

REED PROGRAM AND FOREST MONITORING BY USING OF GIS AND REMOTE SENSING

Dr. nguyen Phu Hung
Deputy Director General
Tel. 04-6870600 or. 04-8615315
Mobil. 0912094190
Email: p.hung.tbi@hn.vnn.vn

Forest Inventory and Planning Institute(FIPI)



I/ USING OF REMOTE SENSING FOR FOREST INVENTORY

- + Since 1971, Forest Inventory and Planning Institute (FIPI) has used air-photos for forest inventory in the north of Vietnam.

For example:

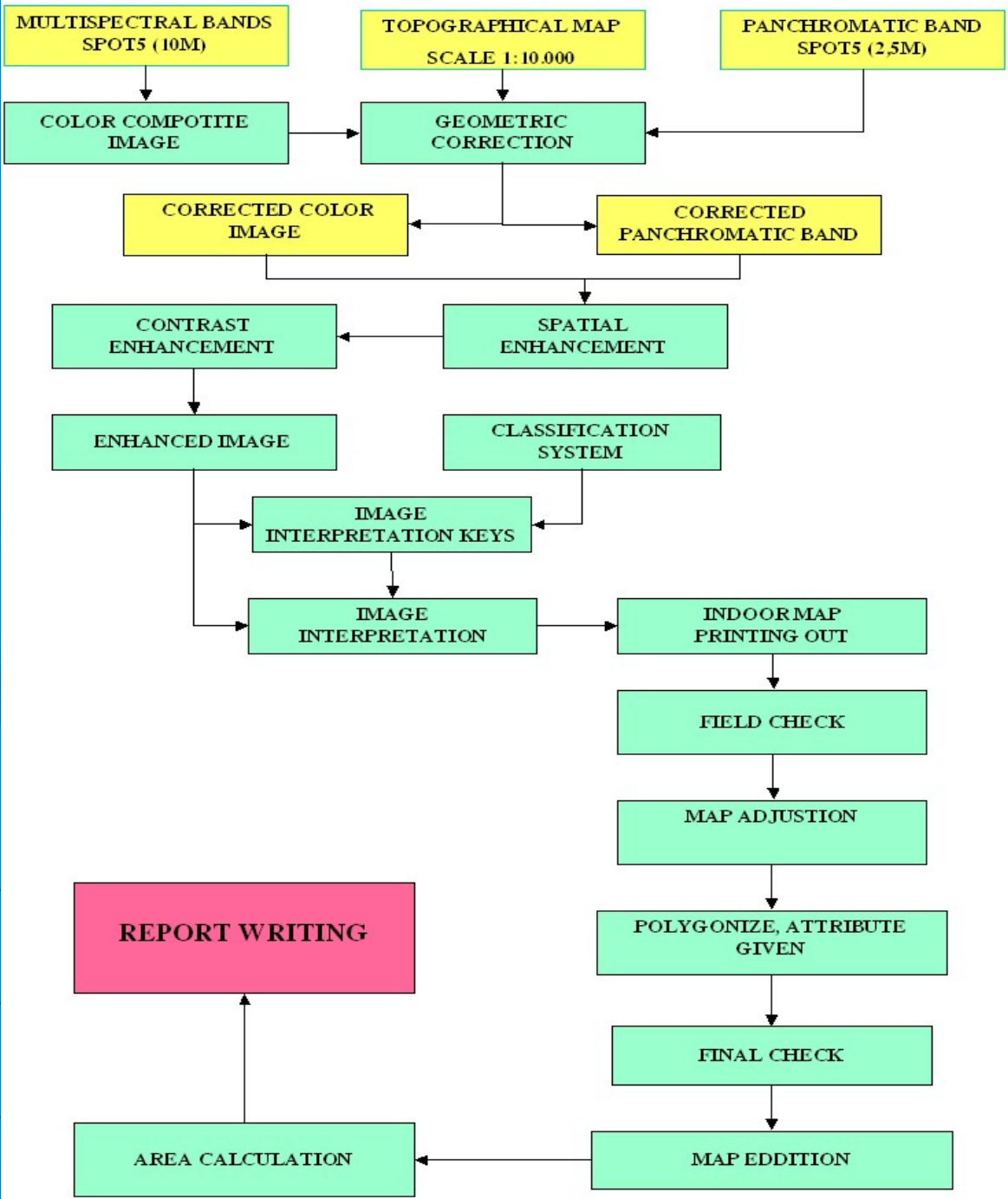
- From October 1971 to June 1972: Forest inventory in Ham Yen (Tuyen Quang and Bac Quang) by using of air photos

