Community-based monitoring tools

Arun Pratihast

REDD+ Monitoring, and Measurement, Reporting and Verification workshop
Training the Trainers
18-22 April 2016
Bangkok, Thailand

Community-based forest monitoring

BBC | Sign in | News | Sport | Weather | Shop | Earth | Travel

NEWS

Home | Video | World | UK | Business | Tech | Science | Magazine | Entertainment &

Science & Environment

Communities can monitor forests 'as well as experts'

By Mark Kinver
Environment reporter, BBC News

29 October 2013 | Science & Environment

Communities living alongside the world's tropical forests can estimate an area's carbon stocks as effectively as hi-tech systems, a study has shown.

An international team of researchers found communities using sticks and ropes obtained the same results as data gathered by satellites.

They added that the study showed that projects aimed at halting deforestation needed to use these people's skills.

The findings have been published in the **journal Ecology and Society**.

"For the first time, we have shown that local communities are able to monitor forest biomass up to the highest standards of the [Intergovernmental

Data by community members was show to be as accurate as data gathered by hi-tech systems

nature.com : Sitemap | Login : Registe

nature International weekly journal of science

Search | Go | Advanced search

Home | News & Comment | Research | Careers & Jobs | Current Issue | Archive | Audio & Video | For Authors

Archive > Volume 524 > Issue 7565 > Editorial > Article

NATURE | EDITORIAL

عربي

Rise of the citizen scientist

From the oceans to the soil, technology is changing the part that amateurs can play in research. But this greater involvement raises concerns that must be addressed.

18 August 2015

PDF | Rights & Permissions

Science is not just for scientists these days. Going on a scuba-diving holiday this summer? Share the temperature data from your dive computer with researchers eager to plug holes in sparse records for inshore areas. Nervous about possible pollution from a nearby fracking project? Ease your concerns by helping to collect and analyse air samples as part of a monitoring project. Stuck at home as the rain pours down? Log on to the Internet and spend a couple of hours folding proteins and RNA to help university scientists work out how biology does it.

E-alert | RSS | Facebook | Twitter

CRISPR children

Should you edit your children's genes?

In the fierce debate about CRISPR gene editing, it's time to give patients a voice.

Like | Share 236,881 people like this.

Recent | Read | Commented

1. Evolution: Doing the locomotion
Nature | 24 February 2016
2. History of science: When eugenics became

Cambodja

TIL KAMP MOD ILLEGAL SKOVHUGST MED MOBIL-APP

Udstyret med smartphones og en særlig udviklet app forsøger indbyggere i Cambodjas Prey Lang-skov at stikke en kæp i hjulet på den illegale skovhugst. Også i lande andre bruges smartphones i kampen for at beskytte naturens ressourcer.

AF NINA TRIGE ANDERSEN

Lokalbefolkningen kan ret nøjagtigt beskrive de forandringsprocesser, der følger med afskovning og nedbrydning af skoven og med forsøg på genbeplantning. Mod mobil-apps kan de dokumentere, præcis hvor disse forandringer sker, hvor omfattende de er, hvornår de foregår, og hvad årsagerne er.

Arun Kumar Pratthast, forsker

LOKAL NATUROVERVÅGNING

- Prey Lang Community Network (PLCN) har siden februar 2015 indsamlet data om illegal skovhugst via en mobil-applikation.
- Rapporter fra arbejdet kan findes på preylang.net/workings
- Flere andre steder i verden udfarderne og/eller og forskere lokale indbyggere i at bruge apps til naturovervågning. Se mere på www.forestcompass.org

Prey Lang hedder Cambodjas største stedsegrønne skovområde, der breder sig over et areal på 3,600 kvadratkilometer. Så længe det varer.

"Afskovningen startede i midten af 1990'erne," fortæller 39-årige Hoeun Sophaap, der bor i Prey Lang og tilhører kuy-folket. Han var i midten af 2000'erne med til at etablere Prey Lang Community Network (PLCN), en frivillig organisation af skovens indbyggere, som arbejder for at bevaren skovhugsten.

"Først var det et virvar af enkeltpersoner og små grupper, der begravede at fælde træ. Siden kom de store virksomheder, cambodjanske og udenlandske, med tilladelser fra staten, og så begyndte afskovningen at gå stærkt," siger Hoeun Sophaap, hvis familie har boet i Prey Lang, så langt tilbage nogen kan huske.

PLCN fik i december overrakt FN's Equator Prize – blandt andet for deres succesrige brug af teknologi til at overvåge skoven – og *Udvikling* mødte Hoeun Sophaap og medaktivisten Phon Sophaak, da de efterfølgende kom forbi København.

Selvom FN i pressemeddelelsen fremhæverede PLCN's evne til at bringe civilsamfund, forskere og myndigheder sammen i kampen for "miljøretfærdighed", minder aktivisternes dagligdag snarere om David's kamp mod Goliat: De er under pres fra virksomheder, myndigheder og ågar deres egne naboer, hvoraf mange har ladet sig rekruttere til både lovlig og illegal skovhugst. Men på det seneste har PLCN taget et

PÅ PATRULJE

I et projekt støttet af Danmission, Alexander Soros Foundation og Københavns Universitet er PLCN's aktivister blevet trænet i at bruge en særlig udviklet app til at overvåge skovens tilstand. Udstyret med smartphones tager de på patruljer i skoven og tager fotos og indtaster beskrivelser af, hvad de har set og hvor. Det kan være ulovligheder eller fund af sjældne planter eller dyrearter. Til ikrentsnævnte kategori hører for eksempel skovhugst uden for de områder, virksomhederne har tilladelse til, transport af ulovligt hugget tømmer eller et ubæredygtigt mønster mellem aktiviteter og myndighederne.

PLCN har på mindre end et år dokumenteret hundredvis af ulovligheder i skoven. Det kan kun foregå i så stort et omfang fordi myndighederne ofte ser gennem fingre med det eller direkte medvirker til afskovningen.

Hoeun Sophaaps familie har levet af at indsamle honning, harpiks og urter fra skoven, men i midten af 2000'erne var det livsgrundlag stort set forsvundet på grund af afskovningen. Derfor blev han involveret i PLCN.

25-årige Phon Sophaak, som blev aktiv i PLCN's ungdomsnetværk sidste år, fortæller en lignende

historie om, hvordan hendes familie fik stadig vanskeligere ved at finde noget at leve af. Nu tager hun på patruljer med de ældre aktivister i et forsøg på at stoppe – eller i det mindste forsinke – ødelæggelserne.

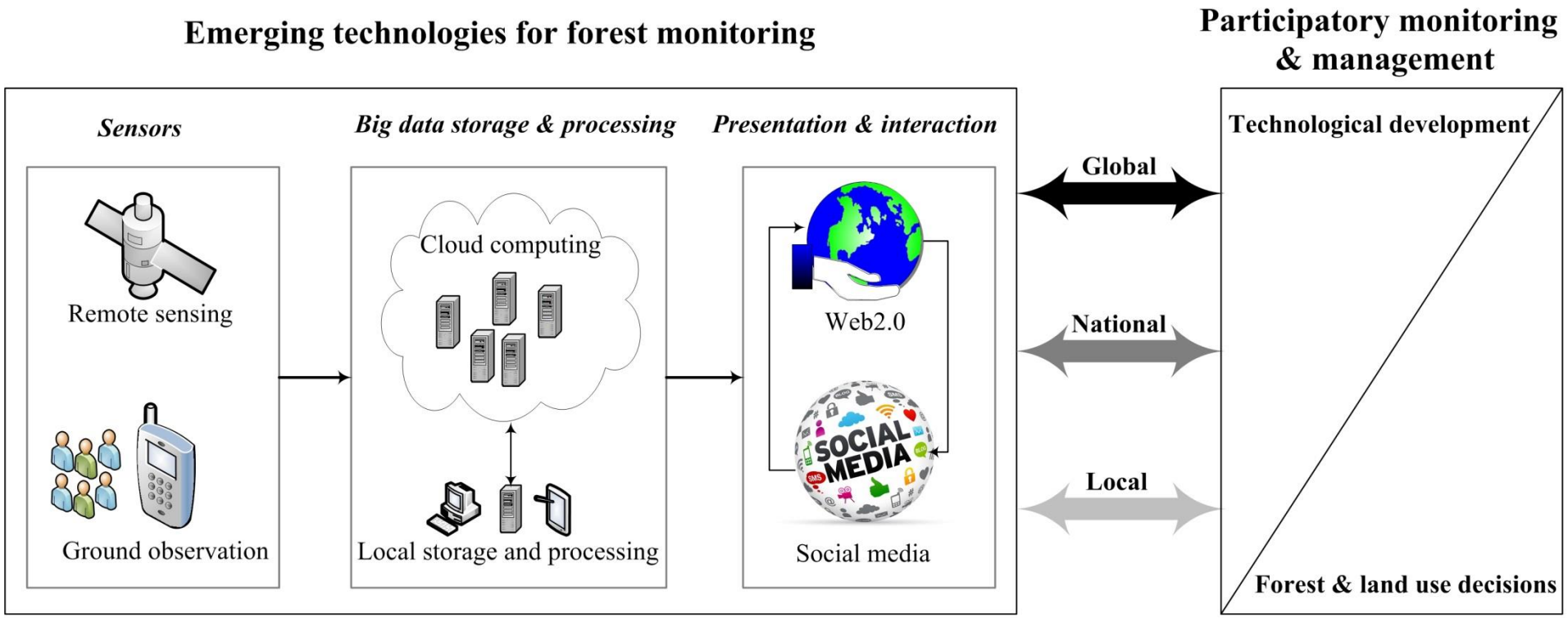
"Mange af de andre unge bliver rekrutteret af de virksomheder, der fælder træerne," fortæller hun. "Folk fælder ikke, de har noget valg. Men jeg vil ikke være med til det, og jeg vil hellere ikke migrere til byerne eller udlandet for at finde arbejde. Jeg vil blive og passe på skoven."

FORANDRINGER I REALTID

PLCN er ikke de eneste, der bruger mobil-apps til at dokumentere for eksempel illegal skovhugst. Arun Kumar Pratthast er ph.d. og forsker ved Laboratory of Geo-information Science and Remote Sensing ved det hollandske Wageningen University, og han udvikler og tester lokalbefolkningens brug af mobil-apps i blandt andet Vietnam, Etiopien og Peru. Teknologien er ifølge Arun Kumar Pratthast velegnet til præcis og omfattende dataindsamling til en billig pengs.

