Japan International
Cooperation Agency

Ministry of Environment, Nature Conservation and
Sustainable Development
Directorate of Forest Inventory and Management (DIAF)

Good Practice of the Preparation of Information System for REDD + and Sustainable Forest Management in Central Africa - Case of the Democratic Republic of the Congo

Project for Strengthening National Forest Resources Monitoring System for Promoting Sustainable Forest Management and REDD+ in the Democratic Republic of the Congo

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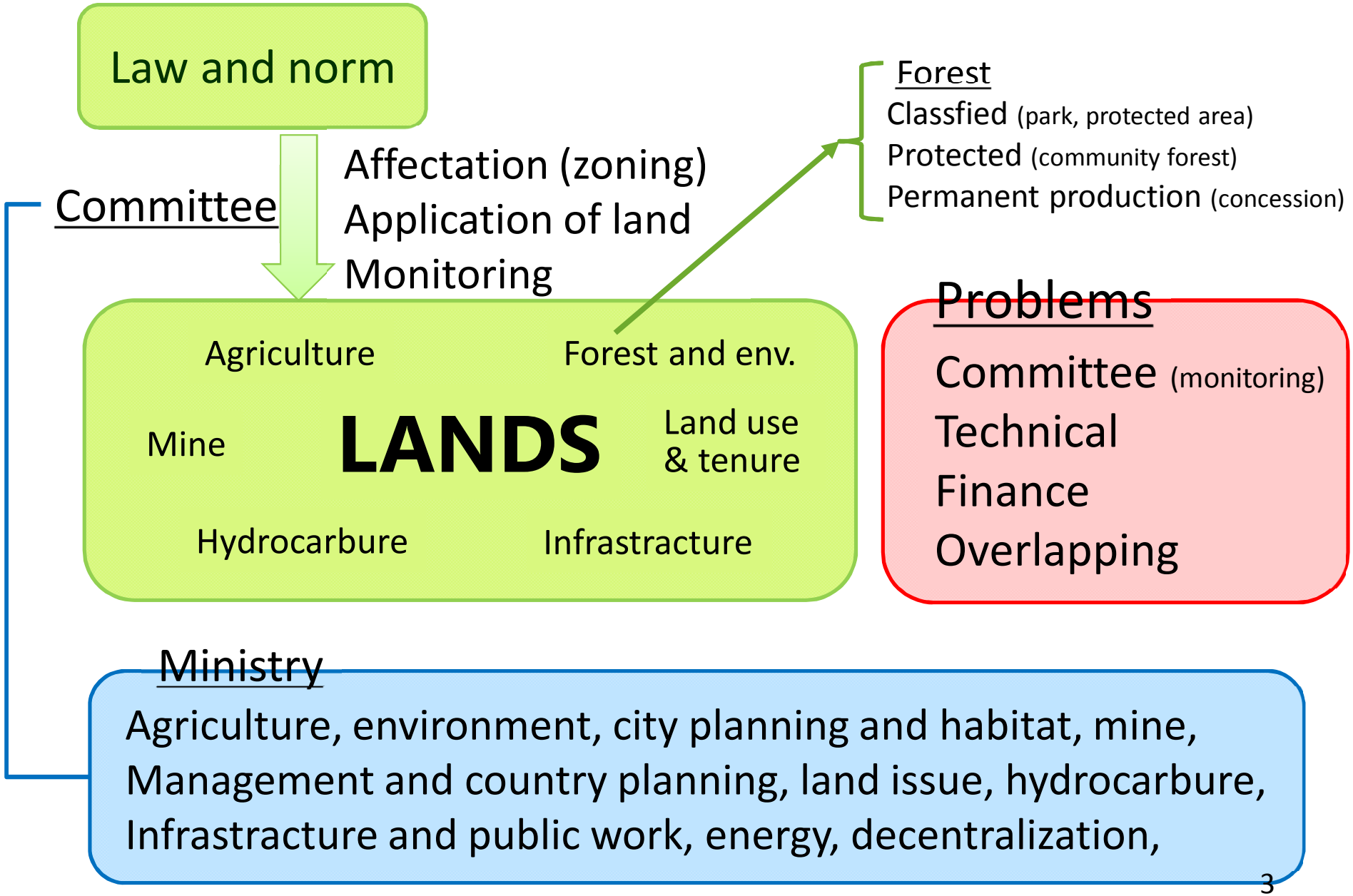
Framework of governance



