



United Nations

FCCC/TAR/2016/CHL



Framework Convention on  
Climate Change

Distr.: General  
3 March 2017

English only

---

## **Report on the technical assessment of the proposed forest reference emission level of Chile submitted in 2016**

### *Summary*

This report covers the technical assessment of the submission of Chile, on a voluntary basis, on its proposed forest reference emission level (FREL) and forest reference level (FRL), in accordance with decision 13/CP.19 and in the context of results-based payments. The FRELs/FRLs proposed by Chile cover four of the activities referred to in decision 1/CP.16, paragraph 70: reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; and enhancement of forest carbon stocks. In its submission, Chile has developed subnational FRELs and FRLs for each of the activities covering five regions in the country, with the aim of transitioning to a national FREL/FRL in the future. The assessment team notes that the data and information used by Chile in constructing its FRELs and FRLs are transparent and complete, and are in overall accordance with the guidelines contained in the annex to decision 12/CP.17. This report contains the assessed FRELs and FRLs and a few areas identified by the assessment team for further technical improvement, according to the scope of the technical assessment in the annex to decision 13/CP.19.

GE.17-03478(E)



\* 1 7 0 3 4 7 8 \*

Please recycle 



## Contents

	<i>Paragraphs</i>	<i>Page</i>
I. Introduction and summary .....	1–10	3
A. Overview .....	1–6	3
B. Proposed forest reference emission level/forest reference level .....	7–10	4
II. Data, methodologies and procedures used in the construction of the proposed forest reference emission levels and forest reference levels .....	11–36	5
How each element in the annex to decision 12/CP.17 was taken into account in the construction of the forest reference emission level.....	11–36	5
III. Conclusions .....	37–47	12
 Annex		
Summary of main features of the proposed forest reference emission level based on information provided by the Party.....		15

## I. Introduction and summary

### A. Overview

1. This report covers the technical assessment (TA) of the submission of Chile on its proposed forest reference emission levels (FRELs) and forest reference levels (FRLs),<sup>1</sup> submitted on 4 January 2016 in accordance with decisions 12/CP.17 and 13/CP.19. The TA took place (as a centralized activity) from 14 to 18 March 2016 in Bonn, Germany, and was coordinated by the UNFCCC secretariat.<sup>2</sup> The TA was conducted by two land use, land-use change and forestry experts from the UNFCCC roster of experts<sup>3</sup> (hereinafter referred to as the assessment team (AT)): Ms. Inge Jonckheere (Belgium) and Mr. Walter Oyhantçabal (Uruguay). In addition, Mr. Kamal Djemouai (Algeria), an expert from the Consultative Group of Experts on National Communications from Parties not included in Annex I to the Convention, participated as an observer<sup>4</sup> during the centralized assessment activity in Bonn.

2. In response to the invitation by the Conference of the Parties (COP) and in accordance with the provisions of decision 12/CP.17, paragraphs 7–15, and its annex, Chile submitted, on a voluntary basis, its proposed FRELs and FRLs. These proposed FRELs and FRLs are one of the elements<sup>5</sup> to be developed in the implementation of the activities referred to in decision 1/CP.16, paragraph 70. The COP decided that each submission of a proposed FREL/FRL, as referred to in decision 12/CP.17, paragraph 13, shall be subject to a TA in the context of results-based payments, pursuant to decisions 13/CP.19, paragraphs 1 and 2, and 14/CP.19, paragraphs 7 and 8.

3. Chile provided its submission in two languages: English and Spanish. During the centralized activity, Chile supported its submission by providing the AT with additional technical clarifications and background information<sup>6</sup> that covered digital image processing, estimation of activity data (AD) and emission factors (EFs), and deforestation simulation, to enhance the transparency of the information and data used in its submission.

4. The objective of this TA was to assess the degree to which information provided by Chile was in accordance with the guidelines for submissions of information on FRELs and/or FRLs<sup>7</sup> and to offer a facilitative, non-intrusive, technical exchange of information on the construction of the FREL/FRL, with a view to supporting the capacity of Chile for the construction and future improvement of its FREL and/or FRL, as appropriate.<sup>8</sup>

5. The TA of the FRELs and FRLs submitted by Chile was undertaken in accordance with the guidelines and procedures for the TA of submissions from Parties on proposed FRELs and/or FRLs as contained in the annex to decision 13/CP.19. This report on the TA was prepared by the AT following the guidelines and procedures in the same decision.

6. Following the process contained in the guidelines and procedures of the same decision, a draft version of this report was communicated to the Government of Chile. The facilitative exchange during the TA allowed Chile to provide clarifications and information

---

<sup>1</sup> The submission of Chile is available at <<http://redd.unfccc.int/submissions.html?country=chl>>.

<sup>2</sup> Decision 13/CP.19, annex, paragraph 7.

<sup>3</sup> Decision 13/CP.19, annex, paragraphs 7 and 9.

<sup>4</sup> Decision 13/CP.19, annex, paragraph 9.

<sup>5</sup> Decision 1/CP.16, paragraph 71(b).

<sup>6</sup> Additional technical and background information is available (in Spanish) at <<http://www.enccrv-chile.cl/index.php/medicion-y-monitoreo>>.

<sup>7</sup> Decision 12/CP.17, annex.

