Quantifying forest degradation and associated drivers in the Congo Basin

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World Wide Fund for Nature (WWF)

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JAXA TKSC/RESTEC HQ, Tsukuba/Tokyo, October 17-21, 2011

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Gross Deforestation 2000-2007

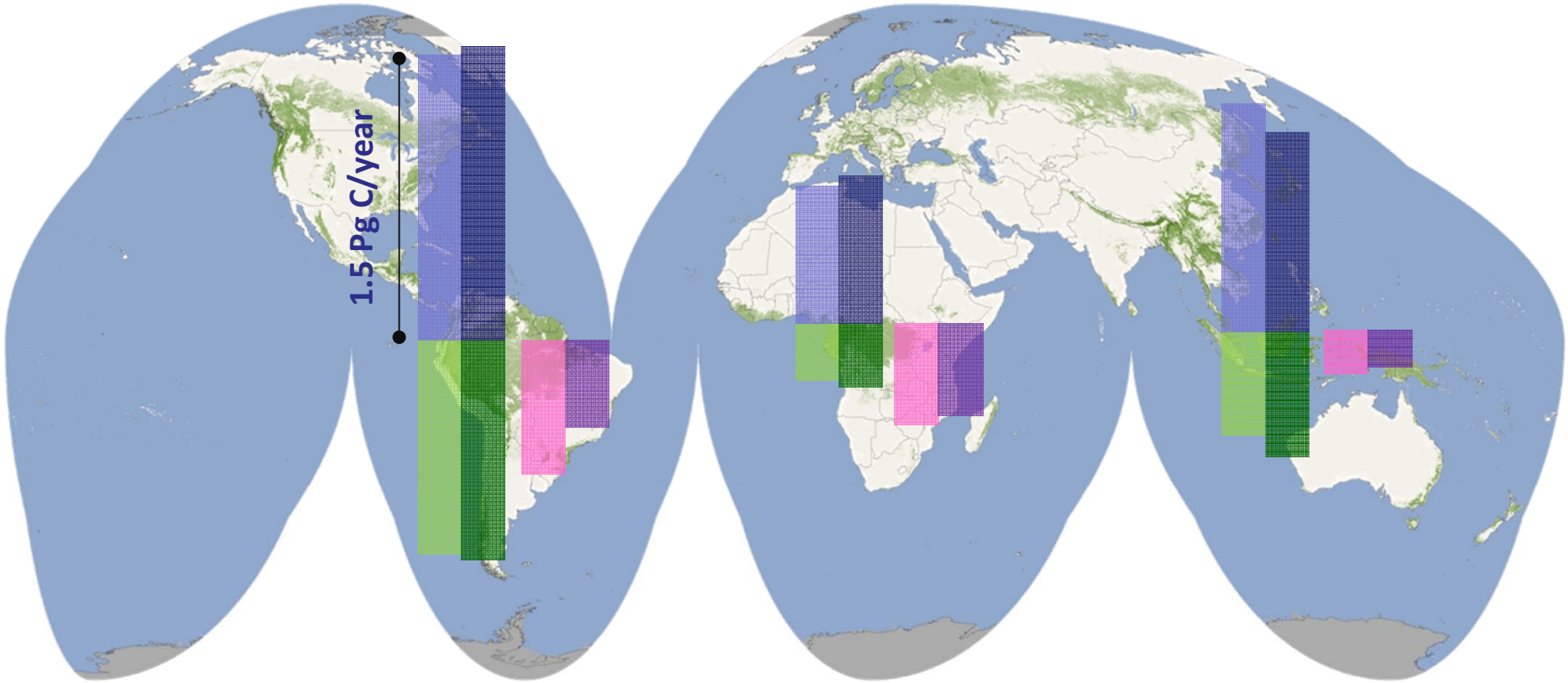
Gross Deforestation 1990-1999

Regrowth 2000-2007

Regrowth 1990-1999

Carbon flux 2000-2007

Carbon flux 1990-1999



Adapted from Pan et al., 2011

The area affected by forest degradation is 10x larger than the area of deforestation (100 million ha vs. 13 million)

Souza, Firestone et al. 2003; IPCC 4th assessment report

Forest degradation is responsible for

20% of total forest carbon emissions from the Amazon,

60% from Indonesia

50% from Africa

Asner et al., 2005; Marklund & Schoene, 2006; Lambin et. Al., 2003)