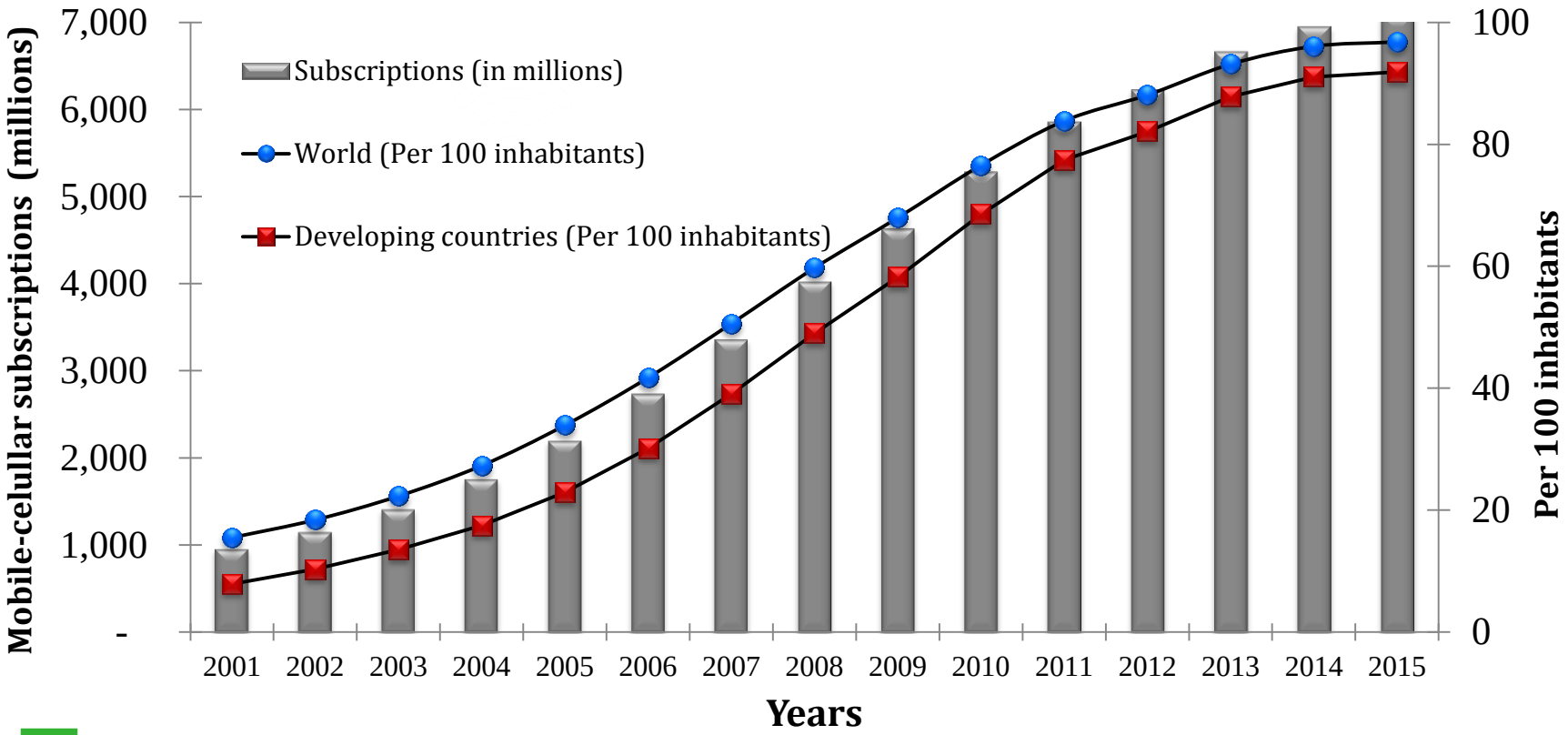
WAGENINGEN UNIVERSITY
WAGENINGEN UR

Utility of emerging technologies



Use of mobile device

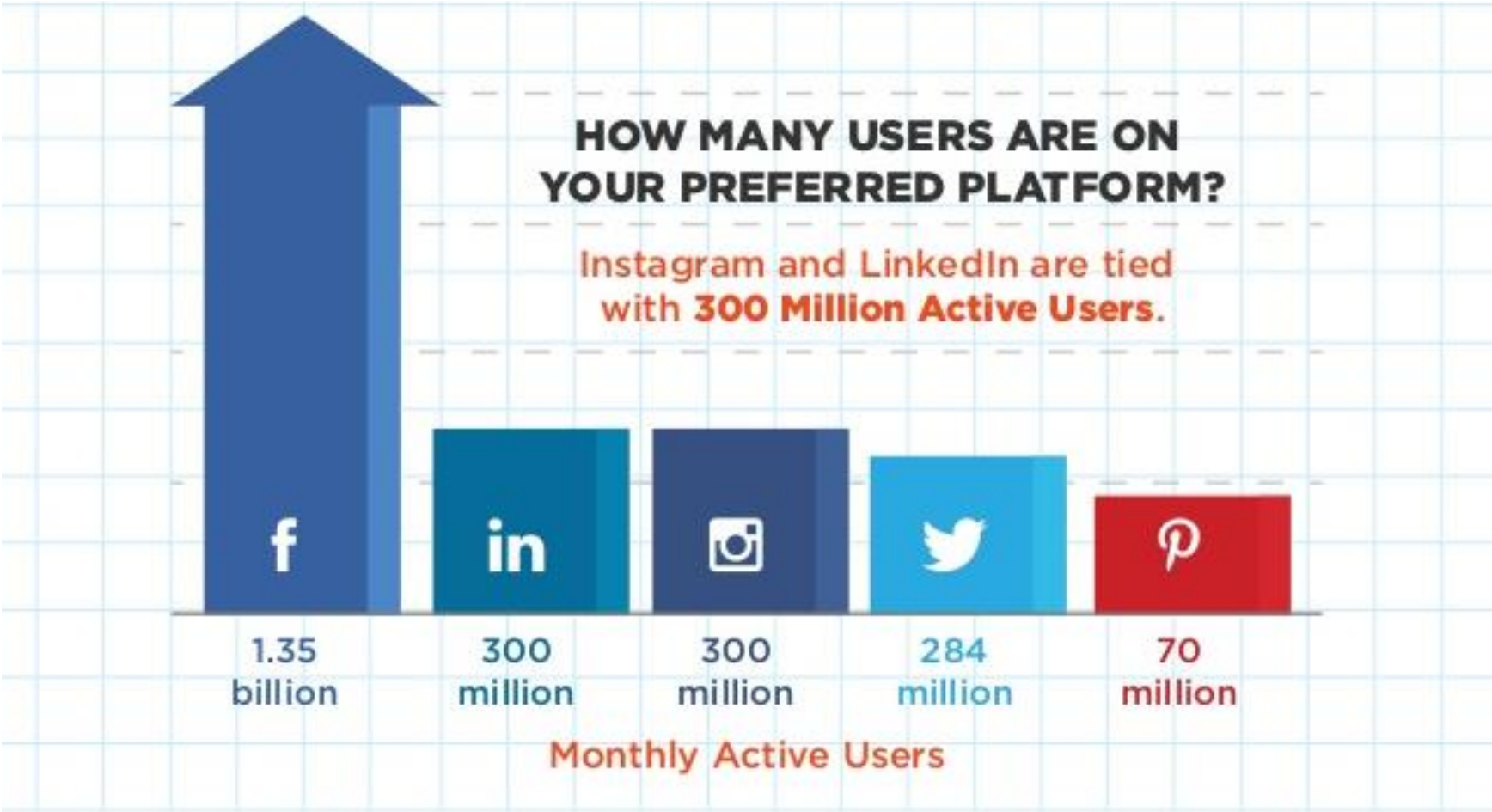
- More than 5 billion mobile users in world
- 2 billion smartphones users



WAGENINGEN UNIVERSITY
WAGENINGEN UR

(I.T.U. 2015)