Advantage Points of the Project

1. The DIAF/JICA system consists of three pillars (components): Remote Sensing, Forest Inventory and Database. This system is developed by securing the linking among these three components coherently: mapping based on interpretation analysis of satellite images, forest inventory data collection and construction of geomatics and inventory Database.
2. After identifying the areas of deforestation and forest degradation through the analysis of changes in forest cover, a field study on deforestation drivers (causes) was conducted also. All these collected information will provide the basis to take measures in the future.
3. Although this system is developed for limited target area, for the ex-province of Bandundu, the elements of this system can be applied for forest resources monitoring system of the national level.

Outline of the Project

Outline of the Project

- **Period:** five years (July 2012 to May 2017)
- **Implementation organizations:**

  Ministry of Environment, Nature Conservation and Sustainable Development

  Directorate of Forest Inventory and Management (DIAF)

  Japan International Cooperation Agency (JICA)
- **Target area:** Ex-province of Bandundu (present provinces of : Kwango, Kwilu and Mai-Ndombe)
- **Goal of the project:**

  Forest resources monitoring is appropriately conducted based on the operation plan for the national forest inventory system.

Result 1: Forest base maps of the ex-province of Bandundu are produced.

Result 2: Ground survey modality and procedures for national forest resources inventory are developed.

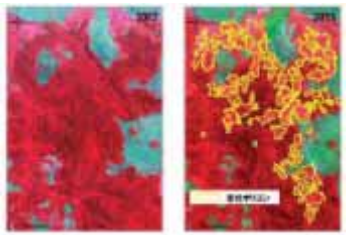
Result 3: Database on national forest resources inventory is established.

Result 4: National forest resources inventory system is established and its operation plan is developed.

Result 5: Forest Reference Emission Levels are established.

General Concept of the System

RESULTS: the DIAF-JICA Model
Sub-national Forest Inventory System in Bandundu

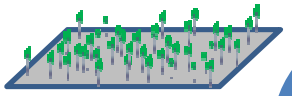


Remote Sensing

- Forest base maps of the ex-province of Bandundu of the year 2010 with high resolution images.
- Validated and harmonized forest types
- Detection of forest changes through the analysis of Landsat images at different times (1995, 2000, 2010, and 2014).
- Forest cover maps reflecting detected forest changes (1995, 2000, 2010, 2014).
- Calculation modality for Activity Data (forest area change data).
- Manual on satellite image analysis and modality for the detection of forest changes.
- Technology transfer of these modalities to DIAF staff.

Coherence of forest types

Forest Inventory System



Forest inventory

- Forest inventory data in Mai-Ndombe, Kwilu and Kwango
- Developed forest inventory methodology
- Modality for calculating emission factors
- Manuals on these modalities
- Technology transfer to DIAF staff

Coherence of inventoried items

Database

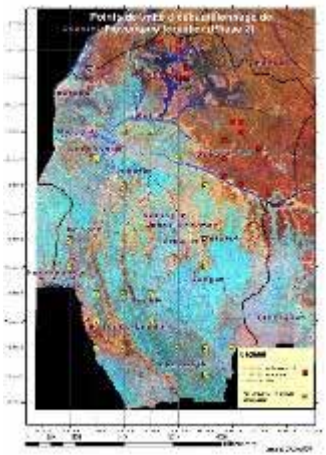
- Forest inventory DB with MS Access (data input interface integrating all inventory items)
- Geodatabase with ArcGIS (including data saving modality)
- Manuals on these modalities
- Technology transfer to DIAF staff

System for MRV (Measurement, Reporting and Verification) / Forest Reference Emission Levels

Results of the forest inventory







Number of inventoried sampling units

Zone	Strate	Total
Majority forest zone	Tropical dense forest	15
	Swamp dense forest	6
Mixed zone	Dry forest and savannah with ligneous vegetation	33
Total		54

Estimated biomass (t/ha) (provisional)

