How Can Forest Monitoring Improve Forest Outcomes for Development Investments?

Karyn Tabor

University of Maryland Baltimore County
Conservation International

BIC Bank Information Center

March 2019

Outline

- Forests' importance and relationship with development
- Review of forest monitoring tools
- Review use of forest monitoring tools by the World Bank
- Recommendations for better integration of tools
- Discussion on opportunities for tool use for development projects

Forests: why do we care?

- Depended on by **1.6 billion people** globally as sources for fuel, building materials, medicine, and food
- Generate **billions of dollars** in revenues (building materials, pharmaceuticals, paper)
- Contain **80%** of terrestrial biodiversity
- Store **45%** of the world's terrestrial carbon
- Influence availability and quality of **freshwater**
- Enhance both ecological and social **resilience** to climate change
- Health & recreation!

Threats to forests

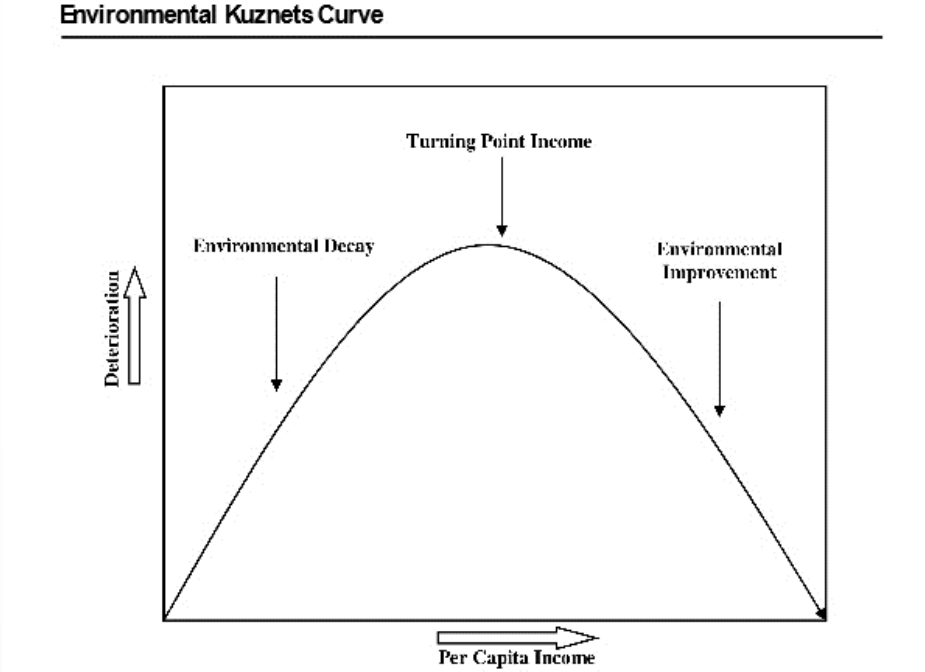
- Deforestation rates remain high
  - 240 M ha natural forest area (6%) lost between 1990-2015
- 47% of deforestation directly driven by commodities & energy
  - soy, palm, timber, beef, mining, energy infrastructure
- 33% local/subsistence agriculture

Ambitious global goals for sustainable development

- Conservation and development actors have adopted a suitable-use model for forests
  - "+" in REDD
  - UN Sustainable Development Goals
    - Sustainable development requires "decoupling economic growth from environmental degradation" (SDG 8)

How to decouple economic growth from environmental degradation?

- Complex relationship between development and deforestation



How to decouple economic growth from environmental degradation?

- World Bank's Forest Action Plan
  - Aims to increase sustainable management of forests more fully into development decisions by
    - Increasing in direct support for forest programs
    - Mainstreaming forests so that they are taken fully into account in other sectors

How to decouple economic growth from environmental degradation?

- Understand the dynamics between development and forest cover change
  - measure landscape condition and extent
  - detect and quantify changes
  - understand long-term trends

Forest Monitoring Tools

- Explosion of tools in the past decade
  - Advances in computing capacity w/cloud computing
  - Free and open-source data and software
  - Diverse set of tools
    - Accurate quantification of forest change
    - Timely alerts to forest disturbances