- With the first support received from FAO in 1981 – 1983, Vietnam carried out the first national forest inventory with the use of air-photos.

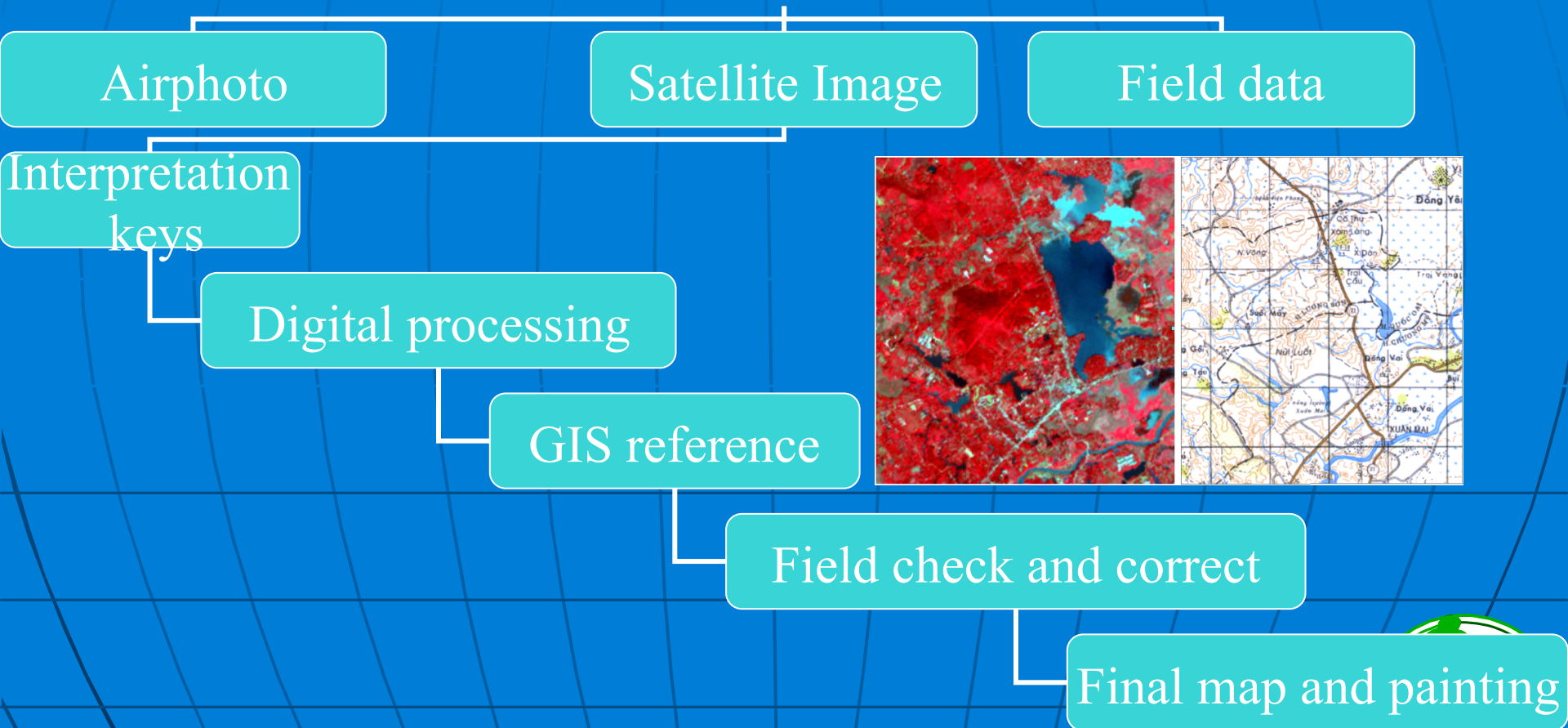
Overview

| Period | Image | Interpretation method | Scale of map | Mapped area |
|------------------|-----------------------------------|--|-------------------------------|-----------------------|
| 1970-1984 | Aerial photos, Landsat MSS | Visual on printed images | 1/10,000 1/250.000 | Pilot areas |
| 1985-1990 | Landsat TM | - Visual on printed images - Digital classification | 1/100,000 | Pilot areas |
| 1991-1995 | Landsat TM | - Visual on printed images | 1/100,000 | Entire country |
| 1996-2000 | SPOT 3 | - Visual on printed images | 1/100,000 | Entire country |
| 2001-2005 | Landsat ETM + | - Digital classification | 1/100,000 | Entire country |
| 2006-2010 | SPOT 5 | - Visual on screen | 1/25,000 | Entire country |

FLOWCHART OF LAND USE MAPPING BY USING SPOT 5



approach for forest mapping By using Landsat image



II. National forest change inventory, assessment and monitoring program

A. Monitoring of forest area changes

1. Phase I (1990-1995)

- + The use of Landsat MSS and Landsat TM images with the resolution of 30x30m serving the identification of changes in forest land area and forest loss in plantation forest and regenerated forest.
- + Landsat MSS and Landsat TM images in hardcopy at the scale of 1/250.000. The map is developed at the scale of 1:250.000 through satellite image interpretation and then topographical map in UTM form.

2. Phase II from 1996-2000

- + SPOT 3 images were used with the resolution of 15m x 15m. This is equivalent with the forest status map at the scale of 1/100.000.
- + Spot 3 images were used in form of real color on image paper

3. Phase III (2001-2005)

- + Status map was established on the basis of Landsat ETM+ image. The image resolution was 30m x 30m. Images were printed out on image papers for interpretation and then stored in CD disks in digital form in 2002.
- + VIETNAM started applying ERDAS IMAGINE 8.5 software for visual interpretation on personal computer screen. The forest status map at the scale of 1/250.000 for the region was established.

4. Phase IV (2006-2010)

- + Spot 5 images are used with the resolution of 2.5x2.5m for forest map development. The data are stored on CD disks. The map scale for 40 provinces with high percentages of areas forest is 1/50,000 for district level and 1/100,000 for provincial level.
- + Satellite image interpretation is implemented on computer screen and map at scale of 1/25,000 for 12 provinces.
- + Digital images are interpreted with the support of ERDAS IMAGINE 8.5, ENV;.. MAPINFO software.

+ Vietnam has started the pilot use of Palsa satellite images for determination of standing volume; However, the initial results show that it is difficult to be corrected since the tropical forest has the correlation between biomass and volume of stand volume of forest.

