impair the ability of the institutions to apply the law.
- How will the suggestions regarding avoiding/mitigating REDD+ risks and boosting benefits be followed-up by applying the REDD+ national interpretation of safeguards?

Category 2:

- Peoples should have sufficient knowledge and training in terms of the aforementioned safeguard instruments, in addition to relying on tools that enable them to be culturally aware and responsive to the needs of indigenous people, apply gender perspective, strengthen involvement by the young and old alike, integrate inclusive decision-making processes, and strengthen of accountability and effective transparency, among others.
- Describe the specific methods which will be used to guarantee compliance with the rights of the indigenous peoples who may be affected/benefit from the REDD+ actions.
- Be preventative by providing information about the procedures and means for reducing and mitigating risks and boosting the associated benefits.
- Describe the way in which the State aims to implement the national interpretation of the REDD+ safeguards within the territory, including the polygons considered to fall within the Investment Programs.

The Investment Programs make provision for activities supported by subsidies from different sectors throughout their period of implementation. Accordingly, with regard to the subsidies granted by the CONAFOR, compliance with environmental and social safeguards will be guaranteed by the provisions established in the legal framework and by the principles, procedures and instruments that the CONAFOR has developed in order to guarantee a social and environmental viewpoint when carrying out activities and in relation to the way of granting subsidies.

In terms of activities supported by other sectors, such as SAGARPA, compliance with the safeguards will be encouraged via the provisions established in the ESMF and in the IRE State Safeguards Plans. In addition, in order to encourage compliance with safeguards in the activities carried out by different sectors, mainly the agricultural sector[149], the Coordination Agreements for the development and implementationof the IRE to be established between the CONAFOR and the State Governments includes as a State obligation: *to deal and comply with the REDD+ safeguards established under the United Nations Framework Convention on Climate Change (UNFCCC), and to report any required information, by means of the procedure defined by "CONAFOR" for this purpose.* In this way, the mandate is established whereby the states can comply with the safeguards. This will encourage them to make the institutional arrangements and adjustments necessary for operating the programs and activities of the various institutions involved in the IRE at state level.

To sum up, compliance with the UNFCCC and World Bank social and environmental safeguards will take place in a transversal way throughout the two stages of implementing the IRE. This will be achieved by taking into consideration the provisions established in the legal framework; progress in compliance with safeguards through the principles, procedures and instruments applied by the CONAFOR when granting subsidies; the safeguard mandate established in the State Coordination Agreements; and by developing the ESMF and the State Safeguards Plans which will bevalid throughout the period of implementing the Initiative.

14.2. Description of the arrangements for providing information on safeguards during the implementation of the Emissions Reduction Initiative

Please describe the arrangements for providing information on how the ER Program meets the World Bank social and environmental safeguards and addresses and respects the safeguards included in UNFCCC guidance related to REDD+ during ER Program implementation. Where relevant, provide reference to the descriptions in the Safeguards Plan(s).

*Refer to **criterion 25** of the Methodological Framework*

As it is responsible for developing and implementing the State Safeguards Plans, the Government of each State will be responsible for regular (annual) updates in order to provide information about how the environmental and social safeguards have been respected.

As part of this updating process, every year a report must be compiled about how measures have been applied in order to boost the benefits and mitigate the risks described in the State Safeguards Plans. Also, any of the sections of the Plan can be adjusted and above all new activities, measures or procedures can be included, if this is felt to be necessary. For the sake of transparency, the State Governments will notify CONAFOR about any updates of its Safeguards Plan so that this can be published in the IRE section of its web page[150].

This information about compliance with safeguards[151] shall be gathered together when the state produces its REDD+ state Report. In addition this information about the State Safeguards Plans would be integrated in the Safeguards Information System (SIS).

As part of the report the procedures whereby the "Reporting needs of the SIS" established by the CONAFOR in order to guarantee compliance with the legal, institutional and fulfilment frameworks applicable to REDD+ V will be dealt with and must be listed and described. The frequency of the report must also be specified for each of the safeguards.

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149 A consultation for analyzing and standardizing technical recommendations for agricultural subsidies is being developed. The way in which compliance with the REDD+ environmental and social safeguards is promoted via the PROGRAN and Joint business Programs will be analyzed, and measures to encourage gender equality will be taken into consideration.

150 http://goo.gl/WDd9kU

151 The Carbon Fund Methodological Framework and the general Conditions of the ERPA establish that the safeguards must be respected at all times while the IRE is being created and implemented. There shall be no payment for results without full compliance.

As a space for learning about how to report compliance with safeguards, within the framework of the Forest and Climate Change Project, a pilot platform to provide information about how CONAFOR tackles and manages the seven safeguards of the PBCC has been created. By developing this pilot platform the most accessible way of returning information to the public in general has been analyzed. It is hoped that this can be public at the end of August of 2016. This platform is available at: http://187.178.171.45/salvaguardas

14.3. Description of the Feedback and Grievance Redress Mechanism (FGRM) in place and possible actions to improve it

Please summarize the assessment of existing FGRM(s), including any applicable customary FGRMs, in place and describe the FGRM procedures for the ER Program. Where applicable refer to descriptions available in other documents such as Benefit Sharing Plan and/or relevant Safeguards Plans. If applicable, provide a description of planned actions to improve the FGRM(s)

Refer to ***criterion 26*** *of the Methodological Framework*

The Mexican legal framework foresees involvement of institutions and mechanisms responsible for promoting transparency[152], fighting against corruption[153], establishing clear mandates for full compliance with the law[154], and considers the existence of judicial agencies with appropriate powers, mandate and authority for issuance of the respective resolutions and procedures.[155]

In the institutional level, in 2012, CONAFOR established a Feedback and Grievance Mechanism (*Mecanismo de Atención Ciudadana*) (MAC)[156], made up of mechanisms and procedures in existence in the CONAFOR and supported by its own laws and regulations for dealing with complaints, grievances, claims, suggestions and requests for information.

The MAC aims to coordinate the operation of its three constituent areas, and thus provide timely answers and solutions that respond to the needs expressed by the population in relation to the running and operation of CONAFOR. The Mechanism also seeks to improve organizational results, enhance accountability, and enable the identification and prevention of issues which, if not dealt with, could have a negative impact on organizational operation.

The MAC is comprised of three different areas, each with the their own attention channels, regulations and protocols, depending on the nature of the issues that need to be resolved or attended to:

1. **Internal Control Unit from the Civil Service Secretariat**, which aims to promote a culture of transparency within the government, encouraging accountability, fighting against corruption and promoting efficient performance of all public institutions. The ICB is responsible for receiving and following up complaints and allegations through breach of obligations by CONAFOR public servants[157].
2. **Liasion Unit of the Transparency and Access to Public Information Institute**, for responding to

[152]CPEUM (Political Constitution of the United Mexican States) Art. 134; LFTAIPG (Federal Transparency and Access To Governmental Public Information Act) art. 33; LGEEPA (General Law of Ecological Equilibrium and Environmental Protection) art. 12; Ley Agraria (Agrarian Law) art. 13 establishes that the National Agrarian Law has an Internal Control Body; LGDFS (General Law for Sustainable Forest Development) art.8, 11, 18.

[153]LGEEPA Art. 10 Internal Regulation SEMARNAT; Art. 22 and 23 of the CONAFOR Organic Statute; Agrarian Law Art. 136 subsection vi. Art. 195; CPEUM Art. 108; the Law of the Professional Service Career in the Federal Civil Service, Regulation of the Law of the Professional Service Career in the Federal Civil Service, Federal Law of Administrative Responsibilities of Public Servants, the Federal Law of Responsibilities of Public Servants, and the Statute of the Professional Career Service of the National Forestry Commission and the CONAFOR Code of Conduct

[154]The General Law for Sustainable Forest Development (LGDFS) Art. 158 establishes that forest monitoring and prevention shall be the responsibility of the Federal Attorney for Environmental Protection; the LOAPF (Organic Law of the Federal Public Administration) Art. 32 BIS subsection V, corresponding to the SEMARNAT (Secretariat of Environment and Natural Resources) for compliance with laws, official Mexican standards and programs related to natural resources and for imposing appropriate sanctions, General Law on Ecological Balance and Environmental Protection (LGEEPA) Art. 5, 6, 169, 189, Planning Law Art. 6 and 9, and General Law on Climate Change (LGCC) Art. 7.

[155]Organic Law of the Agrarian Courts, the Organic Law of the Federal Court of Fiscal and Administrative Justice, the Federal Code of Criminal Procedure, The Federal Administrative Procedure Act, LGEEPA Art. 4, 169, 182 and 189, and the Internal Regulations of the SEMARNAT Art. 118; LGDFS Art. 159, and the Lactar. 114 in reference to the Federal Attorney for Environmental Protection.

[156] More information at http://goo.gl/N2I3Hq

[157]A complaint is the manifestation of allegedly unlawful acts expressed by the person affected by such acts, in relation to activities attributed to a CONAFOR public servant when carrying out their duties. An allegation is the manifestation of allegedly unlawful acts carried out by a person who has observed or is aware of the rights of an affected third party, in relation to an activity attributed to a CONAFOR public servant while carrying out their duties.

requests for public government information regarding CONAFOR. The Liasion Unit is the link between the agency (in this case the CONAFOR) and the applicant, undertaking the necessary agency actions for facilitating access to information by the applicant.

3. **Area of Citizen Care at the Forestry Information Management Department** responds to questions, complaints, suggestions or any other request for information regarding the work and activities of CONAFOR. It coordinates implementation of the CONAFOR Care Module project, and in compliance with the "Decree for establishing the National Care Module for Government Procedures and Information".

The Mechanism also has principles, amongst which are:

- **Accessible:** voluntary, with non-exclusive public access. has various attention channels.
- **Opportune** and **effective:** relying on clear procedures and established and foreseeable deadlines in process terms for each phase associated with attention, resources and appropriate personnel.
- **Equitable:** offers professional treatment, based on dialogue and communication, which follows due process. Supplies results perceived as fair, and does not restrict the right to access to other citizen attention mechanisms.
- **Transparent:** provides active communication about the mechanism and its progress in a regular, proactive way. Respects confidentiality and anonymity, when necessary.
- **Feedback:** relies on a records system relating to inquiries, complaints and requests for information. Carries out systematic reviews of trends in order to improve its performance and these in turn are used as a source of continuous learning.

The instruments that comprise the MAC operate in a continuous and effective manner, and manage to deal with practically all queries received each year.

Additionally, all CONAFOR programs, including those undertaken in collaboration with the state governments shall obligatorily publish in their operational rules and guidelines, as appropriate, all contact information corresponding to the authorities who the public may contact in order to register any complaints regarding such publications, including the Internal Control Unit of CONAFOR, the Civil Service Secretariat, and the state comptrollers.

Similarly, the SAGARPA in conjunction with the NGO "Citizen Control for Accountability", implemented the Citizen Follow up Mechanism in 2013[158] in order to track different programs, components and strategic projects, by analyzing their dual operational and control structure for the purposes of ensuring that visible results would be generated in terms of efficiency, efficacy and transparency for the operation of in-the-field programs and for encouraging accountability in this sector. This includes the following activities:

- Observation: this also takes into account the application of document investigation instruments in the field, gathers information on how to conduct the management procedures from a user (beneficiary/citizen) perspective, and from a government operator (entrusted civil servants) perspective.
- Identification of areas of opportunity/improvement proposals: a specialized civic technical team specialized in providing analysis, having observed and considered, a) the legality at national and international level, and b) effective and efficient good governance and public management.
- Monitoring and certification: The improvement proposals are presented to the agency, which, in turn, shall analyze their viability and the critical path to follow for their adoption. The civic organization can certify/not certify process compliance, followed by documentation of the results.

Furthermore, SAGARPA establishes in article 398 of its 2016 Operational Rules, that the beneficiaries and the public in general may submit their non-conformities, complaints and allegations in writing, in respect toward the operation of SAGARPA, directly to the Secretariat of Public Affairs, to the Internal Control Unit of SAGARPA, through the Regional Executive Audits in the delegations, at the offices of the Internal Control Units of the Decentralized Administrative Units at the Entities coordinated by the Secretariat, at the State Control Unit, and as applicable, at the corresponding Municipal Control Unit, and Complaints and Allegations Modules. Complaints and allegations may be made in writing, via the Internet[159], by email[160], or by telephone, or in the states by means of contacting the respective complaints offices. According to Art. 399, SAGARPA publishes the list of beneficiaries

[158] To find out more about MAC-SAGARPA visit: http://www.mac-sagarpa.org.mx
[159] At the following link: http://www.funcionpublica.gob.mx
[160] At the following addresses: (contact ciudadano@funcionpublica.gob.mx and quejas@funcionpublica.gob.mx)

for each program and each component, broken down by gender, age group, State Authority and Municipality. This information is regularly updated and published every six months on the SAGARPA's website[161].

In accordance with the National Development Plan 2013-2018 and by means of the "*DECREE establishing the National Care Module for Government Procedures and information"* the federal bodies have established modules to provide information about subsidies and to strengthen the registration and follow-up of requests for assistance from citizens.

Accordingly, the CONAFOR has established Care Modules in 8 CONAFOR State Offices, via the Area of Citizen Care in Chiapas, Colima, Jalisco, Ciudad de México, Quintana Roo, Campeche, Guerrero and Estado de México. Via these modules and the remote channels established by the CONAFOR, effective assistance, registration and follow-up of requests for citizen assistance have been reinforced. SAGARPA has care modules in each state in the Republic where requests from beneficiaries of the programs granted by the Secretariat are registered. Through these modules the beneficiaries can begin, follow-up or complete projects supported by the SAGARPA, in addition to accessing information or resolving problems about these projects.

- **Complaints mechanism for REDD+**

Action line 5 of Component 7 of the latest draft of the ENAREDD+ indicates that *mechanisms for dealing with complaints, feedback, accountability and access to information must be established, considering as principles the accessibility, efficacy, effectiveness and transparency in relation to actions carried out within the ENAREDD+.* In line with the ENAREDD+, and bearing in mind that institutional mechanisms, such as the MAC, present a number of limitations, since they ought to be precautionary and accessible to ejidos and communities, take into account matters concerning diversity awareness, inclusive of their needs, and have wide-ranging scope, the CONAFOR is working on developing a pilot project for defining feedback and grievance redress mechanism for REDD+ in the Yucatán Peninsula, one of whose aims is to identify the way in which to seek harmony between existing institutional mechanisms and the traditional or local ones when accessing information and dealing with complaints.

As part of the socialization and participatory construction of this grievance pilot project, 50 focus groups have been held in indigenous communities and workshops in the three states in the Peninsula in order to gather relevant information about traditional methods used to access information, present complaints and solve disputes by the stakeholders involved in implementing REDD+ on state and community level. This is in order to consolidate:

- Historical analysis of the methods employed by the ejidos, communities, indigenous peoples and women to access information, present complaints and resolve disputes.
- Methodology for implementing the grievance pilot project.

In addition a participatory workshop took place on May 12 and 13 2016 with the REDD+ Safeguards Committee and the members of the Observatory of Selva Maya and was held in the REDD+ Learning Community in the Yucatán Península.

Furthermore the pilot project takes into consideration analysis of the compliance framework, relevant and applicable to REDD+ safeguards for the Yucatán Peninsula and Chiapas. This analysis includes identifying the mechanisms for complaints and for resolving disputes, mechanisms for checking compliance, as well as information systems and reporting mechanisms in existence at institutional level. This analysis will be conducted in accordance with the tools and methodology used to construct the National System of Safeguards and will provide information about how these mechanisms interrelate between the various institutions depending on their functions. Also, the Pilot project will work at associating these mechanisms with the traditional forms of accessing information and presenting complaints.

For the IRE, the institutional mechanisms possessed by the various government agencies are those which will initially deal with complaints, reporting and promote access to information about the activities involved in the Initiative. In addition, as mentioned in the previous section, the State Safeguards Plans will include the description of the procedures for dealing with complaints or non-conformities associated with IRE activities and with the various topics, including benefit sharing.

