



# Development of REL in VN

## -Interim results and lessons learned through JICA project-



Dr. Pham Manh Cuong (VNFOREST)  
SUZUKI KEI (JICA Study Team)



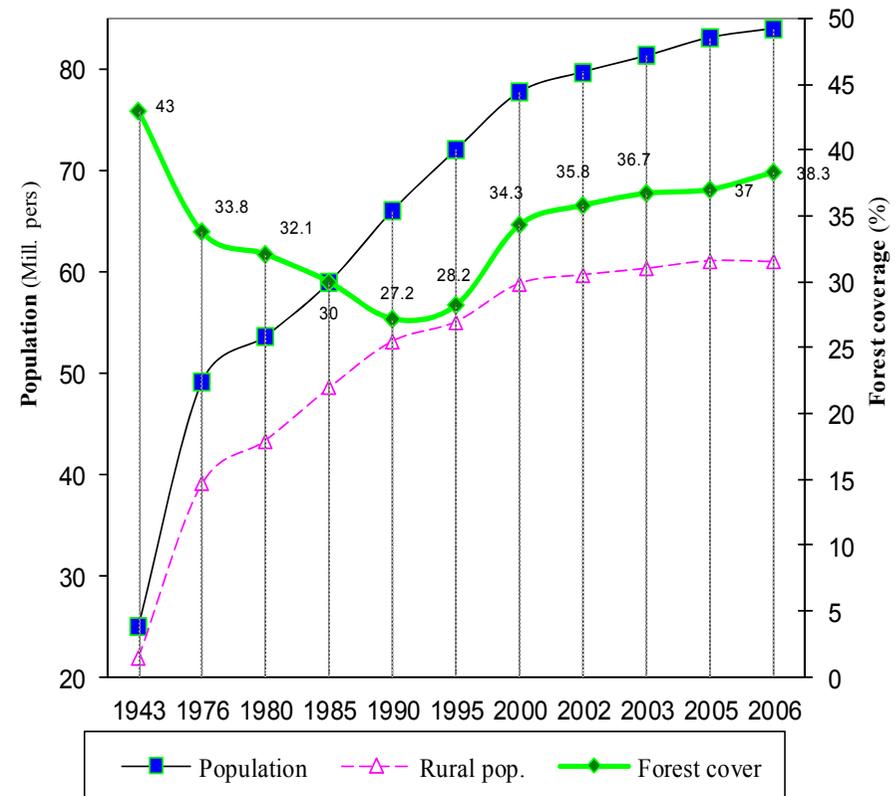
# Background





# Background – Forest cover changes

- In 2010, forest area: 13.3 mill. Ha, of which:
  - Natural forests: 10.03 mill. Ha
  - Forest plantation: 2.7 mill. Ha
- Forest cover decreased from 43% (1943) to 28% (1995) BUT increased to 39.5% (2010).
- However, the changes are **not always** in progressive and the same in all regions





# Background – NFI vs NFM

- Two forest monitoring systems: NFM and NFI
- NFM: bottom-up from sub-compartment level (1989 – 1992) and (1997-1999), **responsible by local forest owners and managers**, No permanent sample plot - for forest management purposes
- NFI: to provide aggregated forest data for forest planning at national and sub-national level, **led by central agencies**



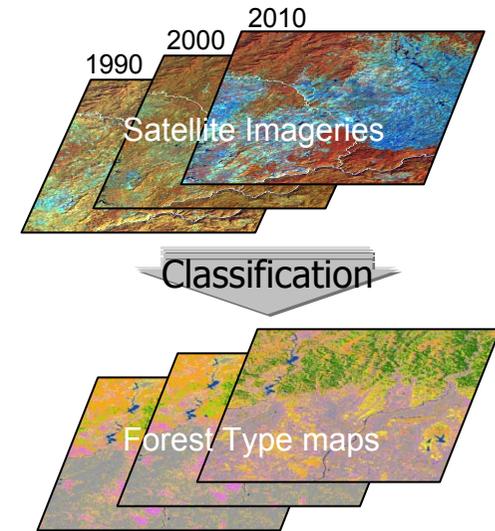
# Background – NFI

- Legal foundation: **mandated by Law**
- Frequency: every 5 year
- Starting year: 1991;
- Coverage: nationwide
- Implemented by: MARD
- Funded by GoV with technical support from FAO
- Methods:
  - Wall-to-wall forest cover mapping using RS imagery, scale: 1/250,000 – 1/10,000
  - Field measurements: permanent sample plots



# NFI: Forest cover mapping

- RS imagery
  - 1<sup>st</sup> cycle 1991 – 1995: Landsat TM
  - 2<sup>nd</sup> cycle 1996 – 2000: SPOT 1, 2
  - 3<sup>rd</sup> cycle 2001 – 2005: Landsat ETM+
  - 4<sup>th</sup> cycle 2006 - 2010: SPOT5