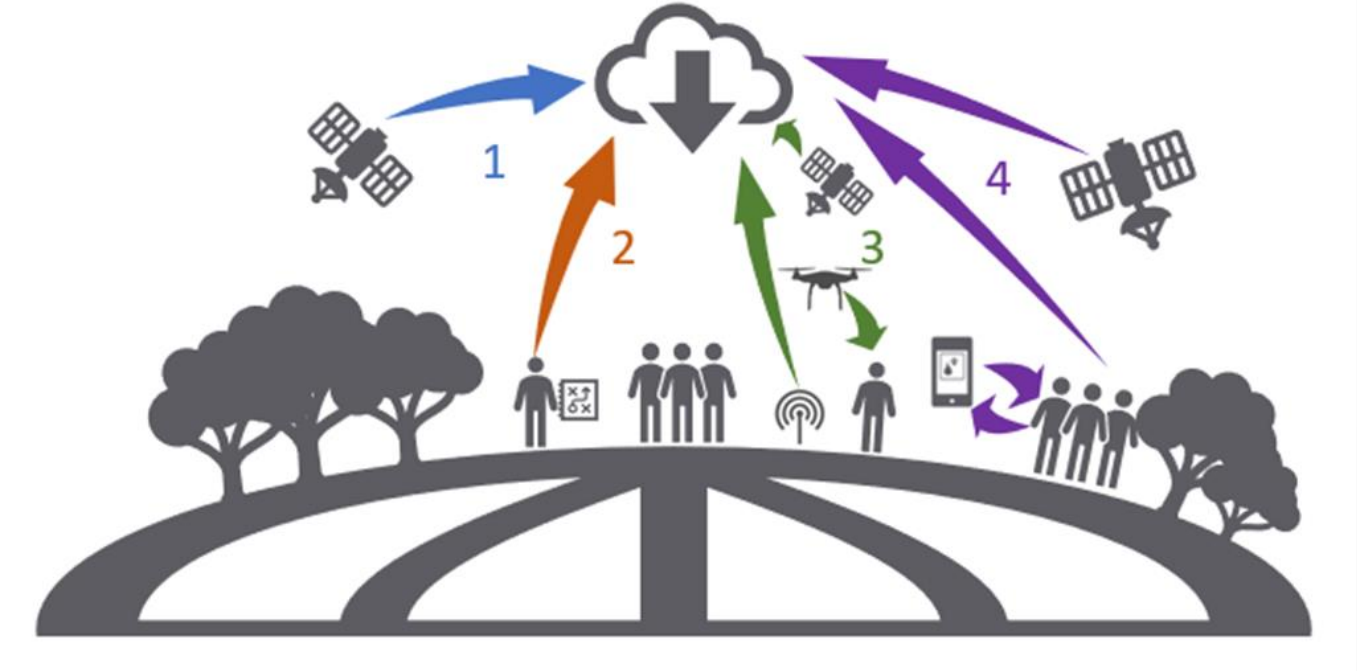
Forest Monitoring Tools

1) Top-down approach
   - Satellite remote sensing

2) Bottom-up approach
   - Community-based monitoring

3) Integrated approach
   - Satellite and ground-based monitoring

4) Interactive approach
   - Satellite and community-based monitoring + social



Top-down

Top-down approaches to Forest monitoring

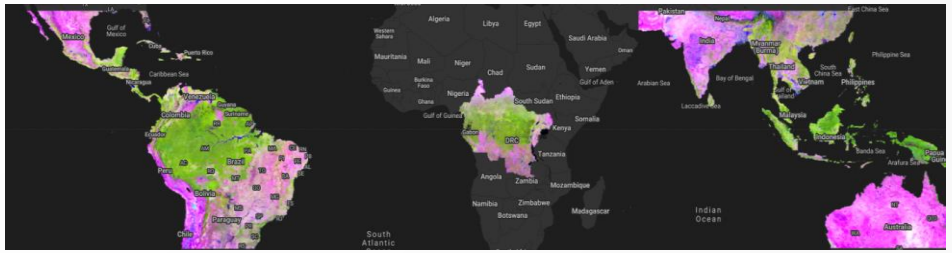
- 1) Near real-time (NRT) Early Warning Systems
  - dozens of global, regional, and national systems
    - Active Fire detection
    - Fire danger forecasting
    - Forest disturbance

Top-down

Near real-time (NRT) Early Warning Systems

- Advanced Fire Information System (AFIS) - CSIR South Africa
  - Active fire alerts (email, mobile)
  - 30-minute latency

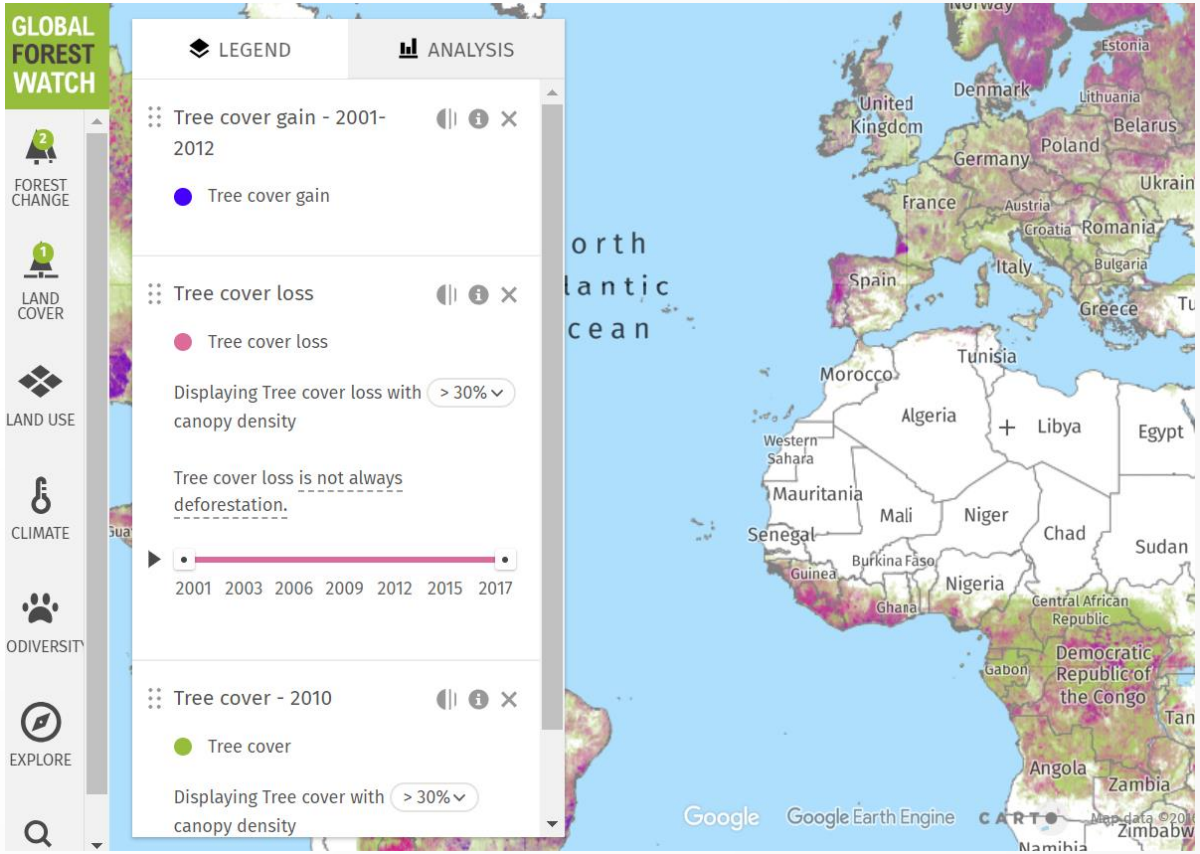
- Global Land Analysis and Discovery (GLAD) alerts - UMD
  - 30-m forest disturbance
  - 16-day latency