<sup>8</sup> Decision 13/CP.19, annex, paragraph 1(a) and (b).

that was considered by the AT in the preparation of this report.<sup>9</sup> As a result of the facilitative interactions with the AT during the TA session, Chile made a modified submission that included the modified FRELs and FRLs (see para. 10 below) on 31 August 2016 (in English and Spanish), which took into consideration the technical inputs by the AT. The modifications, including additional data and information, improved the clarity and transparency of the submitted FRELs and FRLs, and resulted in the modification of the FRELs and FRLs originally proposed. This TA report was prepared based on the context of the modified submission of the FRELs and FRLs. The modified submission, which contains the assessed FRELs and FRLs, and the original submission are available on the UNFCCC website.<sup>10</sup>

## **B. Proposed forest reference emission level/forest reference level**

7. The COP, in its decision 1/CP.16, paragraph 70, encouraged developing country Parties to contribute to mitigation actions in the forest sector, on a voluntary basis, by undertaking a number of activities, as deemed appropriate by each Party, in accordance with their respective capabilities and national circumstances. In its original submission, Chile proposed subnational FRELs and FRLs for the five activities referred to in paragraph 70 of that decision, covering five regions in the country. Based on the technical exchanges with the AT, Chile in its modified submission proposed FRELs and FRLs for four activities: reducing emissions from deforestation; reducing emissions from forest degradation; conservation of forest carbon stocks; and enhancement of forest carbon stocks. Chile explained that, in the case of sustainable management of forests, owing to a lack of geographic data to identify the areas subject to this activity, it decided to include the carbon stock changes resulting from sustainable management of forests under the activity reducing emissions from forest degradation (if the result is an emission) or under enhancement of forest carbon stocks (if the result is a removal).

8. Chile developed its subnational FRELs and FRLs for the temperate native forests in five administrative regions (Maule, Biobío, La Araucanía, Los Ríos and Los Lagos), with the aim of transitioning to a national FREL/FRL in the future, incorporating all biomes/forests in the country. The five regions selected represent 22 per cent of the total surface area of Chile and 41 per cent of the native forest area, and contain temperate forest ecosystems with the potential to reduce and absorb greenhouse gas (GHG) emissions as well as produce non-carbon environmental benefits.

9. The subnational FRELs and FRLs proposed by Chile are based on the annual average carbon dioxide (CO<sub>2</sub>) emissions and/or removals. In addition, the activity reducing emissions from forest degradation includes methane (CH<sub>4</sub>) and nitrous dioxide (N<sub>2</sub>O) emissions from forest fires. In the original submission, the AT noted that the availability of historical data was different for the different activities in the regions, resulting in a matrix of FRELs/FRLs by region and activity. The AT noted that different approaches were used to develop the FRELs/FRLs with different reference periods for every activity in the selected regions. This made it technically impossible to total the regional FRELs/FRLs to obtain a subnational aggregated FREL/FRL. In practice, the approach used resulted in 21 different FRELs and FRLs. The AT suggested that Chile analyse the possibility of using the same reference period for all activities in the selected regions by using appropriate tools, such as extrapolation, described in the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. In response to this technical exchange with the AT, Chile presented a modified

---

<sup>9</sup> Decision 13/CP.19, annex, paragraphs 1(b), 13 and 14.

<sup>10</sup> <<http://redd.unfccc.int/submissions.html?country=chl>>.

submission with two reference periods using interpolation methods: (1) 2001–2013 for activities and subactivities that cause a land-use change (deforestation, substitution,<sup>11</sup> increases in forest areas and restitution<sup>12</sup>); and (2) 2001–2010 for activities that occur in forests remaining forests (conservation of forest carbon stocks, degradation of permanent forests<sup>13</sup> and recovery of degraded forests<sup>14</sup>). The AT acknowledges the difficulties involved in standardizing the historical reference period based on the available information and commends Chile for its effort to reduce the number of reference periods. The AT considers that future submissions could be based upon a single common reference period for all selected activities.

10. The FRELs and the FRLs presented for the four activities in the modified submission and as referred to in paragraph 7 above correspond to: emissions of 3,452,885 tonnes of carbon dioxide equivalent per year (t CO<sub>2</sub> eq/year) from deforestation; emissions of 9,149,392 t CO<sub>2</sub> eq/year from forest degradation; removals of 2,430,439 t CO<sub>2</sub> eq/year from conservation of forest carbon stocks; and removals of 10,012,012 t CO<sub>2</sub> eq/year from enhancement of forest carbon stocks. The proposed modified FRELs and FRLs are significantly different from the ones presented in the original submission<sup>15</sup> because of changes introduced in the reference periods and other methodological changes (see para. 9 above). In addition, the AT notes that Chile provided detailed information in its modified submission on the elements of coverage (i.e. the elements that affect changes in land use or land remaining in the same use) considered for each of the four activities (see pp. 37–40 of the modified submission, English version).

## **II. Data, methodologies and procedures used in the construction of the proposed forest reference emission levels and forest reference levels**

### **How each element in the annex to decision 12/CP.17 was taken into account in the construction of the forest reference emission level**

#### **1. Information that was used by the Party in the construction of the forest reference emission level and/or forest reference level**

11. The AT noted that Chile presented transparent FRELs/FRLs in its modified submission, which were further supported with additional data and information during and after the assessment week. This facilitated the TA by enhancing the AT's understanding of the construction of the FRELs/FRLs. For the construction of the subnational FRELs and

<sup>11</sup> Substitution is defined as the transformation of native forest to forest plantation, which corresponds with the activity reducing emissions from forest degradation.