[161] www.sagarpa.gob.mx

In addition and in accordance with the provisions established in the ENAREDD+, at a later stage, the feedback and grievance redress mechanism will be developed, and this will use as a reference the results of the grievance pilot project and the recommendations received in the course of self-assessment workshops within the framework developing the Readiness Package.

15. Benefit-sharing arrangements

15.1. Description of benefit-sharing arrangements

Please provide a description of the benefit-sharing arrangements for Monetary and Non-Monetary Benefits of the ER Program to the extent known, including:

I. the categories of potential Beneficiaries, eligibility and the types and scale of potential Monetary and Non-Monetary Benefits;
II. Criteria, process and timelines for the distribution of Monetary and Non-Monetary Benefits;
III. Monitoring provisions.

Where available, provide a link to the publicly available Benefit Sharing Plan or inform when the Benefit Sharing Plan is expected be concluded and available.

*Refer to **criterion 29 and 30** of the Methodological Framework*

The Benefit-Sharing Plan (BSP) designed for the IRE (Annex 15) contains clear, effective, and transparent benefit-sharing mechanisms, which include participatory processes in order to ensure that these mechanisms have broad community support and are backed by the other stakeholders involved, as well as to guarantee that benefits are shared in such a way that reflects the importance of legitimizing the decision-making process, respecting the customary rights to land and territories, and achieving objectives related to efficacy, efficiency, and fairness. [162]

The BSP was designed in accordance with the following basic principles [163]:

- Legality: Benefit-sharing is underpinned by the country's legal framework, respecting ownership rights, indigenous rights, and the existing regulatory provisions related to sharing REDD+ benefits as part of the IRE, as well as use of and access to natural resources.
- Legitimacy: Benefit-sharing shall be agreed on by way of true engagement with owners, rural landholders, and the inhabitants of the regions where the emissions results will occur, whether it is emissions due to deforestation or forest degradation that are avoided or reduced, all of which are part of the IRE.
- Efficacy: Benefit-sharing shall significantly contribute to achieving IRE objectives on social, environmental, and mitigation-related terms.
- Efficiency: Benefit-sharing shall incentivize and repay the REDD+ actions that lead to reductions and do so at the lowest transaction cost possible.
- Equity: The monetary benefits shall be distributed fairly across all stakeholders who take part in carrying out REDD+ actions locally, regardless of cultural, social, and gender differences.
- Additionality: Benefits shall be granted to actions that lead to proven emission reductions in the forestry sector that would not have occurred without the REDD+ mechanism.
- Transparency: The mechanism shall distribute benefits clearly, with constant monitoring and evaluation of resource management, guaranteeing access to information and accountability at every level of nesting.

In the IRE framework, the BSP consists of three distinct levels: national, state and local[164]. At the national level, CONAFOR, as the organization responsible for implementing the Emissions Reduction Initiative will receive the

[162] Luttrell et al., 2013. Who Should Benefit from REDD+. Rationales and Realities. Ecology and Society. 18(4)52.
[163] Borrowed from the document: "Elementos y Recomendaciones para el Diseño de un Mecanismo de Distribución de Beneficios de REDD+ para México". Alianza Mexico REDD+. 2014.
[164] Building local benefit-sharing arrangements will be done by the stakeholders in the region by implementing the above methodology described, which is also available in Annex 4 of the IRE, which received feedback from civil society, experts, and state governments.

resources generated from the payment for results on account of emissions reductions, which will be received via the Mexican Forestry Fund.

At national level, resources will be distributed to the states in accordance with their performance obtained in relation to emissions reductions. Accounting of emission reductions will therefore take place for each individual state through the proposed Forest Registry (See section 18). This transfer of resources will take place through state or regional funds or trusts, in compliance with a series of basic principles and operational criteria for ensuring full efficiency and transparency. It should be stressed that the transaction costs for operating these funds (national and state/regional) shall be absorbed by the federal government and the state governments[165].

All resources received as payment for results, through regional or state funds or trusts, will be used for supporting the second phase additional activities that the ejidos and communities have previously identified via a participative construction process, and proposed as being a priority for integral management of their territory (for more information on how these activities shall be identified, see Annex 4). It is recognized that the benefits generated by the IRE shall seek to boost and provide continuity for activities carried out in the areas of intervention, principally benefiting the landowners and inhabitants of the regions who make the effort to address the direct and underlying causes of deforestation and degradation of the forestlands.

To do so, there will be local arrangements built through a local participatory process in engagement with the owners and residents of the lands in the regions where the results happen, pursuant to the "Methodology for guiding the participatory construction of benefit-sharing arrangements in the IRE context." [166]

The Benefit-Sharing Plan for the IRE was designed in consideration of the reference document mentioned above, and also contains the following: aspects related to financial architecture to guarantee efficiency, efficacy, and transparency in the management and allocation of the resources derived from payments for results; the fundamental building blocks that will be used in the participatory process of putting together the local arrangements to share the benefits in the territories where the results are achieved; a description of the potential beneficiary categories and the monetary and non-monetary benefits that could be received.

Along these same lines, benefits shall be understood to mean the economic resources, goods, or services obtained or derived from payments for results obtained by implementing REDD+ actions. Likewise, depending on what is agreed during the process of building the IRE, benefit-sharing could be at the territory level, and these benefits may be both monetary and non-monetary,[167] as described below:

a) *Monetary benefits*: Any benefits that can be quantified or valued in financial terms and are allotted to support additional REDD+ actions to avoid emissions or shore up sustainable forestry management. Pursuant to what is set forth in the IRE, monetary benefits derived from payments for results shall be allocated to performing second-stage activities, which are additional to and different from those that are already being performed to tackle deforestation and forest degradation, and are not currently considered in the subsidy programs or other financing mechanisms, and which fortify the results achieved in the first phase and expand upon actions to stop deforestation and degradation.
b) *Non-monetary benefits*: Any benefit that cannot be appraised in financial terms (for example, capacity-building, improved access to natural resources, access to markets).

Potential beneficiaries of the Emissions Reduction Initiative shall be considered to be as follows:

- Owners[168] or holders[169] of forestlands, or groups thereof: legal entities or individuals owning private property. Ejidos and communities. Men and women who are holders of the agrarian rights (*Ejidatarios and Comuneros*).

[165] Building local benefit-sharing arrangements will be done by the stakeholders in the region by implementing the above methodology described, which is also available in Annex 4 of the IRE, which received feedback from civil society, experts, and state governments.
[166]Building local benefit-sharing arrangements will be done by the stakeholders in the region by implementing the above methodology described, which is also available in Annex 4 of the IRE, which received feedback from civil society, experts, and state governments.
[167] International Reconstruction and Development Bank, 2014. General Conditions Applicable to Emission Reductions Payment Agreements for Emissions Reduction Programs of the Forest Carbon Partnership Facility.
[168] Holder of the right to enjoy a specific item or asset in accordance with that permitted by law and the limitations established therein, and without prejudice to/from third parties. (Art. 830 - 853 of the Federal Civil Code)
[169] Proposed definition: In relation to an item, the person exercising a de facto power over said item; and in relation to a right, the person who has enjoyment of said item. (Art. 790 - 829 of the Federal Civil Code)

- Indigenous peoples and communities with forestlands: indigenous peoples. Ejidos and indigenous communities.
- Legal[170] usufructuaries of forestlands: groups or persons recognized by the ejido or communal assemblies, or having a form of agreement established with *ejidatarios or comuneros*; tenants of private properties.
- Users[171]: persons who do not own property but inhabit ejidos or communal lands, including women or organized groups of women, groups of young people, and other inhabitants of communal lands or ejidos.
- Property owners or groups who carry out non-forest related activities, but affect forests: livestock farming, agricultural farming and tourism.

15.2. Summary of the process of designing the benefit-sharing arrangements

Please provide a summary of the overall process of designing the benefit-sharing arrangements, including who has been participating in this process and how the process was informed by and builds upon the national Readiness process, including the SESA. Please describe how the benefit sharing arrangements have been prepared as part of the consultative, transparent and participatory consultation process for the ER Program. Please attach evidence of the process and how it reflects inputs by relevant stakeholders, including broad community support by affected Indigenous Peoples as an annex to this document.

*Refer to **criterion 31** of the Methodological Framework*

Benefits Distribution Plan

The Benefit Sharing Plan will be made known once the Initiative for Emissions Reduction in Mexico has been approved by the Carbon Fund and after the Emissions Reduction Payment Agreement (ERPA) has been signed[172]. As mentioned in the previous section, the benefit sharing shall be carried out at 3 levels according to a formula, which is described in the Plan.

In addition, the Plan details the financial mechanism by means of which payment shall be received for results of the Carbon Fund and how this payment will be transferred from national level to state level. In the same way, it stipulates the guidelines/standards for good practices with which the state funds or trusts must comply.

Likewise, benefit-sharing shall be determined based on a formula that takes into account the matrix that summarizes the risks and benefits of implementing REDD+, which was developed through national and regional workshops using the Social and Environmental Strategic Assessment (SESA) methodology,[173]
which combines and prioritizes the factors that should be considered to ensure benefits and avoid risks with REDD+, with the ultimate goal of bolstering sustainable rural development.

Also, it establishes the minimum criteria for guaranteeing that the potential beneficiaries of the IRE (described in the previous section) have just, fair and effective access to 100% of the benefits resulting from the payment for results received at national level and distributed at state level. The fact that the benefits identified are culturally relevant, with a gender-based approach and that they are generationally inclusive and oriented towards reinforcing the action which will help to stop the processes of deforestation and forest degradation shall be guaranteed.

Taking into account the importance of dealing with the expectations of the potential beneficiaries, as established by criterion 30 of the Methodological Framework, the definition of the local arrangements for the benefit sharing; namely the second stage activities; shall be defined by the communities and ejidos by means of implementing the methodology described in the next section.

[170] Holder of the real right of temporary effectiveness, that grants the enjoyment of the profits derived from regular use of another person's property, with condition to return the exact item, or equivalent, after a fixed period of time. (Art. 980 - 1048 of the Federal Civil Code)
171Holder of the right to enjoy the benefits of another person's property, covering the actual needs of the user or family. It is a rule of customary character that once recognised by legislation, it shall then become part of positive law. (Art. 1049 - 1056 of the Federal Civil Code)
[172] This is aligned with the Carbon Fund Disclosure Guidelines, which indicates that at least an advanced version of the Benefits Distribution Plan shall be made available before the ERPA is signed, with the final version of the Plan being submitted before the purchase and sale obligations of the ERPA come into force. Indicator 30.1 of the Methodological Framework coincides with the above, adding that this version should be disseminated in a comprehensible format and language, so that all stakeholders involved in the IRE can fully understand it.
[173] https://www.gob.mx/cms/uploads/attachment/file/173696/Reporte_SESA__FINAL_.pdf

Local arrangements for Benefit Sharing of the IRE

The local arrangements for the benefit sharing of the IRE[174] shall be combined taking into consideration the inputs generated via a process of participative construction with the potential beneficiaries indicated under point 15.1, in order to obtain comprehensive community support. The "*Methodology to guide the participative construction process for the Benefits Sharing Arrangements at local level within the IRE context*" [175] (available in Annex 4) was developed in order to provide guidance for the aforementioned process, including feedback received from civil society, experts and state governments. For more information on the Methodology development process, see section 5.1.2.4.

In the course of the process for the participative construction of the local arrangements for benefit sharing, the State Government shall be responsible for coordinating this work, with the participation and support of the CONAFOR State Office. As the facilitating organization it will rely on the participation of the APTD or the Territorial Development Agent (ADT) defined, following the five phases contemplated in the participative methodology. These responsibilities, both for the CONAFOR and for the State Government, are defined in the coordination agreements and are described in section 6.1.1.

With regard to the time when the benefit sharing shall take place, it is thought that this should take place for the first time in the course of 2020, once the first result-based payment has been finalized, and after the IRE has been implemented for two years (2018 and 2019). For this reason, it is felt advisable for the participatory processes for defining the local arrangements for the benefit sharing to be carried out in the course of 2019, once the potential beneficiaries have experienced the effects of the initiative and have been able to identify the additional activities.

The methodology described in annex 4 considers that in addition to the potential beneficiaries, stakeholders from civil society will be involved as observers of this process. Furthermore, the local arrangements made in a participative way and with comprehensive community support, shall be notified to a Mixed Committee of the state and/or regional Fund or Trust, consisting of agencies from the federal, state and municipal government, as well as representatives of civil society and the potential beneficiaries, with the aim of strengthening vigilance over implementation of the Benefit Sharing Plan.

Along the same lines, both the Benefit Sharing Plan and the local arrangements defined, shall be subject to the feedback and grievance redress mechanism described in section 14.3, in order to offer an expeditious mechanism with the ability to resolve complaints or non-conformities occurring during the benefit sharing, and this will be notified and communicated appropriately.

15.3. Description of the of the legal context of the benefit-sharing arrangements

Please describe how the design and implementation of the Benefit-Sharing Plan complies with relevant applicable laws, including relevant international conventions and agreements and customary rights if any.

*Refer to **criterion 33** of the Methodological Framework*

Article 27 of the Political Constitution of the United Mexican States (CPEUM) establishes the Nation's right to make private ownership the modalities dictated by public interest, as well as the right to regulate, relating to social benefit, the use of natural elements susceptible to appropriation, in order to ensure equitable distribution of public wealth, to ensure its preservation, achieve balanced development of the country and an improvement in rural and urban living conditions. This precept requires strong regulatory control in order to ensure both the preservation and the equitable distribution of these resources, considered to be constituents of public wealth.

[174] A benefits distribution plan shall be produced for each area of intervention.

[175] The development of this methodology is aligned with criterion 31 of the Methodology Framework, which requests that the arrangement for Benefits Distribution are designed as part of a transparent, participative and consultative process appropriate for the context within the country. Additionally, this indicator promotes inclusion of the opinions expressed by the relevant stakeholders within the Plan, and requests comprehensive support of the community, which shall be achieved by implementing the proposed participative Methodology.

The constitutional proposal is based on a complex legal protection system that, on the one hand, guarantees owner's property right, but on the other hand conditions the exercising of this right to the permanence of the resources, which signifies recognizing the interests of the Nation through conservation of such elements. The property must therefore remain in compliance with the measures established in all subsidiary laws.

Article 5 of the General Law for Sustainable Forest Development (LGFDS)[176] establishes that forest resources are liable to be appropriated and may be used by their owners, which means that the ownership of the forest resources within national land corresponds to ejidos, communities, indigenous peoples and communities, individuals or entities, among others, who own properties on the land in which they are located, and that the procedures established by the LGDFS shall not change the ownership of this land. Therefore, and based on the fact that carbon dioxide absorbed by vegetation and carbon is incorporated into biomass, ownership of that carbon, as well as the fruits that such ownership generates, corresponds to the owners of forest lands. In this respect, the development of any type of market mechanism on carbon storage and on additions to this stock, that meet the requirements of the established same market, shall result in remuneration to the owner of the forestland. (ENAREDD+, March 2015).

Secondly, as part of the constitutional obligations established in article 4 and 25 of the Public Constitution of the United Mexican States, the State designs and implements public policies directed at countering the processes of deforestation and forest degradation, as one of the measures for ensuring the right to enjoy a sound environment.

Furthermore, in relation to avoided emissions, as deforestation and degradation of forest ecosystems are among the causes of CO_2 emissions being released into the atmosphere, the following activities are regulated as infringements under the General Law for Sustainable Forest Development (GLSFD), namely: i) establishing agricultural crops or carrying out grazing on forestlands without heeding the provisions contained in the authorized forest management program or in contravention of the applicable rules or regulations; and, ii) changing the use of forestlands without obtaining the respective authorization. Likewise, the Federal Criminal Code punishes the following acts by imprisonment or fine: i) the clearance or destruction of natural vegetation; ii) the cutting down, uprooting, felling or chopping down of one or more trees; or iii) forest land use change.

Finally, ownership of the avoided emissions is not determined by the ownership or tenure of the land and cannot be awarded to smallholders, communities and ejidos since deforestation in Mexico constitutes a prohibition which is punishable by the State, which implements public policies to tackle deforestation and degradation. Secondly, the right to receive financial benefits from result-based payments relating to avoided emissions will rest with the land owners and inhabitants of the regions that make the effort to prevent or tackle deforestation and degradation of forest lands using the mechanisms established for this purpose, while respecting the right, at all times, to their full and effective participation in designing the benefit sharing mechanisms and to decide on their own priorities with regard to the development process.