Top-down

Top-down approaches to Forest monitoring

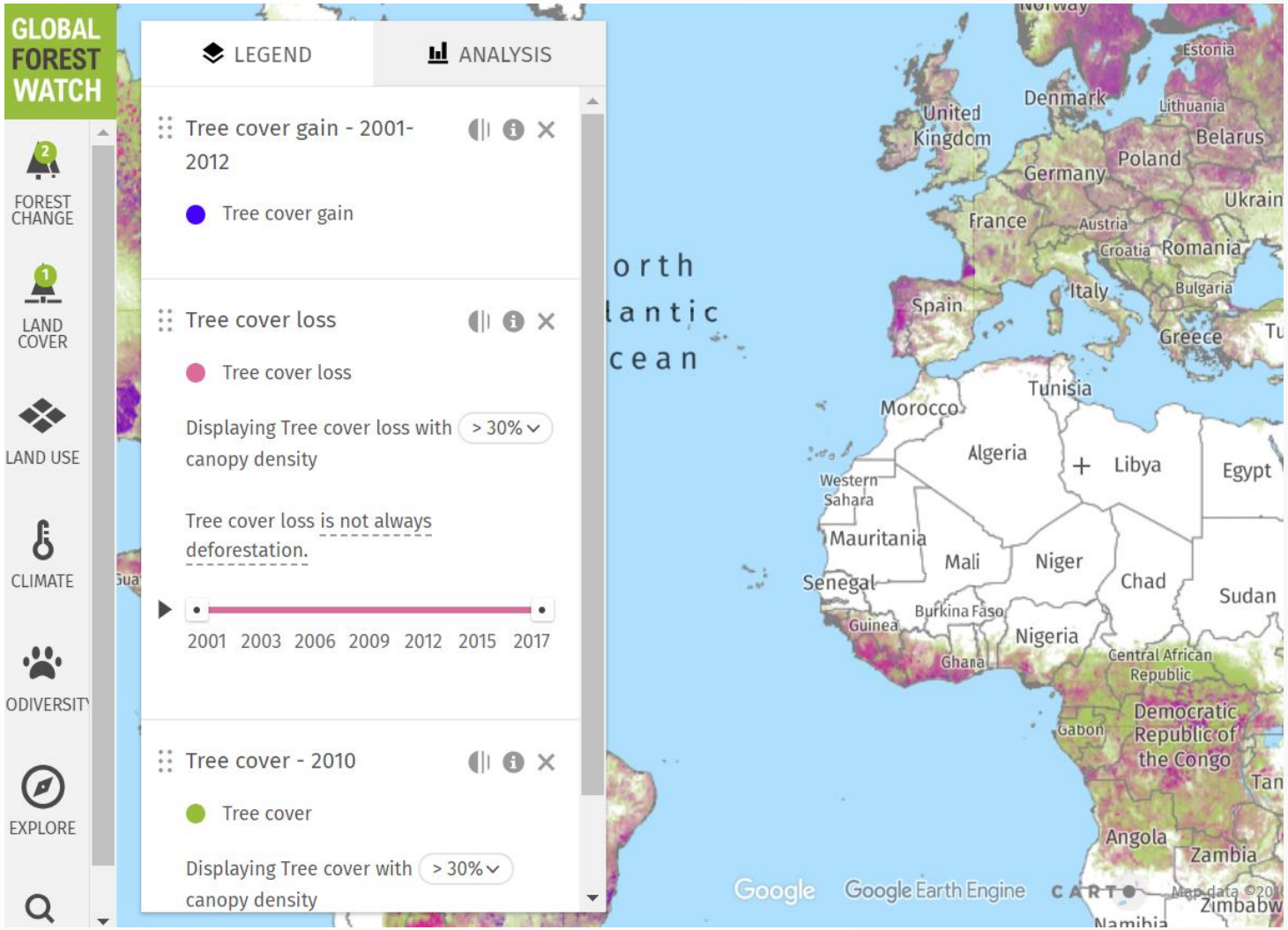
- Quantitative Monitoring
- Forest cover and change
  - Hansen et al. (2013) forest cover and change data
  - National Forest Monitoring Systems that use satellite methods for MRV



Top-down

Quantitative Monitoring

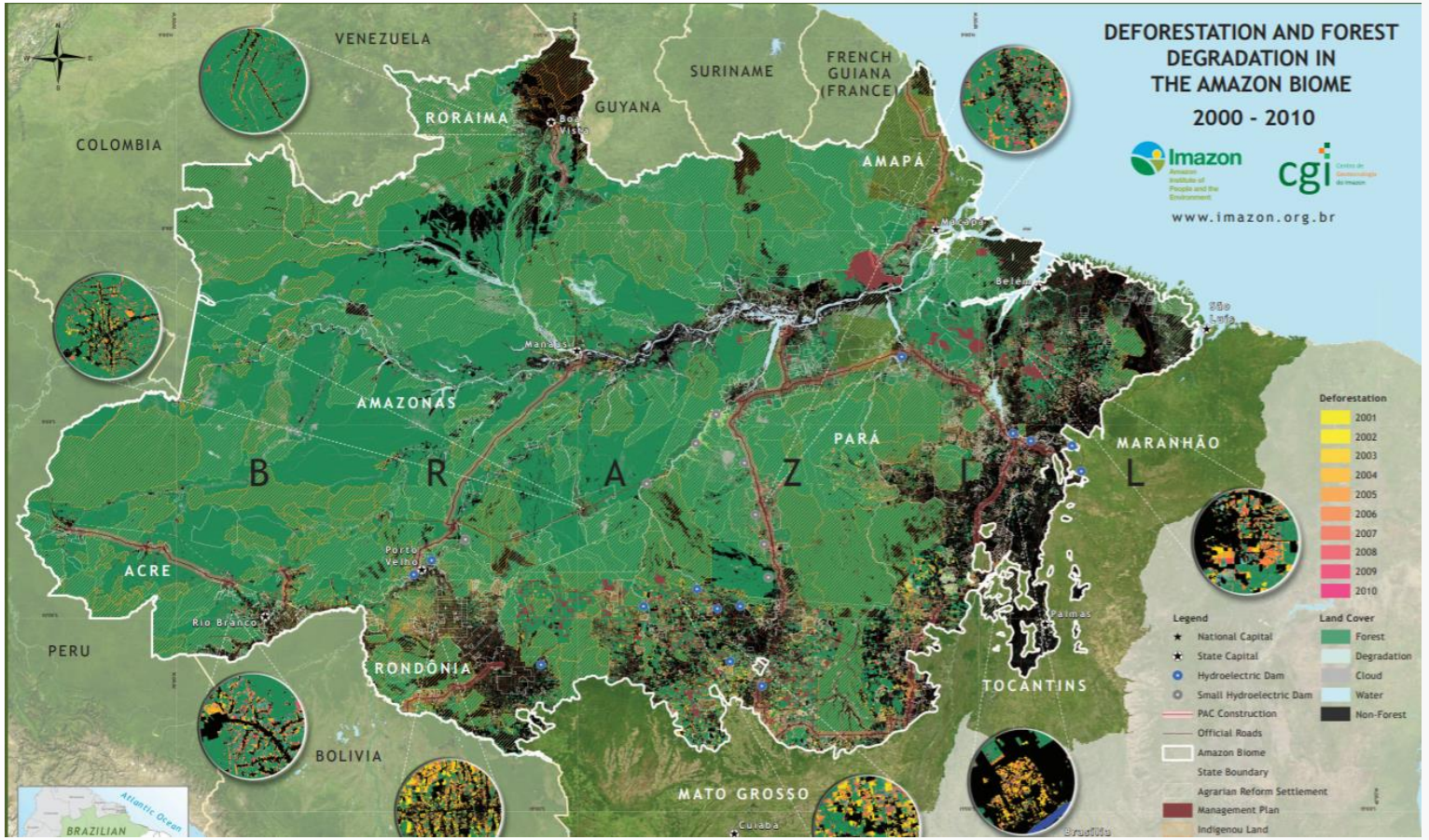
- Hansen et al. (2013) forest cover and change data
- National Forest Monitoring Systems that use satellite methods for MRV