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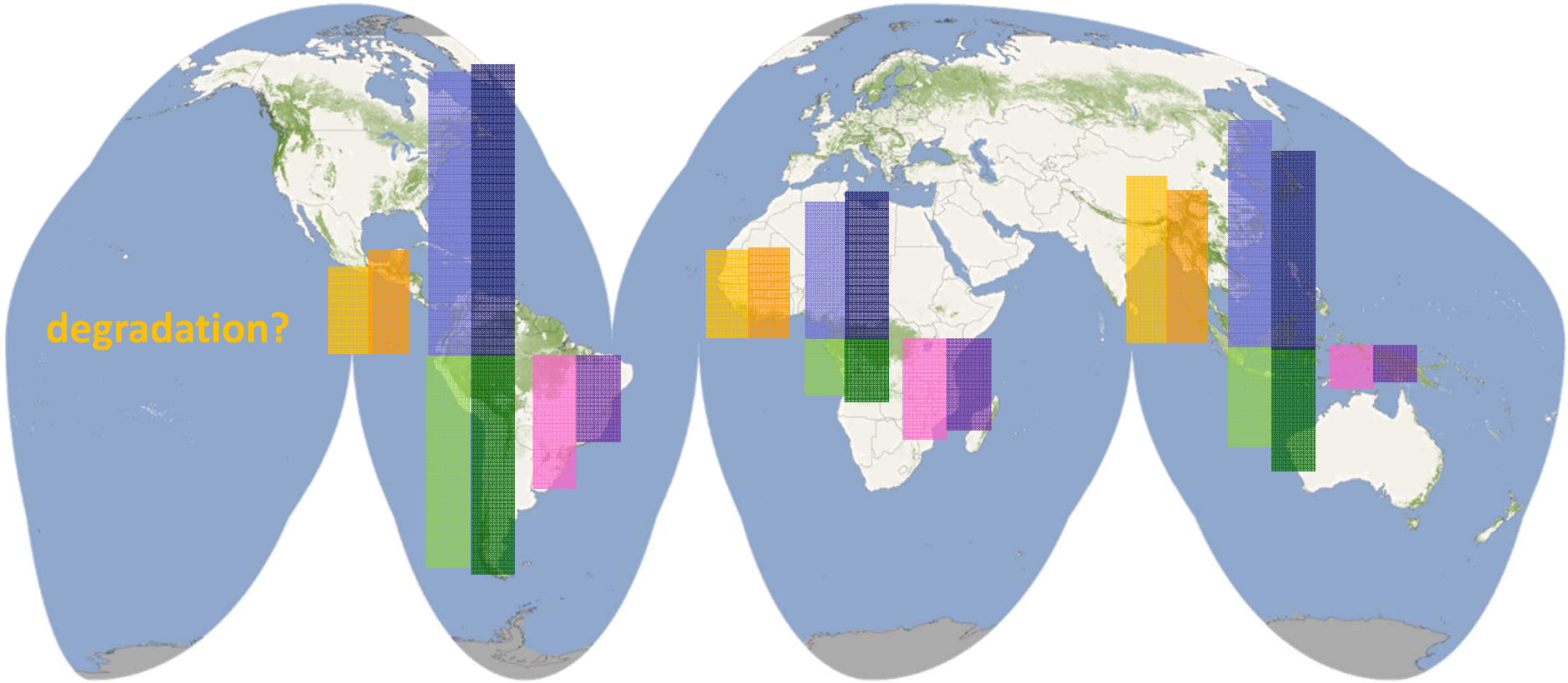

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WWF Global strategy for REDD+

Goals:

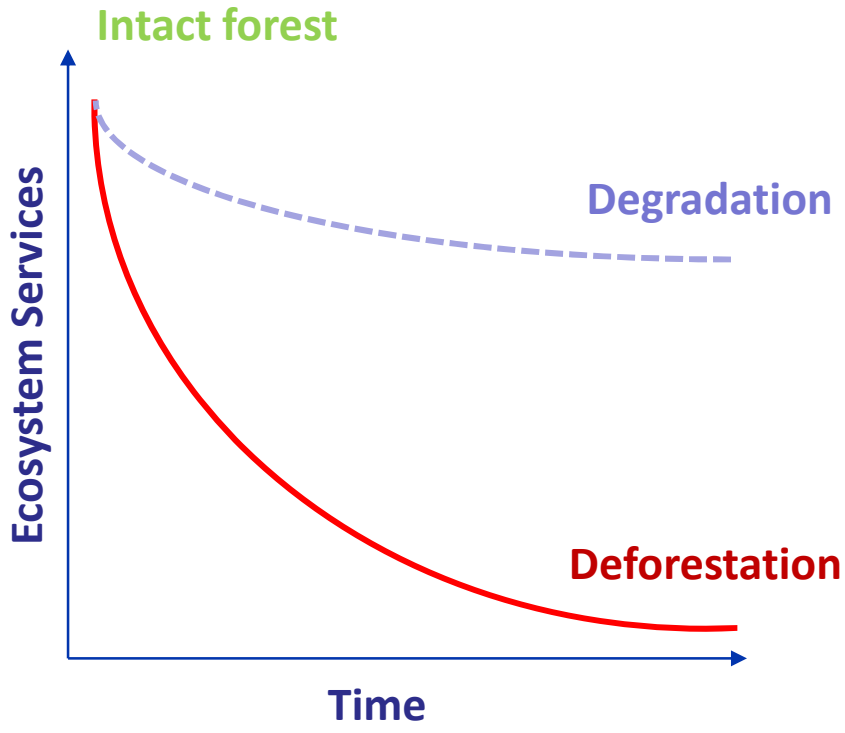
- Generating financial incentives for conservation
- Provide benefits to biodiversity, human livelihoods through the REDD+ process

Needs:

- Reliable methods to support the monitoring, reporting and verification process
- Demonstration projects at multiple scales

Reducing Emissions from Deforestation and Degradation

- **Each country has its own description**
- **Current definitions are related to:**
  - Productivity
  - Process
  - change in structure
  - conversion to other forest type
  - Anthropogenic vs. natural change
  - loss of biodiversity
  - …
- **we need a standardized, measureable and comparable definition between countries and places**