On that basis, the Government of Mexico will receive this results-based payment and it will be channeled through the states, establishing the mechanisms to ensure that the financial benefits resulting from this payment reach the owners and inhabitants of the areas involved in order to allow them to carry out the second stage activities, which they will identify via a participative process as part of the local arrangements for benefit sharing.

Likewise, regulatory provisions and Mexico's international commitments as a result of various United Nations conventions, ILO agreements, and other international treaties, as listed below, were considered in designing the Benefit-Sharing Plan and the methodology to draft the local benefit-sharing arrangements in a participatory fashion.

Article 1 on human rights in the Mexican Constitution signals that the State is responsible for fostering, respecting, protecting, and guaranteeing the human rights recognized in the Constitution and in the International Treaties to which Mexico is party.

Article 2 of the Mexican Constitution acknowledges the pluricultural nature of the Mexican nation and recognizes the right to self-determination and autonomy for indigenous peoples and communities. It also stipulates that the government shall develop institutions and set policy to ensure that the rights of indigenous peoples and communities are respected and to guarantee their development in every dimension.

[176] General Law for Sustainable Forest Development published in the Official Gazette on February 25, 2003.

The United Nations Declaration on the Rights of Indigenous Peoples requires governments to conduct consultations and cooperate in good faith with indigenous peoples affected by way of their representative institutions. On the subject of representative institutions, Article 27 of the Mexican Constitution and the Agrarian Law set forth provisions on collective ownership and how *ejidos* and communities are organized. For such purpose, the assembly shall be the supreme body of the *ejjido* or community population and the *ejido* or common assets committee the body that represents this core group, which is therefore responsible for carrying out the resolutions reached by the assembly. Indigenous communities shall be governed by their uses and customs.

The International Labor Organization (ILO) Convention 169 on Indigenous and Tribal Peoples establishes that governments shall consult affected peoples by way of appropriate procedures and, specifically, through their representative institutions, and that all consultations shall be conducted in good faith and in such a way that is appropriate to the circumstances, in order to reach an agreement.[177] Depending on the situation in question, there may be three levels of indigenous participation:

1. When the measure concerning them shall be applied to the entire indigenous population of the country, where the right to participation would be applicable,
2. When the administrative or legislative measures may affect them directly, where the State has the duty to carry out consultation in advance to reach agreements, and
3. When the impact is such that consultation is not sufficient, but rather free prior informed consent is required.

In light of all of the above, and considering that the Emission Reductions Initiative is meant to push forward a comprehensive model for managing rural territories that supports the development of sustainable productive activities predicated on best practices to make proper use of natural resources, and the alignment of programs and incentives across all three levels of government, as well as voluntary participation on the part of owners, holders, and inhabitants in the regions where the initiative will take place, including indigenous peoples and communities, as well as the fact that it does not consider any changing administrative or legislative measures that could affect them, it is therefore not a mandatory requirement to conduct a prior consultation process to reach agreements or obtain free prior informed consent (FPIC) pursuant to the terms of ILO Convention 169.

On another note, in accordance with the criteria described in the methodological framework of the Carbon Fund, the design for the IRE benefit-sharing already contains elements to guarantee legitimacy, legality, transparency, effectiveness, efficacy, and equity, among other factors, to conduct a participatory process to design the local benefit-sharing arrangements, predicated on garnering widespread community support.

The obligations set forth in the methodological framework related to obtaining widespread community support are backed by the legal framework for decision-making through the representative bodies of the *ejidos,* communities, and indigenous peoples. The items that must be fulfilled pursuant to the general and specific criteria laid out in the Carbon Fund methodological framework (29 to 33) and World Bank Operational Policy OP 4.10 are as follows:

- The existence of an appropriate framework that boosts intergenerational and gender inclusion.
- Use of a participatory methodology that fits the social and cultural values of the indigenous communities, *ejidos,* and communities where the interventions are taking place.
- Guarantee that during each of these phases there is pertinent information related to defining the arrangements for local benefit-sharing, as seen from a cultural standpoint.

Regarding gender inclusion, the international framework is related to the Convention for the Elimination of All Forms of Discrimination Against Women (CEDAW), adopted by the United Nations General Assembly in 1979 and signed by Mexico in 2001. It calls for doing away with all forms of discrimination against women, and also calls for women to have access to all types of education and training, and benefit from all community and outreach services.

The Fourth World Conference on Women, held in 1995 in Beijing, likewise called on all states to pledge to grant attention and recognition to rural women and women working in the agricultural sector or with natural resources to foster greater engagement with sustainable development.

[177] Article 6 of Convention 169 on Indigenous and Tribal Peoples in independent ILO countries.

In regard to the regulatory framework of the Mexican Constitution, Article 2, Section B stipulates that indigenous women shall be encouraged to participate in development. Article 4 recognizes the equality of rights between men and women.

As part of its programmatic framework, it is necessary to consider the cross-cutting dimension iii) Gender Perspective, from the National Development Plan, which holds guaranteeing the substantive equality of opportunities between men and women to be fundamental.

All of these aspects have been incorporated in both the IRE and the "Methodology for guiding the participatory construction of local benefit-sharing arrangements in the context of the IRE in Mexico," which was given feedback through a systematic participatory process with civil society, experts, and the state governments taking part in the IRE. This methodology helped ensure transparency in benefit-sharing and the full participation of ethnic groups in the implementation areas, considering the CMNUCC's REDD+ safeguards.

Of these safeguards, b and c, which are related to transparency, the efficacy of forestry governance and reporting structures, as well as respect for the knowledge and rights of indigenous peoples and members of local communities, respectively, are applicable.

16. Non-Carbon Benefits

16.1. Outline of potential Non-Carbon benefits and identification of Priority Non-Carbon Benefits

Please outline the potential Non-Carbon Benefits for the ER Program. Identify priority Non-Carbon Benefits, and describes how the ER Program will generate and/or enhance such priority Non-Carbon Benefits. The priority Non-Carbon Benefits should be culturally appropriate, and gender and inter-generationally inclusive, as relevant

*Refer to **criterion 34** of the Methodological Framework*

For the Mexican Government, the IRE contributes to sustainable rural development in an integral manner, and the results-based payment will only be linked to the equivalent carbon dioxide emissions reduced, in addition it is recognized that implementation of activities will generate a series of non-carbon benefits, contributing to sustainable development in broader terms.

As mentioned in section 3.2, the five states in which the Emissions Reduction Initiative shall take place rely on important forest areas with high environmental value, particularly in terms of biodiversity and hydrological services and, in turn, have a high socio-economic development demand.

It is worth emphasizing, as mentioned in section 4.3, that the Investment Programs (IP) shall be the territorial management and planning instrument for integrating activities for addressing the drivers of deforestation and forest degradation in each one of the regions. These activities were identified through a participative process[178], deemed appropriate and inclusive from a cultural and gender point of view, and included local workshops and regional forums.

The Investment Programs recognize the shared responsibility of the federal, sub-national and local levels, and the key role played by ejidos and communities in the governance of the forests in terms of achieving sustainable usage. For this reason, the fact that the Investment Programs include the territorial planning instruments at local level[179] provides certainty that appropriate planning of land usage shall enable suitable attention to be paid to the multiple functions of the forests. Furthermore, the Investment Programs promote strategic alignment of the subsidy programs for increasing productivity, and therefore, local income.

Inclusion in the Municipal Development Plans and Sustainable Rural Development Programs shall ensure appropriate collaboration and synergy between the most effective sectors at local level, which, in turn, shall positively contribute to the achievement of non-carbon benefits.

[178] See section 5.1, which describes the workshops for the participative construction of the investment programs.
[179] The Medium-Term integrated development land Program (P-Predial) and the Community Land Management (OTC).

Additionally, the clarity and stability of land tenure in the majority of the regions where the Emissions Reduction Initiative is set to take place (see section 4.4), makes it possible to establish or improve the local governance mechanisms, enabling land owners to obtain authorizations for the use of natural resources (being specially relevant in instances of timber logging, non-timber logging and payment for environmental services), and to encourage the implementation of initiatives such as Investment Programs that, as part of an IRE approach, promotes the achievement of non-carbon benefits such as the conservation of biodiversity or the promotion of sustainable livelihoods.

In view of this, Mexico recognizes that non-carbon benefits are an additional positive result that can be obtained from the activities to be implemented into the IRE framework, which also contribute to the efficiency of activities for combating deforestation and forest degradation over the long-term.

Principal non-carbon benefits in each of the IRE states

By undertaking activities for addressing deforestation and forest degradation, simultaneously there are produced multiple environmental and social services. During the participative process with local stakeholders (workshops for establishing Investment Programs), non-carbon benefits were identified that will be promoted throughout implementation of the Emissions Reduction Initiative. Furthermore, part of this participative process included a specific exercise for its prioritization. The results from each of the regions in which the Investment Program was implemented is presented below, with the benefits being classified into the following categories:

1. Social Benefits: refers to the protection and improvement of livelihoods, participation of all stakeholders, improvements in forest governance, strengthening of social capital, etc.
2. Environmental: refers to the protection, conservation and restoration of biodiversity and ecosystems, adaptation to climate change, diversification of landscape structures, prevention of fires, water-related environmental services, etc.

Campeche

Table 100 Additional carbon benefits associated with activities identified in Campeche

Generic activities	Social co-beneficiaries	Environmental co-beneficiaries
Sustainable livestock farming: Silvopastoral systems	Improvements in livestock productivity Increases in overall income	Comprehensive restoration, supplementing or focusing on degraded areas. Ecological alternative
Improvements in the crop-growing production system (milpa), intensification of traditional agriculture, and conservation of agriculture	Productive diversification Increase in organization Increase in income Improvements in agricultural productivity Increase in family income through commercialization of surplus products	Maintenance of agro-biodiversity
Sustainable management of forest systems and wildlife	Increases in overall income Increases in productivity	Reduction in pressure over natural resources Increases in incentive to protect the forest Promotes the use of medicinal plants and advancements in traditional knowledge
Development of bee-keeping activities	Generates employment Improving incomes Improved valuation of uses and customs	Bees are important for the pollination of natural and wildlife areas, and their existence is a very necessary environmental service. Restoration of melliferous flora The keeping of native bees is important in itself in terms of conservation of biodiversity. The system maintains vegetated areas that, in turn, provides habitat connectivity
Payment for	Increases in overall income	Reduction in pressure over natural

environmental services	Increases in productivity	resources Increases in incentive to protect the forest

Chiapas

Table 101 Additional carbon benefits associated with activities identified in the 4 Chiapas regions: Frailesca, Istmo-Costa, Selva Lacandona and Zoque-Mezcalapa

Generic activities	Social co-beneficiaries	Environmental co-beneficiaries
Renovation and restoration of coffee plantations	Improvement in the income of coffee producers Generates employment Support and encouragement for producer organizations	Conservation of species and their varieties is important in terms of biodiversity The system maintains vegetated areas that, in turn, provides habitat connectivity Improvement in soil fertility, reducing degradation and providing protection against erosion Reduction in the use of agrochemicals (insecticides, fungicides, fertilizers and other pesticides)
Improvements in the crop-growing production system (milpa), intensification of traditional agriculture, and conservation of agriculture	Promotion of traditional knowledge and strengthening of ancestral practices. Improvement in the economic inputs of the producers Generation of alternative economic sources Capitalization for activities aimed at making improvements, and the redevelopment of productive systems	
Sustainable livestock farming, through intensive silvopastoral systems and the semi-intensification of livestock farming	Promotion of the organization of different government sectors and tiers. Improvement in economic inputs Increased variety of products (meat, milk and its derivatives) for maintaining food safety Generation of employment The creation of technical and management skills on the part of the local community. Diversification of livestock businesses Encourages planning of productive activities over the short and medium-term. Creation of alternative saving schemes that provide equity/property and economic security to family members. Better planning and organization of the land, helping to prevent conflicts related to land use and urban development Promotion of diversification of activities and productive competitiveness Development of local skills for the conservation and sustainable use of the forests	Conservation of water: water recharge Increase in tree cover producing a positive effect in terms of biodiversity Reduction in land degradation, and land erosion Conservation of soil biodiversity, and fauna and flora habitats Genetic improvements Makes use of appropriate instruments for identifying the suitability of the soil in terms of productive activities and overall conservation Promotes conservation of areas of biological importance Areas exist that serve as microbiological corridors for fauna in the region, through connection between habitats.
Strengthening of regulatory instruments.		
Strengthening of local governance	Development of local skills for the conservation and sustainable use of the forests Creation of skills between members of the community, for protecting their own resources and proposing conservation alternatives according to their social conditions and the territorial context. Improvement in environmental education within the communities Improvement in economic inputs	Conservation of soil biodiversity, and fauna and flora habitats Preservation of species and ecosystems, while promoting the conservation of biodiversity. Utilization of the forest in the most sustainable manner possible. Promotes the use of medicinal plants and advancements in traditional knowledge
Sustainable management of forest systems and wildlife		

Table 102 Additional carbon benefits associated with activities for specific regions in Chiapas

Generic activities	Social co-beneficiaries	Environmental co-beneficiaries
Payment for environmental services (Zoque-Mezcalapa, Lacandona and Istmo-Costa)	Improvement in environmental education within the communities Improvement in economic inputs Strengthening of value chains in connection with other sustainable and productive systems	Preservation of species and ecosystems, while promoting the conservation of biodiversity. Utilization of the forest in the most sustainable manner possible. Good maintenance practices for natural attractions Reduction of pressure in conservation areas involving other forms of intensive land usage
Productive redevelopment (Lacandona, Frailesca)	Greater economic inputs Increased variety of products (meat, milk and its derivatives) for maintaining food safety Generation of employment	Forest conservation, and increases in environmental services Less siltation of rivers and streams
Productive projects for increase in income (Zoque-Mezcalapa, Lacandona and Frailesca)	Improvement in economic inputs Broadening of product variety for maintenance of food security and productive diversification Generation of employment Increase in the control of economic benefits generated by activities undertaken by women. Empowerment for women at family and community level in the making of decisions. Overview of the contributions made by family members (women, young persons and the elderly) throughout the different phases of the activities.	
Development of bee-keeping activities (Zoque-Mezcalapa)	Generates employment Improves incomes Improved valuation of uses and customs	Bees are important for the pollination of natural and wildlife areas, and their existence is a very necessary environmental service. Restoration of melliferous flora The keeping of native bees is important in itself in terms of conservation of biodiversity. The system maintains vegetated areas that, in turn, provides habitat connectivity

Jalisco

Table 103 Additional carbon benefits associated with activities identified in the 4 Jalisco regions: Costa Sur, Cuenca baja del Río Ayuquila, Cuenca del Río Coahuayana and Sierra Occidental y Costa

Generic activities	Social co-beneficiaries	Environmental co-beneficiaries
Payment for environmental services (Zoque-Mezcalapa, Lacandona and Istmo-Costa)	Improvement in environmental education within the communities Improvement in economic inputs Strengthening of value chains in connection with other sustainable and productive systems	Preservation of species and ecosystems, while promoting the conservation of biodiversity. Utilization of the forest in the most sustainable manner possible. Good maintenance practices for natural attractions Reduction of pressure in conservation areas involving other forms of intensive land usage
Sustainable livestock farming, through intensive silvopastoral systems and	Promotion of the organization of different government sectors and tiers. Improvement in economic inputs	Conservation of water: water recharge Increase in tree coverage, producing a positive effect in terms of biodiversity