Top-down

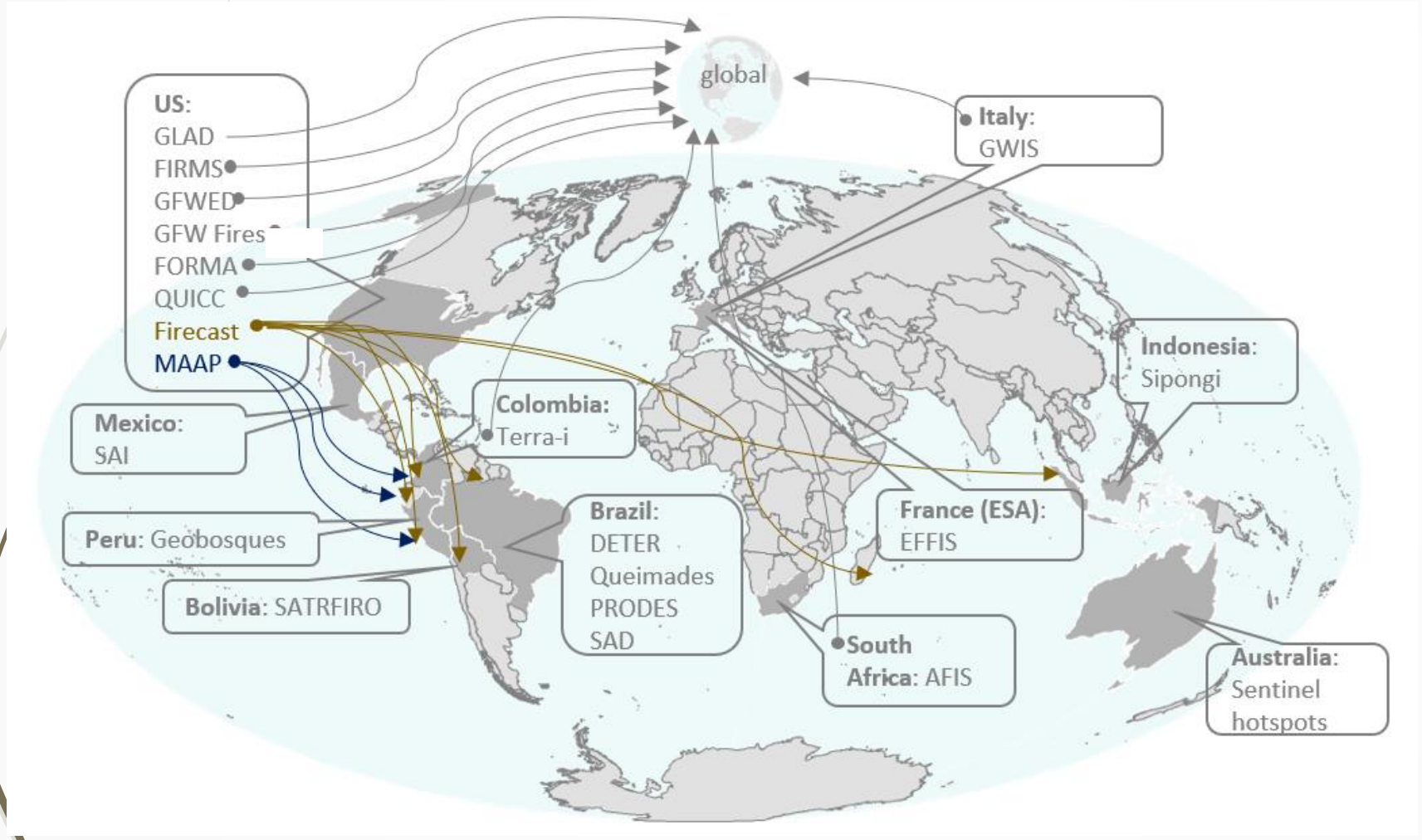
Quantitative Monitoring

- Forest degradation
- DEGRAD- Deforestation and Forest Degradation in the Amazon Biome - IMAZON



Top-down

Top-down approaches to forest monitoring (22 & counting!)