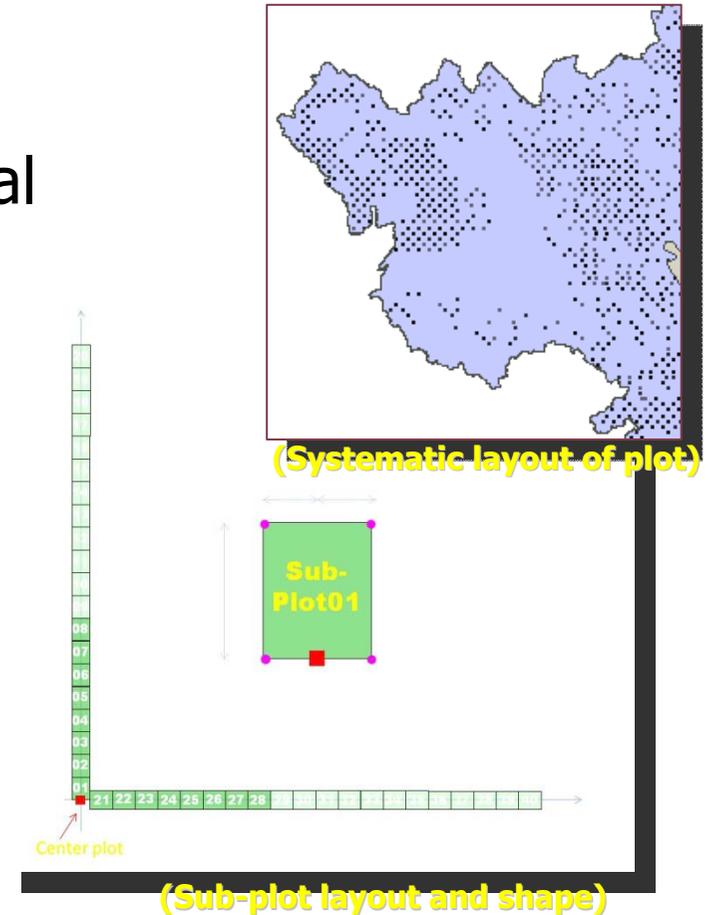


- Visual interpretation and correction through field surveys
- Over 30 detailed LU/LC categories



# NFI Field Measurement

- A sample plot system
- 4 cycles from 1991 with 5 years interval
  - 1<sup>st</sup> cycle 1991 – 1995: 3,000 Plots
  - 2<sup>nd</sup> cycle 1996 – 2000: 3,800 Plots
  - 3<sup>rd</sup> cycle 2001 – 2005: 4,200 Plots
  - 4<sup>th</sup> cycle 2006 - 2010: 2,100 Plots
- 8km systematic sampling
- 1 plot consisting with 40 sub-plots
- Sub-Plot size=20m × 25m Rectangle





# Methodologies and data

–Activity data and Emission Factor–





# Methodologies

JICA Project interpreted REL/RL as.....

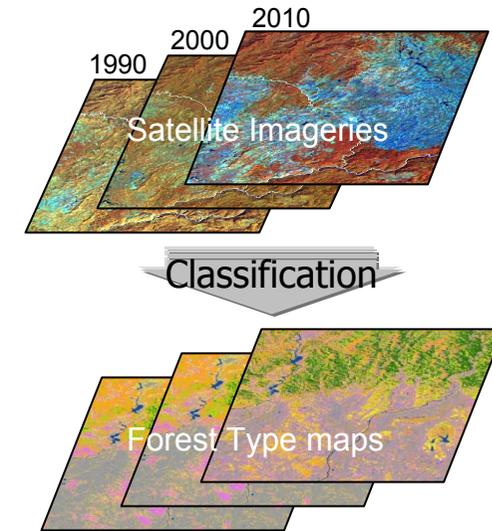
- ...future carbon changes based on extrapolation of historical carbon changes.
- ...carbon changes are estimated by combination of ground base data and remote sensing data.
- ...REL is related activities of i , ii and RL is related activities of iii , iv , and v as mentioned in the decision 1/CP.16



# Data collection

## 1. Activity data (AD)

- 1990 NFM + validated by using Landsat TM
- 1995 NFI + (Landsat TM)
- 2000 NFI + (Landsat TM)
- 2005 NFI + (Landsat TM and ASTER)
- 2010 NFI + (SPOT 5 + field surveys)