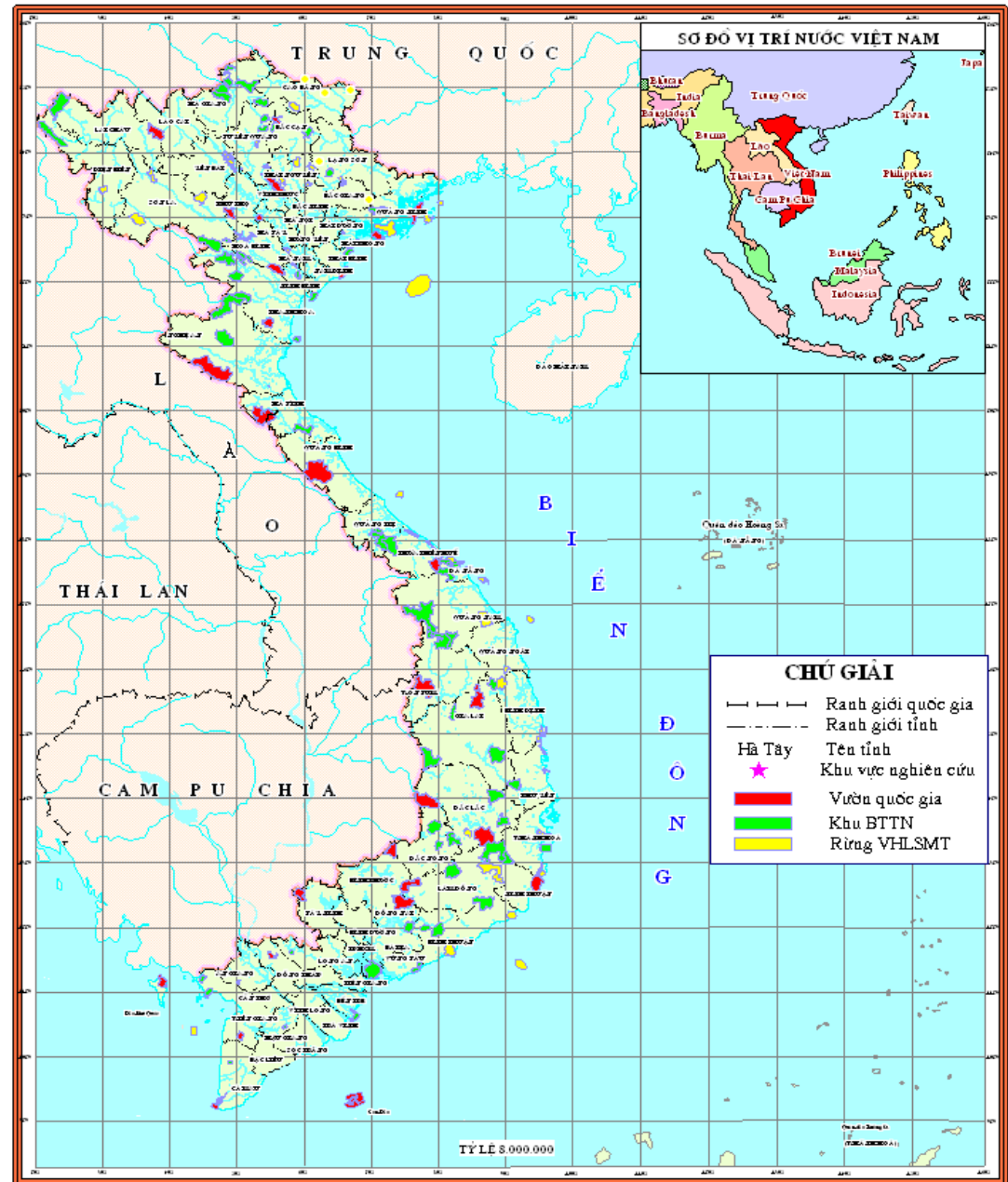
Special used Forest System in Vietnam

+ Total areas of special used forest: about 2,3 mil. ha with 32 national Parks 120 conservation' areas

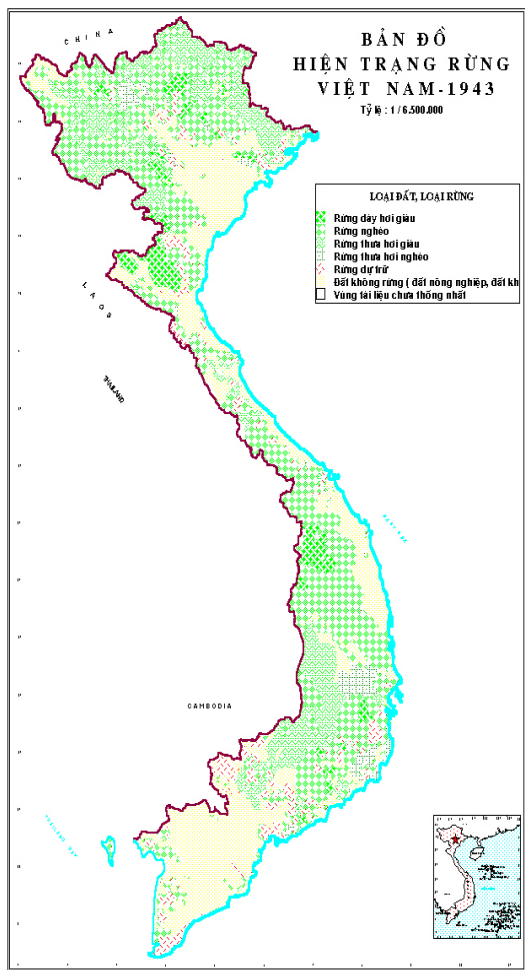
+ Protected forest areas: about 6 mil. Ha