Bottom-up

Bottom-up approaches to Forest monitoring

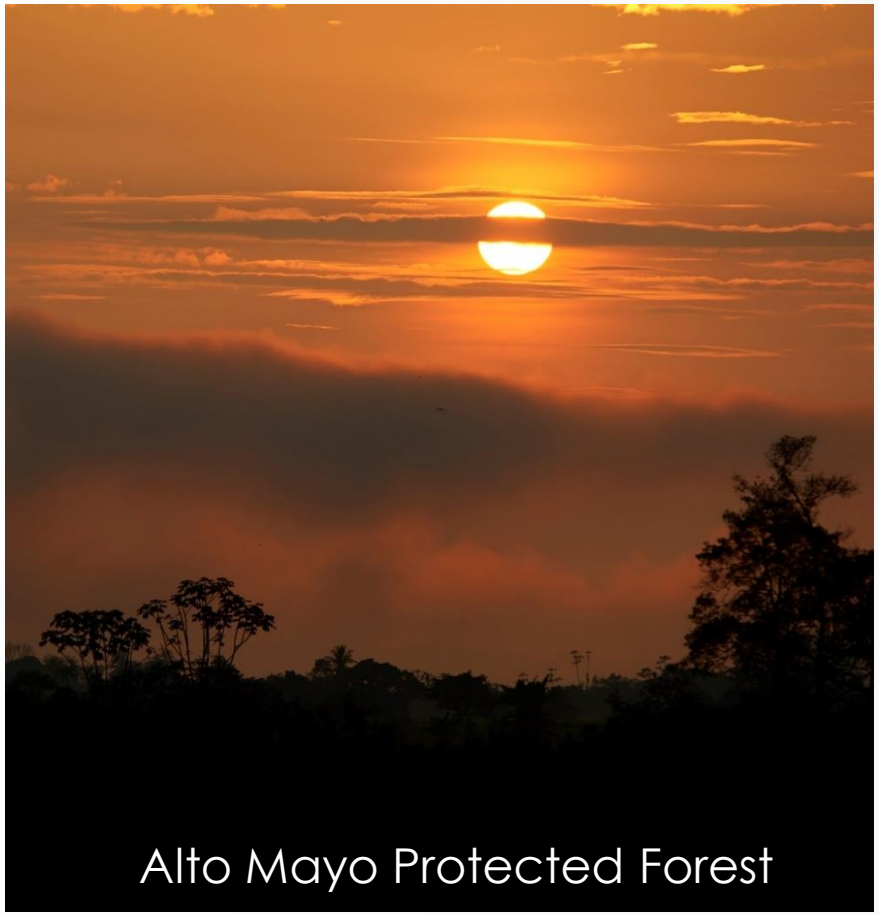
- Community-based monitoring– Engaging local communities and indigenous groups in monitoring
  - Can monitor deforestation and degradation
  - Mobile apps for field data collection

Integrated

Integrated Forest Monitoring

- Collects monitoring information from satellites and ground observations
- In-situ sensors (i.e., acoustic, weather stations, camera traps)
- Field data collection

FIRECAST



Interactive

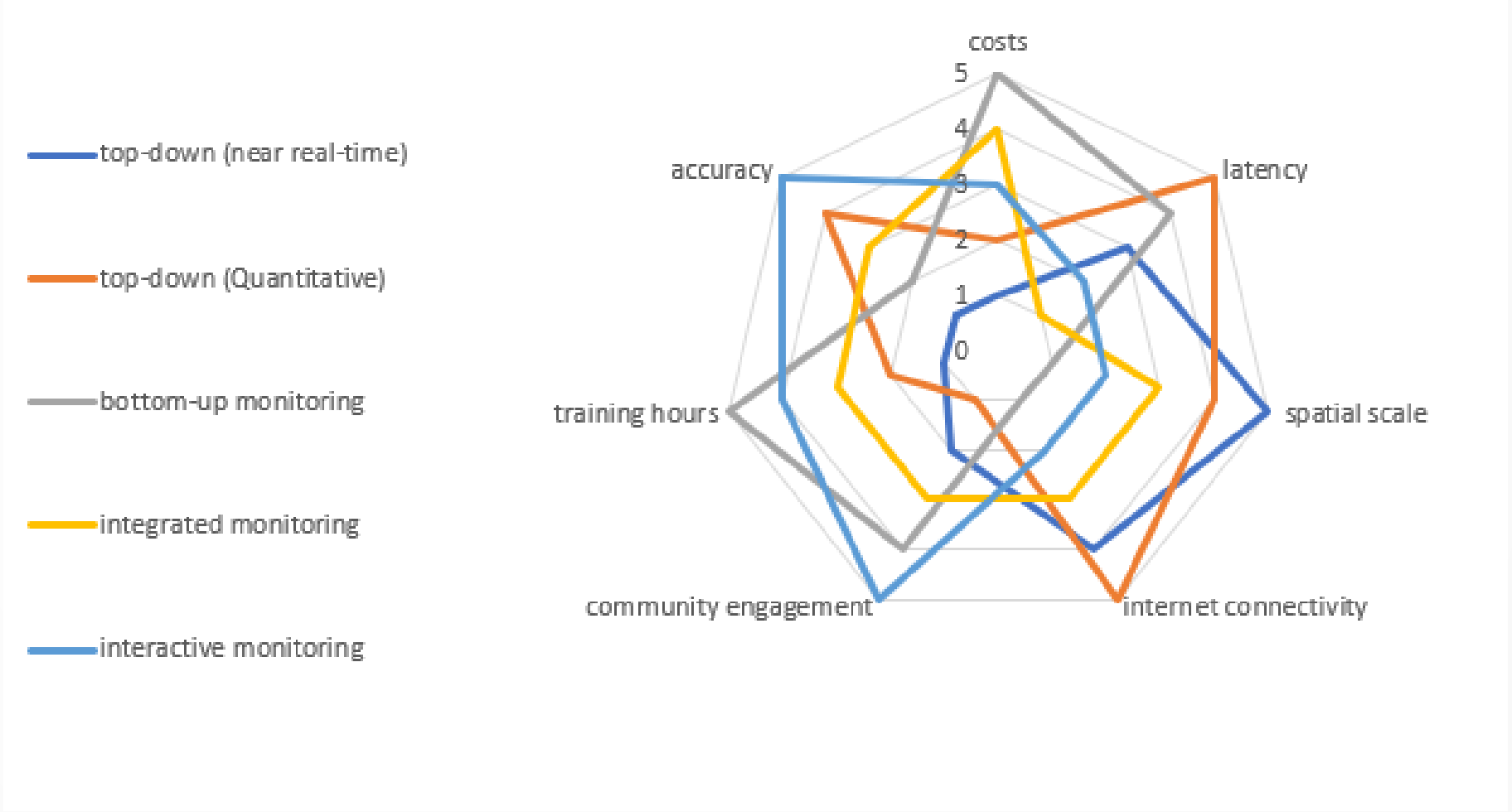
Interactive Forest Monitoring

- Collects monitoring information from satellites and ground observations
- Post to website and social media
- Social media is a feedback initiate ground monitoring

Pratihast (2016)