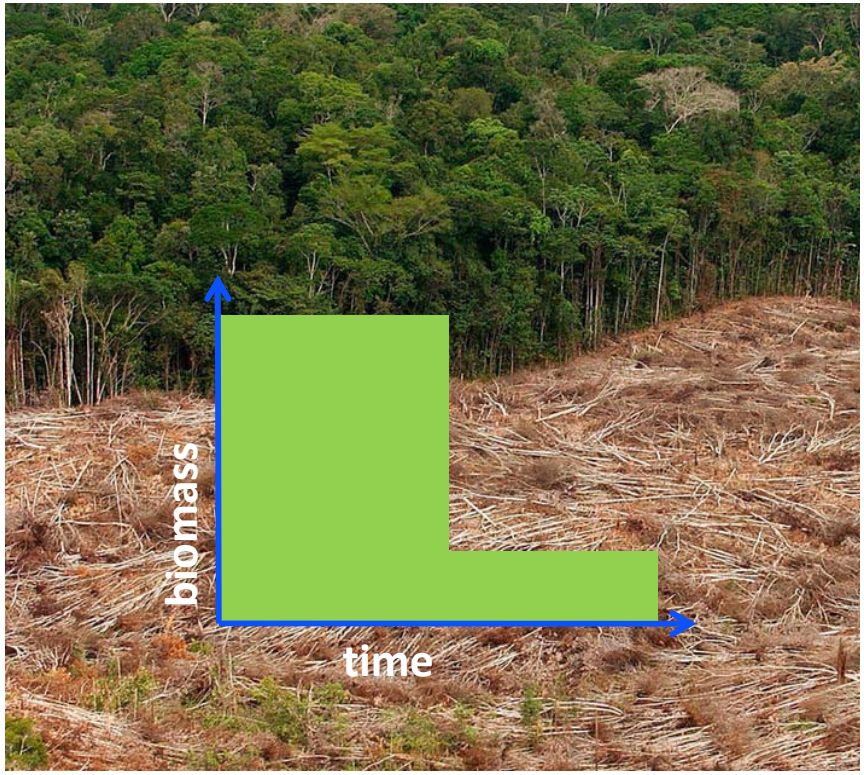


The human causes of degradation

- Collection for charcoal production
- Forest fires
- Logging of timber for commercial sale
- Logging of timber for local use
- Effects of roads
- Agricultural conversion

Deforestation vs. Degradation

measurable sustained decrease in crown cover below a 10–30% threshold



a loss of density without a change in the area of forest cover

Is often a precursor to deforestation

Project Goals:

- **Identify robust methods and derive accurate information for REDD + and WWF evaluation (Key Performance Indicator - KPI)**
- **Estimate amount of degradation vs. deforestation?**
  - How to define it and analyse it
  - Spatial resolution, data, quality, methods/models
- **Determine which factors are driving degradation**
  - Model effects of infrastructure, agriculture…

Project objectives and schedule

- A review of existing methods of identifying and quantifying degradation, with special emphasis on Central Africa
  - *Satellite data collection, applicability of existing methods*

- Mapping forest degradation and accuracy of detection in the Lac Tumba landscape using best methods and data (optical, radar, field, aerial photo and LiDAR)
  - *Field data underway, LiDAR campaign 2013*

- Assessment of spatial pattern of degradation and associated drivers, hotspots of potential carbon emissions, suggested restoration and protection sites.

Key Challenges

- **The method and the resulting variable must be:**
  - Well defined – limits of confidence, accuracy
  - Reliable, reproducible by others; and to observe change over time
  - Cost-efficient, practical
  - Comparable and standardized, repeatable
  - Appropriate for scale
- **Take into account limited funds/time**
- **Best combination of cost/methods to achieve best results**

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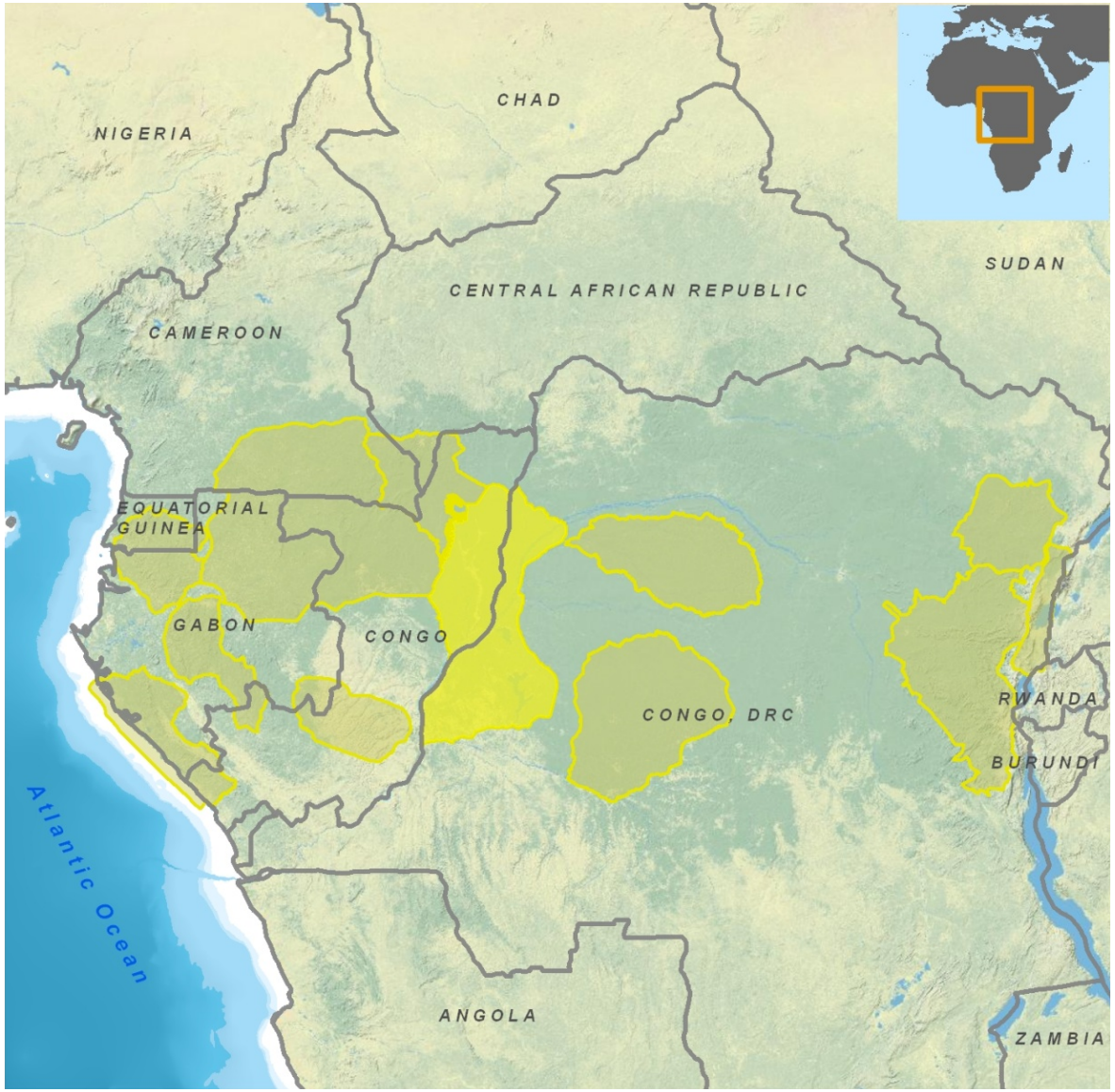

