Role of forest monitoring in DRC
- Results of JICA project-

REDD+ international seminar
Tokyo

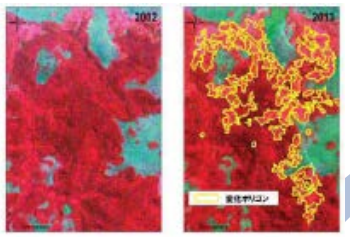
KEI SUZUKI

JAFTA

JICA project area

- The land area is about six times that of Japan
- Forest area is about 154 million ha (about 4% of the world's forests, about 1/4 of the African continent's forest)
- It has a tropical forest next to the Amazon and is also said to be one lung of the earth

Global Scheme of DIAF / JICA Project



Remote sensing

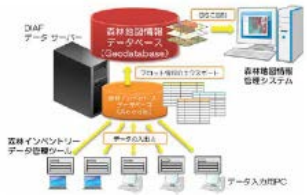
- 2010 basic forest map of Bandundu with high resolution images
- Validated and harmonized forest types
- Detection of changes through the analysis of Landsat images at different times (1995, 2000, 2010, and 2014)
- Forest cover map reflecting detected changes (2000, 2010, 2014)
- Calculation modality for Activity Data (surface area of forest changes)
- Manual relating to analysis of images and change detection modality
- Technological transfer of these modalities to DIAF staff

Coherence of forest types

NFMS

Forest inventory

DB



Coherence of inventoried items

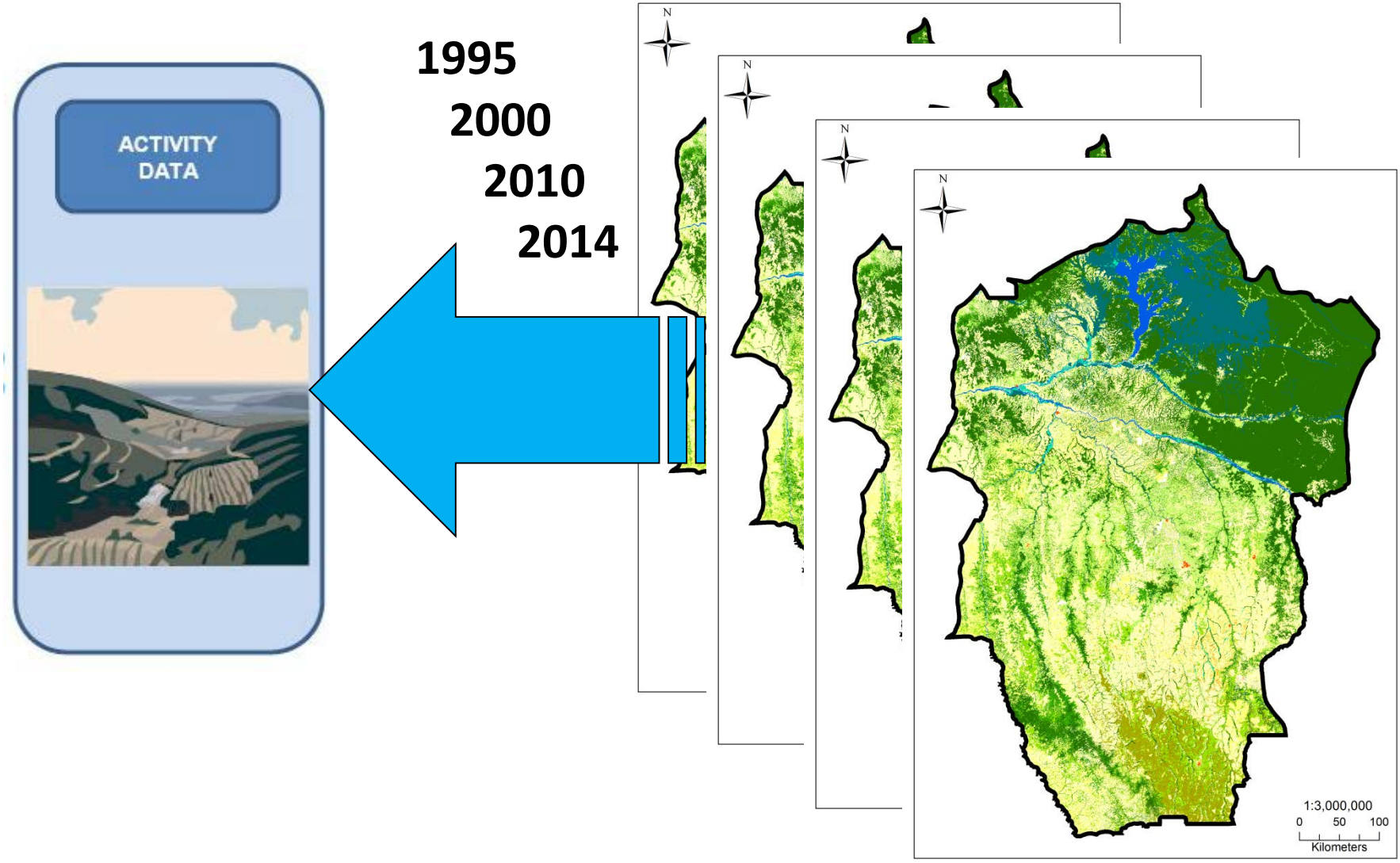
- Forest inventory data in Mai-Ndombe, Kwilu and Kwango
- Developed forest inventory methodology
- Modality for calculating emission factors
- Manuals on these modalities
- Technology transfer to DIAF stuff

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

Contribution to development of the SNSF (development of the sub-national level to the national level)

Development of Activity Data

Historical forest cover data



Classification for FREL

	Classification pour ALOS AVNIR-2 (10m) (carte de base de l'année 2010)		Classification pour Landsat (30m) (1995, 2000, pet 2014)		REL/FREL
Forêt	1	Forêt dense humide sur terre ferme	1	Forêt dense humide sur terre ferme	Forêt dense
	2	Forêt dense humide sur sol hydromorphe	2	Forêt dense humide sur sol hydromorphe	
	3	Forêt secondaire	3	Forêt secondaire	Forêt secondaire
	4	Forêt sèche / Forêt claire	4	Forêt sèche / Forêt claire	Forêt sèche / Forêt claire
Non-forêt	5	Mosaïque terres cultivées / végétation naturelle (herbacée ou arbustive)	5	Mosaïque terres cultivées / végétation naturelle (herbacée ou arbustive)	Non-forêt
	6	Savane arborée	6	Savane arborée	
	7	Savane arbustive	7	Savane arbustive/herbeuse / Prairie	
	8	Savane herbeuse / Prairie			
	9	Prairie aquatique	8	Prairie aquatique	
	10	Cultures	9	Cultures	
	11	Agglomération	10	Agglomération	
	12	Zone d'eau	11	Zone d'eau	
	13	Nuage	12	Nuage	
	14	Ombre du nuage	13	Ombre du nuage	