Majority forest zone	Mixed area (non-forest, dense forest, secondary forest and clear forest)			
Dense tropical forest and swamp forest	Non-forest (savannahs, farm lands, etc.)	Dense forest	Secondary forest	Clear forest (Dry forest and Miombo)
275,91	21,00	223,00	154,00	57,00

The allometric equation of Chave et al. (2014) was used to calculate the above-ground biomass.

$$AB = 0.0673 \times (\rho D^2 H) \times 0.976$$

Equation of Height-DBH used for the DIAF-JICA Project

(1) Majority forest zone (Dense tropical forest and Dense forest on hydromorphic soil)

$$\ln(H) = 0.908227 + 0.658897 \ln(D) - 0.01212 [\ln(d)]^2$$

(2) Mixed zone (Dry forest, Miombo, Savannah, others)

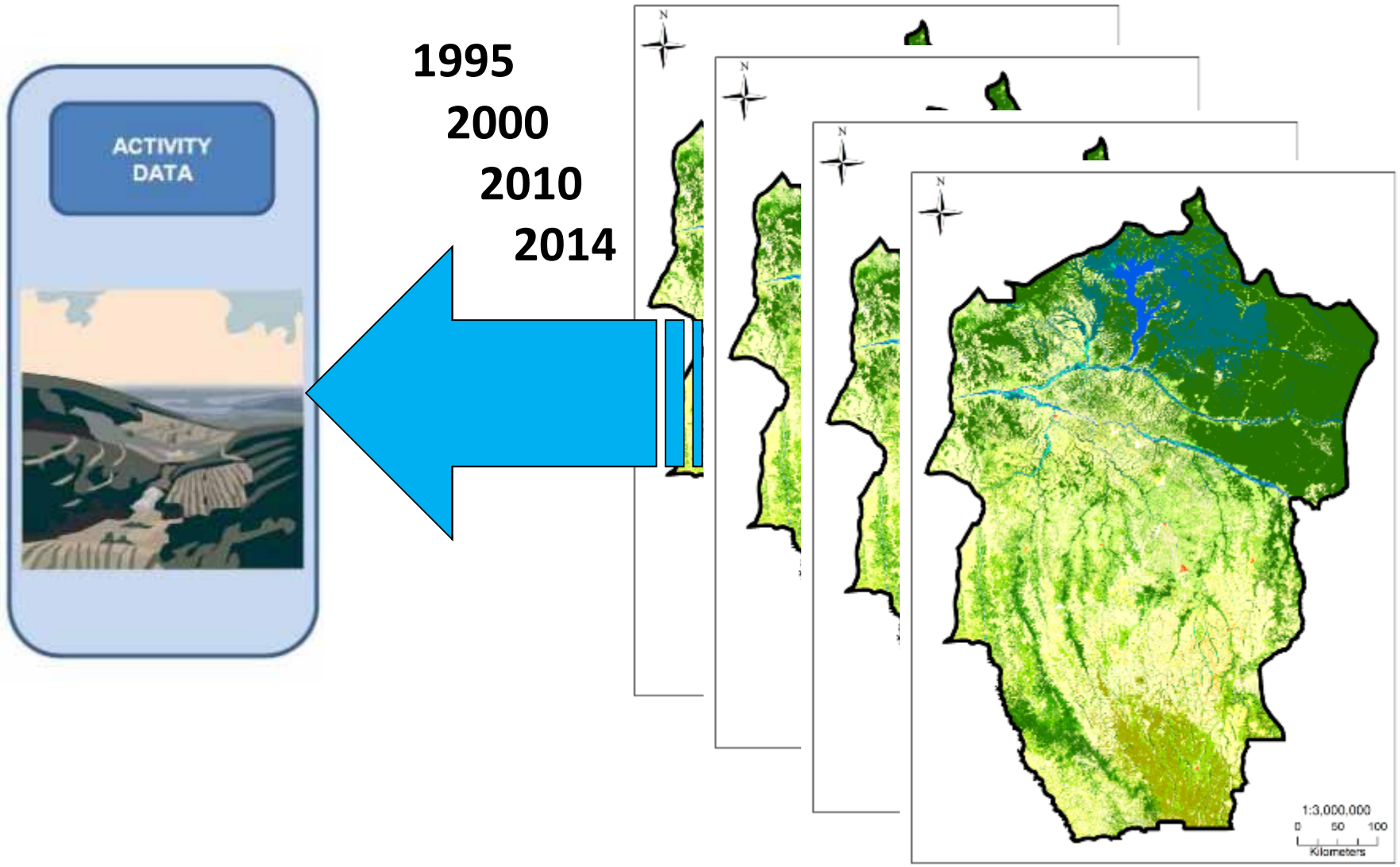
$$\ln(H) = 0.581172 + 0.445659 \ln(D) + 0.049101 [\ln(d)]^2$$