<sup>12</sup> Restitution is defined as the transformation of forest plantation to native forest, which corresponds with the activity enhancement of forest carbon stocks.

<sup>13</sup> Degradation in forests remaining forests resulting from forest fires, wood harvesting and non-wood products extraction.

<sup>14</sup> Increase in carbon stocks resulting from the recovery of degraded forests, which corresponds with the activity enhancement of forest carbon stocks.

<sup>15</sup> In its original submission, Chile proposed subnational FRELs amounting to emissions of 1,781,825 t CO<sub>2</sub> eq/year for deforestation and 6,424,771 t CO<sub>2</sub> eq/year for forest degradation, and subnational FRLs amounting to removals of 1,838,828 t CO<sub>2</sub> eq/year for conservation of carbon stocks and removals of 7,887,089 t CO<sub>2</sub> eq/year for enhancement of forest carbon stocks. The reference period for each of the activities differed because each was based on the availability of information from the cadastre that was necessary for the construction of the reference levels.

FRLs, Chile used the most recent guidance and guidelines provided in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (hereinafter referred to as the 2006 IPCC Guidelines) as a basis for estimating annual changes in carbon stocks and non-CO<sub>2</sub> emissions of the four activities.

12. The proposed FRELs and FRLs of Chile are focused on native forests and exclude forest plantations with exotic species. The information on AD used in constructing the FRELs and FRLs was extracted from the historical time series contained in “Cadastré and evaluation of vegetation resources in Chile”, a project conducted between 1993 and 1997, with periodic updates of the database on spatial information by the National Forest Corporation of Chile (CONAF).<sup>16</sup> The cadastré elaborates information on the use of lands, especially those related to native forests, forest plantations and grasslands, and constitutes the baseline for land-cover mapping in the country. The cadastré was produced using different initial years for different regions of the country (between 1998 and 2007) and was updated at least once between 2008 and 2014, depending on the region. In this way, the five regions have two different points in time to describe land-use and/or land-cover changes. In the case of forest degradation, the AD were complemented with Landsat satellite images. In the case of deforestation, the FREL includes the emissions from deforestation that are associated with drivers such as the expansion of farmlands and settlements but excludes any subsequent emissions and removals from the deforested areas. It is also assumed that the carbon stocks from harvested wood products (HWP) are zero, because there is a lack of reliable national data sources for differentiating between HWP from deforestation and from forest degradation.

13. The information on EFs was obtained from Chile’s national forest inventory. Chile has a continuous inventory of forest ecosystems, implemented by the Forestry Institute of Chile (INFOR),<sup>17</sup> established for the period 2001–2010 and now in its second cycle. Additional EFs used were developed through national research done by INFOR and Universidad Austral de Chile. For deforestation, the EFs used in the construction of the FREL result from a combination of country-specific EFs for above-ground biomass (derived from net annual increment, biomass expansion factors (BEFs) and density, and estimated according to the biome). To estimate below-ground biomass, country-specific root/shoot ratios were developed through national research.<sup>18</sup> For dead organic matter (DOM), the EFs used were also country-specific and were derived from the national forest inventory. For increases in carbon stocks, EFs and associated parameters (net annual increment, BEFs, root/shoot ratios, wood densities) were also derived from the national forest inventory. Finally, for forest degradation, Chile used a tier 3 method that was validated against the “Roble-Raulí-Coihue” forest types (see para. 14 below). The key variables used in the estimation of the volume of wood in degraded lands were basal area and the number of trees and these were also obtained from the national forest inventory.

14. To estimate the carbon stocks of the different activities, including considering the different forest types in regions included in the FRELs and FRLs, Chile uses methods and equations from the 2006 IPCC Guidelines, as well as tier 2 and tier 3 methods (see table 12 of the modified submission). The construction of the FRELs and FRLs used two different IPCC methods to estimate the annual change in carbon stocks: (1) the gain–loss method for

---

<sup>16</sup> The public interface for cadastral information according to the Native Forest Law is available (in Spanish) at <<http://sit.conaf.cl/>>.

<sup>17</sup> The Continuous Forest Inventory (in Spanish *Inventario forestal continuo*) is the name of Chile’s national forest inventory. It is maintained by the Forest Institute (in Spanish *Instituto Forestal* or INFOR) under the Ministry of Agriculture. The Inventory provides data by forest type; estimates of above-ground and below-ground biomass and DOM are derived from these data.