+ About 8 mil. ha production forest.

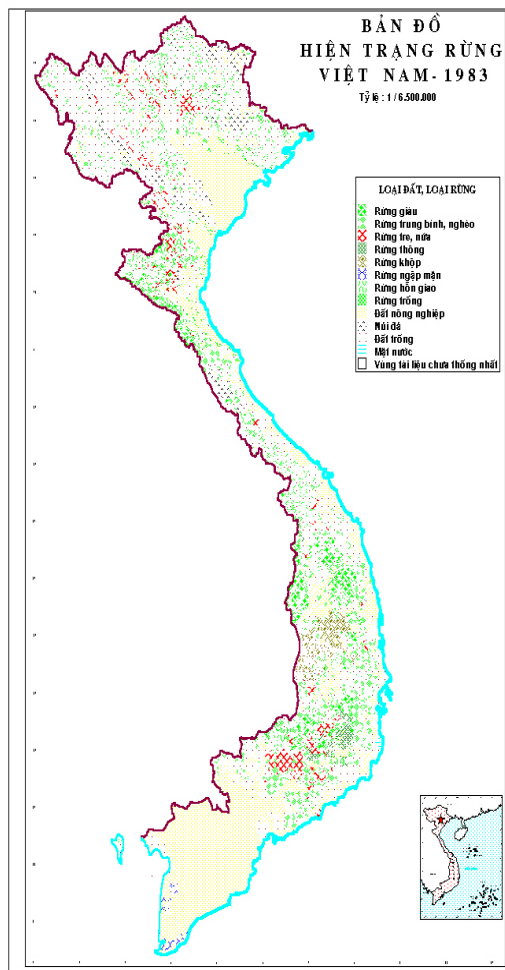
Forest Inver



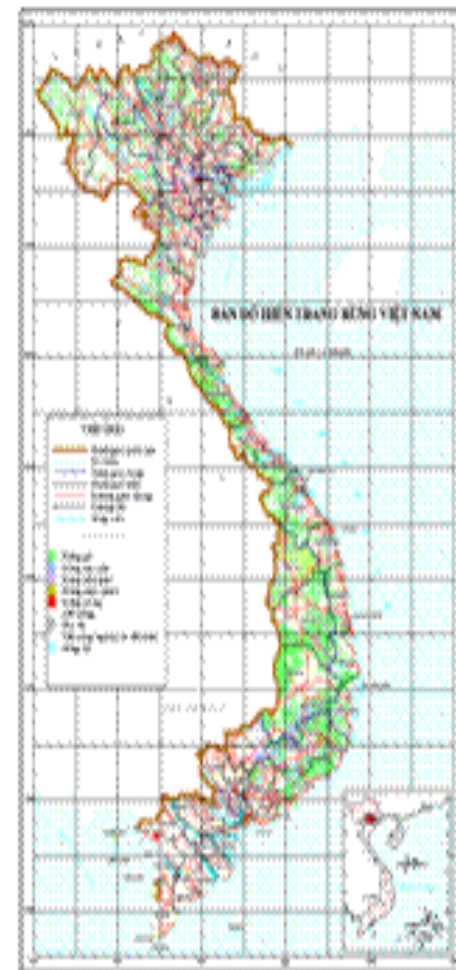
Land use Land cover map in 1943



Land use Land cover map in 1983



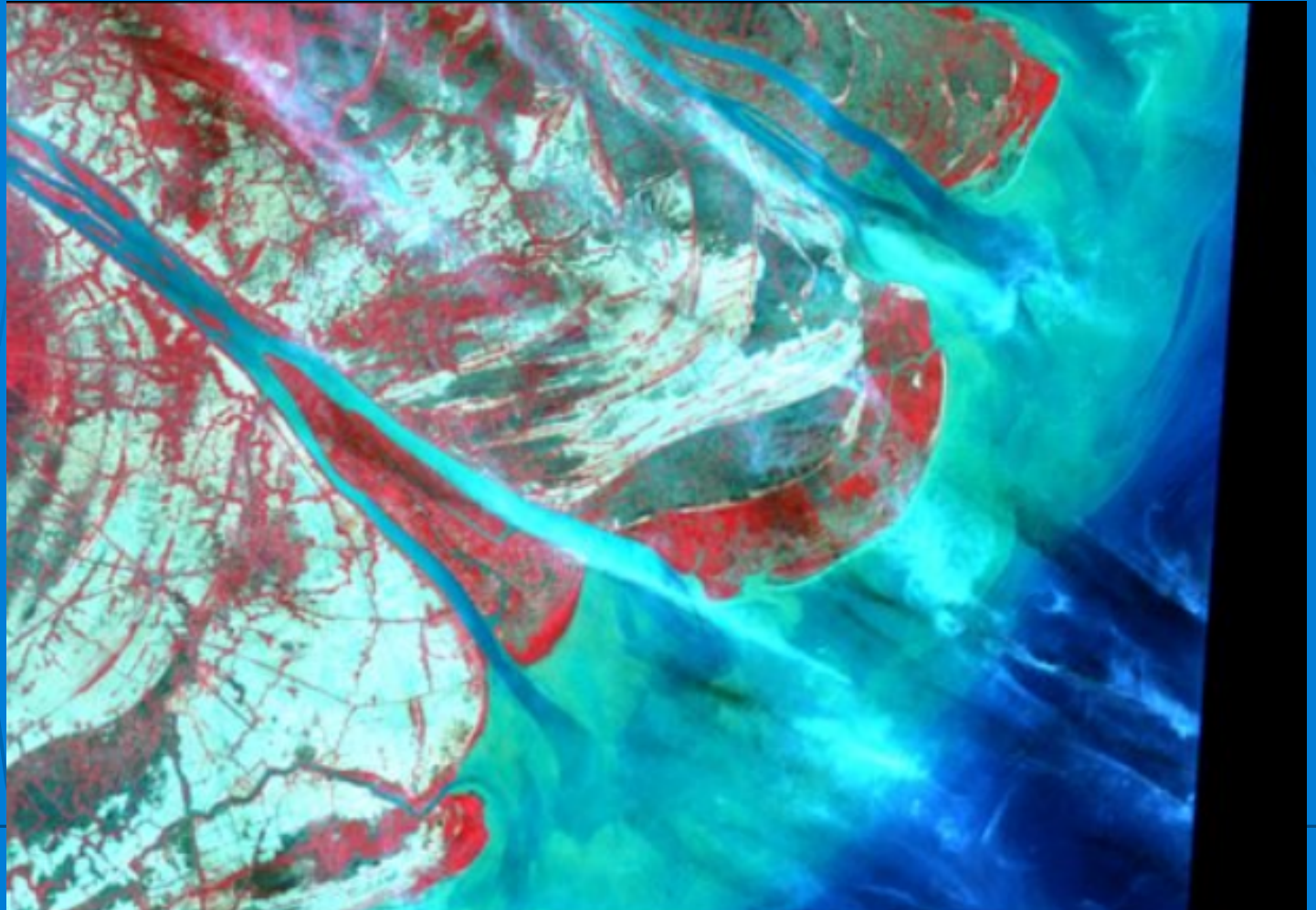
Land use Land cover map in 2005



Changes in forest area and coverage

| Year | Forest land | | | Cover |
|-------------|------------------|------------------|------------------|--------------|