(developed for the ex-province of BDD by the DIAF-JICA Project)

AB : Above-ground biomass (kg) D : DBH (cm) H : Tree height of tree (m) ρ : Wood Density

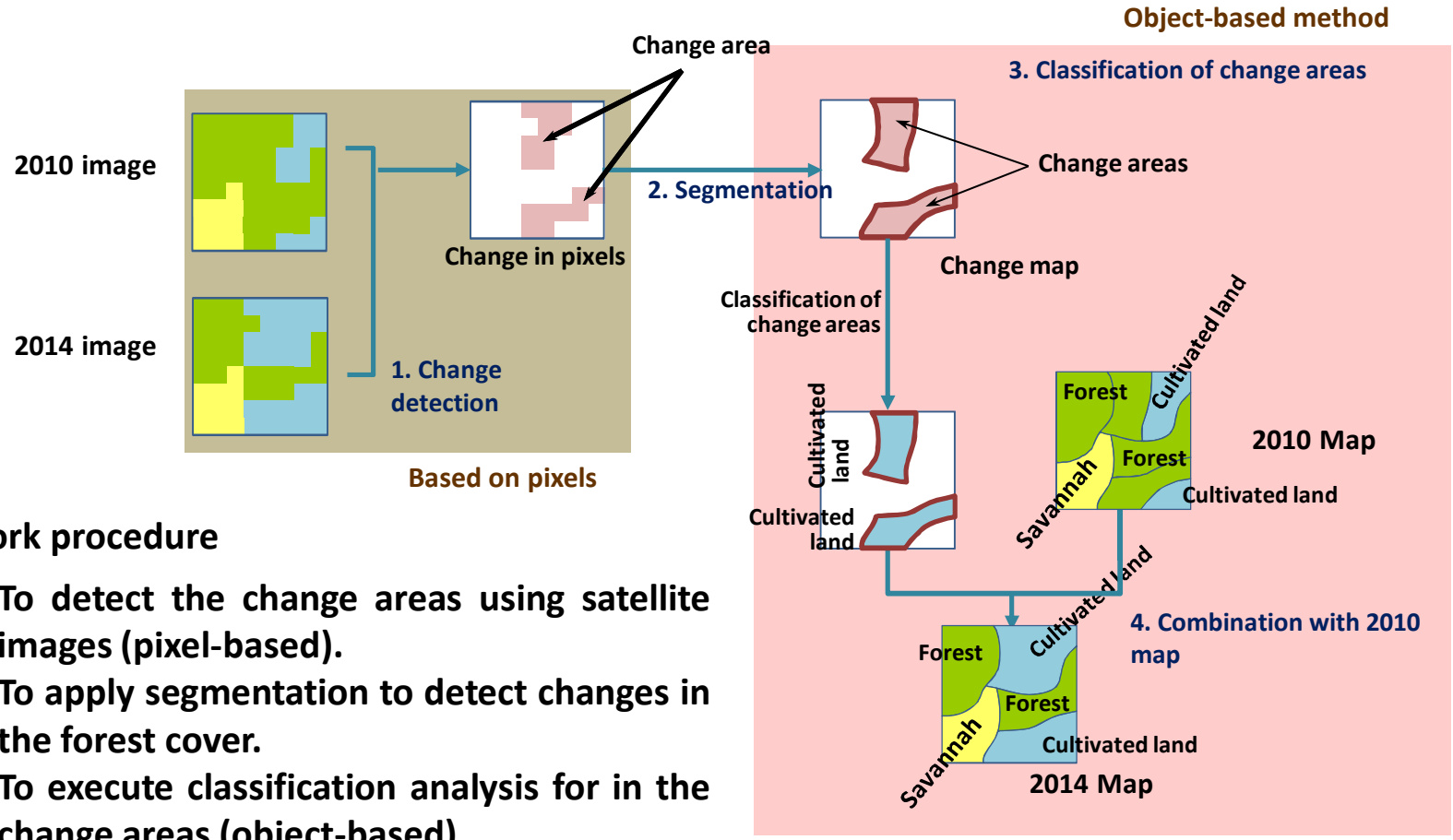
BA : Biomasse aérienne (kg) D : DHP (cm) H : Hauteur d'arbre (m) ρ : Densité du bois