Methodology Material

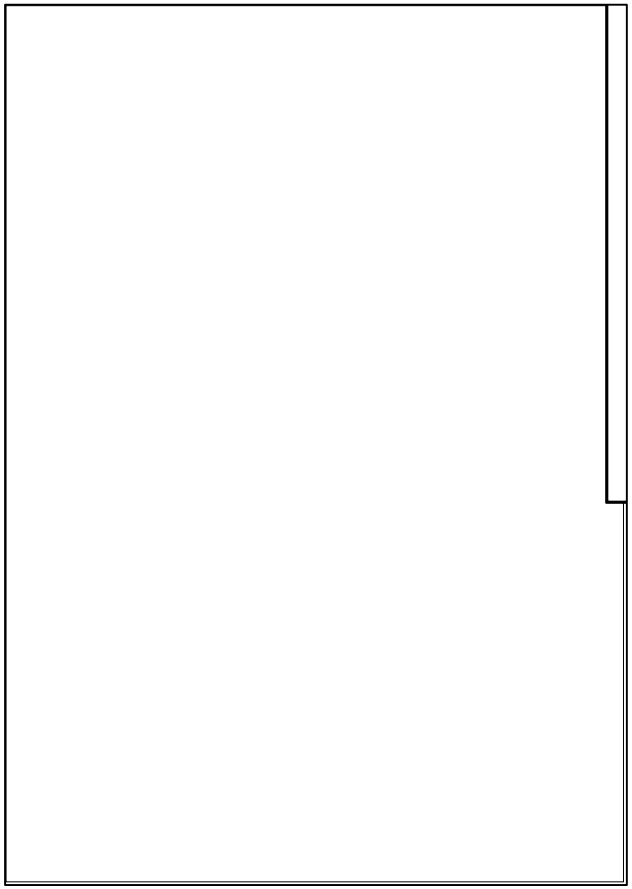
- Landsat images

20 scenes x 4 time points = 80 images

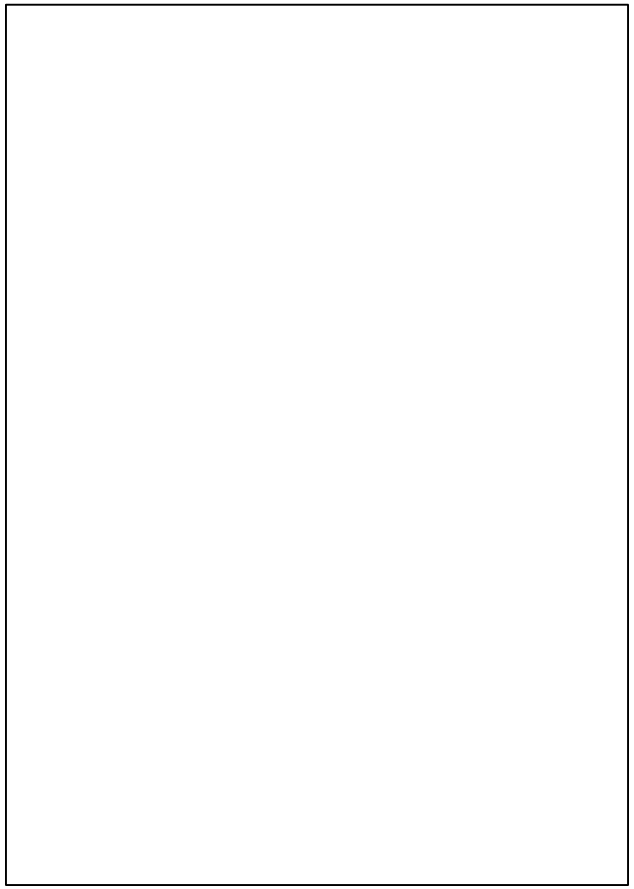
- 2010 year's base map

Analysis of the behavior of deforestation

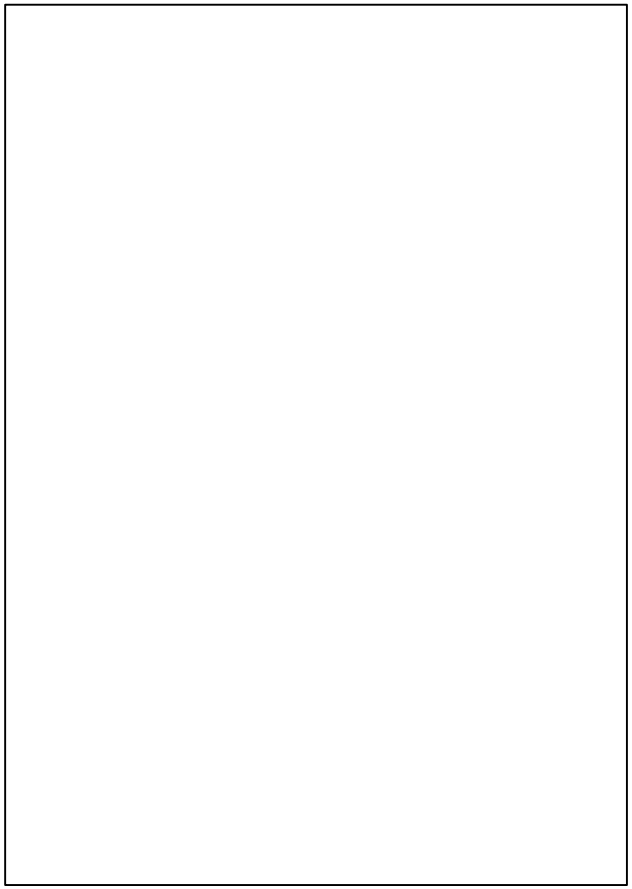
1995-2000



2000-2010



2010-2014



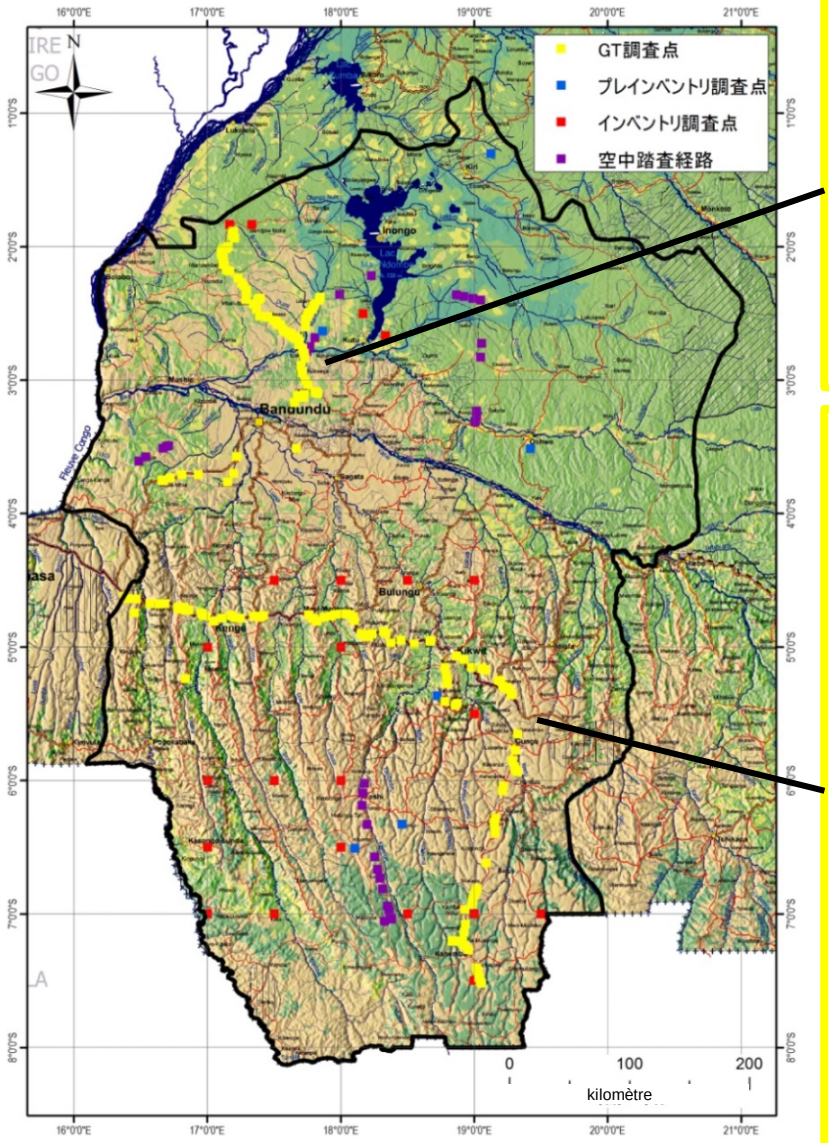
Expressed in grids of 20km x 20km

Activity data: Deforestation, forest degradation and gain of the former Bandundu

Change type	Change	AD (ha/yr)			
		1995-2000	2000-2010	2010-2014	Total (95-14)
Deforestation	FD-NF	18,713	16,362	21,477	18,058
	FS-NF	7,534	4,300	20,297	8,519
	FSC-NF	5,510	3,265	5,558	4,339
	Total	31,757	23,928	47,333	30,915