Active user on social media

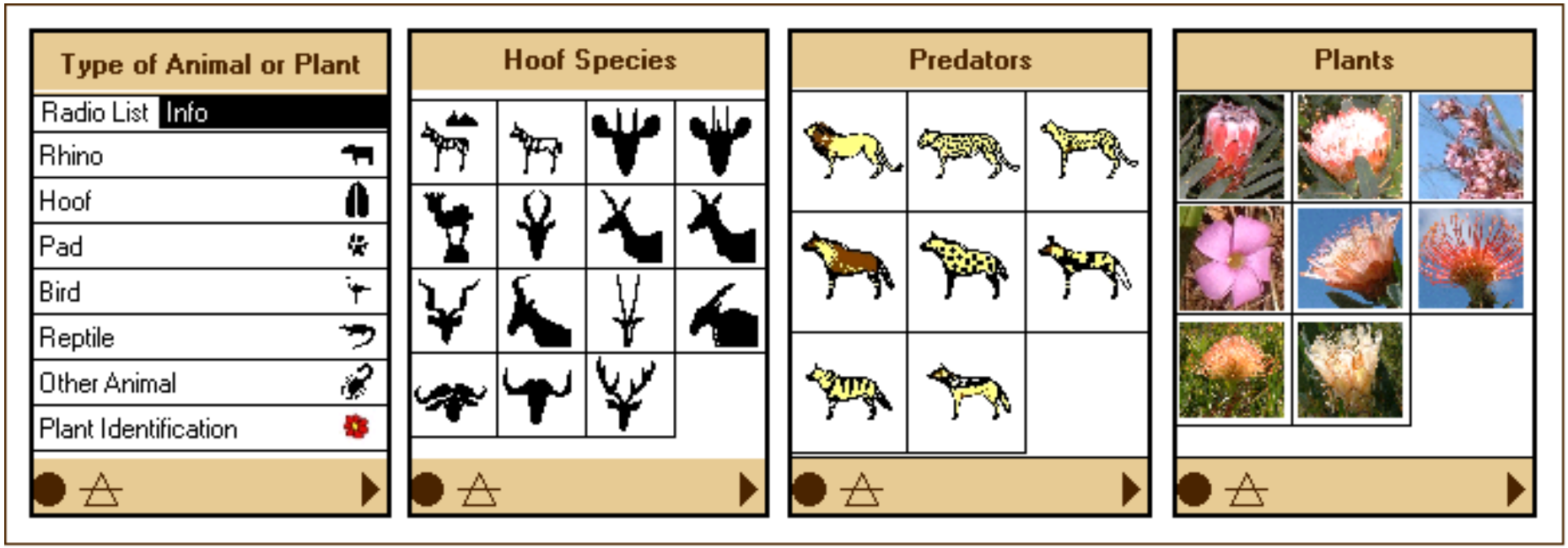


WAGENINGEN UNIVERSITY
WAGENINGEN UR

Internet Usage & Social Media Statistics

Tools for community-based monitoring

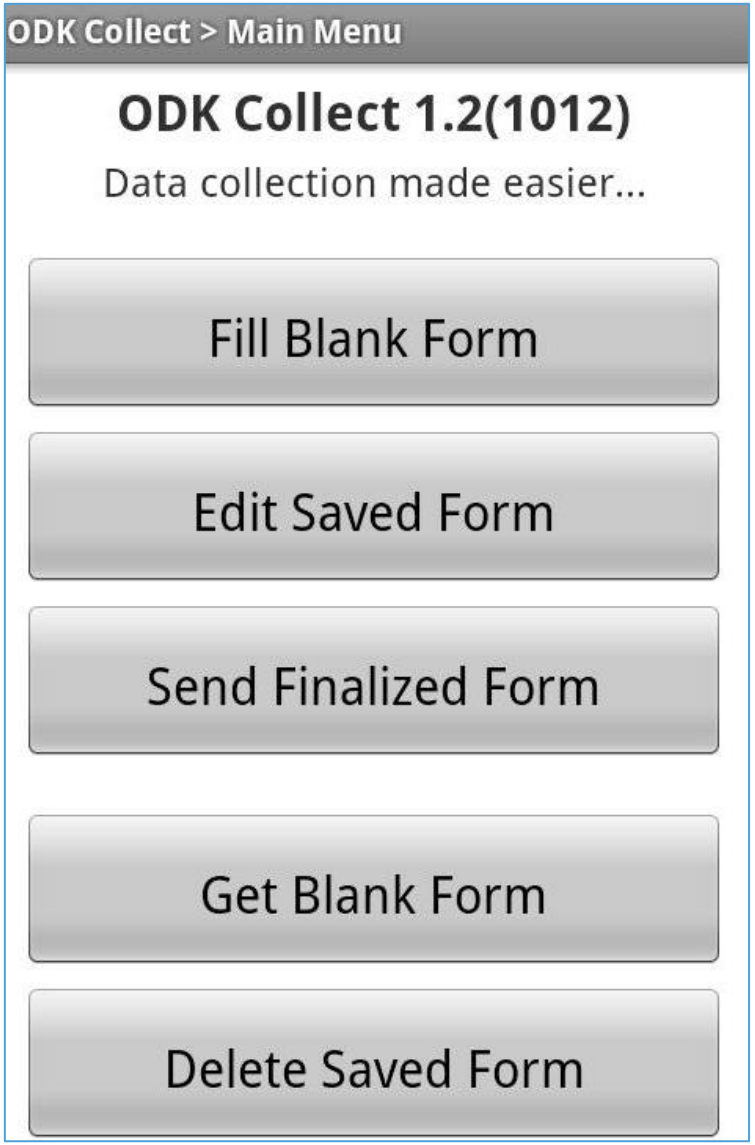
CyberTracker



WAGENINGEN UNIVERSITY
WAGENINGEN UR

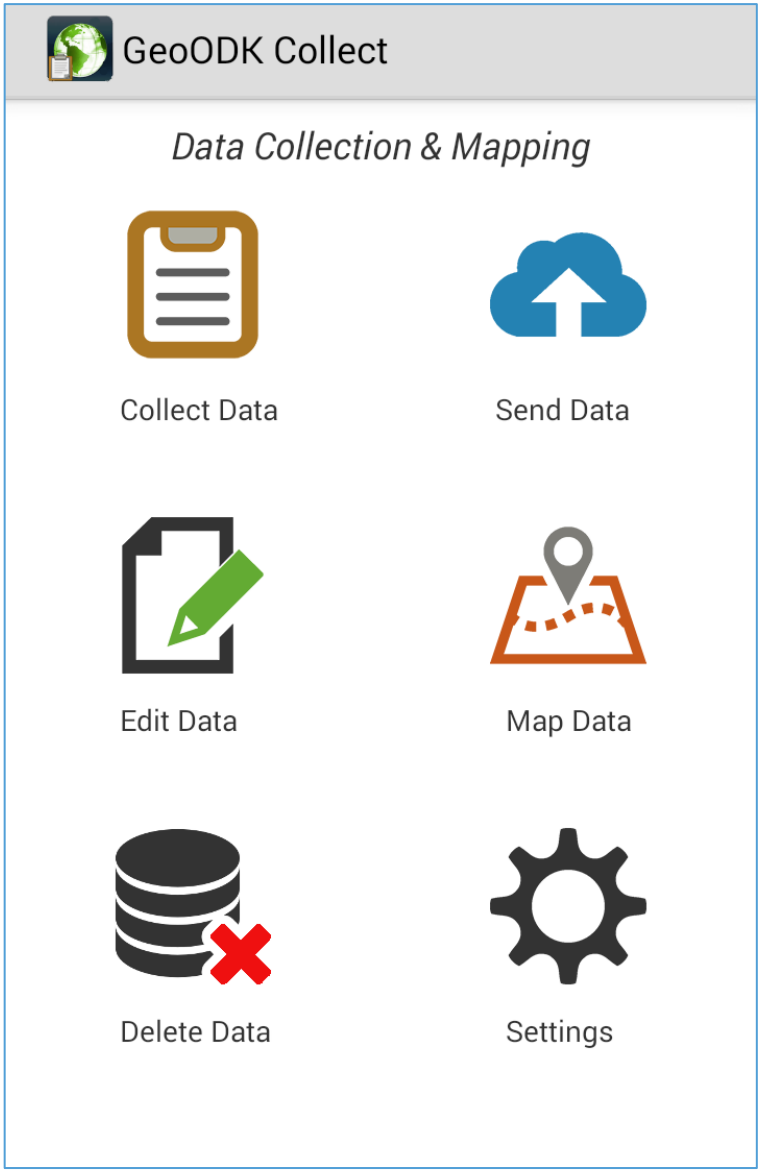
Tools for community-based monitoring

OPEN DATA KIT



WAGENINGEN UNIVERSITY
WAGENINGEN UR

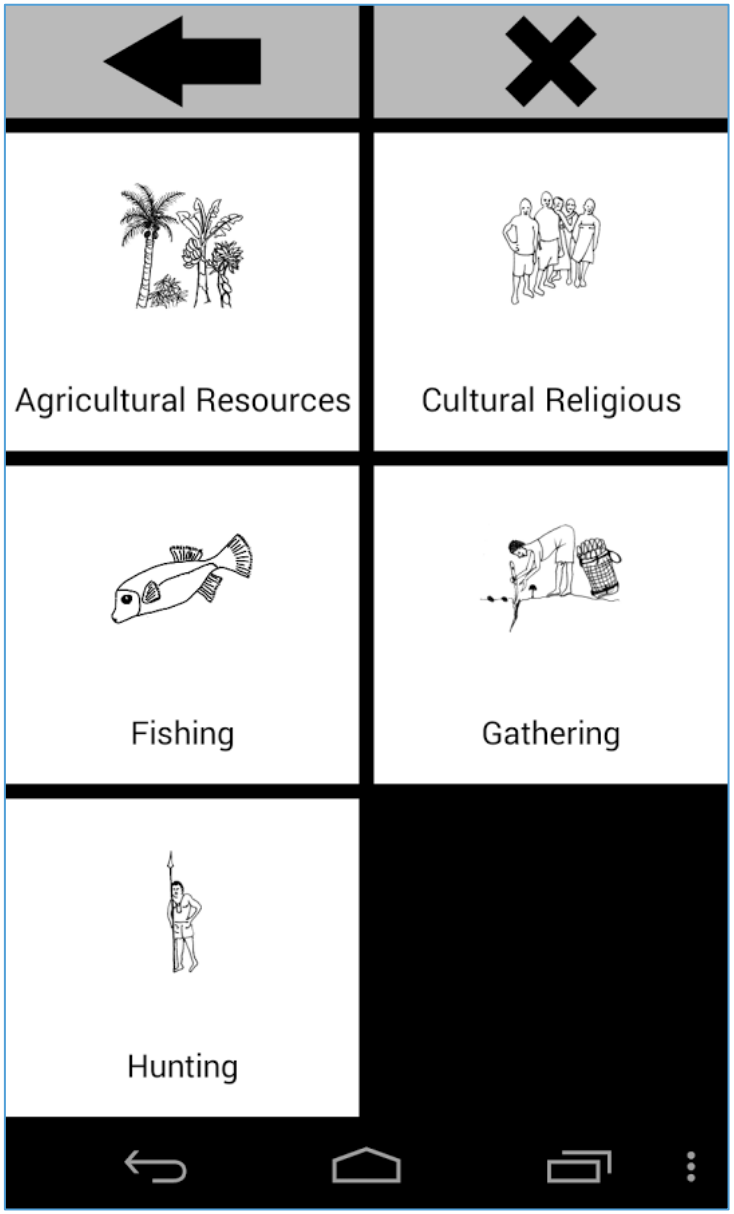
Tools for community-based monitoring



Tools for community-based monitoring

Tools for community-based monitoring

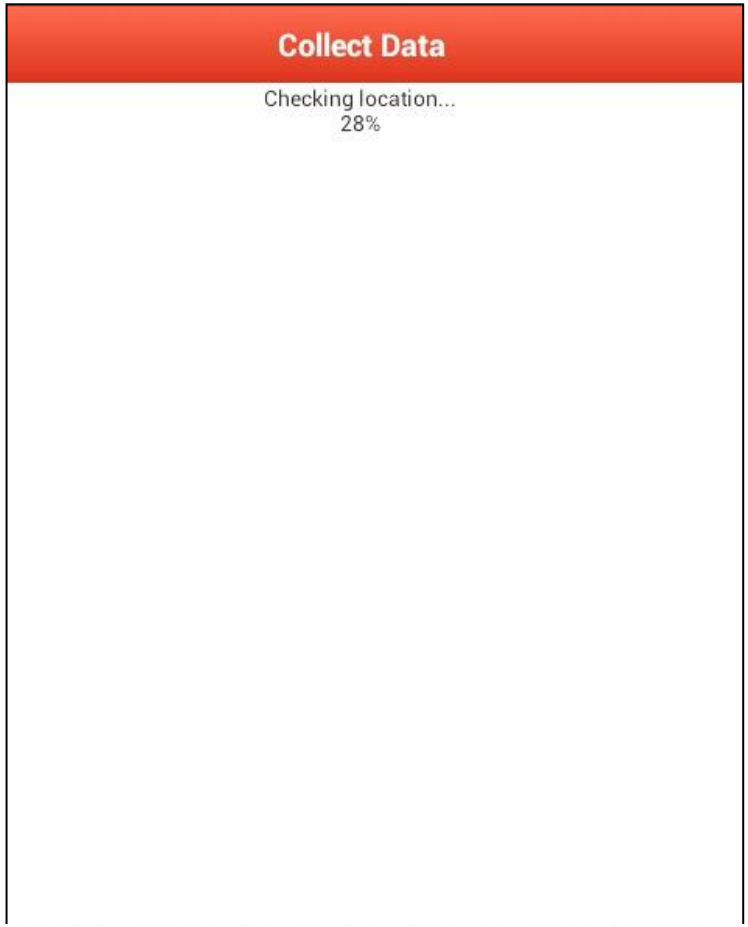
Sapelli

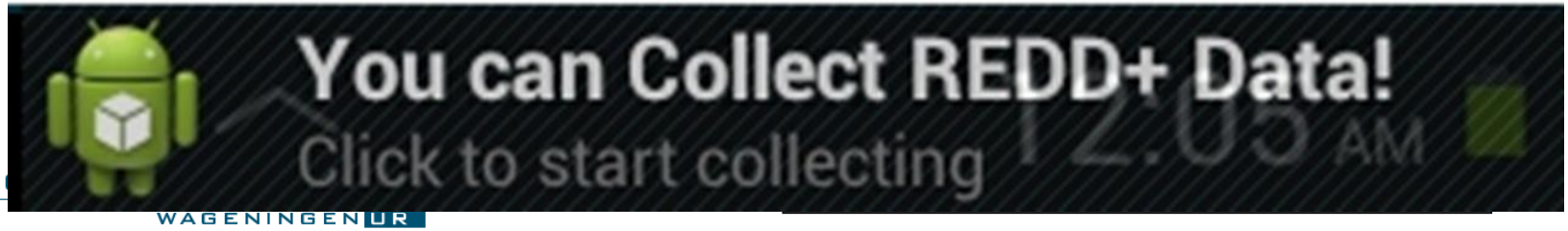


WAGENINGEN UNIVERSITY
WAGENINGEN UR