WAGENINGEN
UNIVERSITY & RESEARCH

Characteristics of Forest Monitoring Approaches

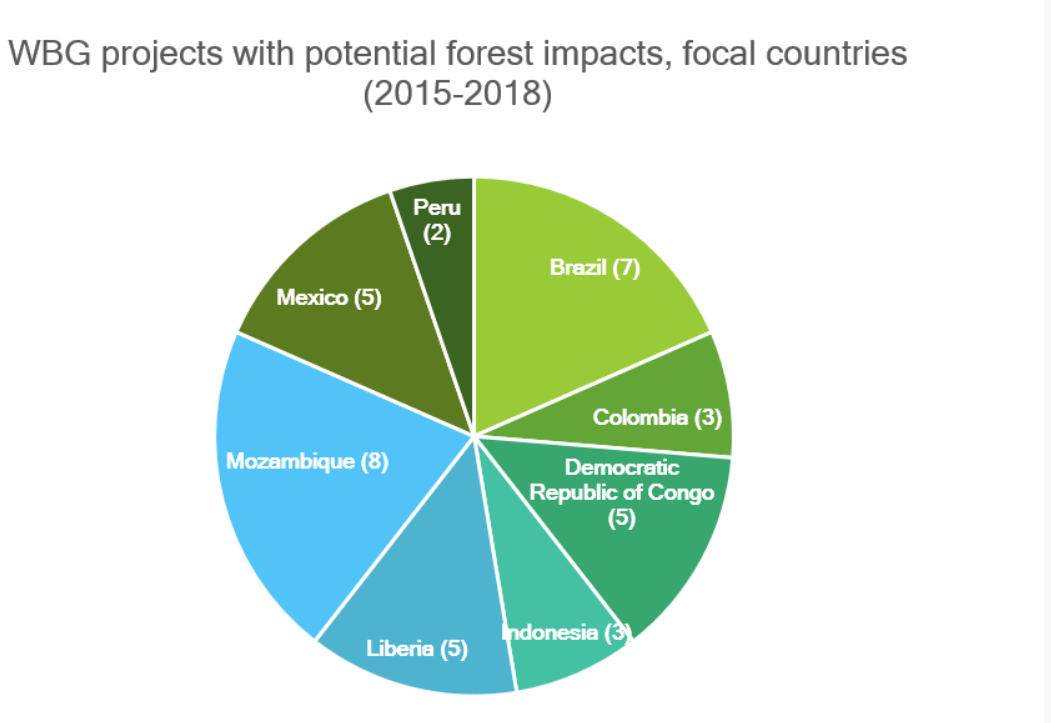


WORLD BANK GROUP

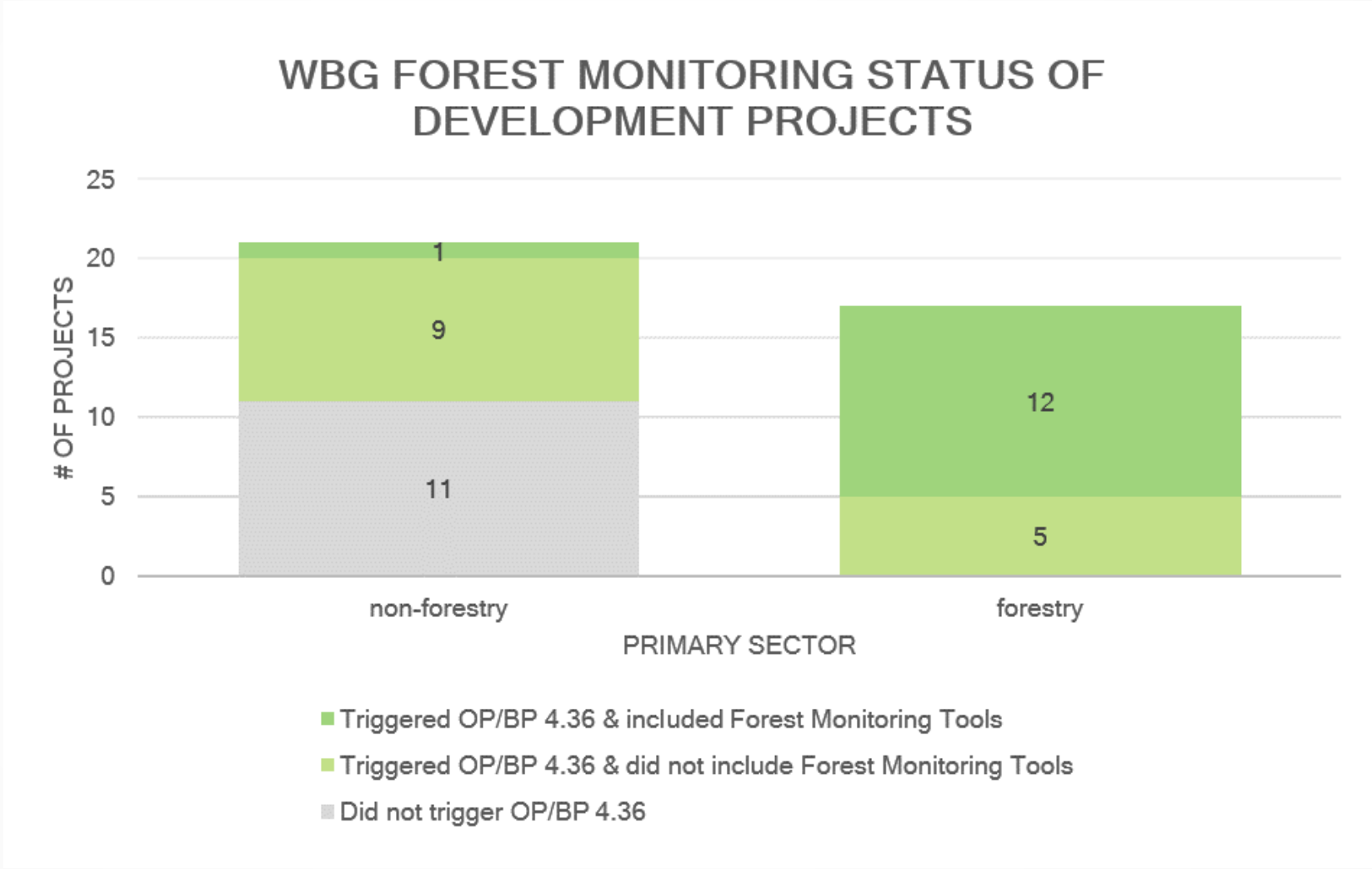
Review results of study on the use of forest monitoring tools by the World Bank

Methods & Results

- Focused on Brazil, Colombia, DRC, Indonesia, Mexico, Mozambique, Peru
- Searched WB database for forest monitoring tools
  - Found 38 projects in total that met search criteria



Methods & Results



Top-down

Platform of Monitoring and Warning of Forest Fires in the Cerrado (Brazil)