Degradation	FD-FS	5,883	9,093	20,755	10,703
	FD-FSC	23	9	2	11
	FS-FSC	20	2	0	6
	Total	5,925	9,103	20,757	10,720
Gain	NF-FD	278	731	1,338	739
	NF-FS	248	544	13,719	3,240
	NF-FSC	35	5	20	16
	FS-FD	1,311	1,100	492	1,027
	FSC-FD	81	48	0	46
	FSC-FS	12	9	3	9
	Total	1,965	2,437	15,572	5,078

Development of Emission Factor

Sample data collection and ground truth

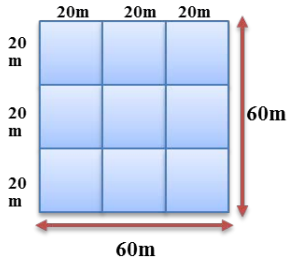


Ground truth in north

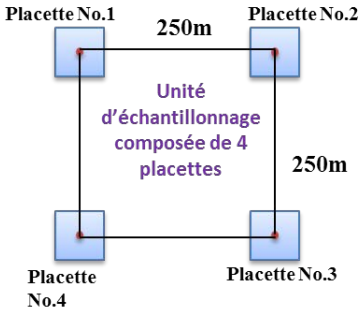
Ground truth in south

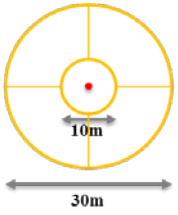
Methodology of forest inventory

- The sampling method is systematic and stratified
- Plots are taken in cluster (clusters are sampling units)