Tools for community-based monitoring

Interactive Forest Monitoring





Utility of the Tools

- Accessibility
- Ease of use
- Affordability

Study sites

Vietnam

Tra Bui

Ethnic minority

Ethiopia

Kafa

Local rangers

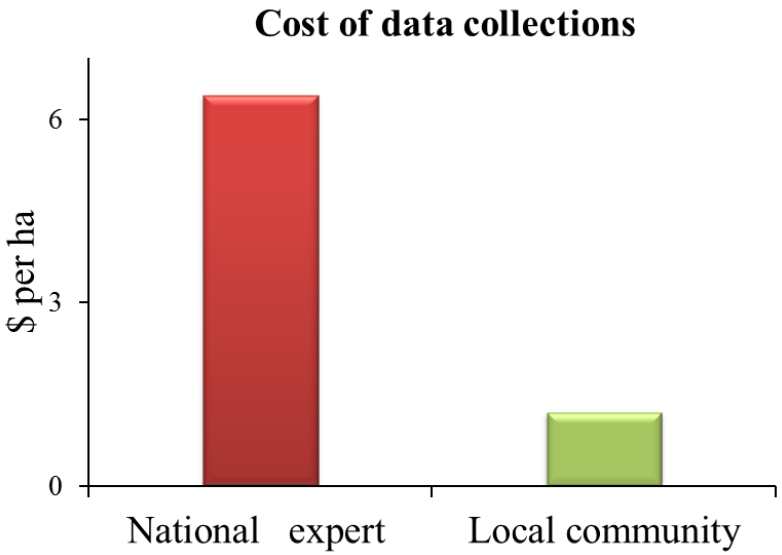
Peru

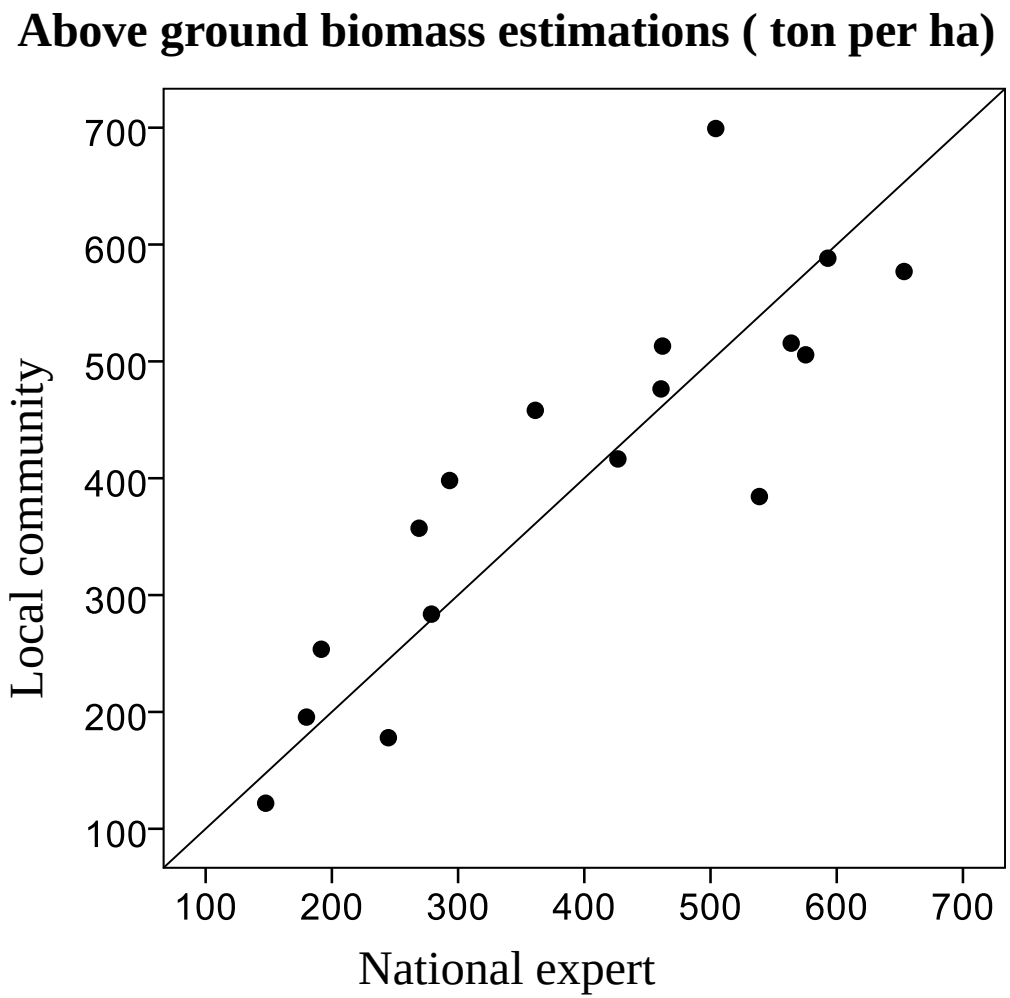
Three communities

Indigenous people

WAGENINGEN UR
For quality of life

Carbon measurement results

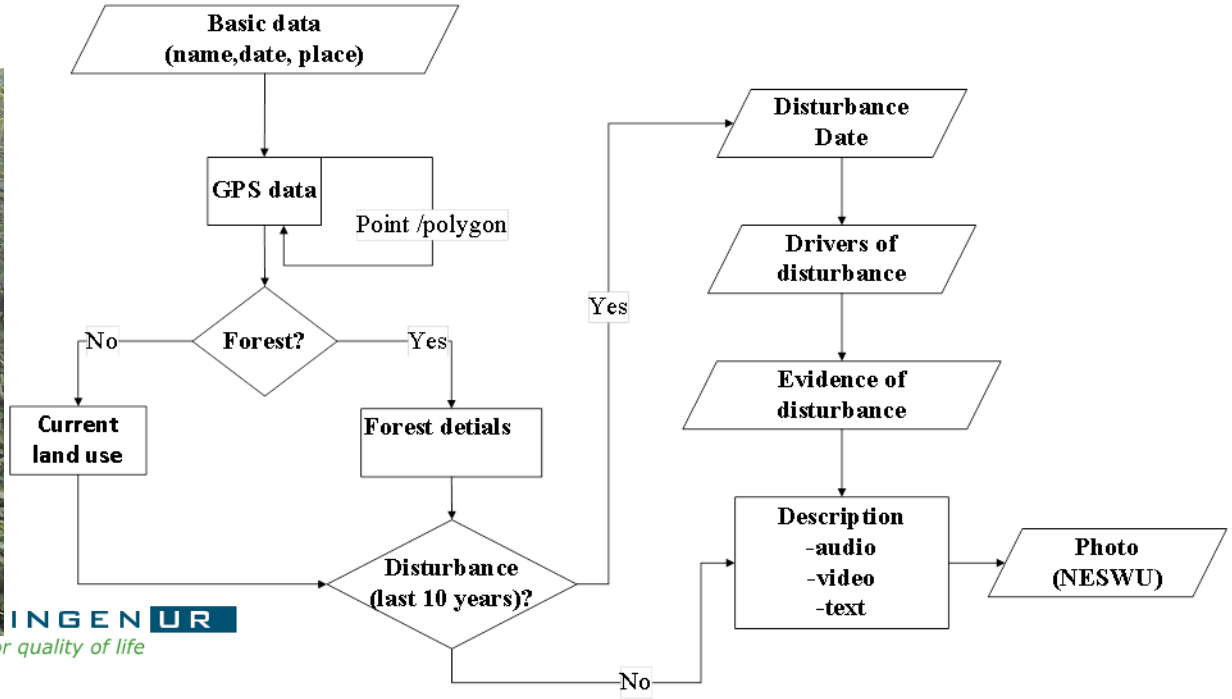




WAGENINGEN UR
For quality of life

Technical setup for forest monitoring

- Data collector : local expert
- Means of data acquisition
  - Analogy system: Paper with hand held GPS
  - Digital system : Mobile
- Systematic form design : decision based form design for Mobile device