forest maps with harmonized 17 LU/LC categories

- ## 2. Emission factor (EF):
- used the NFI sample plot measurement data



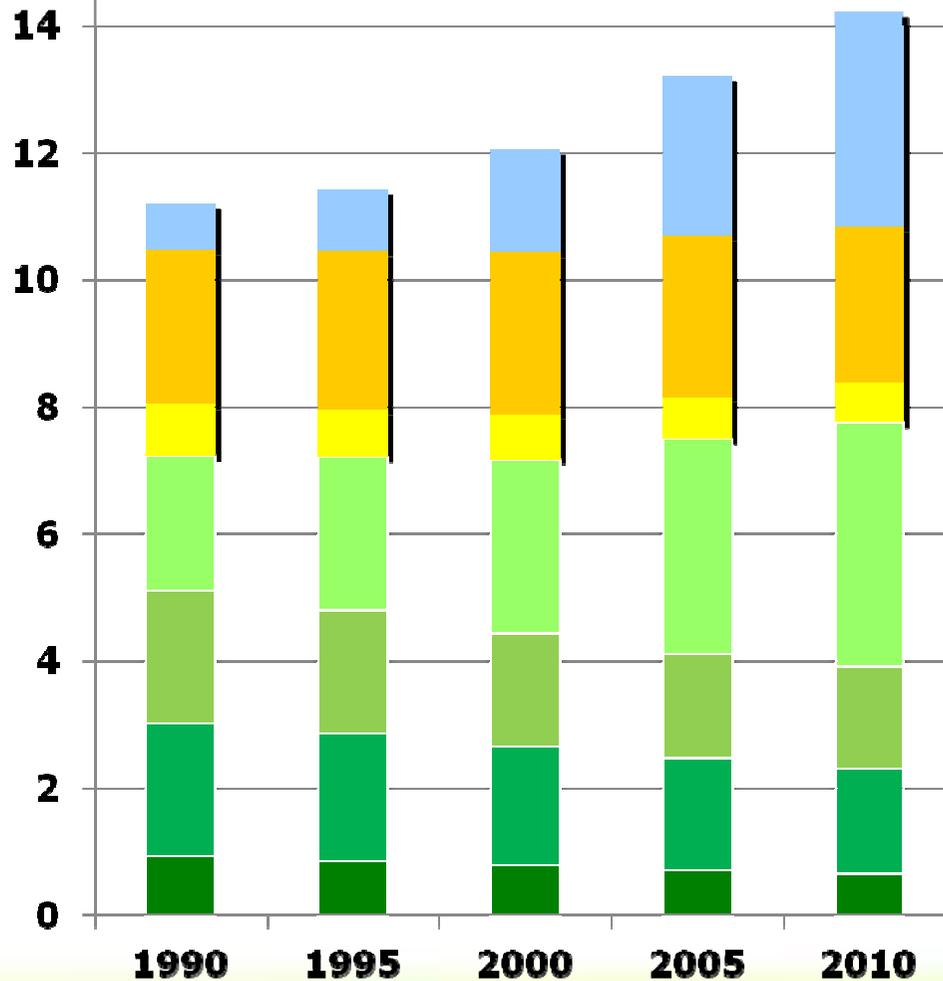
# Results

\* All data needs to be revised after verification



# Historical trends of forest area

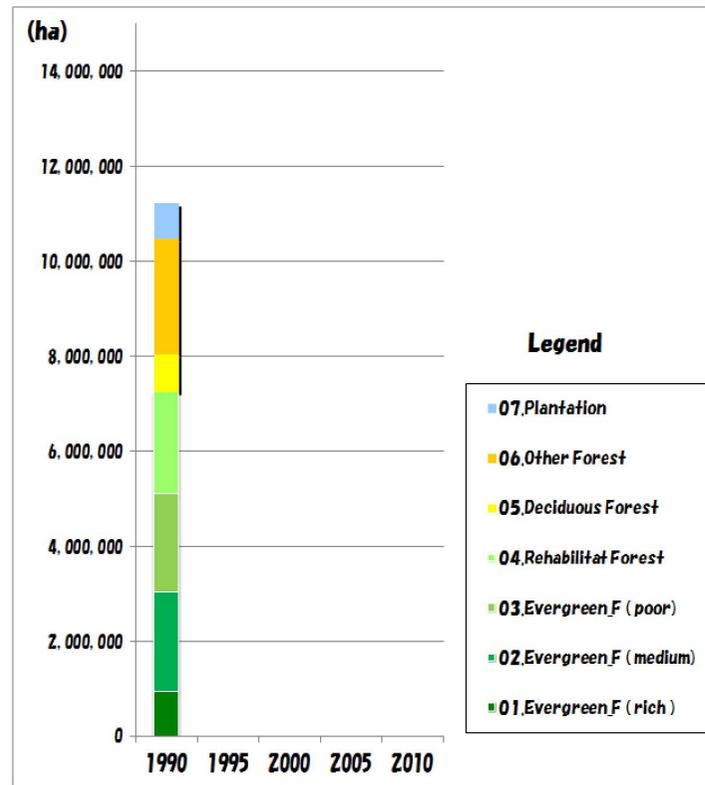
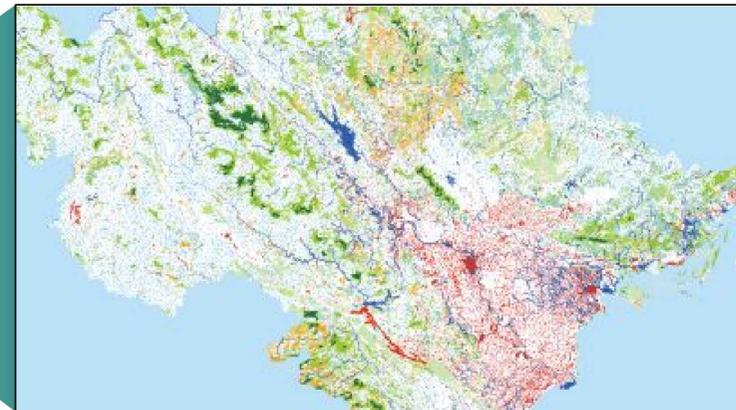
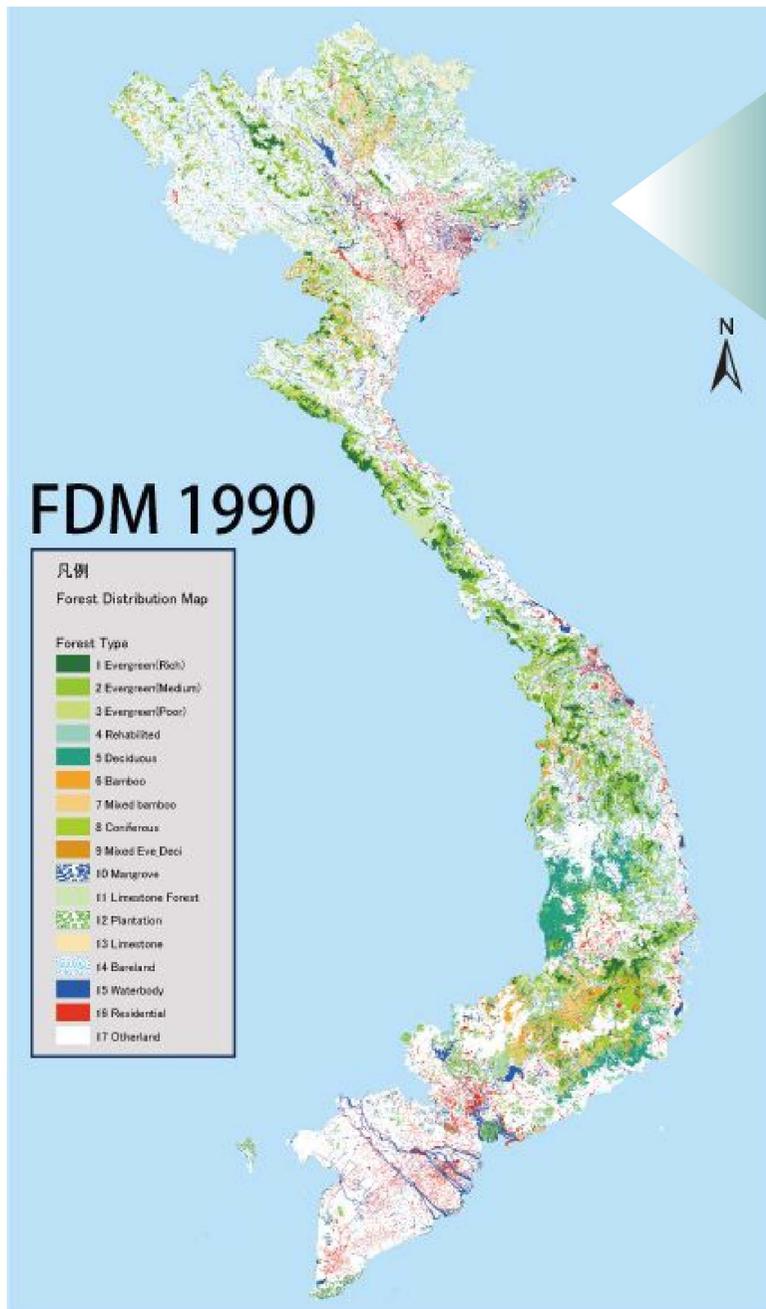
(million ha)