<sup>18</sup> Gayoso J. 2002. *Medición de la capacidad de captura de carbon en bosques de Chile y promoción en el Mercado mundial*. Informe Técnico. Valdivia: Universidad Austral de Chile.

estimating emissions from activities that result in a change in land use (e.g. deforestation); and (2) the stock change approach for estimating emissions from activities that do not result in a change in land use (i.e. forests remaining forests). In the construction of the FRELs and FRLs, information from the national forest inventory (e.g. diameter at breast height, basal area) is combined with parameters derived from national research<sup>19</sup> (e.g. BEFs, root/shoot ratios, wood density) and INFOR data sets (e.g. mean annual increment). The FRELs and FRLs combine different tiers depending on national availability of information; for example, tier 3 methods were used to estimate above-ground biomass and DOM, while tier 2 methods were used to estimate below-ground biomass, except in the case of enhancement of forest carbon stocks where tier 3 methods were used to estimate the below-ground biomass. For above-ground biomass, below-ground biomass, dead wood and litter (DOM), immediate oxidation is assumed following deforestation. For forest degradation, Chile uses a tier 3 method developed by Bahamóndez et al.<sup>20</sup> to estimate carbon stock changes at different points in time. As this methodology estimates only CO<sub>2</sub> emissions, Chile used the relevant equations from the 2006 IPCC Guidelines to estimate the non-CO<sub>2</sub> emissions from forest fires. The AT noted that while Chile has developed stock charts for the forest type “Siempreverde”, which includes the species “Roble” (*Nothofagus obliqua*) and “Raulí” (*Nothofagus alpina*), Chile still needs to develop stock charts for other extended forest types (e.g. “Lenga”, *Nothofagus pumilia*). The AT commends Chile for the extensive use of tier 2 and tier 3 methods, which increased the accuracy of the estimates. The AT also commends Chile for its efforts to further develop stock charts for other forest types.

## 2. Transparency, completeness, consistency and accuracy of the information used in the construction of the forest reference emission level

### Methodological information, including description of data sets, approaches and methods

15. The construction of the FRELs and FRLs in the five administrative regions of Chile with a high native forest coverage was based on historical reference periods based mainly on the national cadastral data, ranging from 1997 to 2012 depending on the region and activity concerned, and the use of medium-resolution satellite data, namely the Landsat time series. The AT commends Chile for providing this information for the four activities selected.

16. In assessing the extent to which the FRELs and FRLs are consistent with the information and descriptions relating to deforestation provided by Chile in its submission, the AT compared the time series of deforestation in the FREL with the global data set of the Global Forest Watch (GFW)<sup>21</sup> as well as Landsat time series for the respective reference periods available for each region. Based on this comparison, the AT noted that, for several years, the values for forest loss for some of the regions were quite different. This indicates that harmonizing the reference period among the regions could enhance the comparison of results and thus the transparency of the estimates and information provided. However, given that the GFW data indicate tree cover and not land use such as forest/non-forest, it should be noted that they do not take into consideration the forest definition of Chile. The AT also noted that the GFW data are only indicative but, owing to their high frequency of update, they could be used for alerting changes. The AT considers that the actual country values to be considered should instead come directly from the forest/non-forest results obtained from the Landsat data.

<sup>19</sup> As footnote 18 above.

<sup>20</sup> Bahamóndez C, Martin M, Muller-Using S, Rojas Y and Vergara G. 2009. *Case Studies in Measuring and Assessing Forest Degradation: An Operational Approach to Forest Degradation*. Forest Resources Assessment Working Paper. Rome: Forestry Department, Food and Agriculture Organization of the United Nations.

<sup>21</sup> See <<http://data.globalforestwatch.org>>.

17. The AT noted that some of the data and information, for example those relating to emissions in the selected regions, as presented in several tables in the original submission (e.g. tables 21, 24 and 26) were not exactly the same throughout the submission, and therefore the AT could not completely assess whether the data and information were representative of the official national data. The AT commends Chile for solving all these inconsistencies in the modified submission.

18. In addition, the AT sought a number of clarifications on the methodologies used in estimating emissions and removals for the proposed FRELs and FRLs during the TA week in Bonn, and Chile provided useful clarifications during the technical exchanges. At the end of the TA week, the AT prepared a summary of the main findings to be considered by Chile in its modified submission of the FRELs and FRLs. Regarding the methodological issues, Chile addressed these in its modified submission; for example, by presenting relevant methodological information in the body of the submission rather than in annexes. The AT acknowledges this and commends Chile for introducing the appropriate improvements in its modified submission.

19. Chile provided in its modified submission extensive information on consistency with the national GHG inventory (INGEI in Spanish) (see chapter 9 of the modified submission) in response to a question on this matter raised by the AT. Chile noted in its modified submission that there is close consistency between its proposed FRELs and FRLs and its national GHG inventory, but where there were differences, Chile provided the rationale for these differences between both estimations. The AT noted that the average emissions from deforestation and degradation in the modified submission are significantly different to those included in the national GHG inventory for the same period (2001–2010) (i.e. three times higher for deforestation and ten times higher for forest degradation in the FRELs, compared with the national GHG inventory). Chile provided a detailed explanation of the reasons for these significant differences in its modified submission. In the case of deforestation, Chile explained that differences are due to better AD and more intensive use of country-specific EFs. In the case of forest degradation, Chile explained that the main reasons for the inconsistencies are related to AD, the calculation methods used (gain–loss method in the national GHG inventory versus stock change in the FRELs) and the exclusion of carbon gains in tree plantations replacing native forests. Regarding the increase of forest carbon stocks, there are also significant differences between the FRLs and the GHG inventory in that the former are approximately eight times smaller than the latter because of the exclusion of carbon removals in tree plantations in the FRLs. The AT commends Chile for its efforts to provide such detailed and transparent information on one of the important elements to be assessed, and for its efforts to improve the consistency between the FRELs and FRLs and the GHG inventory (e.g. by using the same methods and the highest possible tiers in both). In this regard, the AT understands that some differences between the FRELs and FRLs and the national GHG inventory are justified, as they arise from different options relating to which elements to include or exclude in each activity. Chile also explained that it will modify the methodology to be used in its future national GHG inventory in order to maintain consistency with its future submissions of proposed FRELs/FRLs. In addition, Chile noted in its modified submission that it will use the more accurate methodologies in updating its national GHG inventory as part of its biennial update report (BUR) that will be submitted in 2018.