Generic activities	Social co-beneficiaries	Environmental co-beneficiaries
the semi-intensification of livestock farming	Increased variety of products (meat, milk and its derivatives) for maintaining food safety Generation of employment The creation of technical and management skills on the part of the local community. Diversification of livestock businesses Encourages planning of productive activities over the short and medium-term. Creation of alternative saving schemes that provide equity/property and economic security to family members.	Reduction in land degradation, and land erosion Conservation of soil biodiversity, and fauna and flora habitats Genetic improvements
Strengthening of regulatory instruments.	Better planning and organization of the land, helping to prevent conflicts related to land use and urban development Promotion of diversification of activities and productive competitiveness Development of local skills for the conservation and sustainable use of the forests	Making use of appropriate instruments for identifying the suitability of the soil in terms of productive activities and overall conservation Promotes conservation of areas of biological importance Areas exist that serve as microbiological corridors for fauna in the region, through connection between habitats.
Improvements in the crop-growing production system (milpa), intensification of traditional agriculture, and conservation of agriculture	Promotion of traditional knowledge and strengthening of ancestral practices. Improvement in the economic inputs of the producers Generation of alternative economic sources Capitalization for activities aimed at making improvements, and the redevelopment of productive systems	
Sustainable management of forest systems and wildlife	Improvement in economic inputs Better productive yield Generation of employment Organizational development for the appropriate use of forest lands Development of community capabilities	Conservation of natural heritage Full restoration of degraded areas. Conservation of water: water recharge Maintenance of vegetated areas that, in turn, provides habitat connectivity Conservation of soil biodiversity, and fauna and flora habitats Promoting the use of medicinal plants and advancements in traditional knowledge
Payment for Environmental Services	Promoting improvements in local livelihoods through improvements in economic income Training of primary stakeholders on conservation of the forests	Conservation of soil biodiversity, and fauna and flora habitats Reduction of pressure in conservation areas involving other forms of intensive land usage Conservation of water: water recharge Maintenance of vegetated areas that, in turn, provides habitat connectivity
Productive projects for increasing income	Improvement in economic inputs Broadening of product variety for maintenance of food security and productive diversification Generation of employment Increase in the control of economic benefits generated by activities undertaken by women. Empowerment for women at family and community level in the making of decisions. Overview of the contributions made by family members (women, young persons and the elderly) throughout the different phases of the activities.	
Strengthening of local	Development of local skills for the	Conservation of soil biodiversity, and

Generic activities	Social co-beneficiaries	Environmental co-beneficiaries
governance	conservation and sustainable use of the forests Creation of skills between members of the community, for protecting their own resources and proposing conservation alternatives according to their social conditions and the territorial context.	fauna and flora habitats

Quintana Roo

Table 104 Additional carbon benefits associated with activities identified in Quintana Roo

Generic activities	Social co-beneficiaries	Environmental co-beneficiaries
Sustainable livestock farming, through intensive silvopastoral systems and the semi-intensification of livestock farming	Promotion of the organization of different government sectors and tiers. Improvement in economic inputs Increased variety of products (meat, milk and its derivatives) for maintaining food safety Generation of employment The creation of technical and management skills on the part of the local community. Diversification of livestock businesses Encourages planning of productive activities over the short and medium-term. Creation of alternative saving schemes that provide equity/property and economic security to family members.	Conservation of water: water recharge Increase in tree cover producing a positive effect in terms of biodiversity Reduction in land degradation, and land erosion Conservation of soil biodiversity, and fauna and flora habitats Genetic improvements
Productive redevelopment	Generation of employment Reducing migratory agriculture Promoting inclusive organization schemes Reducing the costs of carrying out other activities, by being a provider of better quality inputs with greater access and improved frequency of availability.	Maintenance of soil fertility and reduction in erosion through organic material, nitrogen fixation and the recycling of nutrients applied to the soil Conservation of water (quantity and quality) to encourage infiltration and reduce surface run-off that could contaminate waterways Conservation of biodiversity in fragmented landscapes Control of environmental services such as firewood, wood and other products required for meeting the immediate necessities of the community.
Strengthening of local governance	Development of local skills for the conservation and sustainable use of the forests Creation of skills between members of the community, for protecting their own resources and proposing conservation alternatives according to their social conditions and the territorial context.	Conservation of soil biodiversity, and fauna and flora habitats
Sustainable management of forest systems and wildlife	Better productive yield Generation of employment Organizational development for the appropriate use of forest lands Development of community capabilities	Conservation of natural heritage Full restoration of degraded areas. Conservation of water: water recharge Maintenance of vegetated areas that, in turn, provides habitat connectivity Preservation of species and ecosystems, while promoting the conservation of biodiversity. Utilization of the forest in the most sustainable manner possible. Promotes the use of medicinal plants and advancements in traditional knowledge
Productive projects for increasing income	Improvement in economic inputs	

Generic activities	Social co-beneficiaries	Environmental co-beneficiaries
	Broadening of product variety for maintenance of food security and productive diversification Generation of employment Increase in the control of economic benefits generated by activities undertaken by women. Empowerment for women at family and community level in the making of decisions. Overview of the contributions made by family members (women, young persons and the elderly) throughout the different phases of the activities.	
Improvements in the crop-growing production system (milpa), intensification of traditional agriculture, and conservation of agriculture	Promotion of traditional knowledge and strengthening of ancestral practices. Improvement in the economic inputs of the producers Generation of alternative economic sources Capitalization for activities aimed at making improvements, and the redevelopment of productive systems	Maintenance of soil fertility and reduction in erosion through organic material, nitrogen fixation and the recycling of nutrients applied to the soil Conservation of water (quantity and quality) to encourage infiltration and reduce surface run-off that could contaminate waterways Conservation of biodiversity
Payment for Environmental Services	Promoting improvements in local livelihoods through improvements in economic income Training of primary stakeholders on conservation of the forests	Conservation of soil biodiversity, and fauna and flora habitats Reduction of pressure in conservation areas involving other forms of intensive land usage Conservation of water: water recharge Maintenance of vegetated areas that, in turn, provides habitat connectivity
Development of bee-keeping activities	Generates employment Improving incomes Improved valuation of uses and customs	Bees are important for the pollination of natural and wildlife areas, and their existence is a very necessary environmental service. Restoration of melliferous flora The keeping of native bees is important in itself in terms of conservation of biodiversity. The system maintains vegetated areas that, in turn, provides habitat connectivity

Yucatán

Table 105 Additional carbon benefits associated with activities identified in Yucatán

Generic activities	Social co-beneficiaries	Environmental co-beneficiaries
Sustainable livestock farming, through intensive silvopastoral systems and the semi-intensification of livestock farming	Promotion of the organization of different government sectors and tiers. Improvement in economic inputs Increased variety of products (meat, milk and its derivatives) for maintaining food safety Generation of employment The creation of technical and management skills on the part of the local community. Diversification of livestock businesses Encourages planning of productive activities over the short and medium-term. Creation of alternative saving schemes that provide equity/property and economic security to family members.	Conservation of water: water recharge Increase in tree coverage, producing a positive effect in terms of biodiversity Reduction in land degradation, and land erosion Conservation of soil biodiversity, and fauna and flora habitats Genetic improvements

Generic activities	Social co-beneficiaries	Environmental co-beneficiaries
Development of bee-keeping activities	Generates employment Improving incomes Improved valuation of uses and customs	Bees are important for the pollination of natural and wildlife areas, and their existence is a very necessary environmental service. Restoration of melliferous flora The keeping of native bees is important in itself in terms of conservation of biodiversity. The system maintains vegetated areas that, in turn, provides habitat connectivity
Improvements in the crop-growing production system (milpa), intensification of traditional agriculture, and conservation of agriculture	Involvement of women in production and conservation processes Adequate food supply in terms of nutritional value and variety available to households throughout the territory Assessment and application of the ecological knowledge of the Mayan population.	Attainment of quality products, while maintaining spatial heterogeneity and biodiversity. Permanence of native crops. Benefits awarded to other activities such as bee keeping, on the basis of greater flowering. Generation of production surpluses of associated commercial value.
Commercial forest plantations	Access to more specialized market niches that are willing to pay for differentiated products such as freshness, organoleptic characteristics and crop cultivation processes that are friendly to the environment, etc. Retention of local labor services.	Diversification of local production activities.
Sustainable management of forest systems and wildlife	Social cohesion in terms of decision-making and collective activities. Appropriate security for investing in activities related to sustainable development.	Reassessment of wood-related and non-wood-related products taken from the forest, in addition to the discovery of usage alternatives for these products or for environmental services. Promoting the use of medicinal plants and advancements in traditional knowledge
Productive redevelopment	Generation of employment Reducing migratory agriculture Promoting inclusive organization schemes Reducing the costs of carrying out other activities, by being a provider of better quality inputs with greater access and improved frequency of availability.	Maintenance of soil fertility and reduction in erosion through organic material, nitrogen fixation and the recycling of nutrients applied to the soil Conservation of water (quantity and quality) to encourage infiltration and reduce surface run-off that could contaminate waterways Conservation of biodiversity in fragmented landscapes Control of environmental services such as firewood, wood and other products required for meeting the immediate necessities of the community.
Payment for Environmental Services	Promoting improvements in local livelihoods through improvements in economic income Training of primary stakeholders on conservation of the forests	Conservation of soil biodiversity, and fauna and flora habitats Reduction of pressure in conservation areas involving other forms of intensive land usage Conservation of water: water recharge Maintenance of vegetated areas that, in turn, provides habitat connectivity
Strengthening of local governance Strengthening of regulatory instruments.	Development of local skills for the conservation and sustainable use of the forests Creation of skills between members of the community, for protecting their own resources and proposing conservation alternatives according to their social conditions and the territorial context.	Conservation of soil biodiversity, and fauna and flora habitats
Productive projects for increasing income	Improvement in economic inputs	

Generic activities	Social co-beneficiaries	Environmental co-beneficiaries
	Broadening of product variety for maintenance of food security and productive diversification Generation of employment Increase in the control of economic benefits generated by activities undertaken by women. Empowerment for women at family and community level in the making of decisions. Overview of the contributions made by family members (women, young persons and the elderly) throughout the different phases of the activities.	

16.2. Approach for providing information on Priority non-carbon benefits

Please indicate how information on the generation and/or enhancement of priority Non-Carbon Benefits will be provided during ER Program implementation, as feasible, by providing a description of the preferred methods for collecting and providing information on priority Non-Carbon Benefits taking note of existing and emerging guidance on monitoring of non-carbon benefits by the UNFCCC, CBD, and other relevant platforms.

*Refer to **criterion 35, indicator 35.1** of the Methodological Framework*

It is anticipated that promotion of the activities proposed in the Investment Program shall contribute to management optimization of natural resources and lead to the conservation of forests and biological diversity, in addition to providing integrated management of all productive landscapes and improving the livelihoods of the local populations.

Information on the generation, conservation and improvement of the non-carbon benefits shall be included in the reports that each of the state governments drafts[180] to report on the status of the IRE (Emissions Reduction Initiative) implementation in their respective spheres of influence. Annex 14 includes the proposal detailed within this report.

Such reports shall be produced once every two years and shall include information on matters concerning non-carbon benefits.[181]

A number of indicative questions[182] are listed as follows for the purposes of identifying whether the non-carbon benefits have been created, maintained or improved:

The probability/likelihood that certain activities identified in the Investment Program or implemented, have:

- Promoted the conservation of biodiversity, natural forests and their ecosystem services in order to improve the situation of areas deemed important in terms of biodiversity?
- Avoided erosion of the soil and maintained water quality (e.g. by reducing forest clearings or intensive farming on steep slopes and in riverside forests)?
- Improved the access of local communities to forest products such as firewood, foodstuffs and medicinal plants?
- Improved the ability of the respective community in adapting to climate change, and reduced its vulnerability in terms of climate change?

[180]This information, in turn, forms part of the provisional progress and monitoring reports of the IRE that the Federal Government shall send to the Carbon Fund.

[181]Information on the additional carbon benefits shall vary depending on the implemented activities that have been implemented. For example, conservation of biodiversity was identified as one of the additional benefits in terms of the generic forest management activity. Various technical tools are available for integrating the biodiversity conservation components into the forest management Programmes, such as the document: *Criteria for the conservation of biodiversity in the management programs (*http://goo.gl/eyXRDd), presenting a criteria proposal available to technical service providers, producers and institutional personnel involved in the preparation, revision and implementation of the aforementioned programs.

[182]Inputs were taken from the Bert V2 tool of the ONUREDD+ Program

- Provided local communities with livelihood opportunities, e.g. development of alternative opportunities for generating income that, in turn, reduces pressure on the forest?
- Conserved forests and forest products of traditional and spiritual importance to the indigenous and local communities (conservation of sacred locations, medicinal plants, etc.)?

Mexico has a National Biodiversity Monitoring System. This system allows to generate annual statistics necessary for the sustainable management of the country. In addition, it contributes to the capacity building and training of Mexican scientists in techniques and technologies for sustainable management. Three agencies work in coordination implementing the sytem: CONAFOR, CONABIO and CONANP. CONAFOR contributes with data from the national forest and soil inventory. Also, this agency, as well as CONANP, manages the equipment and finances the logistics necessary for data collection in the field. Finally, CONABIO generates the system of data storage and processing and, in coordination with researchers and national and international experts, carries out the analysis of these. In 2015, the system was implemented to monitor in situ the state of ecosystems'health in Mexico. Information on this system can be found at: http://www.biodiversidad.gob.mx/sistema_monitoreo/

17. Title to Emissions Reduction

17.1. Emissions Reduction Initiative Authorization

Using the table below, please identify the national authority assigned with the responsibility to approve ER Programs in accordance with national laws and regulations, as well as national REDD+ management arrangements. Where applicable, provide a reference to the decree, law or other type of decision that identified this national authority.

Please include as an annex to this document, the formal letter of approval for the ER Program issued by this national authority. The written approval shall confirm that:

a) The REDD Country Participant endorses the proposed ER Program and its consideration for inclusion in the FCPF Carbon Fund; and
b) The ER Program Entity that is proposing the ER Program, whether it be the national government or another entity authorized by the national government, is authorized to enter into an ERPA with the Carbon Fund. This authorization can be provided through the letter of approval or by providing reference to an existing legal and regulatory framework stipulating such authority.

*Refer to **criterion 36, indicator 36.1** of the Methodological Framework*

Name of the Entity	National Forestry Commission (CONAFOR)
Contact person	Mr Jorge Rescala Pérez
Title	Managing Director
Address:	Periférico Poniente No. 5360 Col. San Juan de Ocotán, Zapopan, Jalisco, C.P. 45019
Telephone number:	+52 (33)-3777-7000
E-mail	jorge.rescala@conafor.gob.mx
Website	www.conafor.gob.mx
Reference to a decree, law or other type of ruling that identifies this entity as the national REDD+ authority capable of approving the Emissions Reduction Initiative.	CONAFOR is a decentralized agency of the Federal Public Administration (APF), with the mandate of designing strategies, policies, measures and activities for moving towards a zero percent loss of carbon in the original ecosystems, for its subsequent incorporation into forest policy and sustainable development planning instruments, while also taking sustainable development and community forest management into account (GLCC, transitional article three); in addition to coordinating the incorporation of criteria and activities for adapting to and mitigating climate change through the National Forest Program, to encourage sustainable forest management and the increase and conservation of carbon sinks, in addition to the designing of policies and strategies for cooperation, financing and international commerce, and to establish, in terms of national and international commitments, all necessary cooperation with national and international regulatory authorities in relation to financing, international

	commerce and cooperation for sustainable forest development, plus coordination and monitoring of compliance with conventions and all other national and international acts and agreements that include commitments or projects on cooperation, international commerce and financing, of matters in which CONAFOR takes part, and as established in its organic statute. CONAFOR is therefore the authority with the legal stature for undertaking negotiations corresponding to transactions aimed at reducing emissions, and for the development and implementation of the current initiative.

17.2. Transfer of ownership of the Emissions Reductions

Please demonstrate the ER Program entity's ability to transfer Title to ERs to the Carbon Fund and provide a tentative risk rating that this ability is clear or uncontested. As part of this demonstration, include a discussion on the implications of the land and resource regime on the ability to transfer Title to ERs to the Carbon Fund. If significant difficulties in the ability to transfer ER titles have been identified, please indicated what proportion of the Accounting Area might be affected and what measures will be taken to establish this ability.