Legend

- 07. Plantation
- 06. Other Forest
- 05. Deciduous Forest
- 04. Rehabilitat Forest
- 03. Evergreen\_F ( poor )
- 02. Evergreen\_F ( medium )
- 01. Evergreen\_F ( rich )

National scale forest type area changes from 1990 in Viet Nam





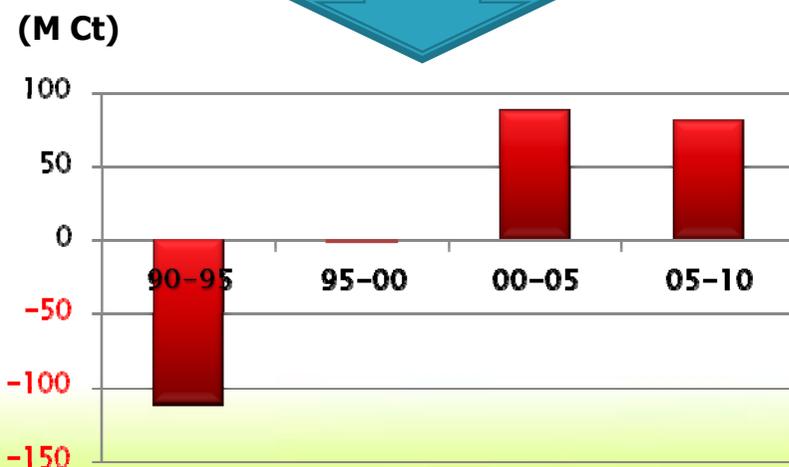
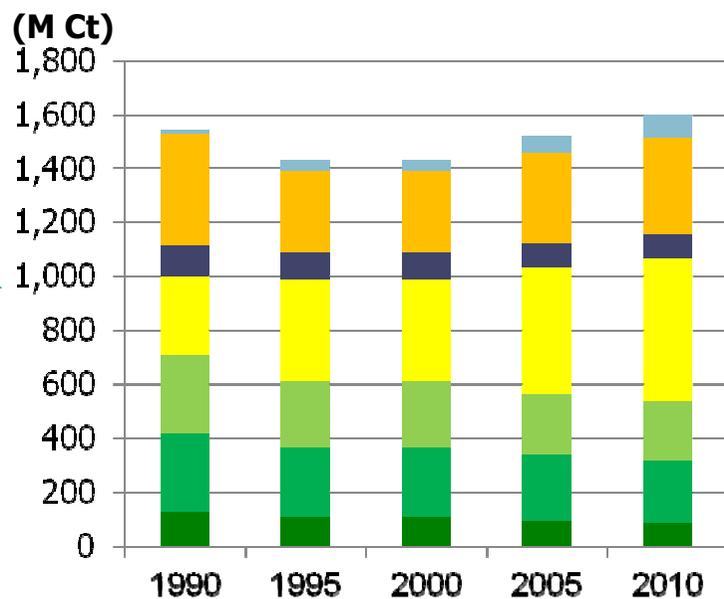
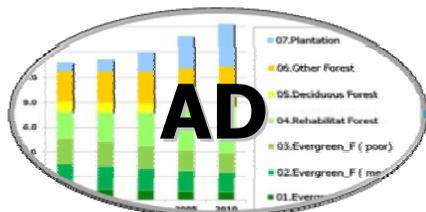
# Development of EF

Example of average carbon stock based on 3<sup>rd</sup> cycle of NFI (Ct/ha)