20. The AT took note of the forest degradation monitoring methodology that uses satellite (Landsat) imagery and its validation based on field data from the Continuous Forest Inventory plots. The AT requested more information about the methodology so that the transparency of the submission would be increased. Regarding the methodology to assess degradation in forests, Chile provided the AT with reports from the scientific literature describing the technique for estimating carbon stocks using field plots, and indicated that partial validation was undertaken based on field validation for the “Roble-



Raulí-Coihue” forest type. The other forest types were validated using freely available high-resolution Google Earth imagery, but without field validation. The AT considers that the additional information provided by Chile considerably increases the transparency of the proposed FRELs and FRLs. The AT also notes that Chile should consider conducting field validation for the other forest types, possibly also using a ground-based forest carbon inventory.

21. The AT noted that Chile did not identify in its original submission specific areas where improvements may be needed. Also, Chile did not present sufficient information on how it plans to move to national-level implementation of the selected activities. The AT requested Chile to provide complementary information in this regard and Chile responded by providing a detailed explanation on its capacity-building needs and on the main improvements it is already undertaking or plans to undertake, with a view to continuing its implementation according to a stepwise approach, eventually moving to the development of a national level FREL/FRL. The AT commends Chile for the detailed clarification provided and its ambitious improvement plan.

22. The main areas that Chile plans to address in future FRELs/FRLs are:

(a) Improving AD: (1) the development of tools and methodologies for the biennial updating of the cadastre as a source of primary information for the estimation of AD as well as for the reporting of the activities referred to in decision 1/CP.16, paragraph 70, in future submissions of its BURs; and (2) the generation of an integrated platform that allows storage and semi-automated generation of reports, visualization of results and dissemination of both spatial and database information;

(b) Improving parameters and EFs: (1) the development of new stock charts for relevant forest types not included in the current proposed FRELs/FRLs (e.g. Lenga forests); and (2) further research on forest degradation through the intensive use of the biomass and carbon monitoring system;

(c) Improving methodologies for the monitoring of activities and carbon fluxes in permanent forests in areas with high cloud cover probability (Austral macrozone) and with strong phenological variations in vegetation (radar and LiDAR images);

(d) Including new regions and biomes: the Mediterranean macrozone (three regions in the northern boundary of the subnational area) and the Austral macrozone (two regions in the southern limit of the subnational area, Aysén and Magallanes);

(e) Including new activities: the development of management plans based on spatially explicit information that would allow the inclusion of other activities such as sustainable management of forests and activities that normally occur at farm level of 10 ha or less.

23. During the TA of the original submission, the AT noted that much of the relevant methodological information was included in annexes, and suggested to Chile that including part of the information in the main body of the submission would increase transparency. The AT notes that, in the modified submission, detailed descriptions of the methodologies and data used for the estimations have been included in the main body of the text. The AT welcomes the change and commends Chile for its efforts, which have resulted in a significant increase in the transparency of the submission. Methods for the estimation of carbon pools in the selected activities are described in detail and useful graphs have been introduced; for example, to explain the methodology to monitor and estimate emissions from forest degradation.

24. The AT notes that in future FREL/FRL submissions Chile could use the same land-use changes as those provided in table 7 of the modified submission, which clearly distinguish the different activities. The AT commends Chile for the improvements made in

the modified submission, such as indicating the satellite data sources, which enhanced the transparency of the submission. Moreover, the AT considers that further use of high-resolution satellite data (Sentinel, RapidEye, etc.) could be used for the full validation of the AD and for the calculation of the areas which the actual AD are based on, including for forest degradation (instead of the partial validation as reported in the modified submission). In this respect, the methodology for AD assessment using high-resolution data for the area assessment could be considered in future FREL/FRL submissions, as well as for future GHG inventories provided in the BURs, to ensure consistency between both.

25. The AT notes that the modified submission provides detailed information on uncertainty assessment and the AT commends Chile for its efforts on including this uncertainty analysis in its submission. Uncertainties are estimated using non-weighted error propagation (2006 IPCC Guidelines, equation 12.1). The AT also commends Chile for presenting the uncertainties disaggregated by activity, subactivity, region, carbon pool and parameters used to estimate the emissions and removals from the carbon pools. For example, in the case of forest degradation, mapping errors were estimated and combined with errors from the estimation of the carbon stocks.

Description of relevant policies and plans, as appropriate

26. Chile presented a description of enabling policies and actions for the implementation of the activities referred to in decision 1/CP.16, paragraph 70. There is a description of the institutional arrangements, the legislation and the relevant policies and plans. The proposed FRELs and FRLs are based entirely on historical data without adjustments; therefore, no assumptions about future changes to domestic policies have been included in the FREL and FRL submission.