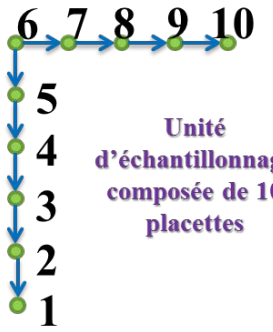


Placette carrée de 60m x 60m



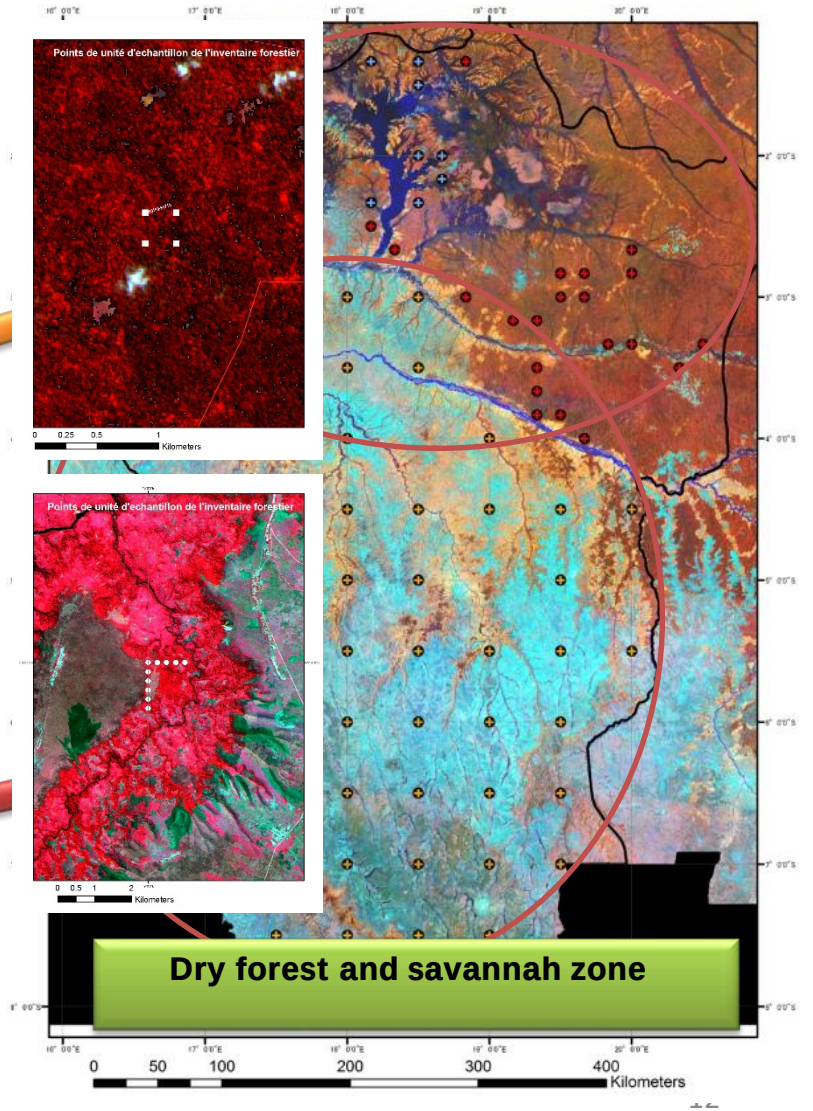


Placette circulaire de 30m de diamètre

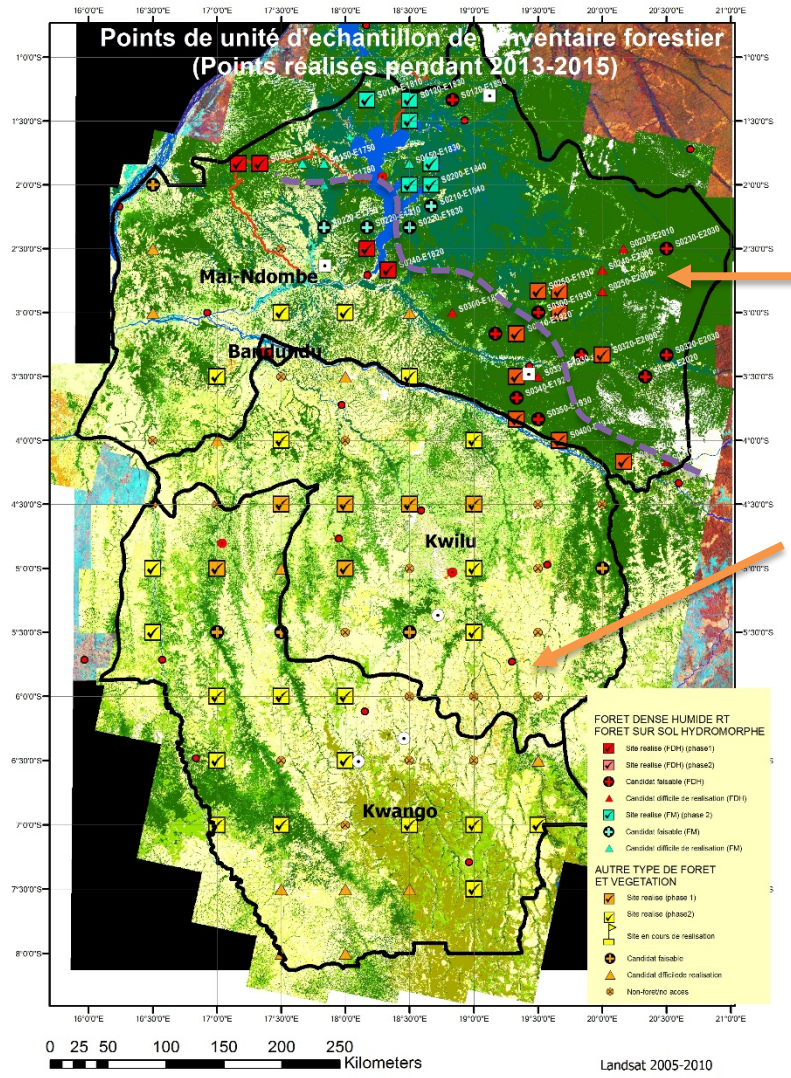


Unité d'échantillonnage composée de 10 placettes

Majority forest areas (dense moist forest and swamp forest)



Number of sampling units inventoried



Number of SU finished up to the end of phase 2

Zone	Type	Ph. 1	Ph. 2	Total
majority forest area	Dense moist forest	4	20	24
	Swamp forest	-	6	6
Mixed zone	Dry forest and savannah with woody vegetation	6	27	33
Total		10	53	63

Stock by stratum and Emission Factor

Table : Stock by stratum

Forest type	Biomass ($t\ ha^{-1}$)	Carbon ($t\ ha^{-1}$)	CO_2 ($t\ ha^{-1}$)
Dense moist forest (Forêt dense humide (FD))	372.34	175.00	**641.67**
Secondary forest (Forêt secondaire (SD))	259.12	121.79	**446.55**
Dry forest / open forest (Forêt sèche / forêt Claire (FSC))	78.17	36.75	**134.75**
Non forest (Non forêt (NF))	27.84	13.08	**47.98**