Analysis of forest cover historical data



Historical data of forest cover

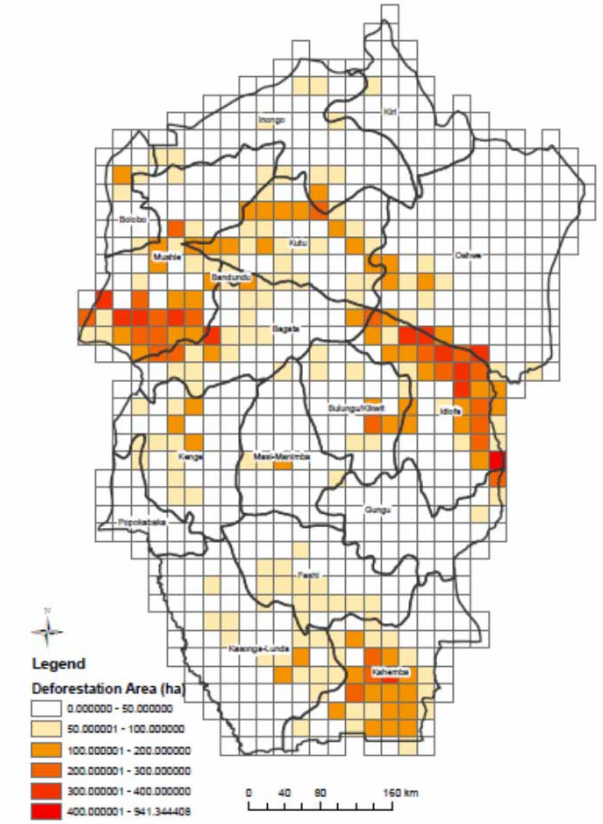
Forest change map



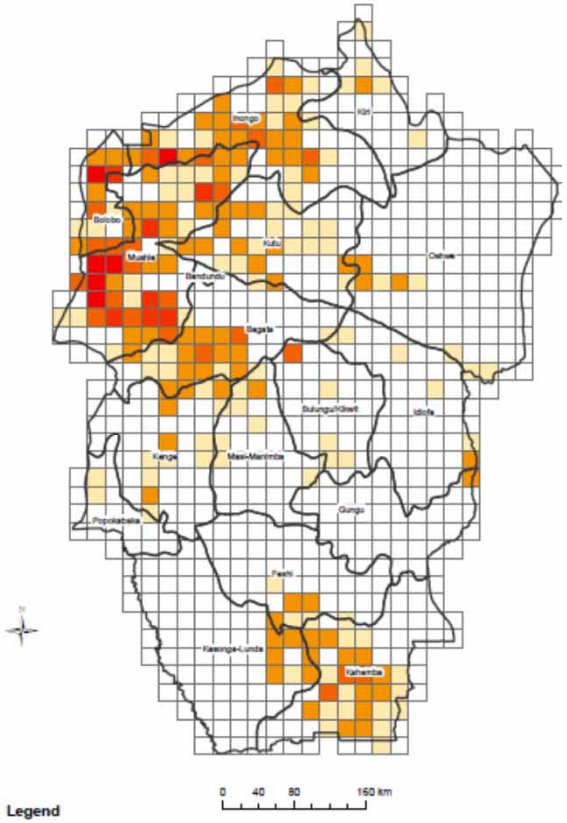
Work procedure

1. To detect the change areas using satellite images (pixel-based).
2. To apply segmentation to detect changes in the forest cover.
3. To execute classification analysis for in the change areas (object-based).
4. To combine the classification results with the 2010 forest type map.