27. Both the original and modified submissions present a detailed description of the native and planted forests in Chile. In the case of native forests, the submissions include the geographical distribution of the 12 main forest types and introduce the National System of Protected Wild Areas (SNASPE). The five regions included in the subnational FRELs and FRLs include 42 of the 108 protected areas that are part of the SNASPE. The AT noted that two regions not included in the modified submission (Aysén and Magallanes) contain most of the protected areas of Chile (almost 12 million ha in a total of 14.7 million ha).

28. The AT commends Chile for presenting a comprehensive description of the main policies and plans, as well as of the relevant legislation and institutional arrangements in the country.

**3. Pools, gases and activities included in the construction of the forest reference emission level**

29. The pools included in the original submission varied according to the activity selected by Chile. For the activities reducing emissions from deforestation and conservation of forest carbon stocks, Chile included all pools: above-ground biomass, below-ground biomass, DOM and soil organic carbon (SOC). For reducing emissions from forest degradation, the pools included were above-ground biomass, below-ground biomass and DOM. Finally, in the case of enhancement of forest carbon stocks, Chile included only above-ground biomass and below-ground biomass. In the modified submission, Chile changed the inclusion of pools in the FRELs and FRLs. Above-ground and below-ground biomass pools were included in all four activities, while DOM was included in three of the four activities (it was not included in enhancement of forest carbon stocks). The main change as noted in the modified submission was the exclusion of SOC from all selected activities and subactivities, as shown in table 12 of the modified submission.

30. As part of the stepwise approach, Chile decided to include the carbon stock changes owing to sustainable management of forests under the activities reducing emissions from

forest degradation and enhancement of forest carbon stocks. In the modified submission, Chile stated that, once information is available allowing it to identify the areas that are subject to the activity sustainable management of forests, it will present the corresponding FRL. The AT highly commends Chile for increasing the transparency of the information relating to the exclusion of this activity and by including instead the carbon stock changes from this activity in two other selected activities in the modified submission.

31. During the TA, the AT requested clarification of the reasons for the omission of SOC in the activity reducing emissions from forest degradation and the omission of DOM in the activity enhancement of forest carbon stocks. The AT noted that the exclusion of the DOM carbon pool seems conservative because this pool is not expected to decrease in the activity enhancement of forest carbon stocks. Chile justified the exclusion of SOC in all four activities because of the lack of national information on the rate of change in this pool and to ensure that consistency is maintained with the national GHG inventory, which excludes SOC. The AT notes that changes in SOC could be significant when forest land is converted to other land uses (e.g. deforestation) but the exclusion of SOC in the case of the activity enhancement of forest carbon stocks could be conservative, because this pool is not expected to decrease in this activity. The AT commends Chile for its efforts to obtain better information on DOM and SOC with the aim of including these carbon pools as part of a stepwise approach in future submissions or to exclude them if there is evidence that changes are not significant. Furthermore, the AT notes that the 2006 IPCC Guidelines provide a method for estimating carbon stock changes using default EFs. The AT considers the treatment of the omitted emissions from SOC as an area for future technical improvement of the FRELs/FRLs. The AT notes that during the TA Chile stated that it is making ongoing efforts to include new and additional pools such as developing EFs and AD linked to SOC fluxes. The AT commends Chile for these continuing efforts.

32. Regarding the inclusion of GHGs, the FRELs and FRLs include CO<sub>2</sub> emissions and removals in the four selected activities, as appropriate, and include the estimation of non-CO<sub>2</sub> emissions (CH<sub>4</sub> and N<sub>2</sub>O) from forest fires, which is considered a subactivity under the activity reducing emissions from forest degradation. The AT commends Chile for its efforts to include non-CO<sub>2</sub> gases using the appropriate equations from the 2006 IPCC Guidelines.

33. The AT acknowledges that Chile included four of the five activities identified in paragraph 70 of decision 1/CP.16, in accordance with national capabilities and circumstances. The activity sustainable management of forests is implicitly included by Chile under the activities of reducing emissions from forest degradation and enhancement of forest carbon stocks. The AT noted that, theoretically, sustainable management of forests is difficult to consider as forest degradation (e.g. a plantation may have higher carbon stocks than shrub land) and requested more explanation. In its modified submission, Chile clarified that, in its national definition of forest degradation, any conversion of native forest land to plantation is considered a degradation process.

#### **4. Definition of forest**

34. Chile provided its definition of forest used in the construction of the FRELs and FRLs. According to this definition, a forest will be considered as all lands that are defined as “Native Forest” according to the current Chilean legislation. This definition is different from the one that the Party uses in its latest national GHG inventory.<sup>22</sup> The latest national GHG inventory (INGEI) uses the forest definition established by Law 20.283; namely, “a place populated with plant formations, in which trees predominate and cover a surface area of at least 5,000 square meters, with a minimum width of 40 meters, with arboreal canopy

<sup>22</sup> Chile’s National Greenhouse Gas Inventory, 1990–2010. December 2014. Available (in English and Spanish) at <[http://unfccc.int/essential\\_background/library/items/3599.php?rec=j&preref=7790#beg](http://unfccc.int/essential_background/library/items/3599.php?rec=j&preref=7790#beg)>.

cover that surpasses 10 per cent of the surface area in arid and semi-arid conditions and 25 per cent in more favorable conditions”. The FREL uses another definition, established by the same Law 20.283, applied to Native Forest; namely, “forest composed of indigenous species deriving from natural production, natural reproduction, or planted under the canopy, with the same species in the area as original distribution, which can contain the presence of randomly distributed introduced species.”