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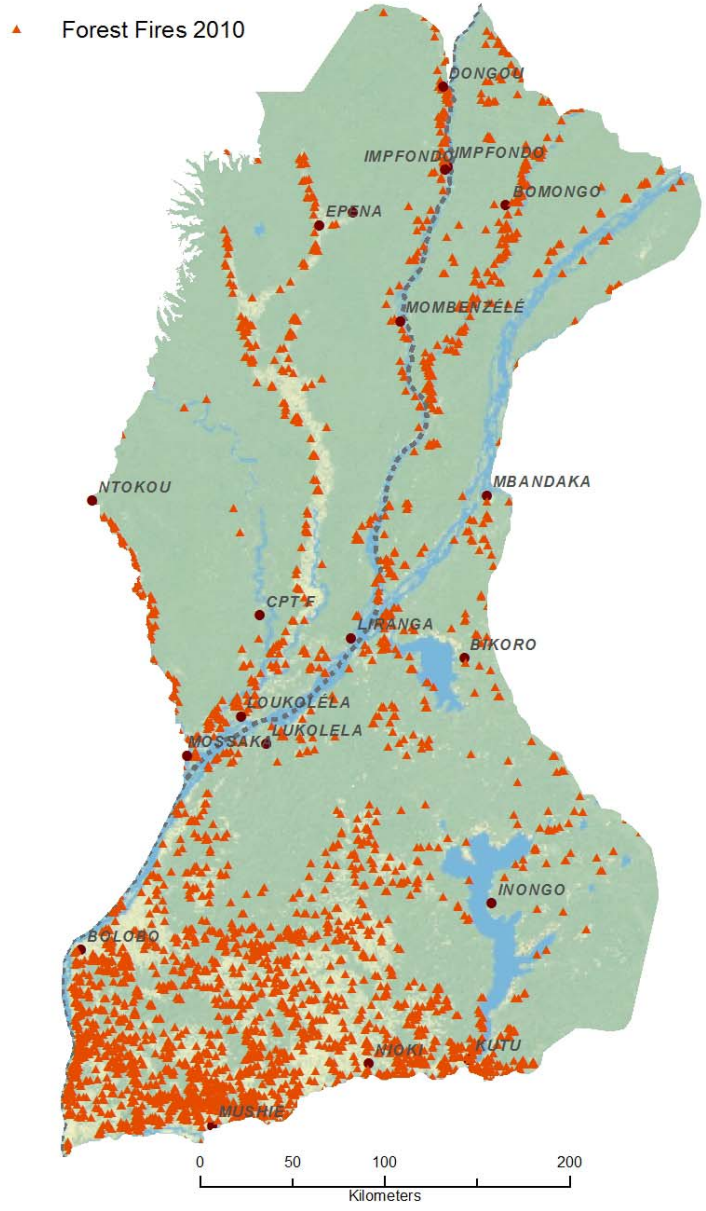
Lac Tumba landscape:

- 13 million ha
- No national parks – community and nature reserves
- Forest concessions (selective logging)
- WWF in DRC, WRI in RoC
- Numerous other pilot, community REDD+ projects