INGEN UR
For quality of life

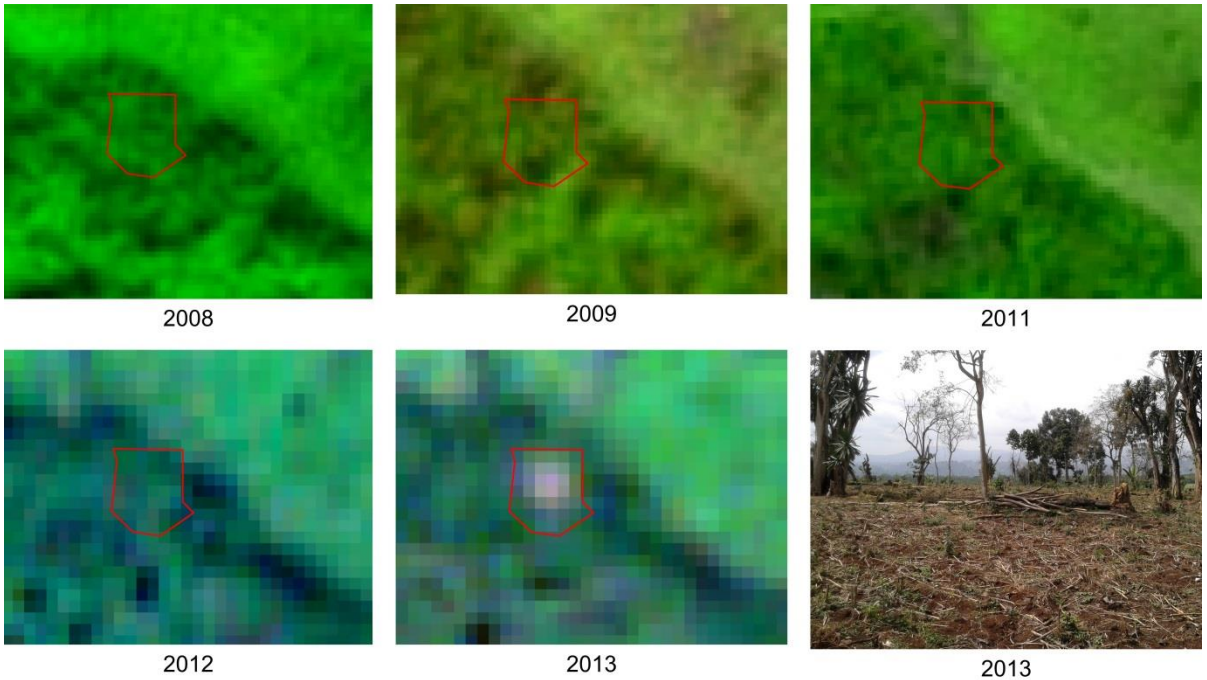
Google
Earth Engine

Overview of data management scheme

Previous **Forest Disturbance Monitoring Form** Next

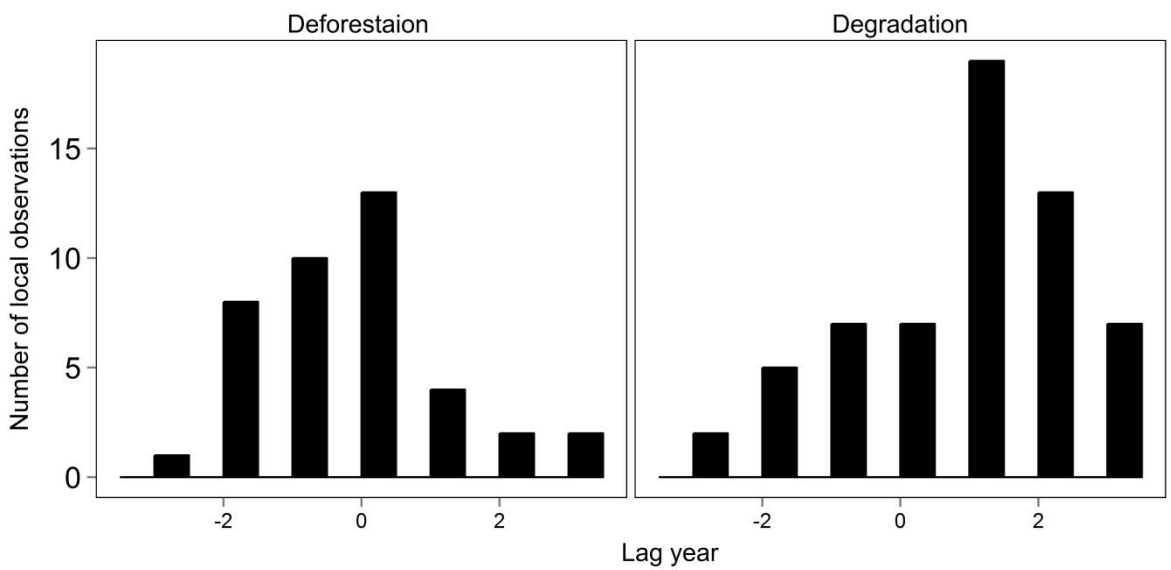
ffected	DriverOfDisturbance	is_Disturbance_No	counttree	reforestation	GeneralDescription DescriptionOfArea	GeneralDescription DescriptionAudio	TakePhoto PhotoNorth	TakePhoto PhotoSouth	TakePhoto PhotoEast	TakePhoto PhotoWeast	TakePhoto PhotoUpward
	ICOFF SETE		4	NO	generally, the areas are distrebed						
	SETE		15	NO							
	SETE		26	NO	The area is completely change into dEming Landy						
	SETE OTH		30	NO	Cultivated land with some trees remaining. Next to Tyra wetland. Maize, cattle. Sense forest to the east.						
	SETE		51	NO							
	SETE		15	NO							

WAGENINGEN UR
For quality of life



Time of Change:

How do local forest change reports compare with remote sensing based estimates?

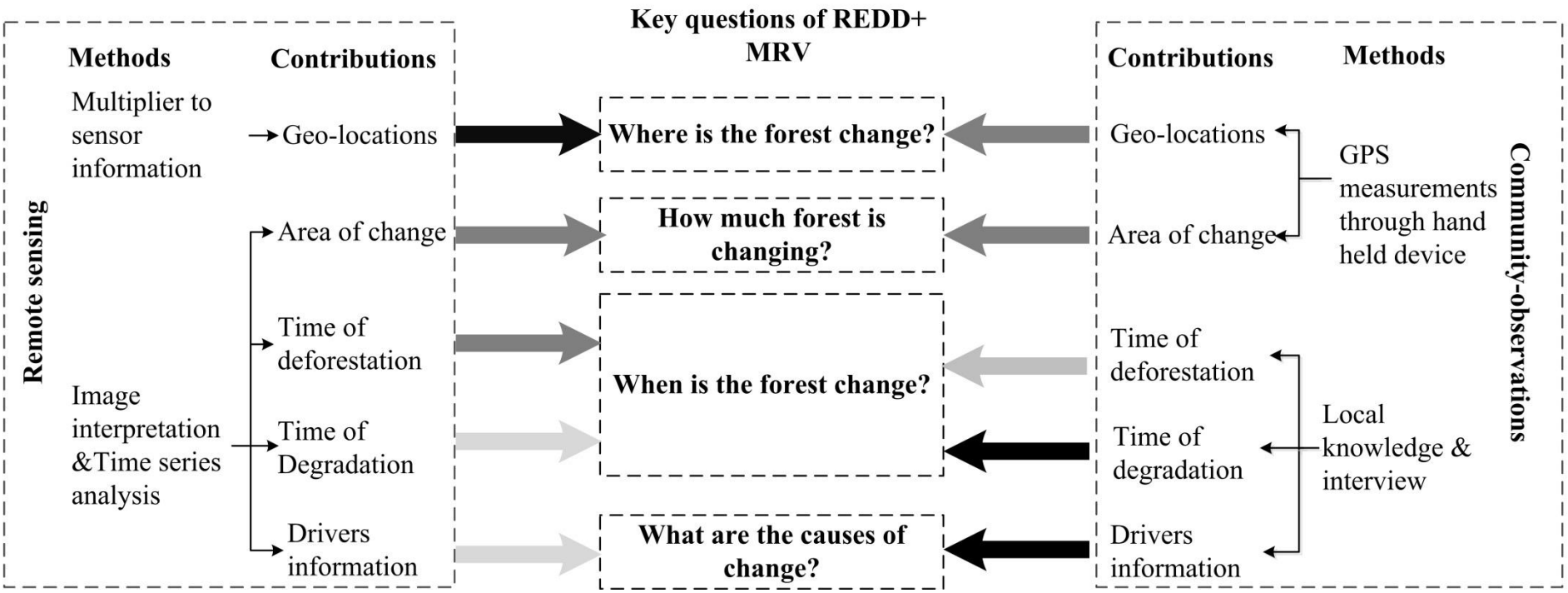


With remote sensing, we can only 'see' changes at the canopy level (limited ability to detect degradation)

However, local reports are often subject to bias, especially when changes are gradual and complex

Pratihast, A., DeVries, B., Kooistra L., de Bruin, S., Avitabile, V., Herold, M. Combining satellite data and community-based observations for forest monitoring. 2014. Forests, *In Review*.

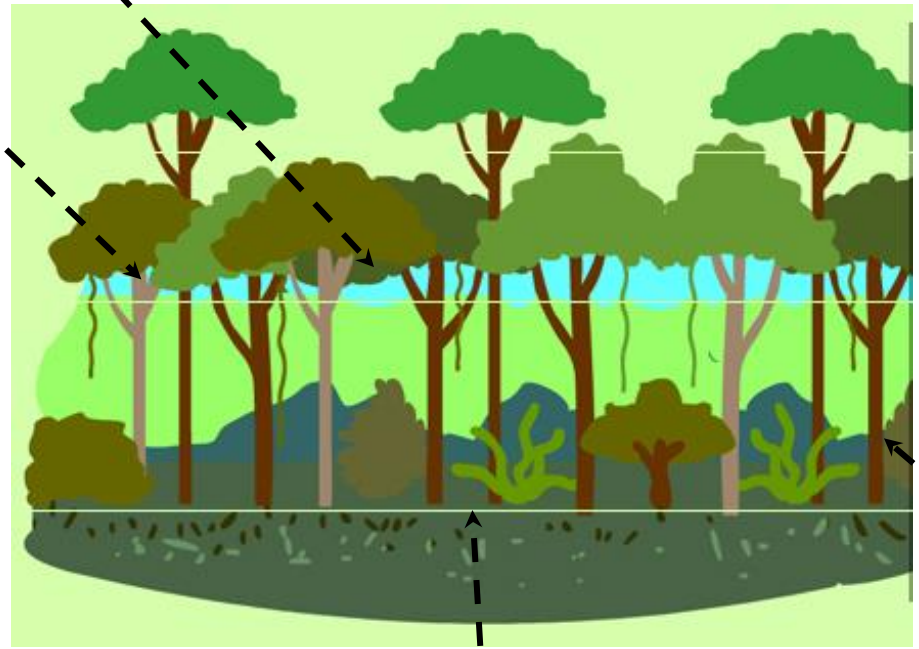
Complementarity of Data Streams



The relative strength of contribution of each data stream to the REDD+ MRV objectives is indicated by shade (dark = strong; light = limited)