Bio-region \ F Types	Evergreen broadleaf forest, rich forest	Evergreen broadleaf forest, medium forest	Evergreen broadleaf forest, poor forest	Evergreen broadleaf forest, rehabilitation forest	Deciduous forest	Bamboo forest	Mixed timber and bamboo forest	Coniferous forest	Mixed broadleaf and coniferous forest	Mangrove forest	Limestone forest	Plantation
Cardamom Mountains rain forests	127	87	45	43	57	56	49	40	72	27	30	32
Central Indochina dry forests	118	74	31	40	58	56	64	40	72	27	30	32
Indochina mangroves	127	76	36	31	57	56	49	40	72	27	30	32
Luang Prabang montane rain forests	129	82	36	31	57	56	68	40	72	27	30	32
Northern Annamites rain forests	142	73	39	28	57	23	49	22	72	27	30	32
Northern Indochina subtropical forests	138	74	32	21	57	77	31	8	72	27	32	23
Northern Vietnam lowland rain forests	117	78	42	30	57	29	41	24	72	27	30	16
Red River freshwater swamp forests	127	76	36	31	57	56	49	40	72	27	30	32
South China-Vietnam subtropical evergreen	127	68	32	19	57	21	26	23	72	27	30	21
Southeastern Indochina dry evergreen forests	119	76	39	40	62	33	55	93	72	27	30	24
Southern Annamites montane rain forests	122	76	39	37	70	20	42	45	73	27	41	53
Southern Vietnam lowland dry forests	123	76	37	38	49	56	52	26	46	27	21	55
Tonle Sap-Mekong peat swamp forests	127	76	36	31	57	56	49	40	72	24	30	34