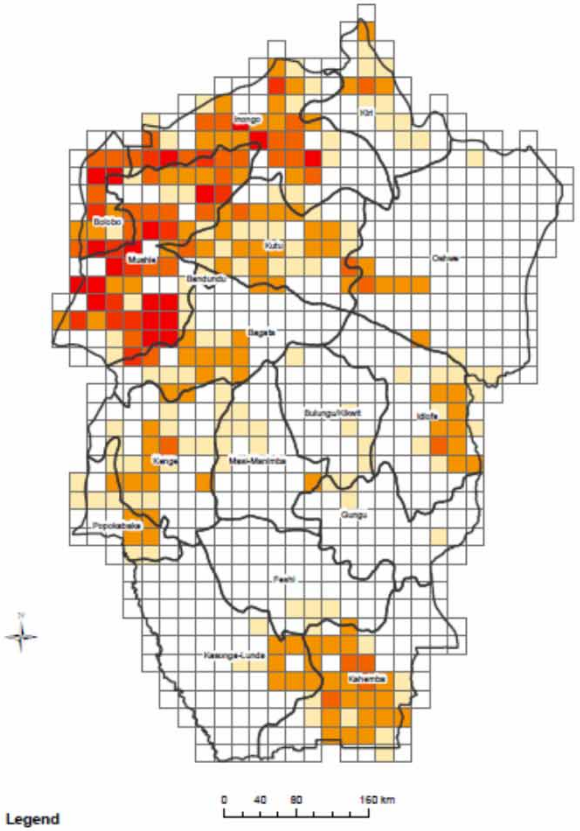
Analysis on deforestation and forest degradation



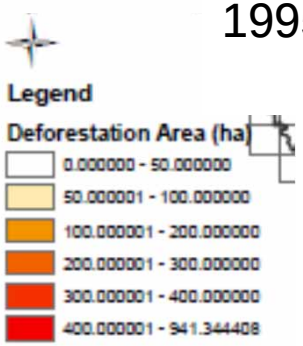
1995-2000



2000-2010



2010-2014



Analysis on deforestation and forest degradation

Drivers of deforestation and forest degradation identified through the study

Principal direct drivers

- ✓ Itinerant and slash and burn farming;
- ✓ Charcoal production;
- ✓ Bush fires;
- ✓ Small-scale manual logging;

Indirect causes

- ✓ Increasing population;
- ✓ Lack of employment;
- ✓ Poverty;
- ✓ Issuance of illicit documents to land exploitation operators;
- ✓ Absence of supervision for agriculture activities

Vision and Approaches

Vision

The MECNDD and JICA work together for promoting the sustainable forest management and operationalization of REDD +, in practical, reliable and sustainable manner to protect the environment and to keep up with the demands of climate change,

Approches

REDD+ well-adapted to the DRC **- Sustainability -**	•Due to its vast territory and underdeveloped infrastructure of the DRC, it is necessary to design an appropriate monitoring system with sustainability taking into consideration cost, accuracy, implementing structure, and other factors. •It is possible to develop a forest monitoring system using advanced technology such as new JICA-JAXA Forest Change Alert System, Global Forest Watch, etc. •Through the cooperative work with DRC technical personnel, it is necessary to develop human resources, in order that the DRC technician takes initiative in the future.
Global-standard MRV **- Reliability and Accuracy -**	•It is required that a consistent MRV system is developed based on combination of Remote sensing and Forest inventory •Forest cover maps produced with Wall to Wall approach can be used for future forest management. •It is necessary to make QC/ QA based on 'PDCA (Plan – Do – Check – Action) cycle
Addressing REDD+ Challenges **- Measures to deforestation -**	• It is important to identify deforestation drivers, to take effective measures for greenhouse gas emission reduction, to enhance forest environmental functions, and to contribute to the improvement of livelihood of the local population. • It is required that all the stakeholders cooperate together for forest conservation of the Congo Basin which has a vast extension and is considered as a lung of the world.

Thank you very much
for your attention !!!