The ability to transfer Title to ERs may be demonstrated through various means, including reference to existing legal and regulatory frameworks, sub-arrangements with potential land and resource tenure rights-holders (including those holding legal and customary rights, as identified by the assessments conducted under section 4.4), and benefit-sharing arrangements under the Benefit-Sharing Plan

Refer to ***criterion 28, indicator 28.3 and criterion 36, indicator 36.2 and indicator 36.3*** *of the Methodological Framework*

The first Heading of the Political Constitution of the United Mexican States (CPEUM) establishes that all persons shall enjoy the human rights recognized by the constitution itself and the international treaties in which Mexico takes part, in addition to all guarantees for its protection. Article 4 of the CPEUM recognizes the human right of every person to enjoy a healthy environment. There are three separate elements to this provision: 1. The human right in itself to enjoy a healthy environment for the development and well-being of all people. 2. The obligation of the Mexican State to ensure this human right is fully respected. 3. The responsibility that must be assumed in the event of any environmental damage or deterioration, in full compliance with applicable law.

The Constitution thus establishes the original ownership of lands and waters within the limits of national territory, in addition to recognizing and regulating private property. So article 27 of the Constitution expressly indicates that the ownership of the land and water falling within the limits of national territory originally corresponded to the Nation, which exercises maximum authority over them and, in accordance with this, it can transfer them to individuals in order to constitute private property, or, once its domain has been transferred, if necessary, use them by means of the method indicated in the Supreme Law, since both Constitutional Congress and doctrine referred to this property as "absolute property", "supreme domain", "freehold" or "eminent domain".

So, although ownership of the land and water may be transferred to individuals, this does not mean that domain over the natural resources found therein is transferred, since paragraphs four and five of said constitutional provision establish that the Nation is responsible for its direct control, namely, it alone can make use of the resources or assets, whether or not living, described in those paragraphs, but when using them sovereignty authorizes governors - without it being possible to create private ownership in these cases -, to exploit and use them temporarily via a concession, apart from those exceptions indicated in the sixth paragraph of article 27 of the Basic Law.

In public ownership, in contrast to the establishment of private ownership, the nation reserves the right to the direct control over properties and resources established by the aforementioned provision. That is to say, the land, water and other resources which have not been conveyed to individuals in order to constitute private property, remain part of the nation's property, and is referred to as public property.

Within this type of property, the nation has direct ownership of all natural resources of the continental shelf and the underwater shelves of the islands; the minerals or substances that form deposits of a nature that differs from land components; deposits of precious stones, rock salt and salts formed by sea water; fertilizers; solid mineral fuels; petroleum and all solid, liquid and gaseous hydrocarbons; and the space situated on national territory. They also include all territorial sea waters, inland sea waters and all hydraulic resources such as rivers, lakes, lagoons, estuaries, springs, runoffs, riverbeds and riversides. The nation also has exclusive ownership of the conduction, transformation, distribution and supply of electrical energy; the use of nuclear fuel to generate nuclear energy and the exclusive economic area beyond and adjacent to territorial waters. The Constitution authorizes the issue of leases to individuals or companies by means of an agreement granted by the Executive Power, specifically referring to natural resources, minerals and water belonging to the nation, but not with regard to petroleum, electrical energy and nuclear energy.

It is important to highlight that article 27 of the Constitution also recognizes the right that the Mexican State has in making private ownership responsible for procedures dictated by public interest, in addition to regulating social well-being, the use of natural elements subject to appropriation for the purpose of ensuring their proper conservation, among other things. The authority shall therefore dictate the necessary measures for the organization of human settlements and establishing adequate provisions, uses, land reserves and destinations, water and forests, with the aim of preserving and restoring ecological equilibrium, and to avoid the destruction of natural elements and any damage that could be incurred to the property and to the detriment of society.

In spite of forest resources being subject to appropriation, and the need for owners to use them in the manner recognized in article 5 of the General Law for Sustainable Forest Development, it is necessary to establish that ownership of forest resources in national territory corresponds to the ejidos, communities, indigenous peoples and communities, individuals or entities, etc., with the CPEUM opening the way to define a strong regulatory control to ensure both conservation and equitable distribution of such resources, considered to be components of public wealth. The constitutional proposal is based on a complex legal protection system that, on the one hand, guarantees property ownership rights, but on the other hand conditions the exercising of the right to remain on resources, which also signifies recognizing the interests of the Nation through conservation of such elements. The property must therefore remain in compliance with the measures established in subsidiary legislations.

The above reinforces the following Thesis of Jurisprudence dictated by the Supreme Court of Justice of the Nation:

> PRIVATE PROPERTY IN RELATION TO THE ENVIRONMENT. ITS MODALITIES. Article27, paragraph three of the CPEUM anticipates that the Nation should sustain the "right" at all times, which is understood as the jurisdiction or power to impose the modalities on private property, as dictated by public interest, in addition to establishing regulations for the use of natural resources subject to appropriation for social benefit, and thus regulating population-related conditions, human settlements, the administration of lands, waters and forests, the planning of urban centers and, in compliance with article73, fraction XXIX-G, constitutional, the preservation and restoration of ecological balance. The aforementioned determination has its correlative part set out in the catalogue of rights established in article 4, paragraph five of the Constitution itself, which anticipates the "right to a healthy environment" and the "obligation of the State to guarantee such an environment", which must be interpreted, not only in the context of the authority to protect the environment and to preserve and restore ecological balance, but in the context of the direct constitutional power for establishing direct public interest and enabling modalities to be established in terms of property, without such modalities being converted into appropriation or confiscation. Thus, the aforementioned modalities that can be imposed on property rights, provided that they are duly founded and motivated and considered to be reasonable and proportional, constitute restrictions that do not involve their deprivation or appropriation, but are simply limiters in terms of the way they are used, which does not signify their annulment.[183]

These premises pose a challenge in determining the ownership of avoided carbon dioxide (CO_2) emissions, even though this implies the non-existence of a non-tangible asset (CO_2) that does not create[184] actual rights in itself. While avoided emissions, among other activities, can be the effect of design and implementation of State public policies in order to slow down the processes of deforestation and forest degradation; the deforestation process that releases such emissions shall involve the execution of the offence as detailed in article 418 of the Criminal

183 Revision restriction 410/2013. Elda Beatriz Villamil Solís. October 23, 2013 Five votes from Ministers, Arturo Zaldívar Lelo de Larrea, José Ramón Cossío Díaz, Alfredo Gutiérrez Ortiz Mena, Olga Sánchez Cordero de García Villegas and Jorge Mario Pardo Rebolledo. Speaker: José Ramón Cossío Díaz. Secretaries: Dolores Rueda Aguilar and Raúl Manuel Mejía Garza. Thesis: 1a. LXXVII/2014 (10a.). 1ª. Sala. Book 4, March 2014, Volume I, Page 552. Isolated thesis (constitutional)

184 This refers to the legal power that a person holds directly and immediately over a particular object, enabling full or partial involvement in a legal sense and being effective against third parties. Similarly, the full or partial usage in a legal sense of the essence of the respective actual right.

Code, which establishes a period of between six months and nine years in prison, or the equivalent of one hundred to three thousand days fine for those who illicitly i) **Remove or destroy natural vegetation; ii) cut down, uproot, fell or chopp down one or more trees; or iii) Change forest land use.**

Owners of the forest are therefore not able to claim ownership of the avoided emissions because, even when having permission or authorization to utilize the land, this does not necessarily include CO_2 emissions, or the permission to make such emissions.

The State has sovereign authority over its territory, an original and traditional property, a real institutional right, or to a greater extent, has the full right to ownership.

Constitutional article 25 establishes the power of the State in being able to exercise stewardship over national development, resulting in social organization in the manner represented by the State, which relies, in turn, on a supremacy of decision in terms of matters concerning national development[185]. To achieve this, it implements policy instruments which take the form of actions directed at avoiding emissions of CO_2

These instruments are divided into four groups:

1. Direct regulation instruments.
In these types of instruments, the authorities define the objectives they would like to achieve, and define the guidelines for ensuring that these objectives are achieved within a well-defined time period. In terms of individuals, compliance with these types of provisions is mandatory.

Included in this category are the necessary authorizations for changes in land-use; forest usage; notices and permits for combating and controlling forest pests and forest diseases; emissions reports; environmental impact statements on land usage in tropical forests, on species of difficult regeneration and changes in land-use in forest areas, tropical forests, and arid zones; Mexican official standards; and sanctions.

2. Planning instruments.
These can also be used as direct regulation mechanisms due to their coercive nature. These instruments are different to the instruments in item 1 as they do not directly regulate activities, but have a medium and long-term outlook over the organization of activities, products or specific areas, and take impacts into account as a whole and not as isolated processes.
Considered herein are the Sectoral Program for the Environment and Natural Resources 2013-2018, the National Climate Change Strategy - 10-20-40 Vision, the Special Program on Climate Change, the 2025 Strategic Forestry Program, and the National Forestry Program 2014-2018.

3. Economic instruments.
These are representative of normative regulations or price formation regulations, based on the economic interests and motivations of the stakeholders, for promoting environmental policy objectives, while enabling these objectives to be adjusted in accordance with their inherent possibilities and interests. The economic instruments are divided into (1) fiscal instruments, (2) financial instruments, and (3) market instruments.

4. Development Instruments.
This category includes all actions aimed at promoting or inhibiting certain types of behavior or activities from a voluntary perspective, i.e. behavior or activities without an economic incentive or coercive element.

Amongst these tools we can highlight the reinforcement of capacities, creation of platforms for the participation of all the stakeholders involved including society, academia, owners, ejidos, communities, growers, etc.

These policy instruments are directly related. According to state stewardship, the state must formulate a National Development Plan as a foundation for planning, conducting, coordinating and directing national economic activity, establishing how to regulate and encourage activities of general interest within the framework of the liberties granted by its own constitution.

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[185]National development is classified (under the terms contained in the Constitution itself) as the constant economic, social and cultural improvement of the people. National development focuses on the improvement of the lives of the communities, and covers the range of national activities.

On the basis of the National Development Plan, the other instruments of public policy resulting from this and the stipulations of article 28 of the constitution, which considers the concept of subsidies for priority activities to be an economic tool; the Federation applies subsidies for activities which the legal framework defines as priority, with the State being obliged to monitor their application and assessment of results.

Priority areas are those which, depending on circumstances, are in most need of being promoted because of the requirements of national development. According to the text of the constitution, priority areas can solely be developed by the public sector, or associated with aspects within the social sector or the private sector. In terms of developing both the strategic areas and the priority ones the State has bodies and public companies for managing them effectively, as stipulated by paragraph six of article 28 of the constitution.

We then find that article 22bis of the General Law of Ecological Equilibrium and Environmental Protection establishes that activities associated with the following are considered to take priority, qualifying them for the fiscal incentives established in accordance with the Federal Revenue Law: (…) **V.-** The establishment, management and supervision of protected natural areas; **VI.-** The processes, products and services which, in accordance with applicable regulations, have been environmentally certified, and **VII.-** In general, those activities associated with the preservation and restoration of ecological equilibrium and environmental protection.

Article 5 of the Law on Sustainable Rural Development establishes that, within the framework indicated in the Constitution, the State, via the Federal Government, in coordination with the federal bodies and the communities, must promote policies, actions and programs within the rural environment which shall be considered to take priority in terms of national development, directed, among other things, at: Correcting differences relating to regional development by paying differentiated attention to regions with higher levels of poverty, by means of a comprehensive plan of action implemented by the State to boost their transformation and productive and economic reconversion, with a productive approach based on sustainable rural development; encouraging the conservation of biodiversity and improving the quality of natural resources, by means of their sustainable use; and recognizing the value of the various economic, environmental, social and cultural operations involved in the different types of national agriculture.

When establishing the aims of the National Forestry Commission, which includes encouraging and boosting activities associated with the production, protection, conservation and restoration of forests, legislation on the subject of forests clearly defines them as priority development areas. (Article 17 LGDFS). Likewise it generally defines the development of sustainable forests as a priority area for national development.

In a more definite way, in terms of the Nation's aims, activities and priority areas, the General Law for Sustainable Forest Development (LGFDS) makes it obligatory for the federation to create, develop and apply economic instruments to incentivize compliance with forestry policy targets (Article 139)

Subsidies, used as economic tools, are regulated via the Federal Law on Budget and Treasury Responsibility which defines them as "allocations of federal resources indicated in the Expenditure Budget which are granted, via agencies and entities, to the various sectors of society, to the federal or municipal organizations in order to promote the development of priority social or economic activities of general interest".

The Federal Law on Budget and Treasury Responsibility regulates the administration of subsidies which form part of the budgets for each agency and make the owners of the agencies and entities directly responsible for ensuring that the subsidies related to their budgets are not only granted but are applied in strict adherence to the legal framework of application. Furthermore, it establishes the obligation on the part of these agencies to, among other things, look for alternative sources of income in order to achieve greater self-sufficiency (Article 75).

The Emissions Reduction Initiative investment programs combine and harmonize the governmental assistance which may be given to rural zones in the area of intervention. This governmental assistance, or economic tool, classified as "subsidies", constitute the initial investments or first stage activities within the Investment Programs, mainly conducted via components from the forestry, rural and social sectors, and they shall allow fulfilment of targets and objectives established in its public policy and national and international undertakings for avoiding deforestation and degradation of forests.

Taking into account the fact that deforestation, in accordance with the stipulations of article 418 of the Penal Code, constitutes a crime; the emissions avoided cannot be awarded to the owners (smallholders, communities or ejidos) of forest land. Consequently, the rights over the emissions avoided are not linked to land tenure in Mexico.

Nevertheless, in order to fulfil the targets and objectives of public policy, and to promote and protect the priority areas or activities established by the legal framework, the State carries out activities via instruments of public policy which promote the development of priority social or economic activities of general interest. This includes the activities associated with preserving and restoring ecological equilibrium and environmental protection; correcting disparities in regional development by paying differentiated attention to regions with higher levels of poverty, by means of a comprehensive plan of action implemented by the State to boost their transformation and productive and economic reconversion, with a productive approach based on sustainable rural development; encouraging the conservation of biodiversity and improving the quality of natural resources by means of their sustainable use; and recognizing the value of the various economic, environmental, social and cultural operations involved in the different types of national agriculture; and encouraging and boosting activities associated with production, protection, conservation and restoration in relation to forests, among other things.

As a result of the above, the State implements different policy instruments - such as the Emissions Reduction initiative - which take the form of action aimed at avoiding emissions of CO_2 in its mandate for implementing the public policy for sustainable rural development in order to achieve national targets and objectives and in order to fulfil national and international undertakings. This does not mean that the economic benefits resulting from this action are held by the State itself, but as part of these policy instruments, and in accordance with article 27 of the constitution which establishes the obligation to carry out equitable distribution of public wealth, to achieve balanced development of the country and improve the rural population's living conditions, it must distribute the benefits through intstruments of public policy as established in the ENAREDD+ consultation draft: "... the right to receive benefits from the payment for results in respect towards avoided emissions, corresponding to the land owners and inhabitants of the regions that make the effort to prevent or hinder deforestation and degradation of forest lands under the mechanisms established for this particular purpose, while respecting the right, at all times, to full and effective participation in the design of benefits sharing mechanisms and to decide on their own priorities with regard to the development process".

Legal nature of the Avoided Emissions

In order to define the legal nature of the Avoided Emissions it is necessary to review the regulations in force with regard to the emissions per se.

The regulations of the General Law of Ecological Equilibrium and Environmental Protection on the subject of Prevention and Control of Atmospheric Contamination, contemplate three sources of emissions:

1. Fixed source: Any installation established in one single place, with the aim of carrying out industrial or commercial operations or processes, services or activities which generate or can generate contaminating emissions in the atmosphere
2. Mobile source: Aircraft, helicopters, railways, trams, tractors, integral buses, trucks, cars, motorcycles, boats, non-fixed equipment and machinery with combustion engines and similar, which in connection with their operations generate or may generate emissions which contaminate the atmosphere; and
3. Multiple source: A fixed source with two or more ducts or chimneys which discharge emissions into the atmosphere, from one single process.

This same regulation establishes that "the emissions of smells, gases, as well as solid and liquid particles into the atmosphere generated by fixed/mobile sources, must not exceed maximum permissible emission and immision levels for contaminants and sources of contamination which are established in the ecological technical standards issued by the Ministry for this purpose in conjunction with the Health Secretary, based on determining the values of maximum permissible concentration of contaminants in a human being's environment[186].