# Estimation of stock and change





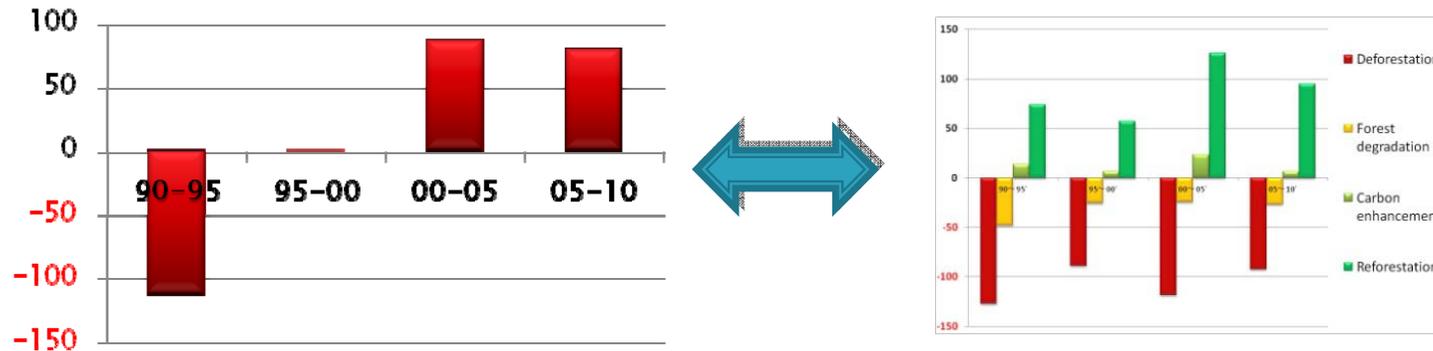
# Challenges –Options for REL–



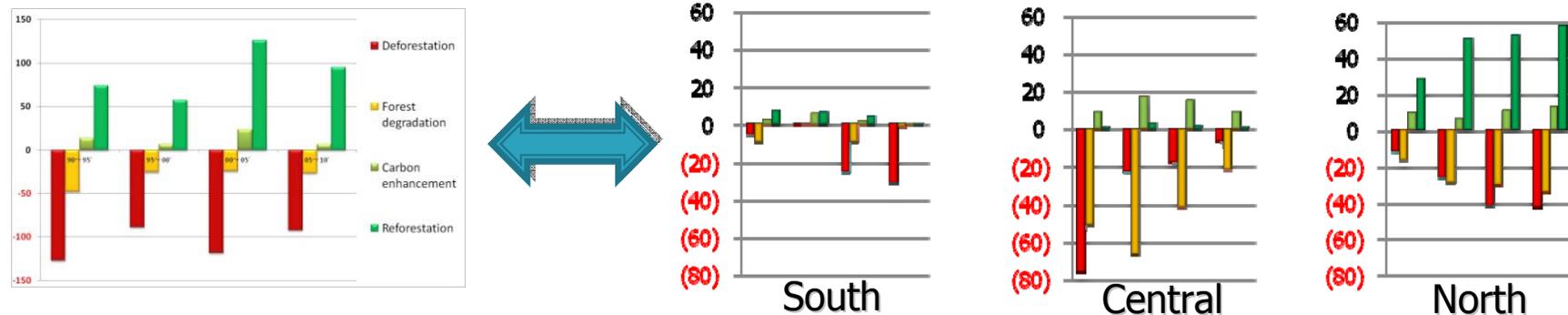


# Several options for development of REL

## 1. Development of separate REL/RL



## 2. National scale of or Sub-national scale of REL/RL ?



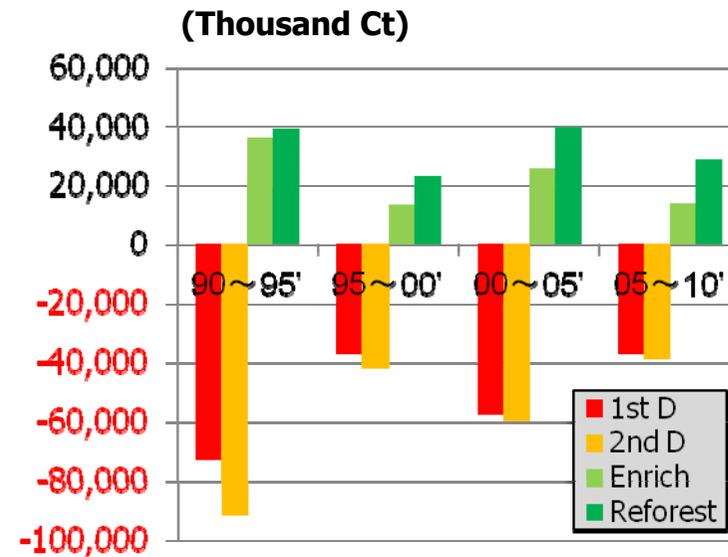
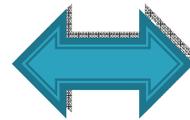
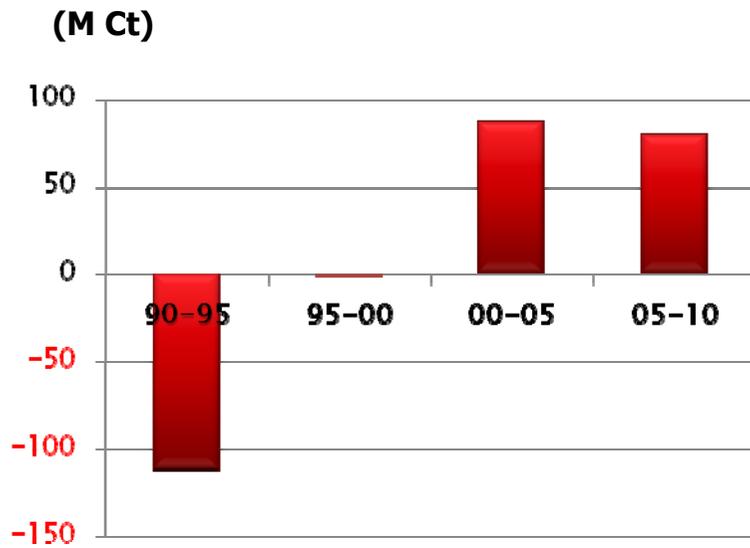
## 3. Time-points of data and extrapolation method

Taking into account of Transparency ,Practicability and National circumstances

\* All data needs to be revised after verification



# 1. Development of separate REL/RL



- **Integration of REL and RL**
- Simple stock change method
- Short processing time
- Difficult to see trends and interpret with driving forces

- **Separation of REL and RL**
- Forest area change matrix method
- Long processing time
- Easy to interpret with driving force and policy action

\* All data needs to be revised after verification



# What is the forest area change matrix

## Forest Type in the year 2000

**Forest Type in the year 1990** (vertical label on the left)

Forest Type in the year 1990	Year 2000													Grand Total		
	Evergreen broadleaf forest, rich forest	Evergreen broadleaf forest, medium forest	Evergreen broadleaf forest, poor forest	Evergreen broadleaf forest, rehabilitation forest	Bamboo forest	Mixed timber forest	Mixed broadleaf forest	Mangrove forest	Limestone forest	Plantation	Limestone area (no forest)	Bare land, soil and fragmented areas	Water body		Residential area	Other land
Evergreen broadleaf forest, rich forest	23,871	8,241	6,470	1,874	100	897	1,640	0	222	0	0	0	0	0	0	48,033
Evergreen broadleaf forest, medium forest	8,415	23,156	4,803	2,673	158	1,135	3,493	0	0	0	0	139	0	0	0	77,316
Evergreen broadleaf forest, poor forest	1,184	2,034	53,630	11,500	1,054	1,003	7,417	0	8	0	0	1,460	0	0	0	140,375
Evergreen broadleaf forest, rehabilitation forest	348	2,734	13,117	3,893	69	886	9,182	0	229	0	0	2,590	0	0	0	55,971
Deciduous forest	74	324	718	959	47,140	0	0	0	0	0	0	0	0	0	0	69,744
Bamboo forest	6	253	477	2,812	1	4,722	3,855	0	0	0	0	56	0	0	0	23,623
Mixed timber forest	357	7,373	7,321	7,321	7	3,558	30,794	0	1,939	0	0	1,330	0	0	0	71,722
Coniferous forest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mixed broadleaf and coniferous forest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mangrove forest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Limestone forest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plantation	0	0	47	12	0	0	0	0	0	0	0	450	0	0	0	965
Limestone area (no forest)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bare land, soil and fragmented areas	204	1,089	12,322	4,987	3,175	2,263	3,242	0	131	0	0	2,579	0	0	0	85,490
Water body	1	4	9	8	0	0	0	0	0	0	0	0	21	2,321	75	2,718
Residential area	0	0	8	0	0	0	0	0	0	0	0	72	0	113	9	791
Other land	10	626	1,738	3,561	333	940	1,182	0	25	0	0	1,470	0	9,866	484	75,098
<b>Grand Total</b>	<b>34,470</b>	<b>65,833</b>	<b>99,371</b>	<b>39,600</b>	<b>51,943</b>	<b>15,411</b>	<b>66,527</b>	<b>0</b>	<b>2,554</b>	<b>0</b>	<b>0</b>	<b>10,655</b>	<b>0</b>	<b>60,535</b>	<b>3,320</b>	<b>651,844</b>