- INPE 2014-2017 ($1.1 M –WB TA)
- Problem: only 55% of the Cerrado Biome remains due to conversion to agriculture and pasture
- Objective: mitigate climate change in the Cerrado Biome by improving policies and practices for natural resources management
- Activities:
  - promote environmental regularization of landholdings;
  - prevent, combat, **monitor** and early detection of forest fires
    - monitoring, analysis and early detection of fires with **TERRA-MA-Queimadas**
  - enhance capacity of the MMA and States to establish integrated forest-fire management and landholding registration
- Results:
  - carbon stored 1.40-1.74 tCO_2/ha/year
  - Potential reduction of 20 years for Cerrado is 8.15–9.97 million tCO_2/hectare

Top-down

Platform of Monitoring and Warning of Forest Fires in the Cerrado (Brazil)

- Successful application of TA to fund the enhancement of an existing system for a specialized or expanded application

Top-down

Sustainable Productive Landscapes Project (Mexico)

- Mexico 2018 - (ongoing)
- Only development project that mentioned forest monitoring tools
- Objective: strengthen sustainable management of productive landscapes and increase economic opportunities for rural producers
- Activities:
- Strengthen national and local capacities to support the sustainable management of productive landscapes in the selected project areas.
- investments in biodiversity-friendly and climate-smart production systems
- project management, monitoring, and evaluation

Top-down

Sustainable Productive Landscapes Project (Mexico)

- Mexico's REDD+ strategy criticized for being too top-down and at the national-level, but not well-nested in sub-national implementation (Deschamps and Larson, 2017).
- National Forest Monitoring Systems provide forest cover or change estimates annual to interannual bases.
- Often have a 12-18 month latency which hinders adaptive land management
- Monitoring systems to prevent land degradation from the intervention require near real-time monitoring.

Bottom-up

Integrated Forest Landscape Management Project in Atalaya, Ucayali (Peru)

- Ministry of Environment and Natural Resources (MINAM): $5.8 M 2019-2024
- Problem:
  - 45% of deforestation is on land with no legal status
  - main drivers of deforestation are migrants, unsustainable small agriculture practices, and mining, oil, and gas extraction.
- Objective: strengthen sustainable management of forest landscapes (Peru's Forest Investment Plan)
- Activities:
  - Strong focus on equality. 80% beneficiates are indigenous peoples and 30% women
  - provision of land use rights in forest landscapes and promoting community-level
  - Technical support will be provided to law enforcement personnel (forestry)
  - **Community-based monitoring**: Promote the integration and operation of community-based monitoring systems **(Veedurias Forestales Communitarias (VFCs)** to improve monitoring and reporting of illegal activities
- Status: just started

Bottom-up

Moz-FIP (Mozambique)

- Government of Mozambique (2017-2022), $22 M
- Objective: Promoting Integrated Landscape Management and Strengthening the Enabling Conditions for Sustainable Forest Management
- Activities:
  - community-based forest management to enhance community-land delineation and community-based natural resources management
  - Status: early evolution reveals challenges in implementing the monitoring strategy especially the limits of funding that challenge long-term success

Top-down

Satellite Forest Monitoring System (East Africa region)

- GEF funded project
- Problem: forest mapping methods are optimized for humid forests. There is an urgent need to map change in dry forests.
- Objective: develop open-source toolkit for satellite-based methods for monitoring biomass changes in dry forests annually
- Activities:
  - Land Cover/Use Mapping toolkit
  - Annual above-ground biomass estimation
  - NRT Deforestation & degradation detection (~5 days)
  - Mapping cause and drivers of land cover change
- Status: established open-source methods and toolkit for monitoring dry for degradation and carbon emissions.

Interactive

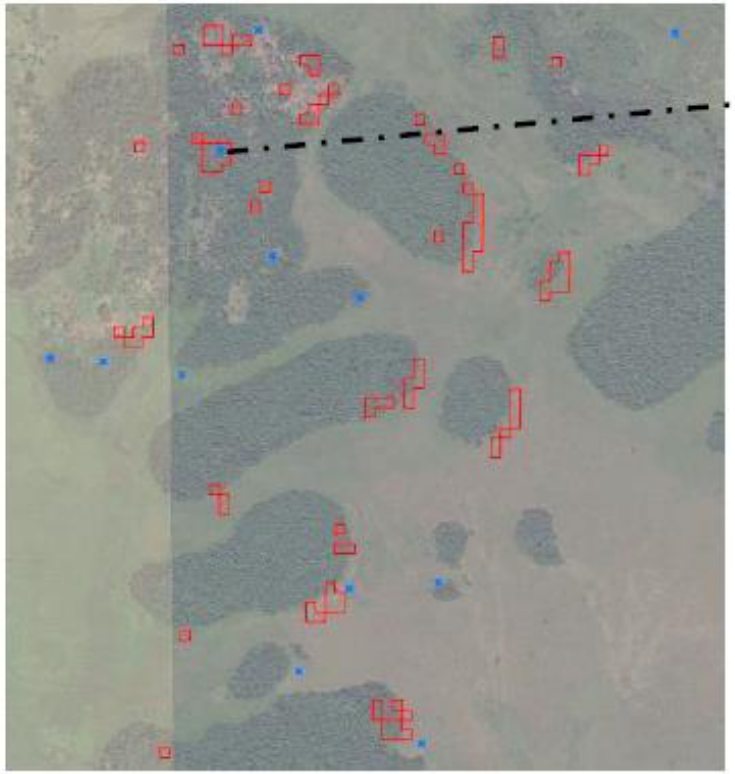
Interactive monitoring Kafa Bio-Sphere Reserve in Southwestern Ethiopia

- IKI (German) funded project
  - Combing both top-down and bottom-up approaches generated more accurate, cost-effective, near-real time information on forest change
    - Deforestation monitoring using changes in greenness from Landsat
    - Monitored degradation from the ground with local experts
    - Stakeholders part of design and implementation of the monitoring system
    - Stakeholders responsible for forest management activities
  - Results
    - Improved accuracy of deforestation and degradation detections
    - Increased conservation awareness within the community

Pratihast et al. (2016)

Interactive

Near real-time forest change monitoring



Satellite based alerts (February 2015)