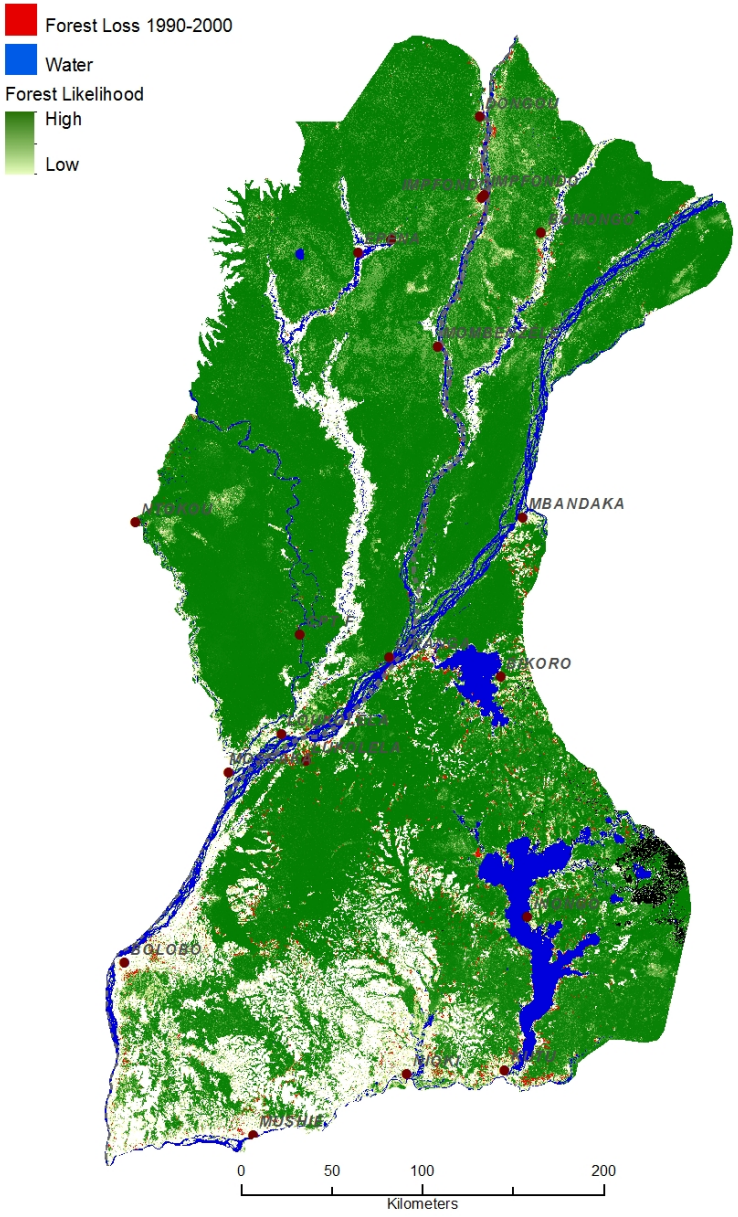
Deforestation rate is low:

- 1990-2000: 1% / year
- 2000-2005: 0,2% / year

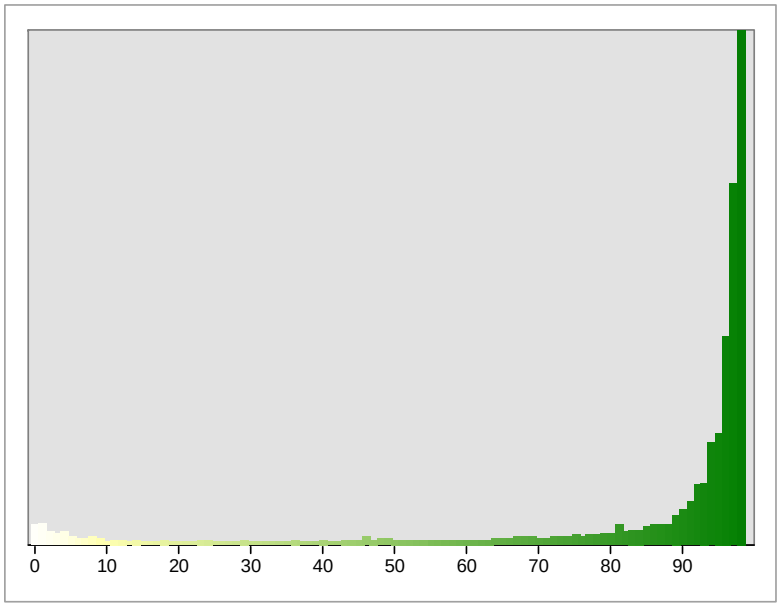
Degradation potentially high:

- population growth ~ 4%
- slash and burn agriculture
- uncontrolled fires
- growing semi-industrial activities

- **what is degraded?**



Forest Cover in Lac Tumba



Distribution of fractional forest values

- **ALOS Palsar data will provide cloud free imagery**
- **More information for 0-80% forest cover**