35. The forest definition applied in the FREL is also different from the definition applied to the national GHG for forestry territories, because in the latter native forests and planted forests are included. During the TA, the Party provided more information at the request of the AT for this different use of definitions, namely, that over 97 per cent of the planted forests in Chile are industrial, single species and composed of introduced species, resulting in the exclusion of carbon fluxes from forest plantations from the construction of the FREL. However, Chile indicated that new planted forests will be included in the FREL if they are destined for permanent cover and are consistent with the goals set by the nationally determined contributions under the Paris Agreement.

36. Moreover, Chile explained that there has been a discussion on the forest definition used in the FRELs carried out through an initiative between CONAF and a panel of national and international experts who commented continuously throughout the development of the original proposal and all subsequent versions of the FREL prior to the Party’s submission of its FRELs/FRLs. The proposed definition was submitted for revision in the “Second international workshop for the elaboration of reference levels for carbon stock and analysis of MRV<sup>23</sup> in the Chilean context”, where the final modifications to the definition were agreed. Members of the Climate Change and Environment Service Unit, Department of Forest Ecosystem Monitoring at CONAF, researchers with the Continuous Forest Inventory at INFOR, academics from Universidad Austral de Chile and Universidad Mayor, experts from the World Bank and Winrock International, and the team from the National Forest Commission of Mexico (CONAFOR) were present at the workshop.<sup>24</sup>

### III. Conclusions

37. The data and information used by Chile in constructing its FRELs and FRLs for the four activities are transparent and complete and in overall accordance with the guidelines for submission of information on FRELs/FRLs (as contained in the annex to decision 12/CP.17). The uncertainty analyses are detailed and provide guidance for future work to improve accuracy.

38. The AT acknowledges that Chile included in the FRELs/FRLs four of the five activities referred to in decision 1/CP.16, paragraph 70, the most important biome, and the most significant pools and gases in terms of emissions and removals from forests. In doing so, the AT considers that Chile followed decision 1/CP.16, paragraph 70, on activities undertaken, paragraph 71(b), on elaboration of subnational FRELs/FRLs as an interim measure, and decision 12/CP.17, paragraph 10, on implementing a stepwise approach. The AT commends Chile for the information provided on the ongoing work relating to the development of FRELs/FRLs for other activities, as well as for other biomes as steps towards a national level FREL/FRL (see paras. 7–9 and 22 above).

39. The AT notes that the transparency and completeness of information improved significantly in the modified FREL/FRL submission. Chile changed the approach and values used to construct the FRELs/FRLs and the AT commends Chile for the efforts it

---

<sup>23</sup> MRV refers to measurement, reporting and verification.

<sup>24</sup> Information about the workshop (in Spanish) is available at <<http://www.encerv-chile.cl/descargas/nivel-de-referencia/51-anexo-acta-taller-nr/file>>.

made. The new information provided in the modified submission, including the description of methods and data sources, increased the reproducibility of FREL/FRL calculations (see paras. 9, 10, 12–14, 18 and 23 above).

40. The AT notes that, overall, the FRELs and FRLs in the modified submission maintain consistency, in terms of sources for the AD and EFs, with the GHG inventory included in Chile's first BUR, which it submitted in 2014.<sup>25</sup> In the cases in which there was no consistency between the FRELs and FRLs and the BUR, the reasons provided by Chile were explained well and the AT considers that the differences are well justified. Moreover, the FRELs/FRLs represent an improvement in terms of the use of higher-tier methods leading to increased accuracy of emission and removal estimates. In this regard, the AT commends Chile for the improvements and notes that Chile could consider including these improvements in its next GHG inventory submission (see para. 19 above).

41. Pursuant to paragraph 3 of the annex to decision 13/CMP.19, the AT identified an area for future technical improvement relating to the AD for deforestation. The AT notes that the dates of land registry maps used for developing the FRELs and FRLs were different from those used for producing national GHG inventories. Chile acknowledged that the differences in dates of the maps produce differences in estimates of annual emissions as the oldest maps in the Land Registry used mosaics of aerial images from various years. Therefore, the AT notes that Chile could ensure more consistent time series by using the same satellite data sources (e.g. from Landsat or RapidEye) to ensure the consistency of AD (in spatial and temporal resolution) applied in estimates.

42. In assessing the pools and the gases included in the FRELs/FRLs, pursuant to decision 13/CP.19, annex, paragraph 2(f), the AT notes that the current omissions of pools (in particular, SOC) is justified because of the lack of national information to describe the rate of change in this pool. For the activity enhancement of forest carbon stocks, the exclusion of SOC is likely to be conservative in the context of the FRLs. In the case of GHG gases, no significant exclusion is identified, because CH<sub>4</sub> and N<sub>2</sub>O from forest fires are taken into account. Nevertheless, the AT identified as areas for future technical improvement the treatment of emissions from DOM (i.e. the inclusion of this pool or the provision of more information to justify its omission) and the inclusion of SOC, unless the Party can demonstrate that both these pools are not sources (see paras. 31–32 above).