Ground observations

Ground observations photographs

Muluken Mekuria
March 18 at 8:16am

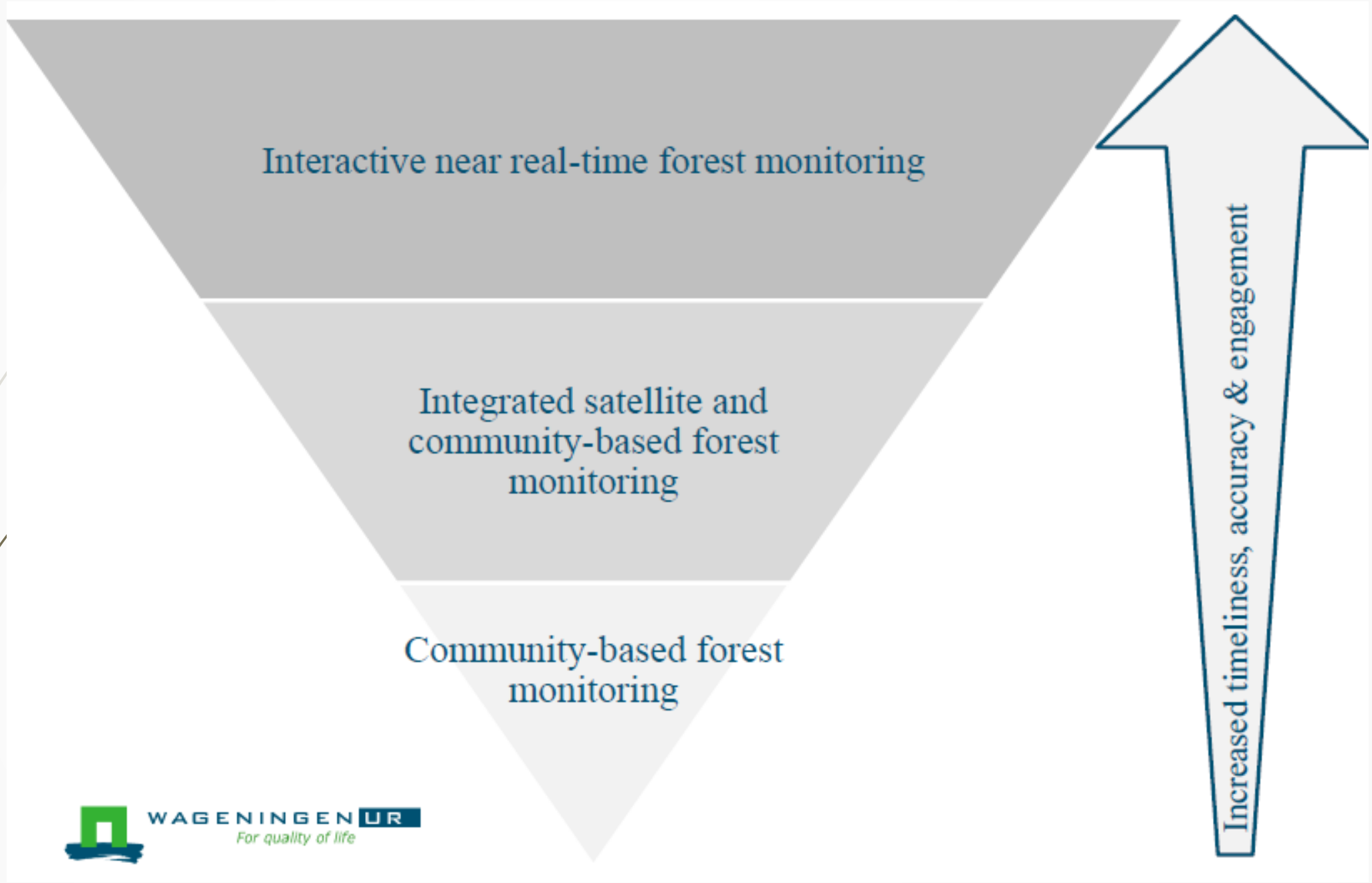
Near real time forest monitoring

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

Pratihast (2016)



WAGENINGEN UR
For quality of life

Pratihast (2016)

Summary of Results

- Dozens of forest monitoring tools for diverse applications
- Expansion of tool development by developing countries or co-developed by in-country institutions
- No need to invest in tool creation if you can find a tool to meet your need
- Many mobile field data collection applications developed by business, NGOs, governments, and academic institutions

Summary of Results

- Multiple forest monitoring tools and approaches is GOOD
  - Tool designed should be targeted to application and user
- CHALLENGE is discovering & navigating tools

Summary of Results: WBG Projects

- WBG projects that use tools are projects in forestry sector
  - REDD+ MRV
- 1 non-forestry project mentioned forest monitoring
  - Under the umbrella of REDD+

Recommendations for better integration of forest monitoring tools

- WBG-funded projects need guidance to navigate the tools options
  - Bank engagement with the Group on Earth Observations (GEO)?
- Encourage proposers to use or build off existing tools from previous investments
- Ensure references to forest monitoring tools are included in project planning documents
- Require borrowers to allocate resources for repeated capacity building and engagement with key decision makers
- Require theory of change: do the tools match the application?
- Evaluation of systems to understand effectiveness and potential barriers

Recommendations for creating new forest monitoring tools

- Tool developers could benefit from lessons learned of other developers
  - Need system for sharing knowledge of tool development.
- Require reporting on application metrics during development
- Coordination between the projects
  - Development Banks fund multiple projects, sometimes developing similar or complementary tools
  - Could enhance tools and save resources on joint trainings with common stakeholders.

Take-Aways

- There are already dozens operational forest monitoring tools
  - Why build a system if there is a free one that meets your needs?
- Evaluate the need to build/fund a new system
  - Does it have a novel application? unique end-user?
- Need for system to navigate the suite of tools available
- Little evidence that forest monitoring tools are applied for development
- Development projects could benefit from
  - Bottom-up/interactive approaches to increase conservation awareness
  - Near real-time monitoring

Discussion

- What do you see as **opportunities for improving** the tools and uptake of tools to reduce impacts of development projects?
- What tools are most effective for monitoring **development** (as opposed to forest-focused) projects?
- How do we distinguish a forest monitoring **tool** vs. a **system**?
- Given availability of tools such as Global Forest Watch, what is the case for development of **different systems**?
- What's the best system to monitor forest **degradation** as well as deforestation? How do we develop a better one?
- With all the **mobile apps**, can't every project be monitored on the ground?
- What are the **capacity challenges** that are most critical to address?

Thank You

Karyn Tabor

ktabor1@umbc.edu