Within this context we can talk of a "right to emit", provided that this does not exceed the maximum permissible levels established in the official Mexican standards corresponding to the sectors, subsectors and activities listed by the LEGEEPA and in its own regulations, such as: the chemical, oil and petrochemical, paint

[186] Art. 6º, 16 and 28 of the Regulations of the General Law of Ecological Equilibrium and Environmental Protection on the subject of Prevention and Control of Atmospheric Contamination

and dyes, automotive, cellulose and paper, metallurgy, glass, generation of electrical energy, asbestos, cement and heating industries and industries for processing dangerous waste.

However, the LGCC regulates the financial instruments including regulatory and administrative mechanisms of a fiscal, financial or market nature whereby the individuals assume the costs and benefits associated with mitigating and adapting to climate change, encouraging them to carry out activities in favor of the environment.

Amongst the market instruments are the concessions, authorizations, licences and permits corresponding to pre-established volumes of emissions, or which provide an incentive for carrying out actions to reduce emissions providing alternatives to improve their cost effectiveness[187].

Treatment is different when it comes to forest matters. In principle the LGDFS establishes that the federation will issue, as an exception, authorization for the change of land use of forest lands, and must control and monitor the use of forest land[188].

The LGDFS itself establishes that carrying out any type of work or activity other than the forest activities inherent in its use, on forest or preferably forest lands, is a violation in contravention of the applicable law, regulations or NOMs189.

In the same way, the Federal Criminal Code imposes six to nine months of prison or a fine equivalent to one hundred to three thousand times the daily wage for those who illicitly i) Remove or destroy natural vegetation; ii) Cut, pull up, pull down or seriously damage one or more trees; or iii) Change usage of forest land.

Taking into account the fact that in the context of the Mexican legal framework there is no "right" to discharge greenhouse gas emissions in the forest sector, and that when we speak of avoided/reduced emissions we are referring to an obligation of "not doing" and that its existence is determined as long as these emissions have been measured, notified and checked, we can conclude that this can be defined as: widespread, indivisible and intergenerational assets or as an external factor. The possibility of considering the emissions to be an environmental service would imply an unfair distribution of benefits; with the above taking into account that, from strict application of article 134a, establishing that: "The landowners and legitimate owners of forest land which, further to sustainable forest management, preserve and/or improve environmental services, will receive the financial benefits resulting from these.", it can be concluded that it will only be possible to distribute the financial benefit from the emissions avoided and referred to as an environmental service to those with legal ownership and possession of the land, excluding any other user (including women, young people, neighbouring farmers, and so on.)

In order to satisfy collective needs and guarantee the individual rights of the people, the State must issue and apply the necessary provisions for compliance with the laws and for preserving and promoting the public interest. In this regard it has a body of organisations and institutions responsible for carrying out this task.

As established in the Organic Law of the Federal Public Administration (LOAPF),[190] the Secretariat of Environment and Natural Resources (SEMARNAT) is the empowering authority for promoting the protection, restoration and conservation of ecosystems, natural resources, assets and environmental services, aimed at; i) promoting sustainable use and development; ii) formulating and conducting national policies on natural resources; iii) administrating, regulating and promoting the sustainable use of natural resources that belong to the Federation.

The LGDFS specifies that SEMARNAT must formulate and conduct national policy on the development of sustainable forest, including CONAFOR participation, for ensuring consistency with national environmental policy and natural resources and policies related to rural development, in addition to designing the forest policy instruments specified in this Law, and operating such policies as appropriate.

[187] Art. 92, General Law on Climate Change
[188] Art. 12 of the General Law on Sustainable Forestry Development
[189] Art. 166 of the LGDFS
[190] Organic Law of the Federal Public Administration published in the Official Gazette of the Federation on December 29, 1976. Article 32 bis, fractions I, II and III.

The LGCC[191] establishes SEMARNAT as the authority empowered with preparing and applying public policies, in collaboration with other government ministries, aimed at ensuring compliance with mitigation and adaptation activities. The GLCC, in turn, states that in order to reduce emissions, all Federal Public Administration agencies and entities, including States and Municipalities, shall promote the design and preparation of mitigation policies and activities associated with the corresponding sectors within their areas of competence, while taking into account, in terms of the forest industry, the reduction of emissions and carbon capture, while maintaining and increasing the carbon sinks, in addition to halting and reversing deforestation and degradation of the forest ecosystems, and gradually incorporating more ecosystems and conservation schemes into their areas of competence, and thus minimizing emissions through reductions in deforestation and the avoidance of degradation[192].

As a decentralized organism fromSEMARNAT, the aim of CONAFOR is to focus on developing, encouraging and promoting productive activities, including the protection, conservation and restoration of forest systems, declared as a priority area for development in the GLDFS, in addition to participating in the formulation of plans, programs and the application of the sustainable forest development policy and its instruments. Furthermore, the contents of the GLCC establishes the obligations of CONAFOR in designing strategies, policies, measures and activities for moving towards a zero percent loss of carbon in the original ecosystems, for its subsequent incorporation into the forest policy and sustainable development planning instruments, while also taking sustainable development and community forest management into account[193].

CONAFOR relies on a structure defined by its organic statute in order to be in full compliance with the functions and powers of GLCC, GLSFD and other applicable regulations. The various administrative units now have the responsibility of undertaking and wielding the corresponding powers. For example, the aforementioned statute establishes that CONAFOR shall "coordinate the incorporation of criteria and activities for adapting to climate changes through the National Forest Program, which encourages sustainable forest management and increases conservation of carbon sinks", with the aforementioned power being specifically conferred to the General Coordination of Planning and Information.

Thus, the General Coordination of Planning and Information, in order to be in full compliance with the aforementioned power, shall prepare its National Forest Program (PRONAFOR) 2014 - 2018, for establishing adaptation and mitigation criteria and activities. Several indicators have been defined for measuring compliance with its goals. The National Forestry Program (PRONAFOR) indicator 12 entitled "Emissions of CO_2 avoided through deforestation and forest degradation" measures the emissions of greenhouse gases which have been avoided as a result of deforestation and degradation of the woods via early action within the territory of the states of Campeche, Chiapas, Jalisco, Quintana Roo and Yucatán, federal bodies in which the implementation of investment programs are promoted within the framework of the Emissions Reduction Initiative, for which reason the PRONAFOR indicator entitled "Emissions of CO_2 and avoided through deforestation and forest degradation" was included in the Carbon Fund Program for Reducing Emissions (ER-PD). This initiative constitutes another way of fulfilling all obligations and being in compliance with CONAFOR goals and objectives, while being equally applicable to the legal framework and the national programmatic framework.

However, taking into account that the Emissions Reduction Initiative involves processes, negotiations and decisions on legal commitments of an international nature, an administrative entity that carries out such actions must be used. The CONAFOR International Affairs Unit shall: I. Design, propose, develop, evaluate and monitor cooperative, financial and international commerce policies and strategies for CONAFOR; II. Promote and enter into agreements on coordination and cooperation of affairs on international forestry; ... III. Coordinate, manage, negotiate, supervise, implement and follow-up the obtaining of resources in the form of money or in kind, for public, private, social organizations, physical or legal persons, and national and international organizations, in order to promote sustainable forest development in the country;…VII. Establish, in terms of national and international commitments, the necessary levels of coordination between CONAFOR and the national and international empowering authorities, regarding matters of financing, international commerce and cooperation, for sustainable forest development; VIII. Plan, coordinate and support in the national and international scene, the participation of the General Director and other administrative units in matters concerning financing,

[191] Organic Law of the Federal Public Administration published in the Official Gazette of the Federation on December 29, 1976. Article 32 BIS, fraction XL.
[192]GLCC. Article 34, fraction III, subsections a, b and e.
[193]GLCC. Transitory Article Three.

international commerce and cooperation, in addition to monitoring all such activities; IX. Coordinate and follow up compliance with conventions and any other national or international acts or agreements covering commitments or projects on cooperation, international commerce and financing of matters in which CONAFOR participates; and ... XI. Represent the Mexican forest sector in international business negotiations in which Mexico has signed agreements or treaties on free trade.

In addition, we encounter the powers which in a general way the Federal Law of Parastatal Entities, grants the owners of Decentralized Public Organisms, in which CONAFOR is included: I. To draw up and grant all types of deeds and documents inherent in its purpose; II. To exercise the broadest powers of control, administration, lawsuits and collections, including those requiring special authorization in accordance with other legal or regulatory provisions pursuant to the law, decree of creation and its organic statute; III. To issue, guarantee and negotiate debentures and; VI. To conclude transactions.

In accordance with these provisions, SEMARNAT and CONAFOR are the two environmental authorities responsible for the forest policy and for the fulfilment of its objectives, in addition to designing and implementing instruments that ensure prevention of deforestation and forest degradation, and the avoidance of emissions into the atmosphere.

In accordance with the methodological framework of the FCPF, emissions reductions must be measured, notified and verified. In the same way, in order to effect transfers in accordance with the Payment Agreement (ERPA) a verification process must be carried out to certify the quantity of reduced emissions generated and measured and; deliver the “Form for Transferring reduced emissions”. This form must be issued by CONAFOR, as it is the instrument for documenting the transfers of reduced emissions and the associated payment requests. The above provides confirmation that rights over emissions avoided and the possibility of completing the associated transaction, are generated as long as these emissions avoided have been “measured, notified and verified”.

That said, at the time of the transaction, CONAFOR can – where appropriate - accompany these two requirements with a document guaranteeing the reduced emissions, including the transfer of rights, titles and interests attached to these reduced emissions. This occurred, for example, when executing the “Program for the Development of Markets of Environmental Services of Carbon Sequestration and Derivatives of Biodiversity, and for Promoting the Establishment and Improvement of Agroforestry Systems (PSA-CABSA)”. At the point when fulfillment of the corresponding project was updated and carbon sequestration was verified on the land, CONAFOR issued a certificate which validated the tonnes of CO_2 sequestrated in the course of a year.

It is concluded, in accordance with the above:

That the State has priority over the ownership of property on its lands, and in accordance with the Constitution, ownership of this property shall then be transmitted to individuals.

Even when it recognizes private property the State retains the right to impose rules about such property, and therefore relies on regulatory provisions for governing the use and exploitation of the forests, utilizing policy instruments to avoid the emission of greenhouse gases (GHG) into the atmosphere.

Since deforestation is a criminal offence in Mexico, smallholders, communities and ejidos cannot be awarded ownership of the emissions avoided.

As a result of the above, the State employs different policy instruments - such as the Emissions Reduction initiative (IRE) - which take the form of actions aimed at avoiding emissions of CO_2 in its mandate for implementing the public policy for sustainable rural development in order to achieve national targets and objectives and in order to fulfil national and international undertakings.

Notwithstanding the fact that ownership of the emissions avoided is not determined by the ownership or tenure of the land, but rather by the design and execution of public policies, the right to receive financial benefits from the results-based payment relating to avoided emissions, will correspond to the land owners and inhabitants of the regions that make the effort to prevent or tackle deforestation and degradation of forest lands under the mechanisms established for this particular purpose, while respecting the right, at all times, to full and effective participation in the design of benefit sharing mechanisms and to decide on their own priorities with regard to the development process.

CONAFOR is the authority responsible for the development, encouragement and promotion of activities involving the production, protection, conservation and restoration of the forest, while establishing a set of measures for ensuring that no further Greenhouse Gases are emitted into the atmosphere. This leads to total certainty about its ability to undertake to transfer Reduced Emissions within the framework of the ERPA using a "Form for Transferring reduced emissions".

In accordance with the Mexican legal framework in force, ownership of the ERs is not linked or limited to the rights resulting from tenure of the land. In the same way, the aim of distributing benefits from payment for results is to boost and provide continuity for the activities developed in the areas of intervention, which include those owners, holders and inhabitants who take part in the management and preservation of the forest resources.

On 24 August 2016, a Panel Discussion was held to analyze the Ownership of Emissions Reduction within the context of the Emissions Reduction Initiative. This discussion panel formed part of the activities associated with the consultancy entitled "Analysis of Land Tenure and Ownership of Reduction of Emissions within the context of the IRE".

The aim of the meeting was to analyze and discuss the legal nature of the emissions avoided within the context of the Emissions Reduction Initiative (IRE) and the Mexican legal framework, as well as analyzing and discussing the possibility of awarding the ownership of the emissions avoided within the framework of the IRE and the Mexican legal framework. Over 10 specialist environmental lawyers attended the meeting, which included representatives from PRONATURA, CEMDA, CECROPIA, CONAFOR, a legislative liaison officer, as well as independent legal Consultants.

One of the matters discussed was the legal nature of the transfer form which the general conditions of the ERPA establishes as: document which must be issued by the CONAFOR, whose form and content are acceptable to the World Bank/Carbon Fund, and which documents the transfers of ER and the associated requests for payment[194].

The panel concluded that the document in its existing state could have three different legal natures which will depend on the targets set by the Mexican government.

Below is a description of the three proposals which were established about the legal nature of the document:

a) As proof of the reduced emissions and the payment received

An administrative document which must contain the serial number corresponding to the number entered in the Forest Register will be considered to be proof of the reduced emissions. This document must be kept safe by the CONAFOR for the required audits by the relevant authorities, which may include the Carbon Fund or the World Bank itself, in order to prove that there has been no double recording. The legal basis of this document will be linked to the ERPA which views the undertaking of the wishes of both the institutions as a purchase-sale contract.

b) Associated with a NOM

Associated with an Official Mexican Standard. The General Law on Climate Change published on 06 June 2012 in the Official Bulletin of the Federation, establishes the concept of "Certified reductions of emissions" defining them as emissions reductions expressed in equivalent tons of carbon dioxide produced by activities and projects, which were certified by any organisation with authorization for this purpose.[195]

Likewise, in its article 90 it states that by means of regulatory provisions the procedures and rules will be established for the monitoring, reporting and checking and, where applicable, the "certification of the emissions reductions" obtained in projects entered in the RENE, via accredited organisations in accordance with the Federal Law of Metrology and Standardization, and authorized by the SEMARNAT or by international organisations of which Mexico is a member. These regulatory provisions must establish the requirements for validating the certifications of the reduction effected in the country before the RENE, obtained for international registers.

[194] FCPF ERPA General Conditions. P. 5
[195] Article 3º section XXVI, LGCC

Consequently the provisions of the Regulation of the General Law on Climate Change on the subject of the National Emissions Registry published on 28 October 2014 in the Official Bulletin of the Federation are included. This order establishes the issuing of a certificate accrediting the entry of a project or activity and the reductions registered[196].

Nevertheless, the information from the RENE includes that relating to the direct and indirect emissions generated by processes and activities of the establishment subject of the report, discharged by the fixed or mobile sources, without mentioning within the list of sectors and subsectors in which the establishments subject to the report are grouped, the forest sector.

We then find that the information relating to the reductions of emissions from the forest sector will be associated indirectly with the RENE and in principle the concept of the certificate issued as a result of activities which are recorded in the same, and the corresponding emissions reductions, would not apply.

However, the LGCC considers the concept of official Mexican standards establishing that the SEMARNAT itself, or with the help of other agencies of the APF, can issue official Mexican standards, whose aim is to establish guidelines, criteria, technical specifications and procedures for guaranteeing the measures for adapting to, and mitigating, climate change.[197]

On this basis, it would be possible for the Mexican government to issue a Mexican Standard,[198] establishing the process for registration and verification of emissions reduction at national level and identifying the document which must be issued for said reduced emissions as carried out by the NMX-AA-173-SCFI-2015 for registering carbon forest projects and certifying the increase in the carbon stock.

c) As a Carbon Credit

With regard to carbon credits the CONAFOR, via its Director General, has the authority, in accordance with the Federal Law of Parastatal Entities (LEFP)[199] to issue, guarantee and negotiate carbon credits[200].

Likewise, under the LGDFS the CONAFOR has the authority to design, implement and operate within its areas of competence, inducements, incentives and financial instruments on the subject of forests[201].