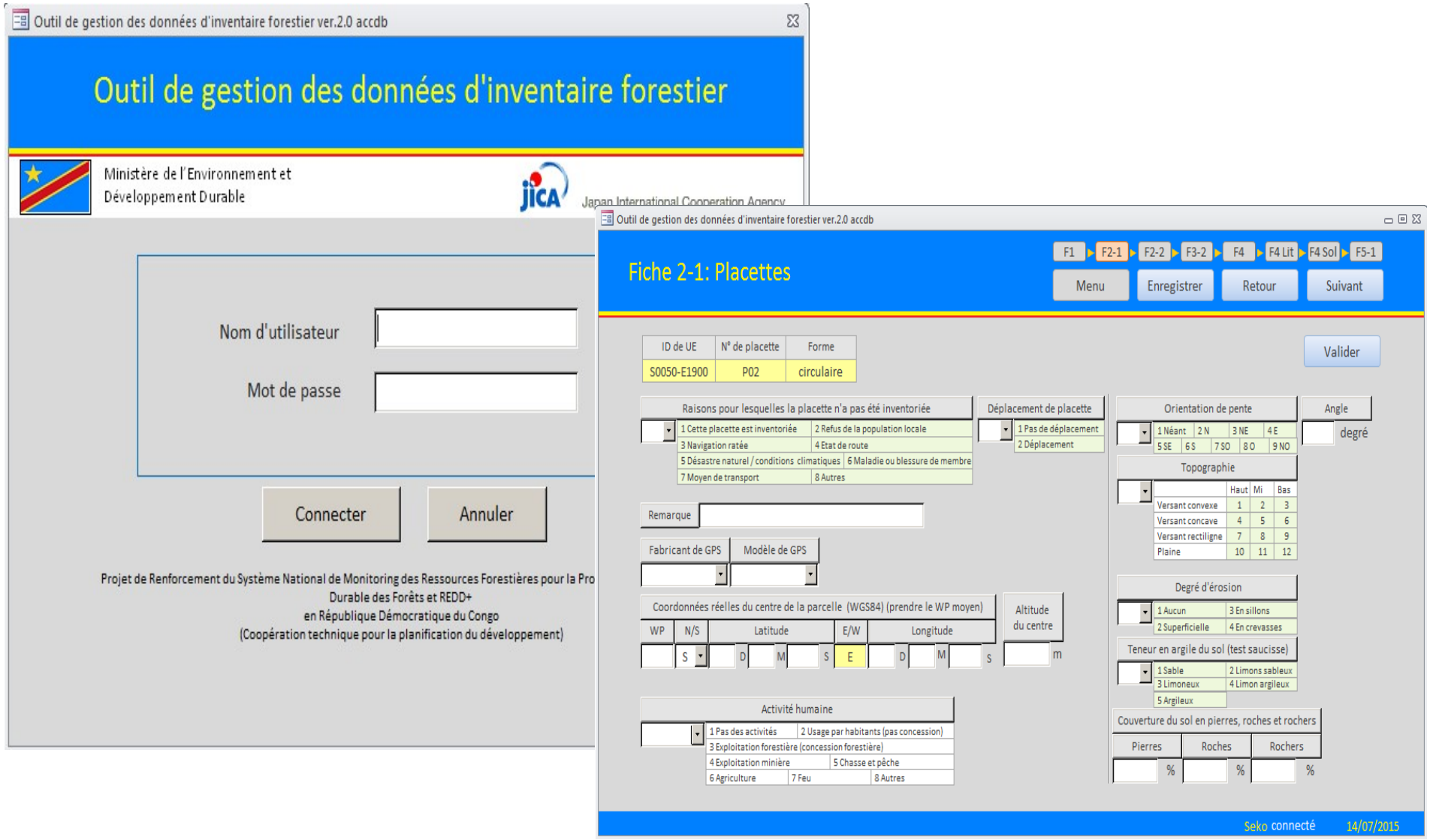
Table : Emission Factor of deforestation and forest degradation

Change type	Change type	CO_2 (=EF)
Deforestation	FD-NF	593.69
	FS-NF	398.57
	FSC-NF	86.77
Degradation	FD-FS	195.12
	FD-FSC	506.92
	FS-FSC	311.80

EF = (Quantity of CO_2 after conversion) - (Quantity of CO_2 before conversion)

Establishment of database

Development of data input interface is accomplished

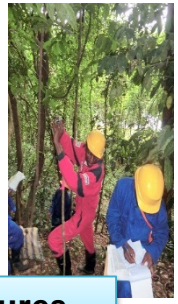


Data processing capacities are enhanced

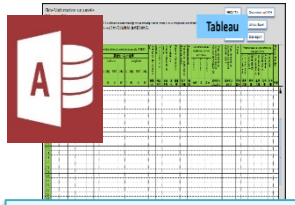
Field survey → Collected data → Data stored in DB