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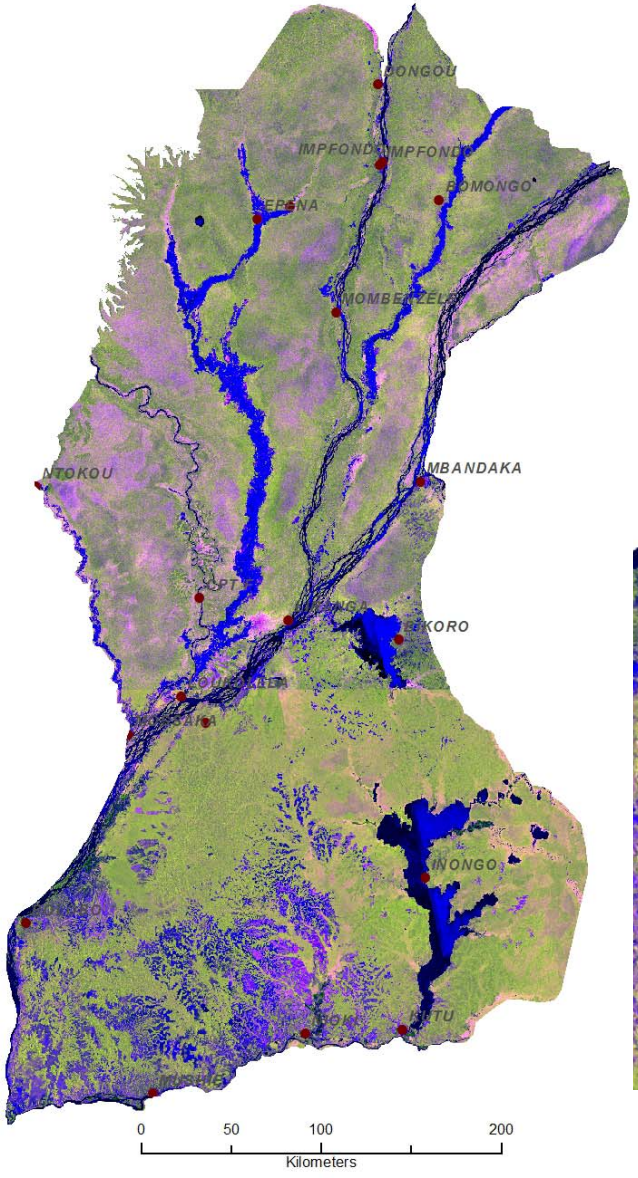
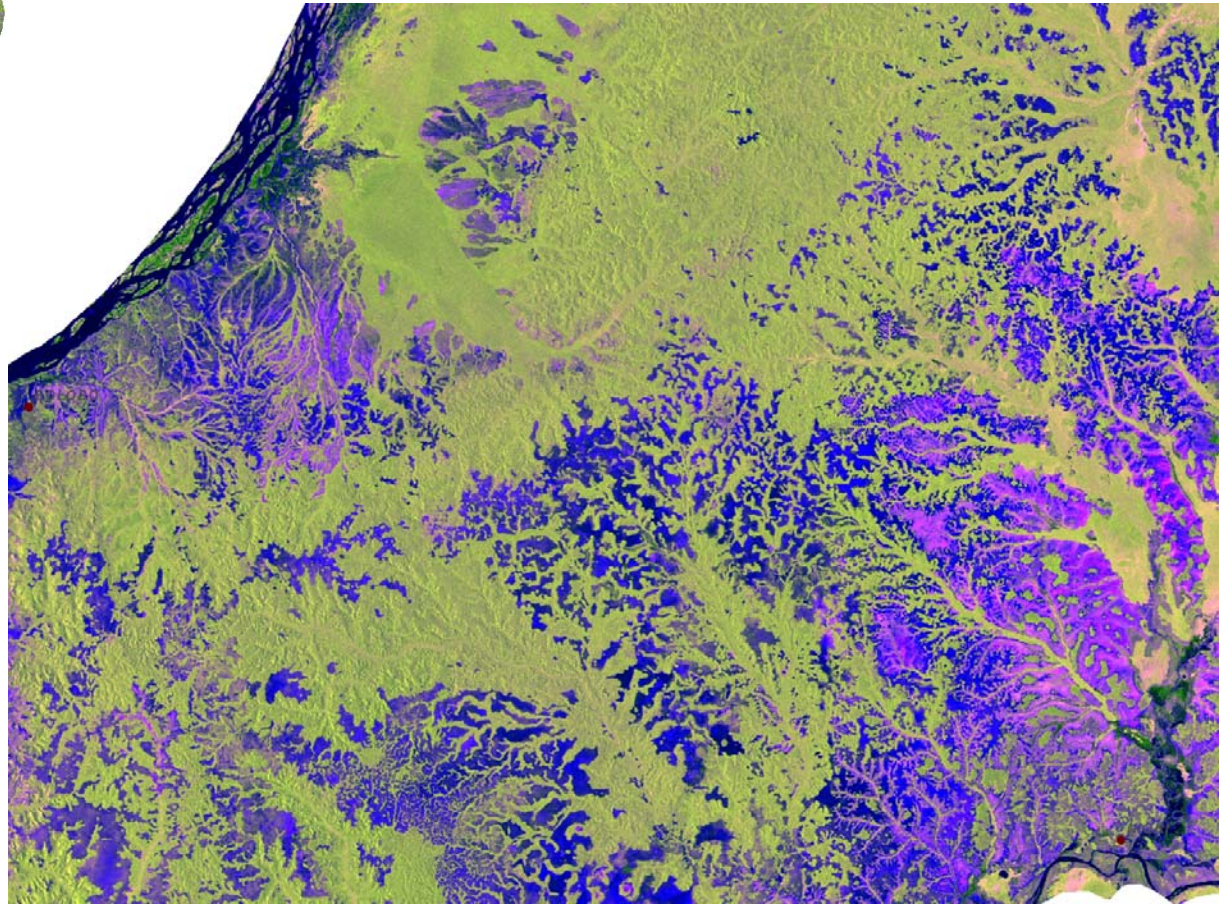
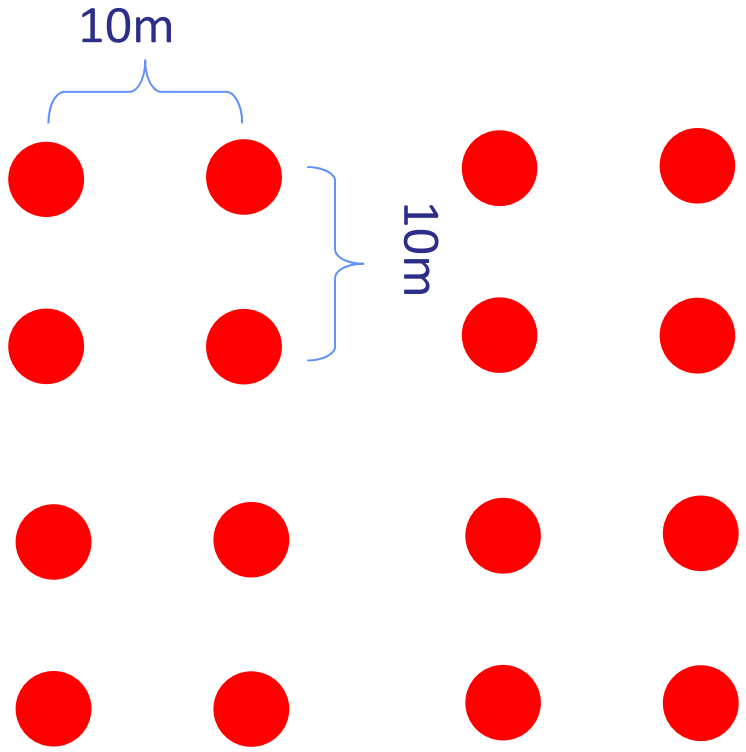