Then the CONAFOR as owner of the emissions avoided in accordance with the arguments previously expressed will have to comply with the stipulations of the law of Credit Titles and Operations[202] so that it can issue a document necessary for implementing the full law to which this refers.

The document will be an innominate public carbon credit, issued in favor of the Carbon Fund, and establishing the number of emissions avoided to be transferred, since these were already registered in the Forest Registry and verified.

They will be unique and in series since they will be issued exclusively for the Carbon Fund and will have a serial number based on the number identifying the emissions in the Forest Registry.

It will be a payment instrument since on delivery to the Carbon Fund the latter will be obliged to make the payment agreed for the emissions avoided.

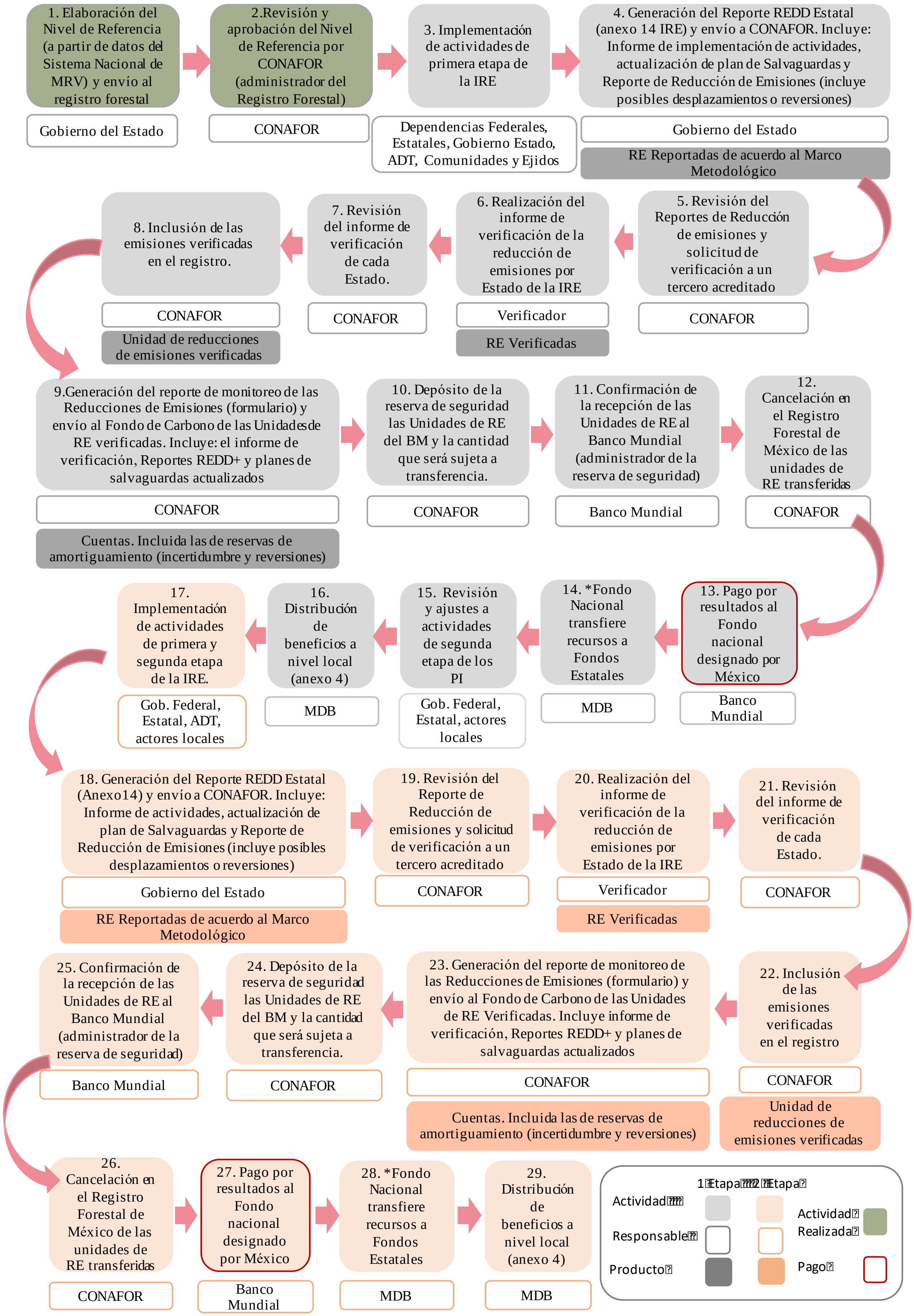
It will be considered to be a supplementary title since its existence depends on the emissions registered and verified in the Forest Registry.

The above covers all the features of these instruments:

[196] Article 28 Regulation of the LGCC
[197] Article 96 Regulation of the LGCC
[198] Mexican Standard: which is compiled by a national standardization organization, or the Ministry, under the terms of this Law, anticipating, for standard and repeated use, rules, specifications, regulations, test methods, directives, characteristics or stipulations applicable to a product, process, installation, system, activity, service or method of production or operation, as well as those relating to terminology, symbolism, packaging, marking or labelling;
[199] Federal Law of Parastatal Entities published in the Official Bulletin of the Federation on 14 May 1986.
[200] LFEP, article 22 section III
[201] LGDFS, article 22, section IV.
[202] General Law of Credit Titles and Operations published in the Official Bulletin of the Federation on 27 August 1932.

1. Incorporation: In order to be able to exercise the right it is necessary to be in possession of the title or document. The right over the reduced emissions is defined in the document therefore the person holding it is its owner.
2. Legitimation: In order to have legal validity these must be made out in someone's name. It will be in the name of the Carbon Fund guaranteeing its position as owner of the emissions with regard to any future legal action.
3. Integrality: The document must be enforced by the beneficiary as indicated in the carbon credit, and the payer must comply with these terms, so the Carbon Fund will exercise ownership of the emissions avoided transferred by the CONAFOR with the payment defined in figures and words.
4. Independence: The right will be exercised independently of any condition associated with amending the terms or limiting the right and the payer must comply with the terms of the document.
5. Circulation: It is a characteristic of carbon credits that these documents circulate by being transferred from one person to another by means of endorsement on delivery of the document. This means that the Carbon Fund will in turn be able to transfer this document to any third party it deems fit. Transferring the carbon credit implies conveyance of the principal right it contains[203].

[203] General Law of Credit Titles and Operations, article 18.


1. Elaboración del Nivel de Referencia (a partir de datos del Sistema Nacional de MRV) y envío al registro forestal
Gobierno del Estado
2.Revisión y aprobación del Nivel de Referencia por CONAFOR (administrador del Registro Forestal)
CONAFOR
3. Implementación de actividades de primera etapa de la IRE
Dependencias Federales, Estatales, Gobierno Estado, ADT, Comunidades y Ejidos
4. Generación del Reporte REDD Estatal (anexo 14 IRE) y envío a CONAFOR. Incluye: Informe de implementación de actividades, actualización de plan de Salvaguardas y Reporte de Reducción de Emisiones (incluye posibles desplazamientos o reversiones)
Gobierno del Estado
RE Reportadas de acuerdo al Marco Metodológico
5. Revisión del Reportes de Reducción de emisiones y solicitud de verificación a un tercero acreditado
CONAFOR
6. Realización del informe de verificación de la reducción de emisiones por Estado de la IRE
Verificador
RE Verificadas
7. Revisión del informe de verificación de cada Estado.
CONAFOR
8. Inclusión de las emisiones verificadas en el registro.
CONAFOR
Unidad de reducciones de emisiones verificadas
9.Generación del reporte de monitoreo de las Reducciones de Emisiones (formulario) y envío al Fondo de Carbono de las Unidades de RE verificadas. Incluye: el informe de verificación, Reportes REDD+ y planes de salvaguardas actualizados
CONAFOR
Cuentas. Incluida las de reservas de amortiguamiento (incertidumbre y reversiones)
10. Depósito de la reserva de seguridad las Unidades de RE del BM y la cantidad que será sujeta a transferencia.
CONAFOR
11. Confirmación de la recepción de las Unidades de RE al Banco Mundial (administrador de la reserva de seguridad)
Banco Mundial
12. Cancelación en el Registro Forestal de México de las unidades de RE transferidas
CONAFOR
13. Pago por resultados al Fondo nacional designado por México
Banco Mundial
14. *Fondo Nacional transfiere recursos a Fondos Estatales
MDB
15. Revisión y ajustes a actividades de segunda etapa de los PI
Gob. Federal, Estatal, actores locales
16. Distribución de beneficios a nivel local (anexo 4)
MDB
17. Implementación de actividades de primera y segunda etapa de la IRE.
Gob. Federal, Estatal, ADT, actores locales
18. Generación del Reporte REDD Estatal (Anexo14) y envío a CONAFOR. Incluye: Informe de actividades, actualización de plan de Salvaguardas y Reporte de Reducción de Emisiones (incluye posibles desplazamientos o reversiones)
Gobierno del Estado
RE Reportadas de acuerdo al Marco Metodológico
19. Revisión del Reporte de Reducción de emisiones y solicitud de verificación a un tercero acreditado
CONAFOR
20. Realización del informe de verificación de la reducción de emisiones por Estado de la IRE
Verificador
RE Verificadas
21. Revisión del informe de verificación de cada Estado.
CONAFOR
22. Inclusión de las emisiones verificadas en el registro
CONAFOR
Unidad de reducciones de emisiones verificadas
23. Generación del reporte de monitoreo de las Reducciones de Emisiones (formulario) y envío al Fondo de Carbono de las Unidades de RE Verificadas. Incluye informe de verificación, Reportes REDD+ y planes de salvaguardas actualizados
CONAFOR
Cuentas. Incluida las de reservas de amortiguamiento (incertidumbre y reversiones)
24. Depósito de la reserva de seguridad las Unidades de RE del BM y la cantidad que será sujeta a transferencia.
CONAFOR
25. Confirmación de la recepción de las Unidades de RE al Banco Mundial (administrador de la reserva de seguridad)
Banco Mundial
26. Cancelación en el Registro Forestal de México de las unidades de RE transferidas
CONAFOR
27. Pago por resultados al Fondo nacional designado por México
Banco Mundial
28. *Fondo Nacional transfiere recursos a Fondos Estatales
MDB
29. Distribución de beneficios a nivel local (anexo 4)
MDB
1 Etapa
2 Etapa
Actividad
Responsable
Producto
Actividad Realizada
Pago

* Selection of the fund is based on a process of analysis and discussion

Figure 48. Flow of the process for generating reduced emissions

18. Data Administration and Registration Systems

18.1. Participation in other GHG initiatives

Please indicate whether the ER Program, or any part of the ER Program, has transferred, or is planning to transfer, any ERs to any other GHG Mitigation Initiative. This would include parts of the Accounting Area that are registered or are seeking registration under project level standards such as the CDM or the VCS.

Please also indicate any actions that might not be included in the ER Program but which could address the drivers of deforestation within the Accounting Area and that have transferred, or are planning to transfer, emission reductions to other GHG Mitigation Initiatives (i.e., improved cook stoves programs under the CDM).

Where the ER Program, or any part of the ER Program, has been registered under any other GHG Mitigation Initiative, provide the registration number(s) and details for each of these.

Mexico has a robust legal framework on this topic, and there is a mandate within the General Law on Climate Change (LGCC) to create a National Register of Emissions (RENE) and its regulations contain a reference to how mitigation projects can be incorporated. This includes those which are designed to reduce or absorb Emissions; those related to the sustainable management and conservation of the ecosystems, for increasing or conserving carbon sinks from the forestry sector, and any other activity that is intended for carbon sequestration."

In addition, in the country there is experience with developing and implementing forestry projects relating to carbon, firstly with a few isolated projects focused on topics of afforestation and reforestation. Then, since 2004, CONAFOR has had the PSA-CABSA program, where the lessons learned led to the creation of the Mexican Standard for registering Carbon Forestry Projects and Certification of the Increase in Carbon Stocks NMX-AA-173-SCFI-2015.

Through the IRE Mexico intends to use its own platform (temporarily called the Forestry Register) which has been developed with an external company. This platform can be used to follow-up each state in relation to the actions it implements in association with Emissions Reduction. This Forestry Register may have an indirect link with the National Register of Emissions (RENE) since the General Law on Climate Change (LGCC) itself states as one of the elements in the register "*The association, where applicable, with other federal or state registers of emissions"*, this will make possible to avoid double counting alongside other mitigation initiatives both within the forest sector and other sectors. In addition, the proposed Forestry Register has a series of features which ensure that these reductions will not be transferred to other mitigation initiatives, and the most important of these features seems to be a unique identification which will allow each of the units registered to be traced. The following section describes the features of the registry in more detail. These will mitigate the risk of double counting.

In addition to the measures proposed in the Forest Registry framework for avoiding national and international double counting, it is proposed that all states participating in the Emissions Reduction Initiative identify and include, within their REDD+ reports, all information on particular projects that quantify CO_2 emissions based on increases in carbon stocks in the state or any other initiative with any international standard.

Another element within the legal framework which will allow other mitigation initiatives to be tracked, thus avoiding double counting, is the climate change information system [204] which includes the mitigation projects contained in the National Appropriate Mitigation Actions (NAMAS) and the Clean Development Mechanism (CDM).

[204] See: http://gaia.inegi.org.mx/sicc2015/

At the moment there are not many carbon increase forestry projects in Mexico, and an obvious example of this is that within the counting area, only one voluntary market project has been identified in the state of Chiapas, specifically in the regions of Lacandona, Frailesca and Zoque-Mezcalapa, under the international standard of Plan Vivo[205]. The following table outlines the general characteristics of the project.

Table 106 Characteristics of the Scolel'te Project under the international Vivo Plan standard

International standard	Vivo Plan
Project identification number	Project ID: PV_1997_001
Size of area under the standard	7,641.75 ha
Project coordinator	Cooperativa Ambio S.C. de R.L.
Operation start date	1997
Project interventions	Afforestation, agroforestry, reforestation, forest restoration

18.2. Data administration and registration systems for avoiding multiple ER claims

Please indicate how the ER Program works with the host country to select an appropriate arrangement to avoid having multiple claims to an ER Title. Discuss the choice and implementation of a Program and Projects Data Management System and how this meets the requirements of the Methodological Framework.

In addition please indicate how the ER Program will ensure that any ER from REDD+ activities under the ER Program are not generated more than once; and that any ER from REDD+ activities under the ER Program sold and transferred to the Carbon Fund are not used again by any entity for sale, public relations, compliance or any other purpose. Discuss the choice and implementation of an ER transaction registry and how this meets the requirements of the Methodological Framework.

*Refer to **criterion 37 and 38** of the Methodological Framework*

18.2.1 Forest Registry Legal Framework

In terms of the Emissions Reduction Initiative, Mexico shall utilize the Forest Registry, which has been developed under the framework of the General Law on Climate Change (GLCC). This Law establishes the creation of the National Register of Emissions (RENE) and its Regulations as mentioned above; the law takes into consideration the link with other registers[206]. In addition, article 89 establishes that in the regulatory provisions *measures shall be established to avoid double counting of emissions reductions occurring within national territory and the areas in which the Nation exercises its sovereignty and jurisdiction, taking into consideration the international systems and methodologies available*.

The Secretariat of Environment and Natural Resources (SEMARNAT) is responsible for the National Emissions Registry (RENE) and must therefore integrate all emissions from fixed and mobile sources which must be reported. In accordance with the provisions established in the Regulation for the National Emissions Registry (RENE), the Registry shall have two main sections.

- Emissions Registry: Used for reporting all emissions that take place in Mexico, as established in the Regulation for the National Emissions Registry and within existing legal provisions.
- Emissions Reduction Register This records the reduction of emissions due to mitigation, which is of a voluntary nature and is where it will be linked indirectly with the Forestry Register.