Field note

GPS data

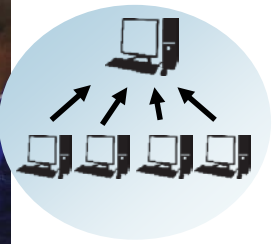


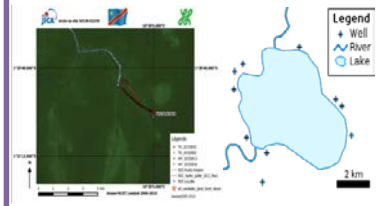
Pictures



Dendrometric data

Raw data



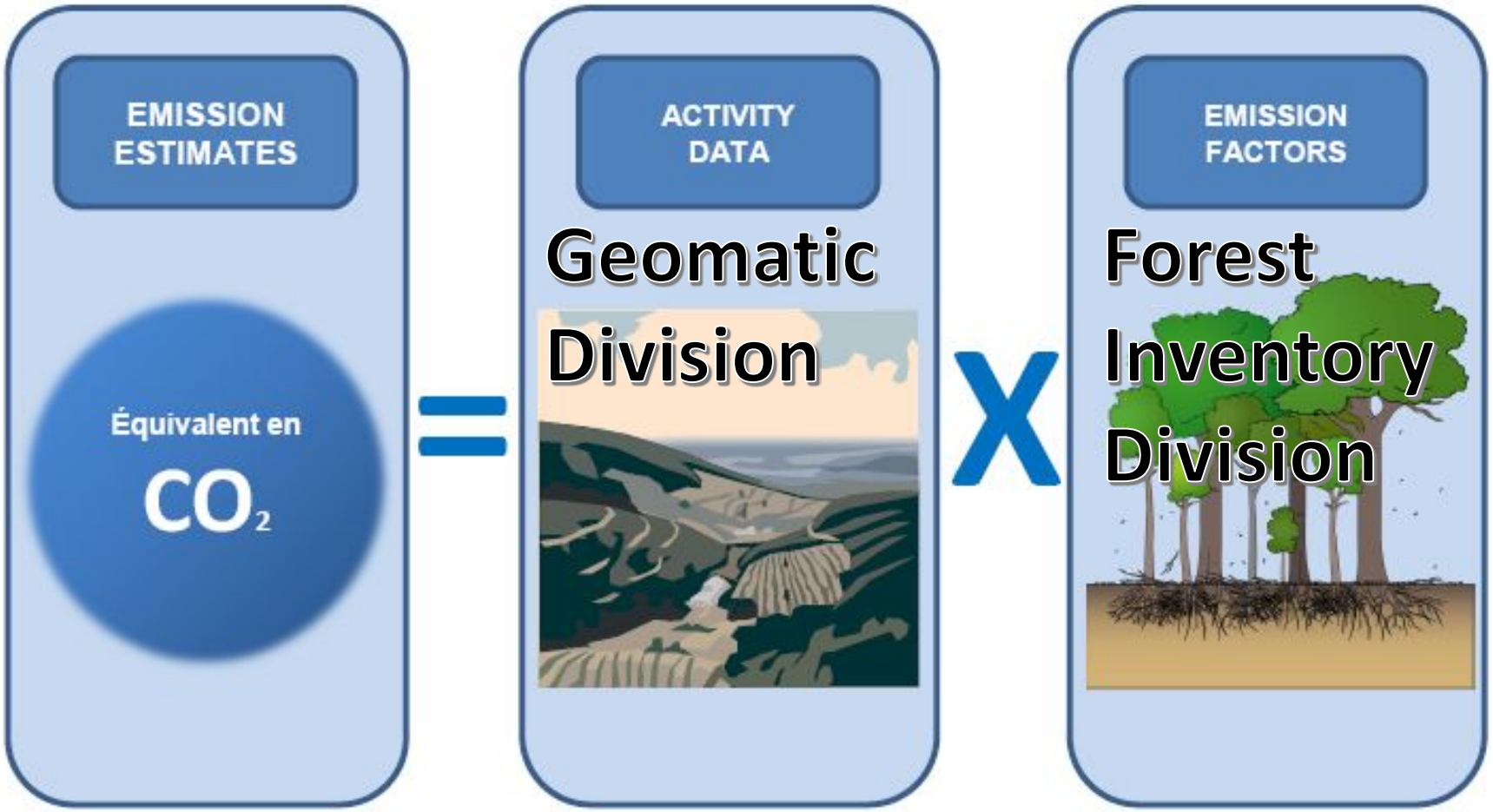


Shape file, access map and plot location

Picture of forest condition

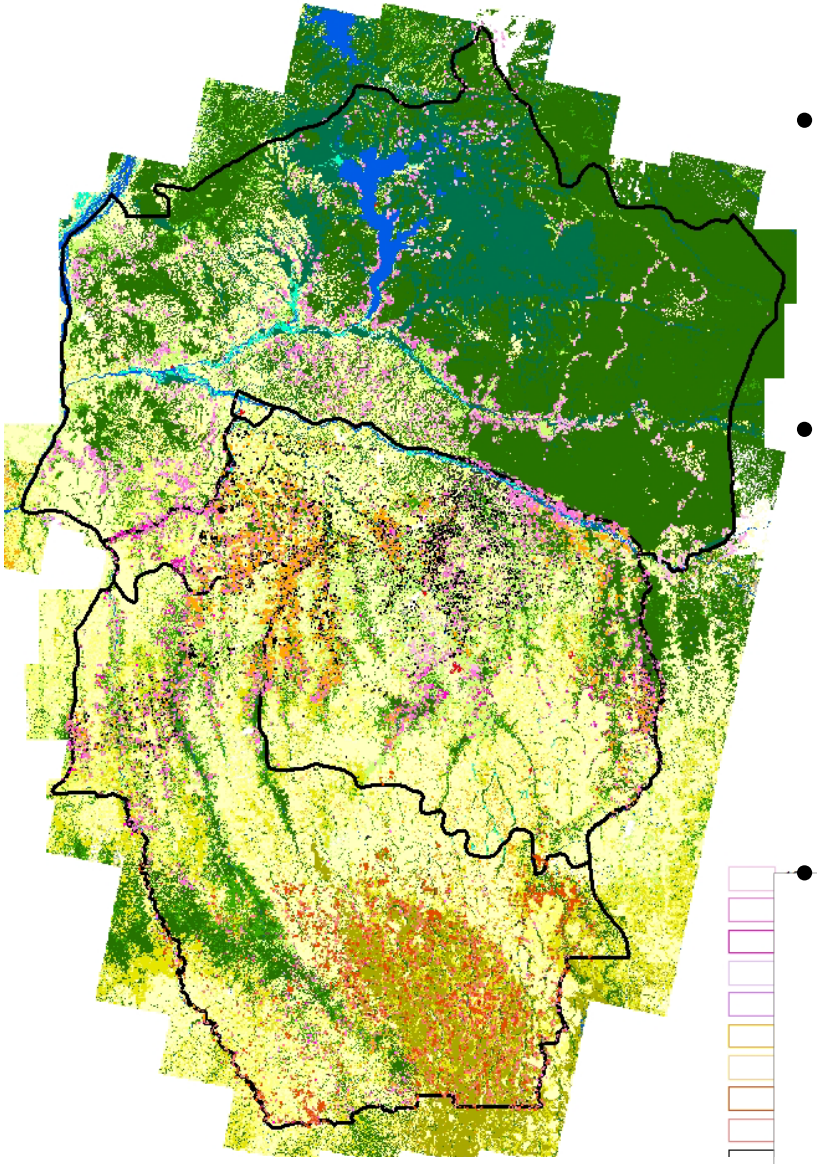
Construction of FREL/FRL

CO_2 Emission



Danilo Mollicone, FAO

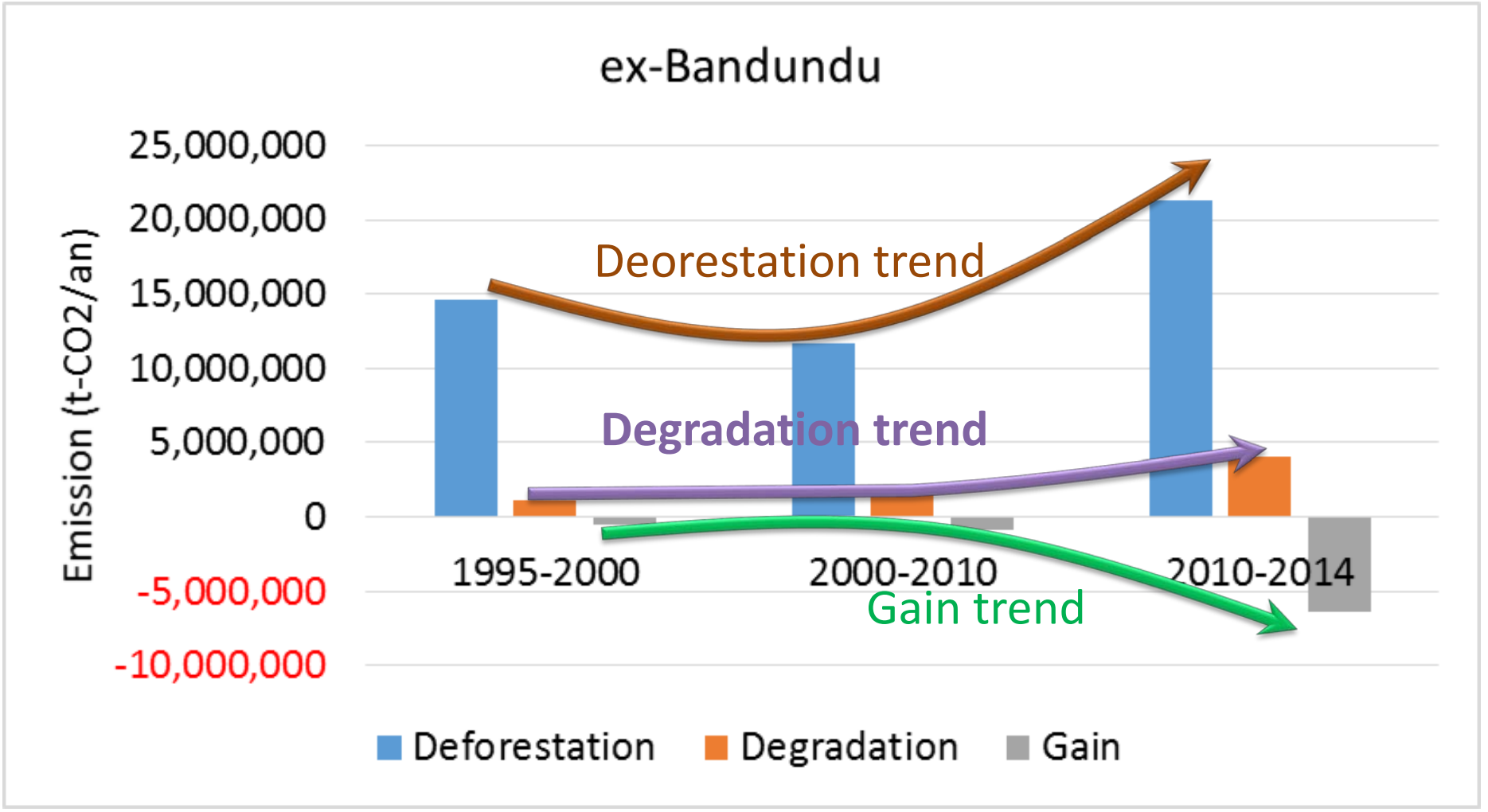
General information about the provinces



- **Mai-Ndombe**
  - ✓ Forest area (dense moist forest and swamp forest)
  - ✓ Forest cover rate : 71%
- **Kwilu**
  - ✓ Tributary of its median position between forest area and savannah area. From North to South, the landscape of this province changes from forest to savanna
  - ✓ Rate of forest cover : 21%
- **Kwango**
  - ✓ Savannah area (Savannah, gallery forest and Miombo forest are distributed)
  - ✓ Rate of forest cover: 30%