Finally cloud free!

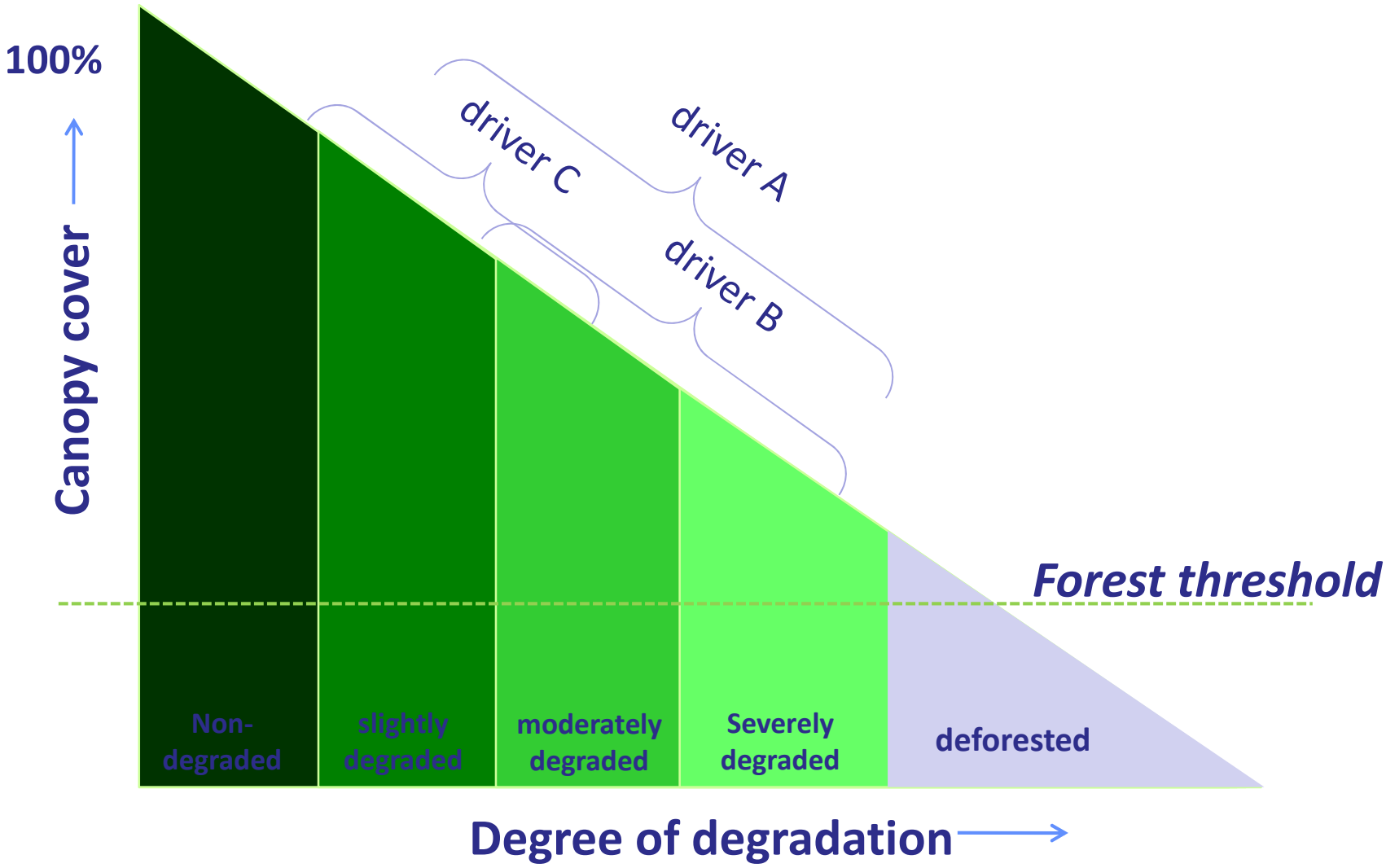


Simple field methods to calibrate satellite imagery

- Canopy closure (hemispherical camera or estimation)
- Visual identification of woody debris, felled trees, stumps
- Basal area, DBH



- **Applicable for multiple scales**
- **Can be collected with other data**


100%
Canopy cover
driver C
driver A
driver B
Forest threshold
Non-degraded
slightly degraded
moderately degraded
Severely degraded
deforested
Degree of degradation

Deliverables

Methods Toolkit

Tier	method	description	data	accuracy	cost
I	**Proxy indicators**	Fragmentation assessment of forest/non-forest – (e.g. based on Riitters et al., 2000), 1-3 different classes of degradation	*Existing forest cover*	?	?
II	**Modeled index**	Based on known instances of degradation model the potential of degradation based on indicator variables Monitoring by detecting changes in indicator variables	*Roads, concession, thematic data*	??	?
III	**Remote sensing measurements**	Remote sensing of degradation based on spectral indicators Neighborhood analysis, fractional cover, radar	*Radar, optical, aerial…*	???	???