[205] For more information on the Project click on the following link: http://goo.gl/0AqDOD

[206] Article 87 of the Law on Climate Change establishes its creation and its points and section V establishes the link, where applicable, with other federal or state registers on emissions

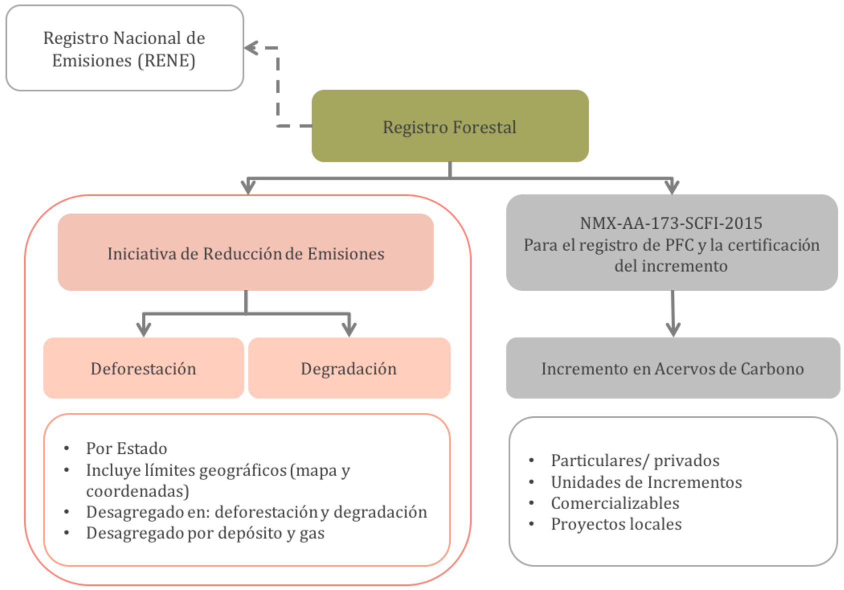


Figura 49. Mechanism for indirectly linking the Forestry Register with the National Emissions Registry

RENE is still in the process of implementation. SEMARNAT's responsibilities, as well as the responsabilities of other parties involved must be formally established. Additionally, the Mitigation Platform (under which the Forest Registry is indirectly linked) is under construction and implementation, therefore the coordination between RENE and the Forest Registry, and the communication protocols between SEMARNAT and CONAFOR, are still being defined.

18.2.2 Characteristics of the Forest Registry

The Forest Registry is the responsibility of CONAFOR and has been designed[207] and developed by a third party with excellent experience in the topic, in accordance with the requirements established by CONAFOR; it is hoped that it will include two different components:

1. The Emissions Reduction component for registering REDD+ activities. During implementation of the IRE, this component shall provide the five States included in the Initiative with appropriate guidelines and orientation, as necessary, and this can be further refined before being used on a national level for registering REDD+ activities in the results-based payment phase.
2. Mexican Standard for registering Carbon Forestry Projects [208] and Certification of the Increase in Carbon Stocks[209], which shall, in turn, enable the registration of individual projects that contribute to increases in carbon stocks.

The emissions reduction component contained in the forest registry shall issue emissions reduction units, be responsible for electronic transfers and withdrawals of these units, in addition to establishing their real-time ownership, and providing the public with full transparency on these emissions reduction units. The registry shall effectively show the verified reduction of emissions within a uniquely identified resource, providing full transparency and traceability of the emissions reduction unit throughout the entire life span.

[207] The design of the register included: an analysis of the environmental register systems, comparison of the existing platforms, description of the way in which it operates and differentiation between them. a feasibility analysis was also carried out on the options available for implementing an environmental register. Once these elements were identified efforts were concentrated on designing the platform and on CONAFOR's requirements (there are still elements involved in implementing the register that need to be defined). The human and technological resources needed for it to operate have been identified. Support materials have also been defined, such as: the user guide and the protocols needed for it to operate. Finally a pilot test was carried out with CONAFOR and lasted for 3 weeks, in the course of which participants were able to access the registration platform and see how a register operates, highlighting changes which can be implemented in the future.

[208] Data relative to emissions reduction projects shall include, in the event that such projects exist, trade transactions (national and international) for certified emissions and reductions, expressed in metric tonnes or equivalent tonnes of carbon dioxide, and the date on which the corresponding transactions were verified. Funding for such transactions must also be included. Measures shall also be established for avoiding the double counting of emissions reductions already verified in Mexico.

[209] See NMX-AA-173-SCFI-2015 at: http://goo.gl/g0VmQv

In order to reduce the risk of double counting of reductions of emissions, the Forest Register will develop processes and functions, the most important of which are:

a. Operational check: This is used in order to carry out a manual check of whether or not a project (or initiative/program) has been registered yet in any of the registers and databases in existence at the time. This operational check will form part of the CONAFOR forest registry general Operational Procedure.
b. Serial numbers: It will automatically create serial numbers allocated to the emissions reductions. An algorithmic check must also be included in order to ensure that the serial number created is unique (it did not exist previously in the register).
c. GPS and GIS: This comprises a geographical check on the existence of its projects or other activities in the zone. The register shall include a warning system which issues an alert within a given radius (for example 5 km) from the GPS location. The message from the automatic warning system must indicate that another project is nearby, requesting confirmation that the project or program is a different and unique project.
d. Indirect link with the National Register of Emissions (RENE) and other internationally recognized standards.

In addition, in order to avoid the risk of an emissions reduction unit being transferred more than once, a process for reviewing the registers of national and international carbon project standards [210]existing in the IRE's area of intervention will be established in order to identify those projects which may be able to trade carbon credits. This process will be implemented on sending the emissions reduction transfer form signed by the FCPF and establishing the ERPA general conditions.

If there is any project in the IRE area of intervention, the CONAFOR will analyze its characteristics in order to make sure that a double transaction has not occurred. If the analysis reveals that a double transaction may have occurred, the CONAFOR will deduct the number of reduced emissions from the total to be transferred to the Carbon Fund.

The Forest Registry is a web platform which will come into operation from the first trimester of 2017 and will include a public view on the CONAFOR webpage. The data to be published are: name of state, information about the state, reference levels, reference level period, activities, gases, initiative, quantity verified, link to relevant documents.

Figure 50 shows the fields which will contain the public view of the Forest Register for the IRE.

[210] At the moment the following carbon project standards registers have been identified and reviewed and these will be reviewed again in the future: :

a) Markit which includes: Plan Vivo, VCS and Gold standard. Seehttps://mer.markit.com/br-reg/public/index.jsp?name=mexico&entity=project&entity_domain=Markit,GoldStandard

b)American Carbon Registry (https://acr2.apx.com/myModule/rpt/myrpt.asp) donde actualmente no existe ningñun proyecto registrado en el área de la IRE,

c)CAR (https://thereserve2.apx.com/mymodule/mypage.asp) en donde actualmente existe un project in Yucatán, for using methane on a pig farm

d)ClimateStandards.(http://www.climate-standards.org/?s=mexico), donde actualmente no hay ningún proyecto registrado en el área de la IRE.

There is also a suggestion to review the VCS database separately due to the fact that it has come to light that not all the projects were registered. The VCS's own databases can be consulted on:
http://www.vcsprojectdatabase.org/#/projects/st_/c_MX/ss_0/so_/di_/np_. On 30 September 2016 the following projects were on this database:

Project in Jalisco to reduce methane emissions on pig farms.
http://www.vcsprojectdatabase.org/#/project_details/1516

A project is registered in relation to commercial forest plantations (afforestation), which covers several states, including Chiapas.
http://www.vcsprojectdatabase.org/#/project_details/1141

Figure 50. Public view of the Forest Registry for the IRE

At the moment, the forest registry is designed according to the requirements identified by CONAFOR with the platform having been developed in accordance with these requirements, together with a proposal of a general protocol for the way in which it shall operate (See Annex 7 User Manual for the Registry). At the moment it is in a test phase and once this is finalized any necessary adaptations can be made. In the course of implementation specific procedures will be developed for each user.

When the forest registry is in operation, CONAFOR will be able to:

— Have a general overview of the counts registered within its jurisdiction (multiple States).
— Open an account in the registry for each state.
— Approve the registration of emissions reduction units, transfers and withdrawals for each state in the Emissions Reduction Initiative (IRE)
— Ensure traceability of the emissions reduction units and their ownership, including account balances, which will reduce the risk of double counting
— Produce reports on request about counts and emissions reduction units per state for the required purposes, including audits.
— Link up or move emissions reduction units to another system or registration list in the course of exchanges which are both worldwide and national
— Be capable of generating internal information about the way in which the registry operates and the activities which are developed in order to allow internal and external audits to take place.

Guaranteeing that the projects and emissions reductions can be traced from the start will help CONAFOR to maintain its vigilance and accountability regarding the emissions reduction units

The features described above mean that the forest registry functions as: *REDD+ Program and Projects Data Management National System* (established in indicator 37.1 of the methodological framework) and as *National Register of transactions for Forest Reductions*.

18.2.3 Verification

In the case of the forest registry it is intended to use a framework similar to that established by the LGCC, which defines Validating Organisms and Verifiers as those organisms accredited and approved in accordance with the mechanisms stipulated in Federal Law on Metrology and Standardization, for verifying the information contained in the Emissions reports, or validating the Mitigation or reduction of Emissions of a project which is scheduled for submission or entering into the Registry.

In this context the Mexican Entity of Accreditation (EMA) has the responsibility of accrediting, among other duties, the aforementioned Validating Organisms/Verifiers of Greenhouse Gas Emissions (VOV, GHG). The EMA already has its own accredited Validating Organisms/Verifiers of Greenhouse Gas Emissions, but is still in the process of providing training and accreditation to the Land Use, Land-Use Change and Forestry (LULUCF) sector.

It is anticipated that after the EMA has accredited Validating Organisms/Verifiers for the LULUCF sector, these will be able to:

1- Undertake verification of projects registered in the Mexican Standard, for the subsequent registration of Forest Carbon Projects and for Certification of Increases in Carbon Stocks (NMX-AA-173-SCFI-2015).

2- Verify REDD+ activities[211]

[211] Under the framework of the IRE, it is anticipated that it will be possible to verify the results for each of the states. It is also expected that Mexico will be able to use these independent entities as verifiers who, in turn, shall be able to establish general ERPA conditions.

19. Glossary

Area of intervention: Refers to the region where activities (interventions) for the Investment Program are implemented, covering various municipalities within a single state.

Direct cause: human activity or immediate action at local level, caused by intentional changes to land-use, and having a direct impact on the forest canopy. For example, expansion of agricultural borders.

Underlying or indirect cause: refers to a social, economic or political process that consolidates the direct cause, which can operate at local level or have an indirect impact at national or global level. For example, on the human population dynamic or on agricultural policies.

Investment Program territorial management tool for establishing specific investments over a five year period. Includes, for example, productive and conservation activities from various different sectors, including regions (intervention areas) of significance for the state authorities involved. Investment programs also identify productive practices and natural resources management for the promotion of rural development that, in turn, are influential in terms of the causes of deforestation and forest degradation.

Generic activities that have a clear incidence on one or many causes, either direct or underlying, in terms of deforestation and forest degradation. These types of activities are implemented by means of existing subsidies from various different sectors, whose implementation is governed through a synergistic approach within each territorial unit, derived from joint planning and participative processes.

Complementary activities: activities that enable or contribute to the effective implementation of a generic activity. The purpose of these activities is to strengthen generic activities through investments, management activities or the creation of specific tools or instruments, such as establishing exclusion zones for the granting of agricultural subsidies.

Second or additional phase activities: in addition to those already under way, for addressing matters on deforestation and forest degradation which are not currently part of subsidy programs or other financing mechanisms, for strengthening achievements accomplished in the first phase, and extending actions for the prevention of deforestation and forest degradation.

REDD+ Early Actions: Institutionally coordinated efforts at sub-national level (state, regional and local) for enabling matters to be addressed on loss of forest and loss of forest carbon through different public policy instruments, in addition to specific stakeholder actions aligned to public policies for creating economic and social development opportunities for the communities.

Public Agents for Territorial Development (APDT): any of the public organizations with mandates related to integrated rural development, working at regional scale for supporting the strategic planning of national territory, while facilitating inter-governmental collaboration and the coordination of public policies at regional and local level, thus promoting the sustainable management of natural resources. These agents can operate at Federal, State, municipal or inter-municipal levels.

Forest: Lands extending over more than 50 hectares and containing trees of more than 4 meters in height, and with a forest canopy of greater than 10 percent, or containing in-situ trees capable of reaching this height. This does not include land that is predominantly being used for agricultural or urban purposes. Definition used in the proposed Forest Emissions Reference Level of Mexico, in line with that used by the National Greenhouse Gas Emissions Inventory (INEGEI) presented in the BUR (Biennial Update Report), as well as in the Forest Resources Assessment (FRA) presented to the Food and Agriculture Organization (FAO) and the Minimum Mapping Unit (MMU) of the INEGI USV Series.

Non-Carbon Benefits or Co-benefits: Refers to all additional REDD+ implementation benefits different to carbon storage, such as reductions in poverty, conservation of biodiversity and other ecosystem services for improving forest governance, improving local livelihoods, etc.

Emissions displacement: (or "leakage") is a process by which actions for the reduction of emissions, arising from deforestation and degradation in the area in which such emissions occur (known as the accounting area), leads to an increase in emissions outside of this area.

Drivers or Driving Forces: Principal causal processes, either direct or underlying, that move and actually cause the observed phenomena (in this case, deforestation and forest degradation).

Intermunicipal Boards: decentralized public offices of associated municipalities, with the power to act in the municipalities in which they are established. These municipal associations promote strategic planning in the territories of their respective intervention, in addition to facilitating inter-governmental interaction and the coordination of public policies at regional and local level.

Permanence: In accordance with special information on Land Use, Land-Use Change and Forestry (LULUCF) from the Intergovernmental Panel on Climate Change (IPCC), the permanence of the benefits of mitigation activities taking place in that sector refer to the "longevity of a carbon contingent and the stability of its content, while bearing in mind the type of management and changes to the environment in which such activities take place". This report further indicates that this potential reversibility is a typical feature of LULUCF activities, unlike those carried out in other sectors.

Safeguards: In accordance with the details established in the most recent version of the REDD+ National Strategy (ENAREDD+), safeguards in Mexico are understood as principles, conditions or social and environmental criteria that govern the design and implementation of policies, programs and other activities. The purpose of safeguards is to prevent and mitigate any form of direct or indirect negative impact on the ecosystems and their populations, particularly in terms of the indigenous peoples and communities who inhabit these ecosystems, including their associated rights in scenarios involving irrigation or damages incurred from actions for reducing emissions caused by deforestation and degradation. They also identify, analyze and manage risks and areas of opportunity, then their implementation helps to boost the benefits and positive social and environmental impacts. The safeguards shall seek to ensure attention, participation and improvements to the conditions of specific and vulnerable groups, in addition to respecting the rights of all the social groups involved, while ensuring the conservation and sustainability of the forests.

SIS - (Safeguards Information System): a tool that enables monitoring of the aforementioned safeguards, in addition to presenting integrated information and issuing reports on implementation and compliance with all REDD+ safeguards.

SNS - (Safeguards National System): defines the manner in which compliance with REDD+ safeguards in Mexico shall occur, in addition to all activities applicable to these safeguards. It shall also identify laws and institutions capable of supporting its implementation, including compliance aspects of the system for enabling the resolution of conflicts, attending to complaints, and reporting and providing feedback on relevant information.

20. Annexes

- Annex 1. Stakeholders that have participated in the REDD+ preparation process in Mexico
- Annex 2. Information on the environmental conditions of the States and their intervention areas under the IRE framework
- Annex 3. Summary of the Investment Programs
- Annex 4. Methodology for guiding the process for the participatory construction of the arrangements for benefit sharing at local level within the context of the IRE in Mexico
- Annex 5. Commentaries and observations of relevant stakeholders in relation to the IRE document
- Annex 6. Financial Plan
- Annex 7. User Manual for the Registry
- Annex 8. Protocol for changes in carbon and propagation of uncertainties
- Annex 9. Basic information for reversals
- Annex 10. Methodology for evaluating IRE reversals
- Annex 11. National and international legal framework, REDD+ safeguards and operational polices of the World Bank
- Annex 12. Attention to World Bank operational policies
- Annex 13. Environmental and social risk matrix of the Investment Program
- Annex 14. Emissions Reduction Reporting Format for REDD+ activities at state level in Mexico
- Annex 15. Benefit-Sharing Plan

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