**Category of Forest** (horizontal label above the matrix)

**Category of Non Forest** (horizontal label above the matrix)

**Forest degradation** (diagonal label pointing from top-left to bottom-right)

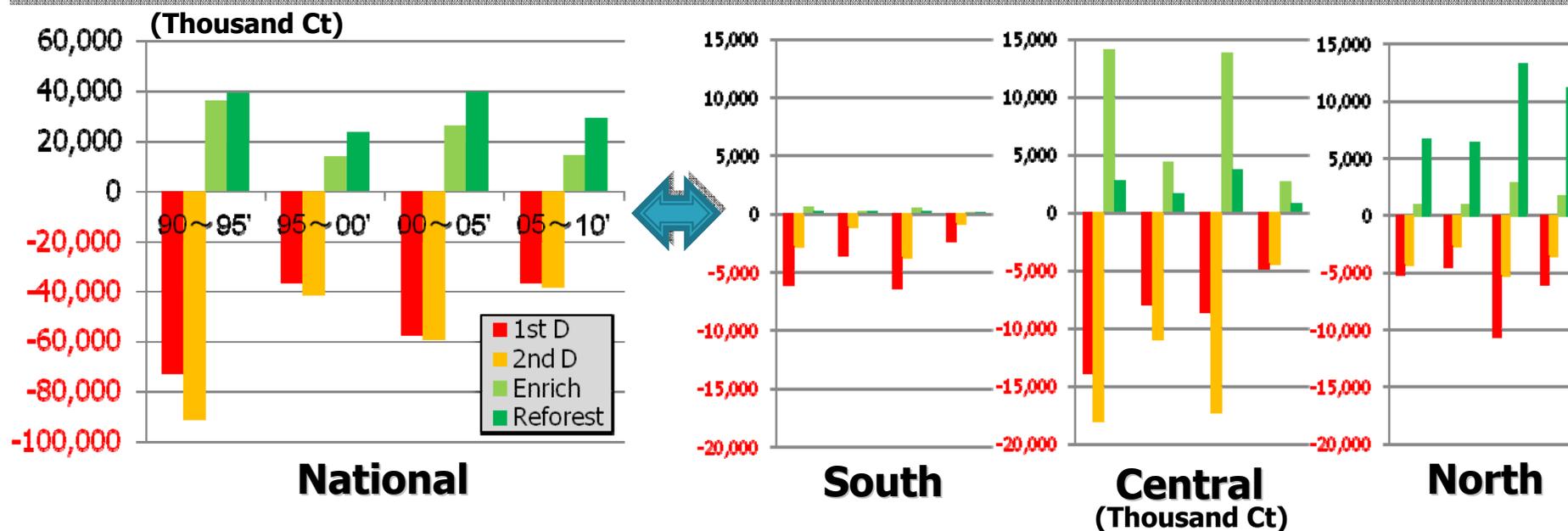
**Forest enhancement/regrowth** (diagonal label pointing from bottom-left to top-right)

**Deforestation** (label pointing to the transition from forest to non-forest)

**Reforestation** (label pointing to the transition from non-forest to forest)



## 2. National scale or Sub-national scale of REL/RL



### ● REL/RL in National scale

- Closely related with national strategy
- Difficult to extrapolate forest change trends associated with driving forces

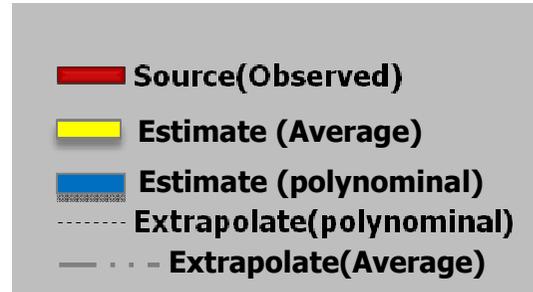
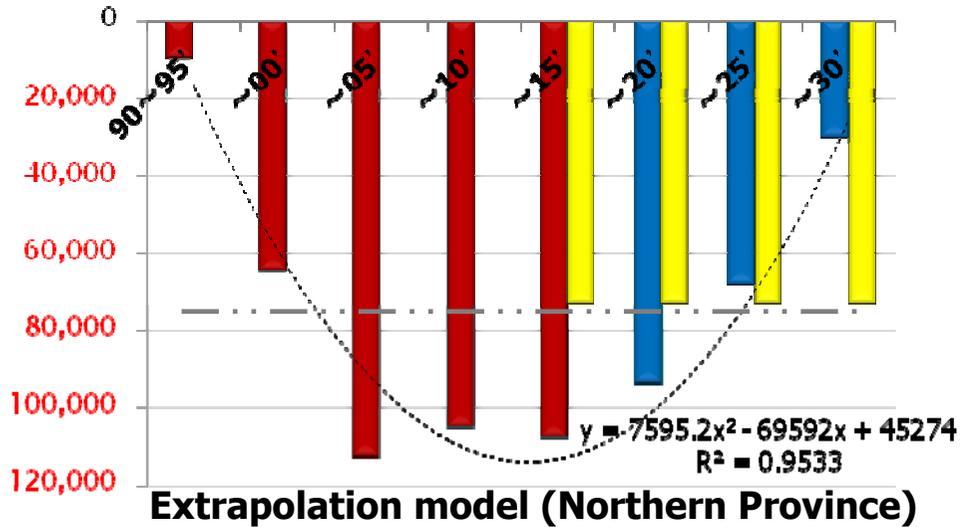
### ● REL/RL in Sub-national scale

- Closely related with regional strategy and driving forces
- Easy to extrapolate forest change trends associated with driving forces

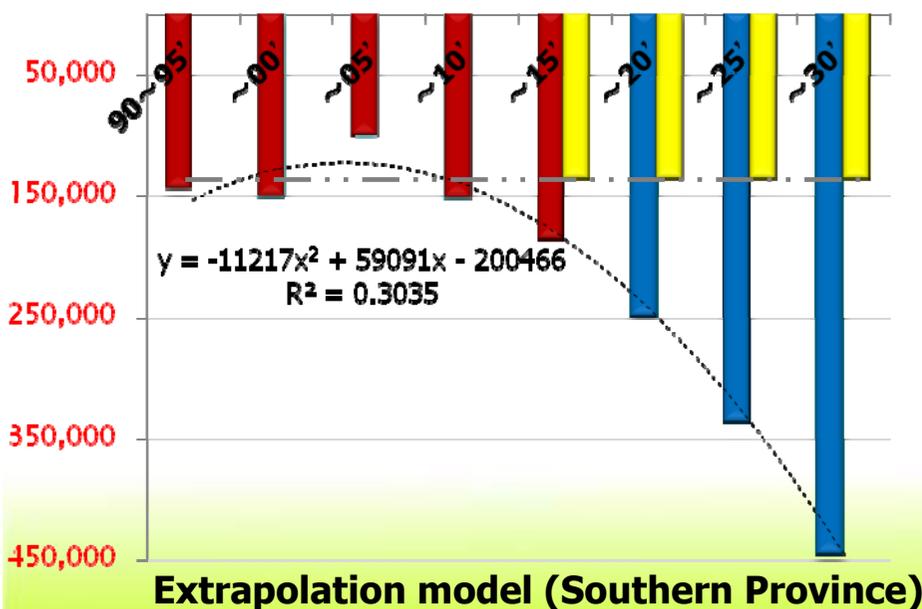
\* All data needs to be revised after verification