43. The AT acknowledges and welcomes the intentions expressed by Chile: to continue monitoring forest degradation; to assess whether the reduction of deforestation is leading to the displacement of emissions; to include emissions from forest degradation in future submissions of FRELs/FRLs when new, adequate data and better information become available; and to extend the FRELs/FRLs to other biomes, as part of efforts to move towards a national FREL.

44. During the TA, the AT requested Chile to provide information on its efforts that are ongoing or planned to improve its data and information for future submissions of FRELs/FRLs, as part of the stepwise approach. Chile identified several areas as part of its ongoing efforts (see para. 22 above). Chile further noted that it is improving capacities in the Department of Monitoring at CONAF, such as developing capacities internally to perform uncertainty analyses, training staff in the development of GHG inventories, and using new tools such as Collect Earth and Google Earth Engine for land-cover mapping.

45. The AT commends Chile for providing additional data and information that increased the transparency of its submission and facilitated the work of the AT in technically assessing the submission. The AT acknowledges Chile's efforts to continue

---

<sup>25</sup> Chile's first BUR (in Spanish only) is available at <[http://unfccc.int/national\\_reports/non-annex\\_i\\_natcom/reporting\\_on\\_climate\\_change/items/8722.php](http://unfccc.int/national_reports/non-annex_i_natcom/reporting_on_climate_change/items/8722.php)>.

working on updating and improving the subnational FRELS/FRLs, noting that this is a stepwise approach towards the development of a national FREL/FRL.

46. In conclusion, the AT commends Chile for the efforts made to submit high-quality FRELS/FRLs, and for showing a strong commitment to continuous improvement of its FREL/FRL estimates, in line with the stepwise approach. Some areas for future technical improvements of Chile's FRELS/FRLs have been identified in this report. At the same time, the AT acknowledges that these improvements are subject to national capabilities and policies, and notes the importance of adequate and predictable support.<sup>26</sup> The AT also acknowledges that the assessment process was an opportunity for a rich, open, facilitative and constructive technical exchange of information with Chile.

47. The table in the annex summarizes the main characteristics of Chile's proposed FRELS and FRLs.

---

<sup>26</sup> Decision 13/CP.19, annex, paragraph 1(b), and decision 12/CP.17, paragraph 10.

## Annex

### Summary of main features of the proposed forest reference emission level based on information provided by the Party

	<i>Main features of the FREL</i>	<i>Remarks</i>
Proposed FREL (in t CO <sub>2</sub> eq/year)	3,452,885 (deforestation) 9,149,392 (forest degradation) -2,430,439 (conservation) -10,012,012 (enhancement)	The subnational FRELs and FRLs include CO <sub>2</sub> emissions and removals. For the activity reducing emissions from forest degradation, CH <sub>4</sub> and N <sub>2</sub> O from forest fires are included (para. 10)
Type and duration of FREL	FREL/FRL = annual average change in carbon stocks in AB and BB  2001–2013 for activities that have a land-use change  2001–2010 for activities that occur in forests remaining forests	Paragraph 9
Adjustment for national circumstances	No	
National/subnational <sup>a</sup>	Subnational	For five administrative regions with 41 per cent of the national native forest areas (paras. 8, 9 and 43)
Activities included <sup>b</sup>	Reducing emissions from deforestation  Reducing emissions from forest degradation  Conservation of forest carbon stocks  Enhancement of forest carbon stocks	Paragraph 7
Pools included <sup>b</sup>	AB and BB for all activities  DW is included for the activities deforestation, forest degradation and conservation	Chile justified the exclusion of SOC in all four activities because of a lack of national information (paras. 29–31)
Gases included	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O	Non-CO <sub>2</sub> gases were included as part of estimating emissions from forest fires under the

<i>Main features of the FREL</i>		<i>Remarks</i>
		activity reducing emissions from forest degradation (para. 32)
Forest definition <sup>c</sup>	All lands that are defined as Native Forests under the current Chilean legislation	Differs from the definition applied to the national GHG inventory for forest territories, in which both native forests and planted forests are included (para. 34)
Relationship with latest GHG inventory	Close consistency between FREL/FRL and GHG inventory	Paragraphs 19 and 40
Description of relevant policies and plans <sup>d</sup>	Included	A detailed description is provided by Chile in its submission
Description of assumptions on future changes in policies <sup>d</sup>	Not applicable	
Descriptions of changes to previous FREL	Not applicable	
Future improvements identified	Yes	Paragraphs 22 and 41–44

*Abbreviations:* AB = above-ground biomass, BB = below-ground biomass, DW = dead wood, FREL = forest reference emission level, FRL = forest reference level, GHG = greenhouse gas, SOC = soil organic carbon, t CO<sub>2</sub> eq/year = tonnes of carbon dioxide equivalent per year.

<sup>a</sup> If subnational, comments should include information on the treatment of displacement of emissions.

<sup>b</sup> In the case of omitted pools or activities, comments should include the justification provided by the country.

<sup>c</sup> The forest definition should be summarized, and it should be stated if it differs from the definition used in the GHG inventory or in reporting to other international organizations.

<sup>d</sup> May be relevant to the description of national circumstances, which is required in the case of adjustment.