Expected Results

- **Array of remote sensing indicators for degradation**
  - Combination of algorithms, different data sets
- **Extent of degradation in the Lac Tumba-Lac Télé landscape is quantified**
  - Estimate area affected, calibrated by field data, identification of drivers, scenario analysis
- **Appropriate spatial scales, trade-offs are assessed**
  - Accuracy, cost, efficiency
- **Identification of main drivers**
  - Most important factors influencing degradation
  - Scenarios for restoration, enforcement, prediction

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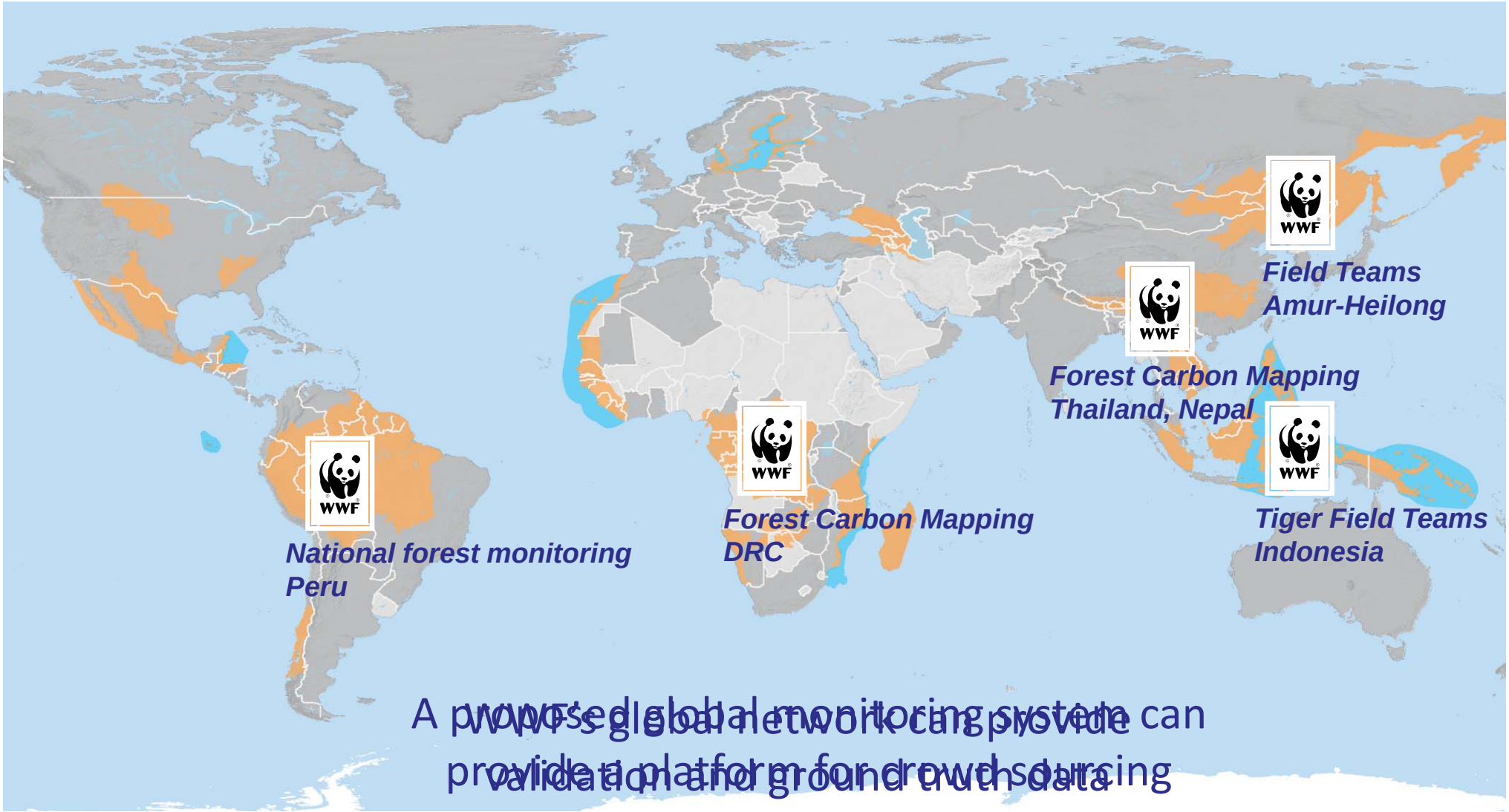
Support to JAXA's global forest mapping effort



A proposed global monitoring system can provide a platform for crowdsourcing validation and ground truth data

WWF's global network can provide

EARTH HOUR 2012
DEINE STUNDE FÜR UNSEREN PLANETEN

Samstag, 31. März, 20.30 Uhr