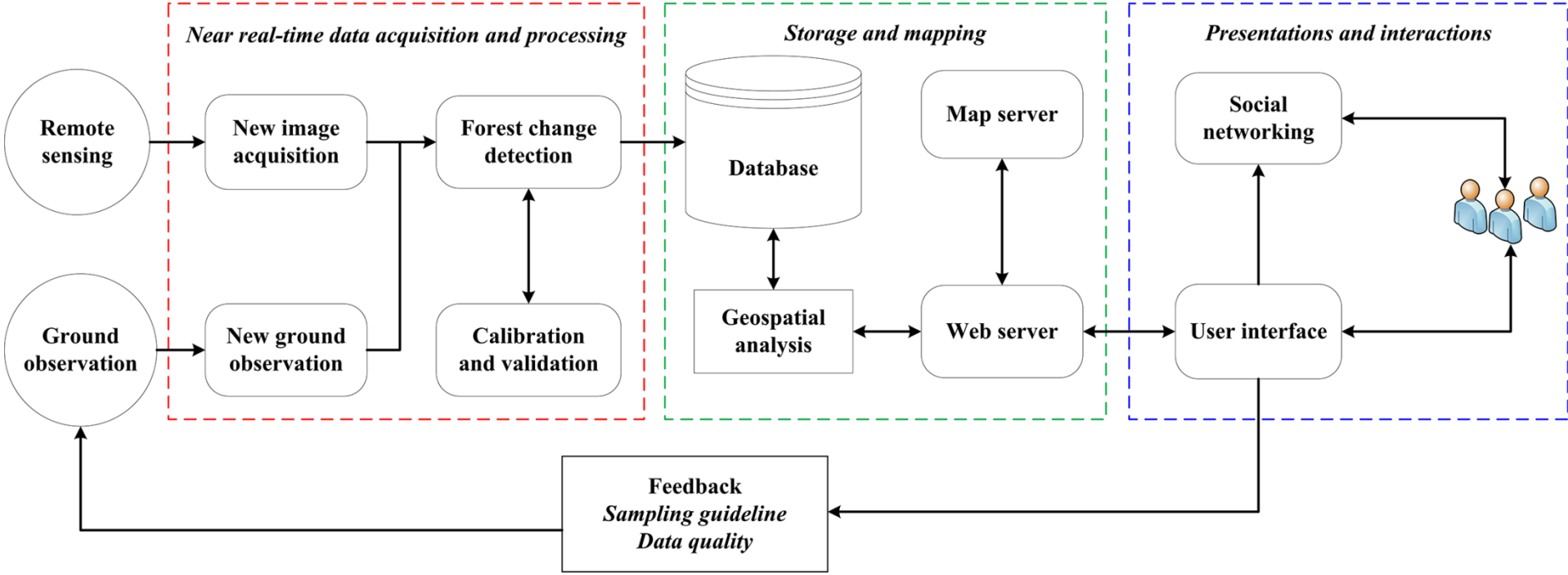
WAGENINGEN UR
For quality of life

Interactive forest monitoring system



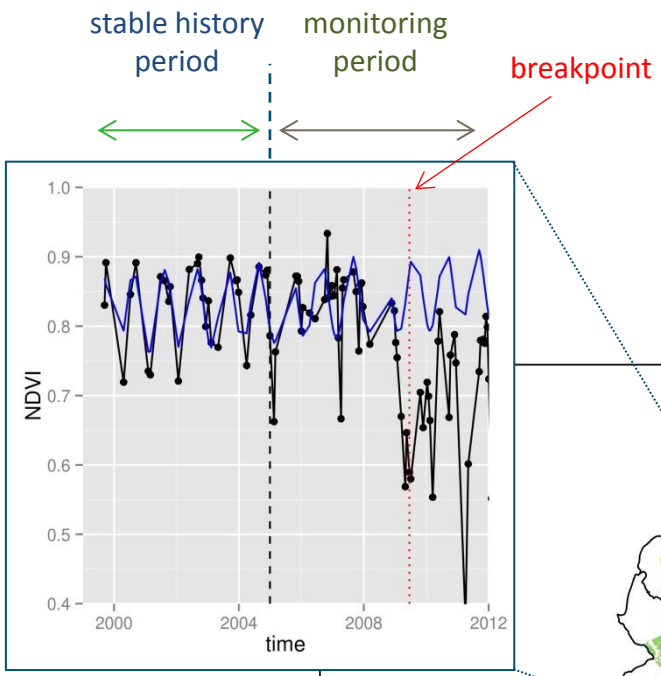
WAGENING
For quality

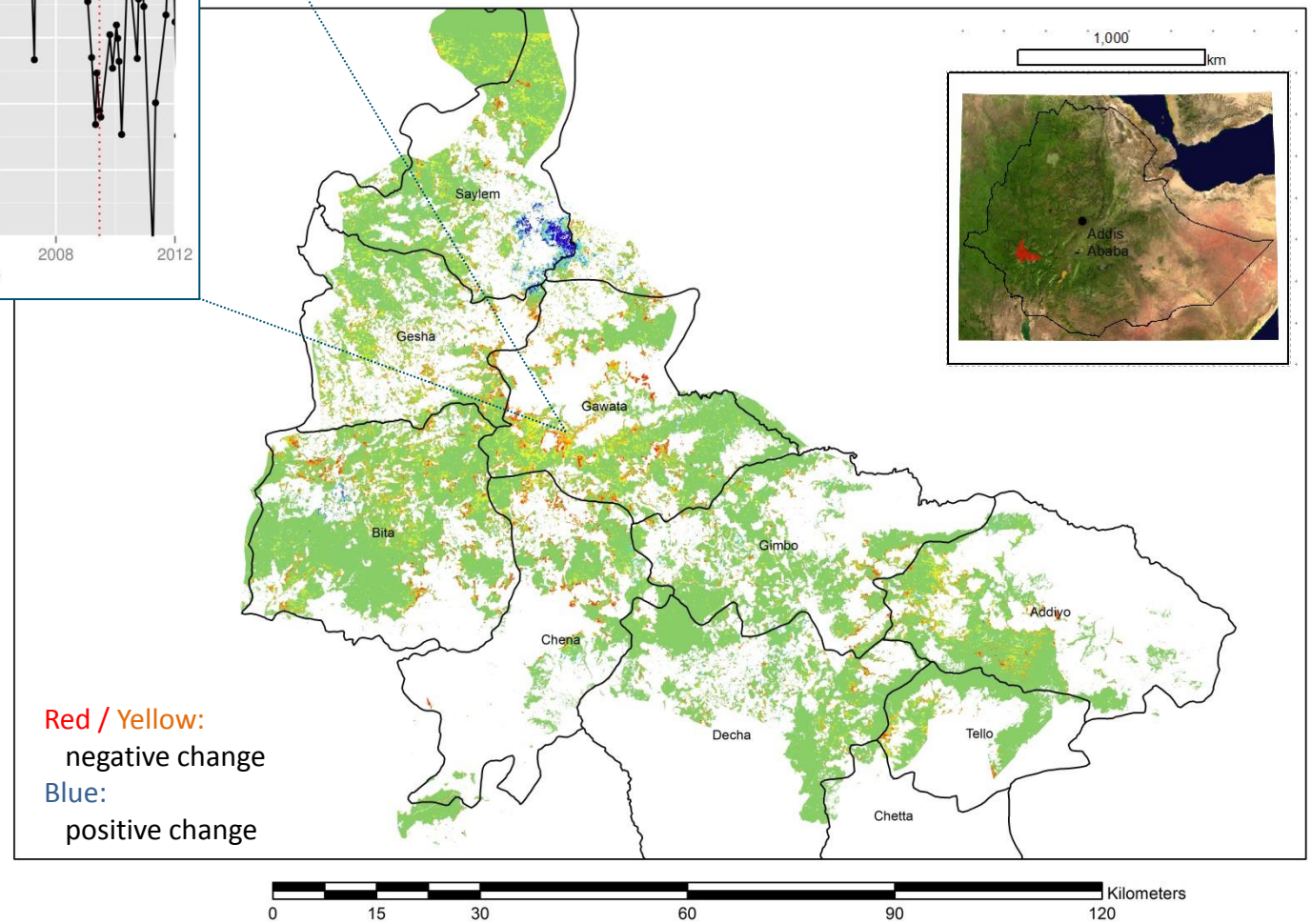
Interactive forest monitoring system



BFAST Monitor:
Breaks For Additive Season and Trend

Can we use statistical breakpoints to quantify, map and predict forest change (Activity Data)?

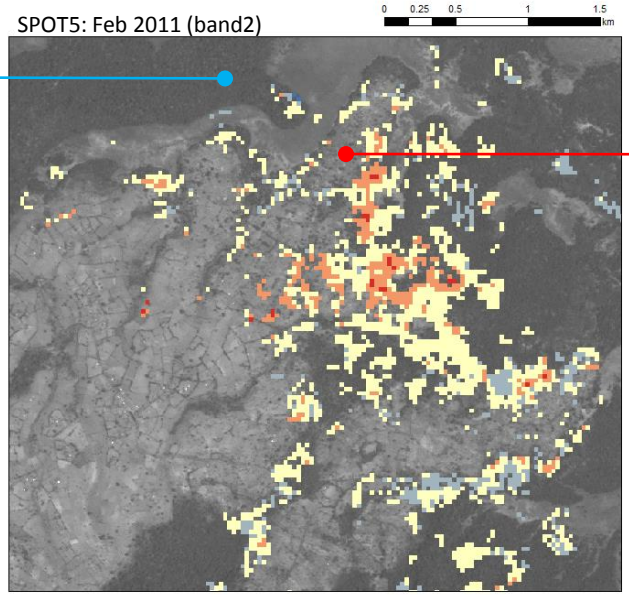




WAGENINGI
For quality

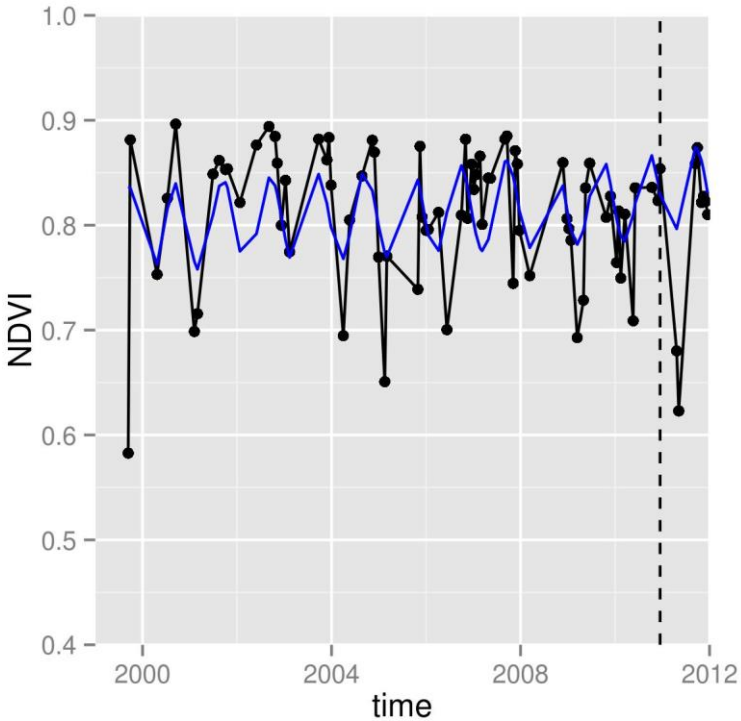
Monitoring Period:

2011-12

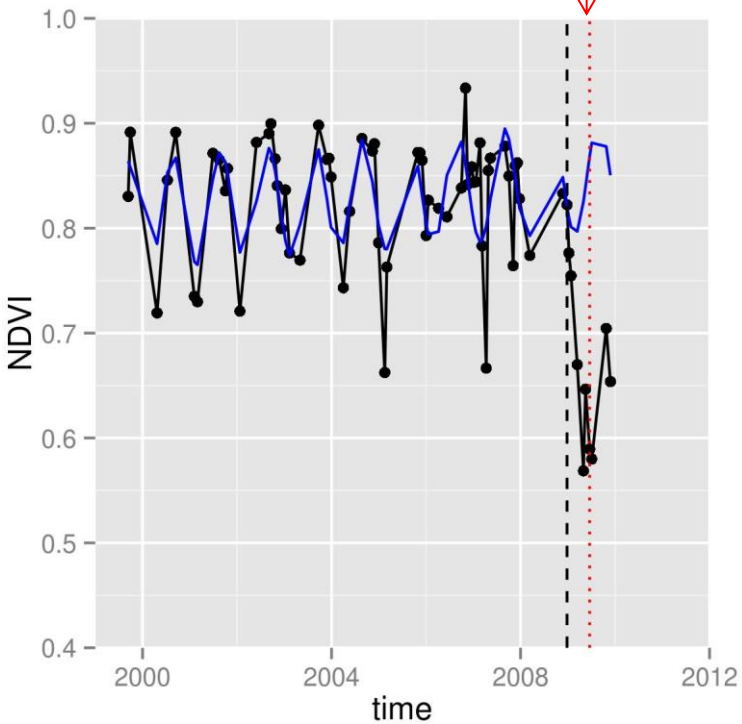


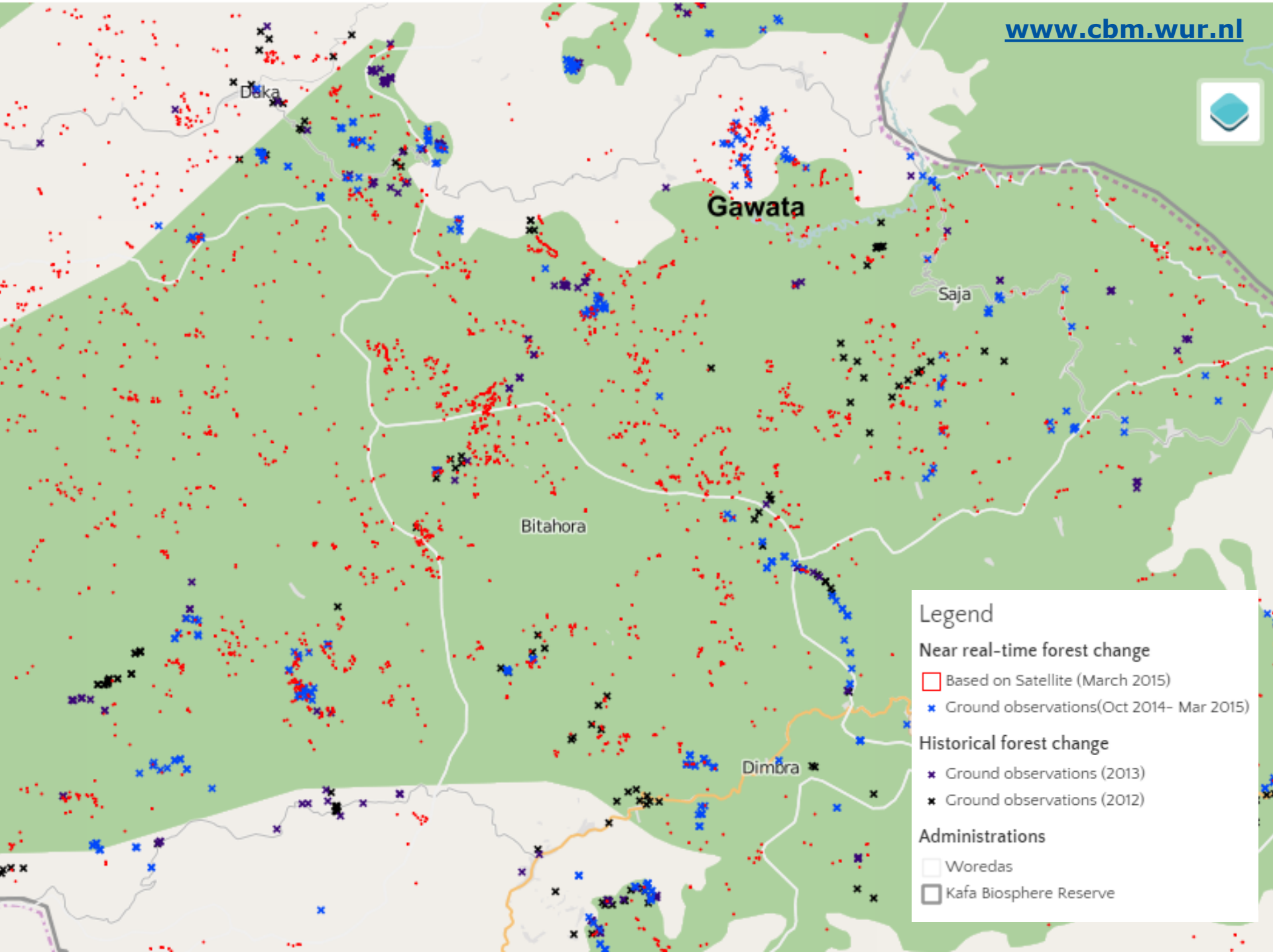
Change Magnitude

- high
- low

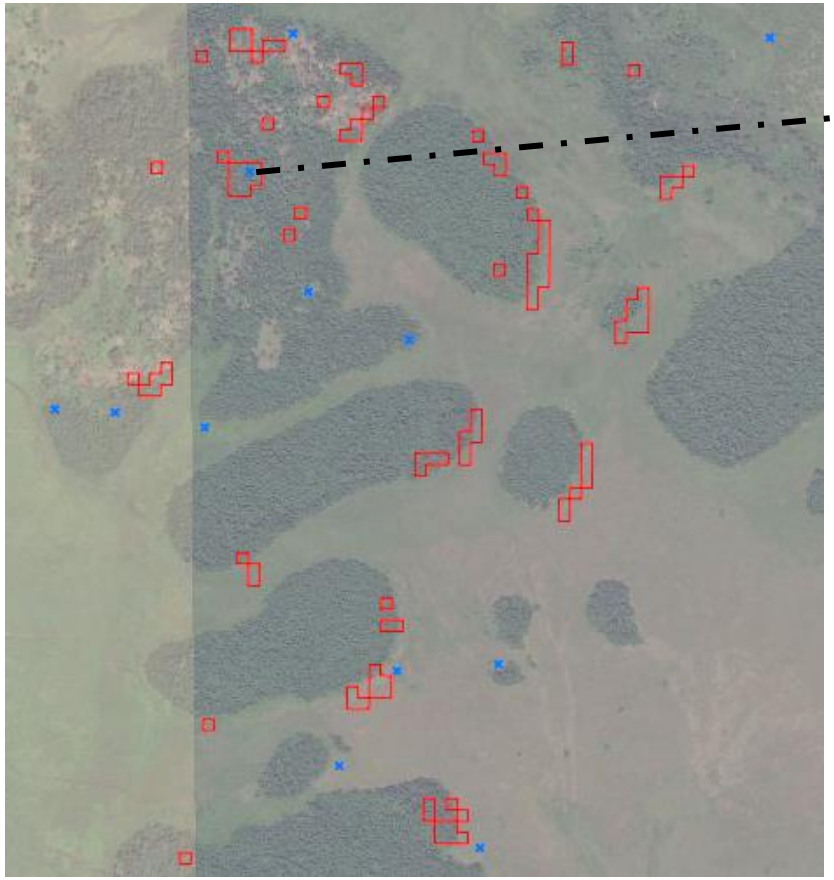


breakpoint (mid-2009)




www.cbm.wur.nl
Duka
Gawata
Saja
Bitahora
Dimbra
Legend
Near real-time forest change
Based on Satellite (March 2015)
Ground observations(Oct 2014- Mar 2015)
Historical forest change
Ground observations (2013)
Ground observations (2012)
Administrations
Woredas
Kafa Biosphere Reserve

Near real-time forest change monitoring



Ground observations photographs

Satellite based alerts (February 2015)

Ground observations

Muluken Mekuria
March 18 at 8:16am

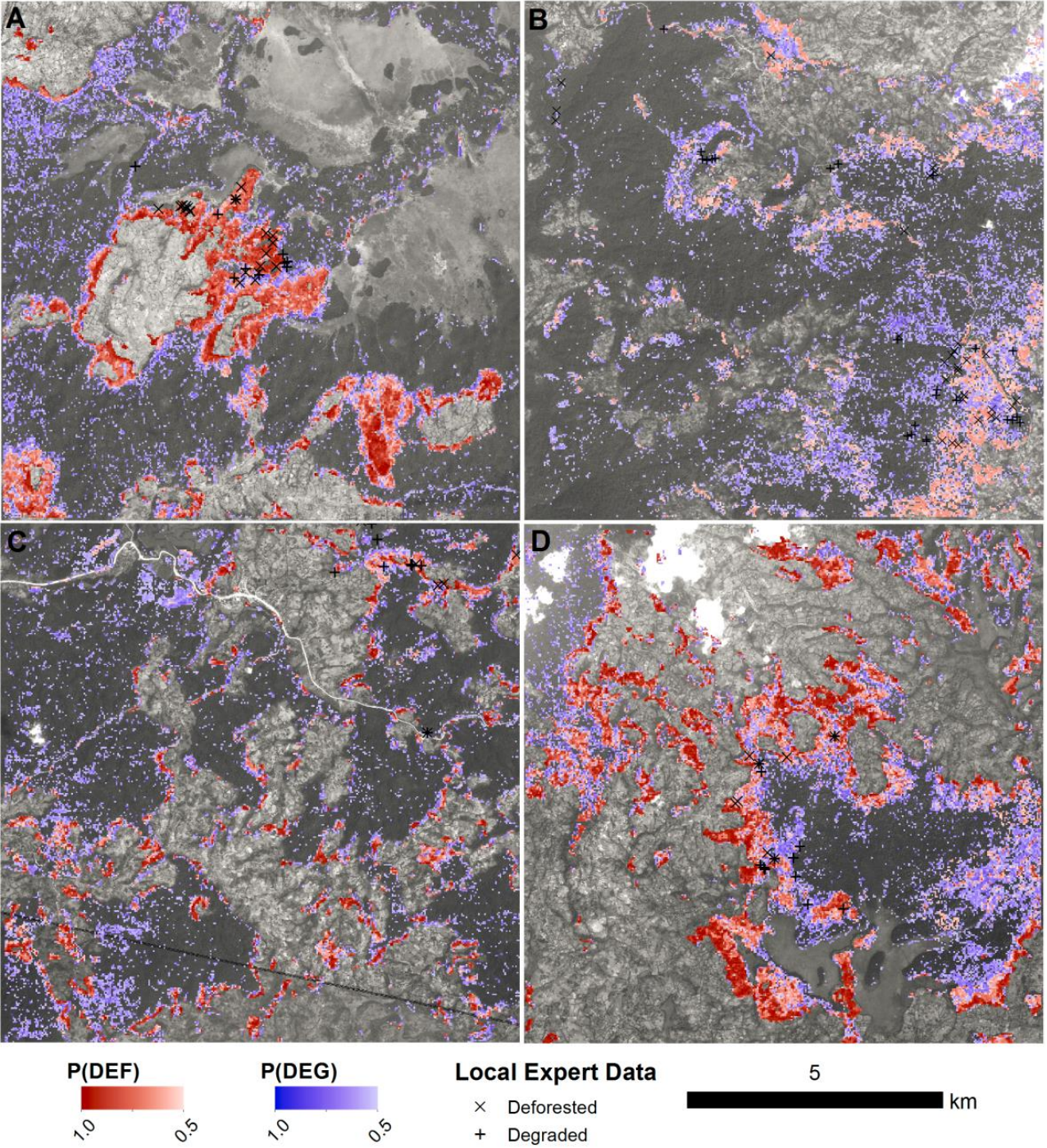
Near real time forest monitoring

Dear all/rangers

admasu did his change point last week at chomeca kebele/ far kebele of chena and he discover that there was huge fire disturbance there, so please try to visit yours as much as possible because you have your own change point on your hand