### 3. Time-points of data and extrapolation method



$\Sigma(\text{Estimate Average})=331 \text{ (Mct)}$   
 $\Sigma(\text{Estimate Polynomial})=300 \text{ (Mct)}$



The extrapolation models have to be scrutinized to make an appropriate selection. Otherwise, over/underestimation is likely to take place.

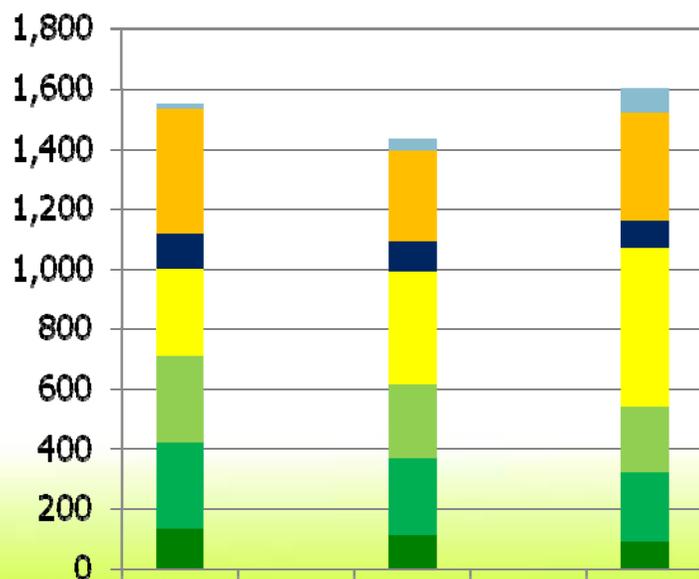
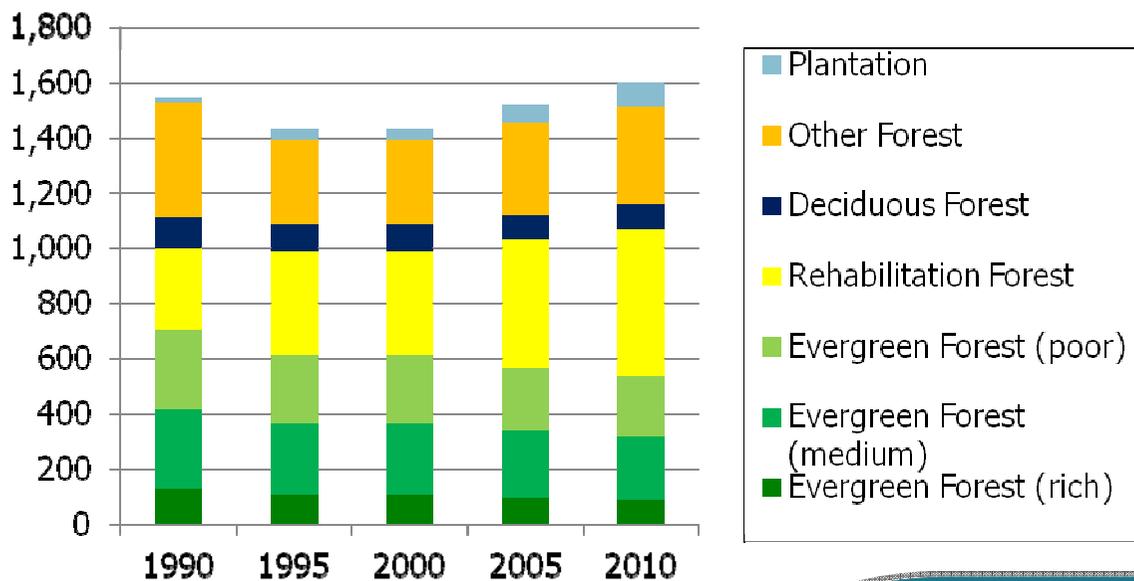


$\Sigma(\text{Estimate Average})=547 \text{ (Mct)}$   
 $\Sigma(\text{Estimate Polynomial})=1,217 \text{ (Mct)}$





### 3. Time-points of data and extrapolation method



As compared to the other countries, Vietnam relatively possesses abundant data in good condition, with less cloud coverage and NFI data. The REDD research and development center (FFPRI) of Japan found it difficult to collect the satellite data for the tropical countries at five different points in time.



# Findings(1)



→ NFI (The data)



→ Drivers, which may be diverse locally, will have to be analyzed for the construction of REL/RL.



## Findings(2)



Local (sub-national) differences in the status of deforestation and forest degradation should be evaluated, and these differences should be connected to the construction of REL/RL. To this end, Setting REL and RL separately in sub-national scales is appropriate to understand forest change trends and their driving forces in the past and to ensure formulation of suitable policy actions.



Selection of extrapolation methodologies should take into account transparency, practicability and national circumstances. As a future challenge, it is a key to managing and reducing uncertainty.



## **Next steps for Vietnam**

---

- 1. Consideration of National circumstances into BAU and turn to be REL/RL**
  - National and sub-national levels**
  - REL for detail REDD activities**
- 2. Improvement of current NFI to also meet REDD+ requirements**



*Thank you for attention!*