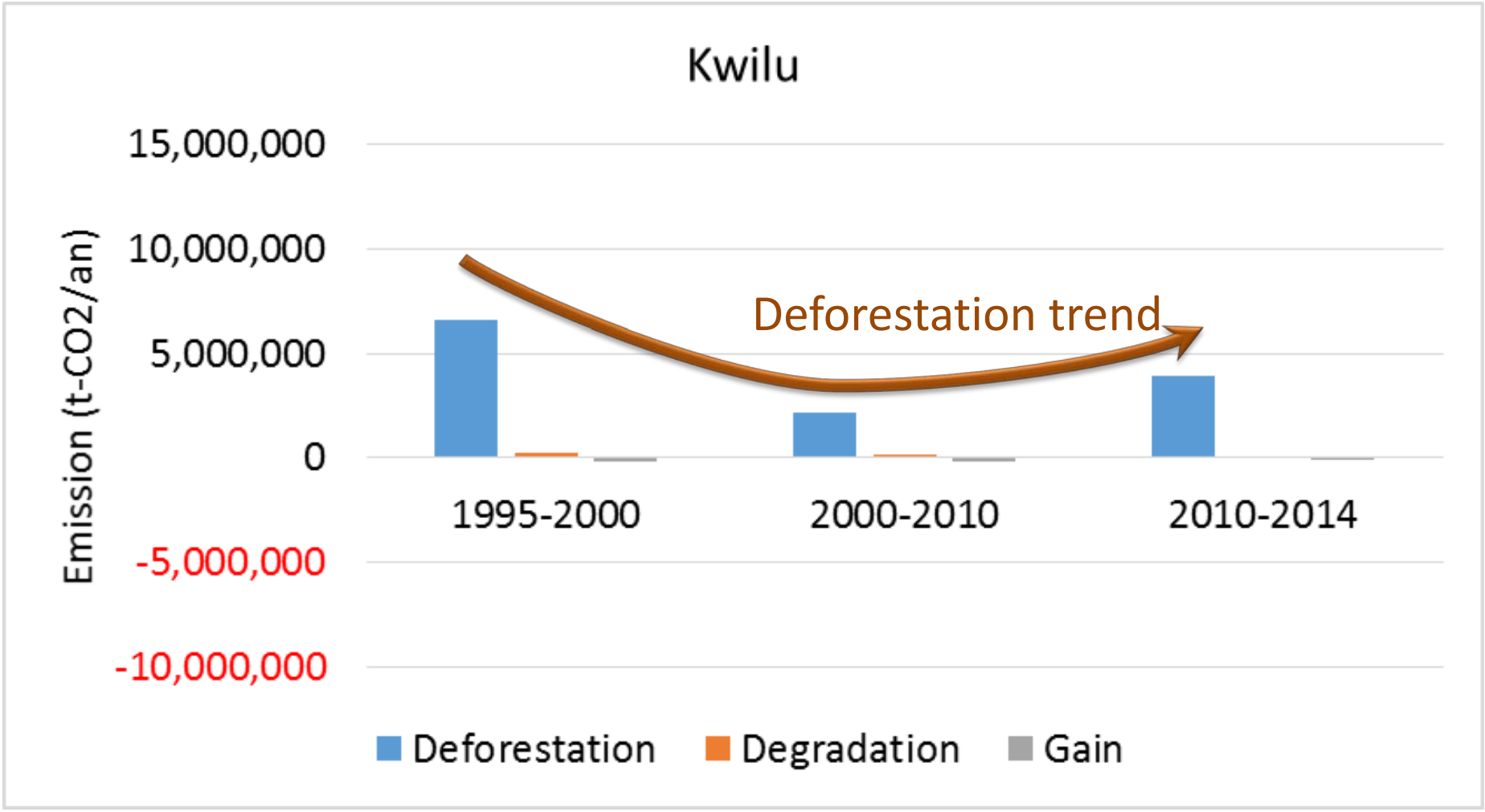
CO_2 emission, Ex-Bandundu

Proportion of Annual Forest Area Change from 1995 to 2014 -0.20%



CO_2 emission, Kwilu

Proportion of Annual Forest Area Change from 1995 to 2014
-0.39 %



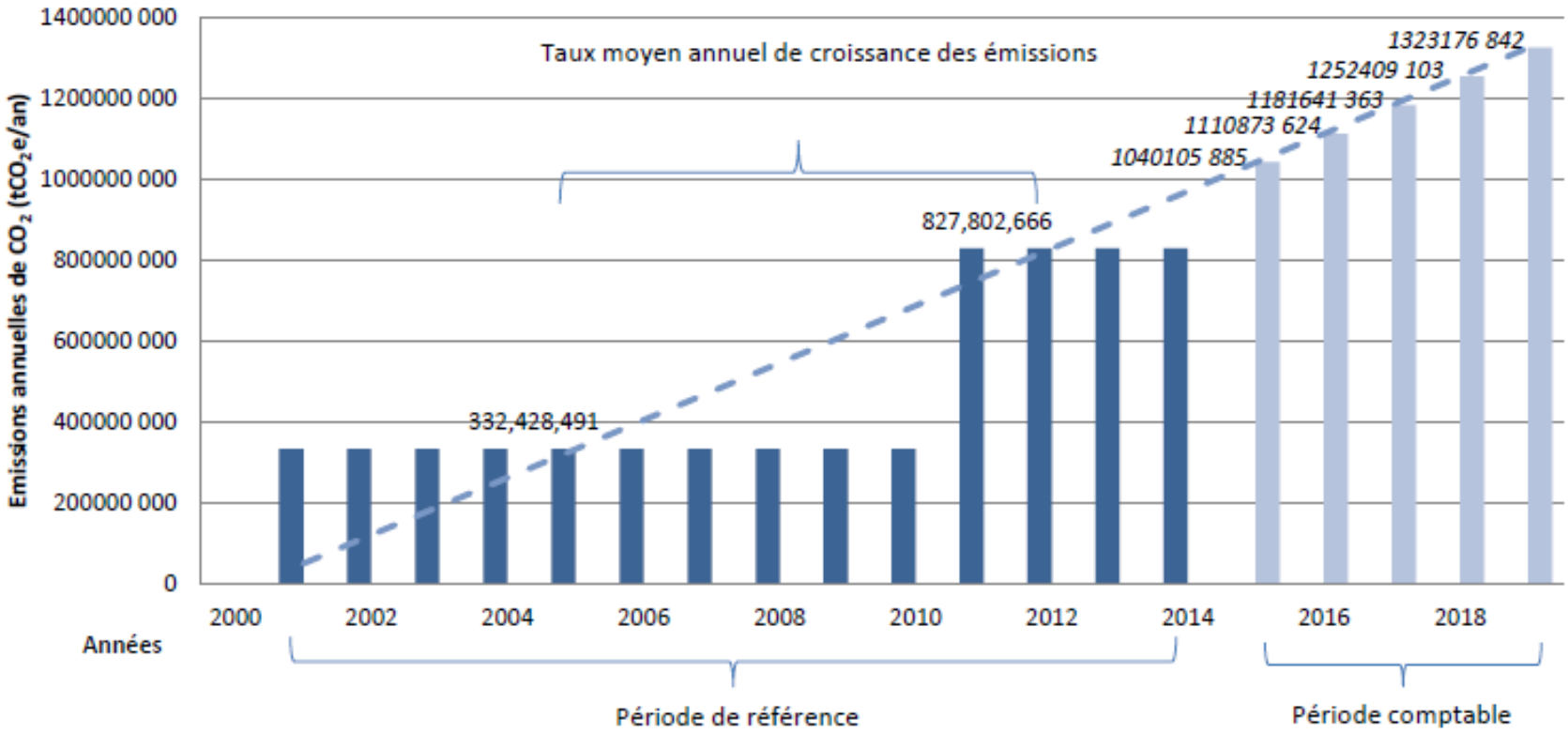
CO_2 emission estimates

- Estimates (period from 1995 to 2014)

Province	Type de chang.	Emission (t-CO2/an)
		1995-2014
Kwango	Deforestation	1,575,783
	Degradation	103,646
	Gain	-110,102
Kwilu	Deforestation	3,697,709
	Degradation	140,327
	Gain	-161,445
Mai-Ndombe	Deforestation	9,219,003
	Degradation	1,851,889
	Gain	-1,686,768

National FREL/FRL in DRC

Historical annual emissions (2000 - 2014) and projected emissions during the accounting period



Achievements of JICA Project

- JICA successfully develop national forest monitoring system in sub-national scale and it has been impacted to NFMS and contribute to FREL/FRL submission
- Applying collected data, JICA developed sub-national FREL/FRL
- JICA will address to improve forest monitoring and forest governance by applying our assets including JJ-FAST.
- JICA will shift to project level activities and realize emission reduction in Kwilu province.

What is roles of forest monitoring in different implementation scale?

Expectation for project by approach types

Approach type 1

- National FREL/FRL dose not exist
- Project scale REDD+ put in place as a **demonstration**
- Project scale FREL/FRL shall be **influenced** to national FREL/FRL

Approach type 2

- National FREL/FRL dose exisit
- Project scale REDD+ put in place as **implementation**
- Project scale FREL/FRL shall be **followed** national FREL/FRL

Current stats of FREL/FRL submission

Approach 2 is the most likely case in the future.

What is the role of forest monitoring at the project level?

Necessary items to be monitored under REDD+

Monitoring items	NFMS	Project
Deforestation	◎	◎
Degradation of forest	○	○
Forest Improvement	△	
Bio-diversity	△	
Policy and measures	△	
Lively hood improvement	×	

Discussion

- Increase the submission of FREL/REL to UNFCCC in tropical forest countries which have high expectation to REDD+.

- Development of FREL/REL as trial at the project level REDD+ activities were achieved. However, it is necessary to re-recognize the roles of forest monitoring.

- Under circumstances that REDD+ activities shift to implementation phase, it is expected to collect important information for REDD+, which is not able to collect national level forest monitoring.

- These above points will connect to add values of project itself.

- Let’s discus the roles of forest monitoring in different scale such as national, sub-national, local administration, or project !!