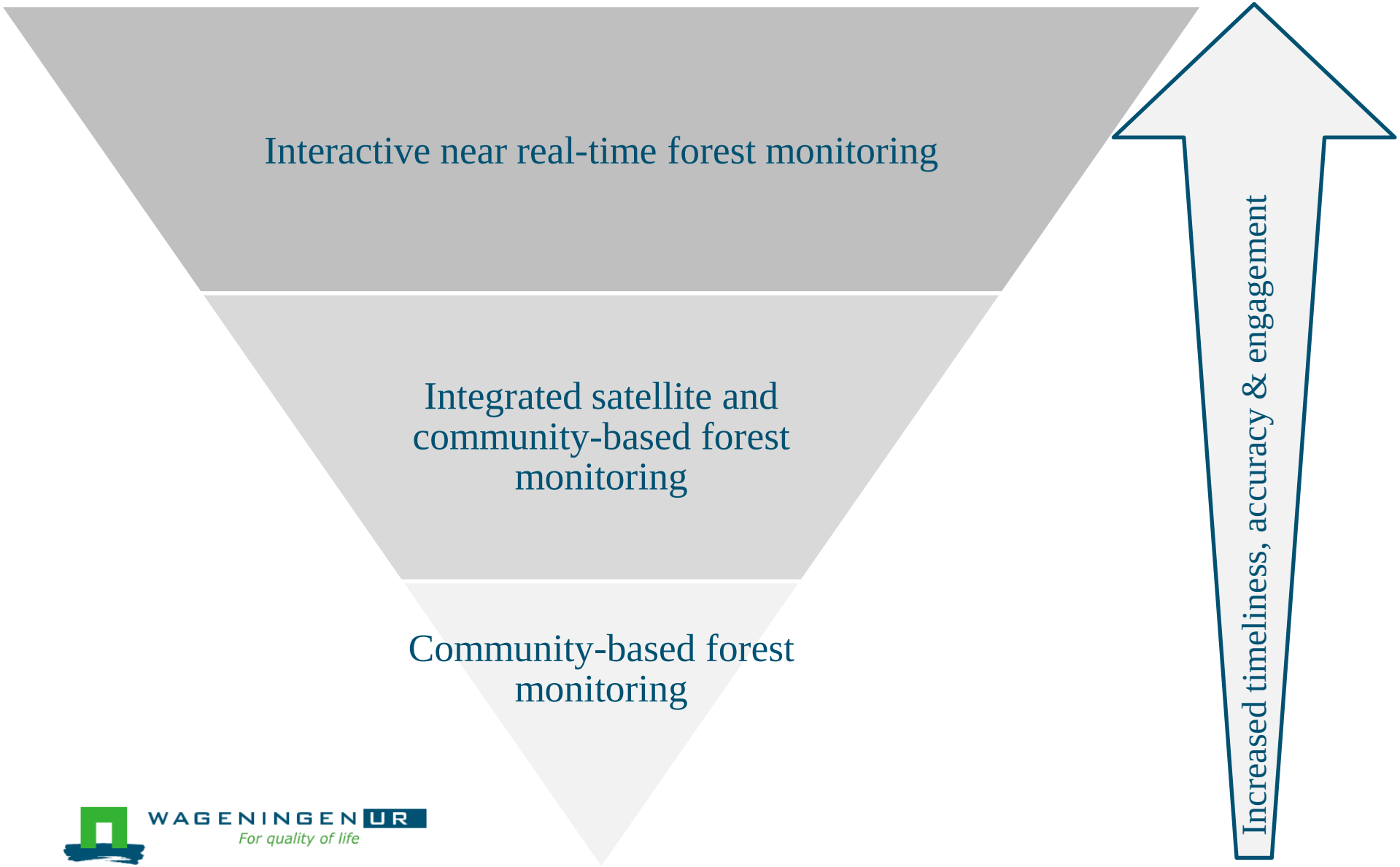
Unlike · Comment

For quality of life



Mapping Forest change using community-based monitoring data & Landsat time series

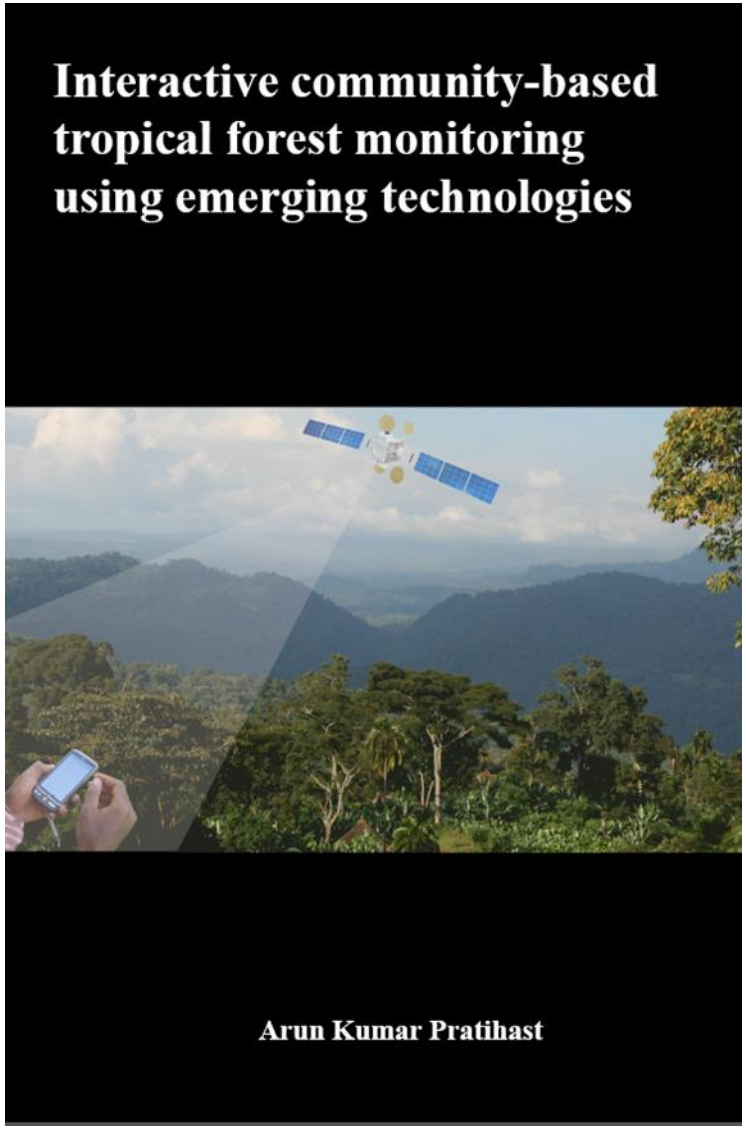
Conclusion



WAGENINGEN UR
For quality of life

Weblink

- www.wageningenur.nl/changemonitor
- www.wageningenur.nl/cbm



WAGENINGEN UR
For quality of life

Reference

- Brammer, J. R.; Brunet, N. D.; Burton, A. C.; Cuerrier, A.; Danielsen, F.; Dewan, K.; Herrmann, T. M.; Jackson, M.; Kennett, R.; Larocque, G.; Mulrennan, M.; Pratihast, A. K.; Saint-Arnaud, M.; Scott, C. and Humphries, M. M. 2016. The role of digital data entry in participatory environmental monitoring. Conservation Biology.
- Pratihast, A.K., DeVries, B., Avitabile, V., de Bruin, S., Herold, M. and Bergsma, A. 2016. Design and implementation of an interactive web-based near real-time forest monitoring system. PLoS ONE.
- DeVries, B., Pratihast, A.K., Verbesselt, J., Kooistra, L. and Herold, M. 2016. Characterizing forest change using community-based monitoring data and Landsat time series. PLoS ONE.
- Pratihast, A.K.; DeVries, B.; Avitabile, V.; de Bruin, S.; Kooistra, L.; Tekle, M.; Herold, M. 2014. Combining Satellite Data and Community-Based Observations for Forest Monitoring. Forests, 5, 2464-2489.
- Pratihast, A. K.; M. Herold; Sy, V. de; Murdiyarso, D.; Skutsch, M. 2013. Linking community-based and national REDD+ monitoring: a review of the potential. Carbon Management 4(1): 91-104.
- Pratihast, A.K.; Herold, M.; Avitabile, V.; de Bruin, S.; Bartholomeus, H.; Jr., C.M.S.; Ribbe, L. 2013. Mobile Devices for Community-Based REDD+ Monitoring: A Case Study for Central Vietnam. Sensors, 13, 21-38.

Thank you for your attention!

Arun Pratihast

arun.pratihast@wur.nl

Laboratory of Geo-Information Science and Remote Sensing (GRS)

Wageningen University

http://www.grs.wur.nl

WAGENINGEN UR
For quality of life

Types of community-based monitoring

1. Autonomous local monitoring with no formal affiliations with professional scientists
2. Collaborative monitoring with local data interpretation, where local stakeholders are involved in data collection, interpretation, or analysis, and management decision-making, although external scientists may provide advice and training
3. Collaborative monitoring with external data interpretation, where local stakeholders are involved only in data collection and decision-making emanating from the monitoring
4. Externally driven monitoring with local data collectors, where local stakeholders are only involved in data collection (commonly called citizen science)
5. Externally driven, scientist - executed monitoring, where external scientists manage all aspects of the project and local stakeholders are not involved.

(Danielsen et al.'s 2009, 2014)