| | Total | Nature forest | Plantation | |
| 1998 | 9.432.900 | 8.099.858 | 1.333.042 | 28,80 |
| 1999 | 10.915.592 | 9.444.198 | 1.471.394 | 33,20 |
| 2000 | 11.314.626 | 9.675.700 | 1.638.926 | 34,40 |
| 2001 | 11.685.835 | 9.942.920 | 1.742.915 | 35,50 |
| 2002 | 11.784.589 | 9.865.020 | 1.919.569 | 35,80 |
| 2003 | 12.094.517 | 10.004.709 | 2.089.808 | 36,10 |
| 2004 | 12.306.805 | 10.088.288 | 2.218.517 | 36,70 |
| 2005 | 12.616.700 | 10.283.173 | 2.333.527 | 37,00 |
| 2006 | 12.873.850 | 10.410.141 | 2.463.709 | 38,00 |
| 2007 | 12.895.396 | 10.340.284 | 2.555.112 | 38,20 |
| 2008 | 13.118.773 | 10.348.591 | 2.770.182 | 38,70 |
| 2010 | 13.388.075 | 10.304.816 | 3.083.259 | 39,50 |

Application SPOT

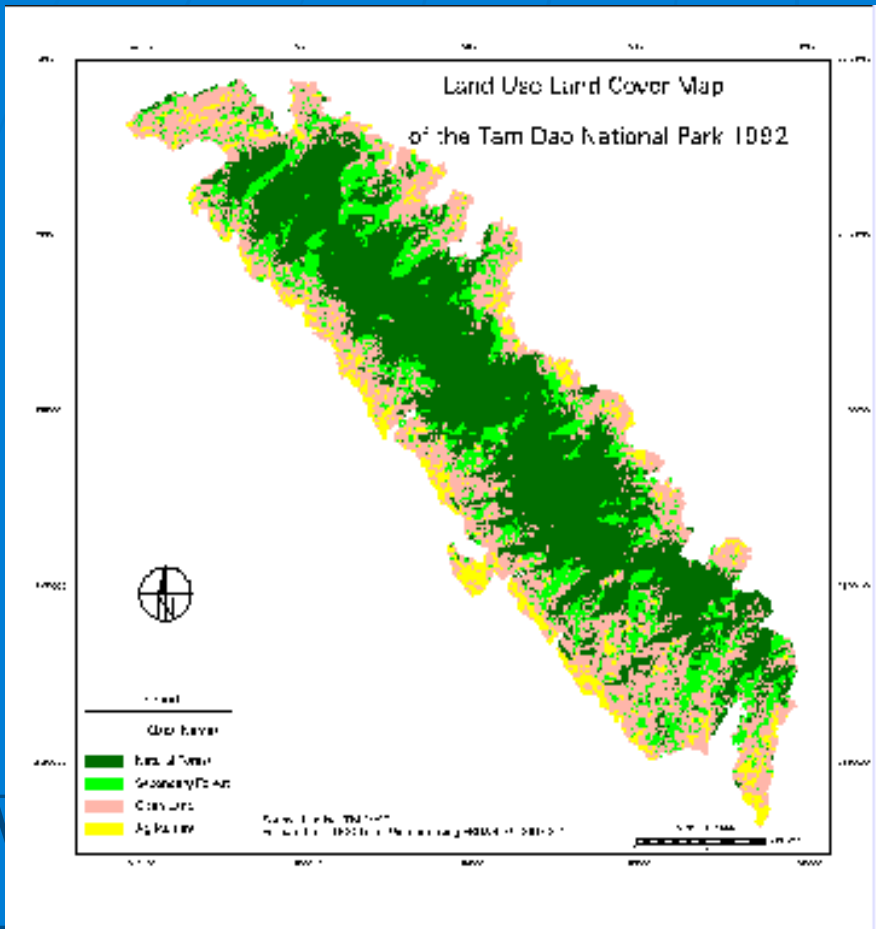


Changing of land use in M^o K^ong delta:
Forest cover in C^u M^ou: 59.9 % (1989) reduces to 28.7% (1996)

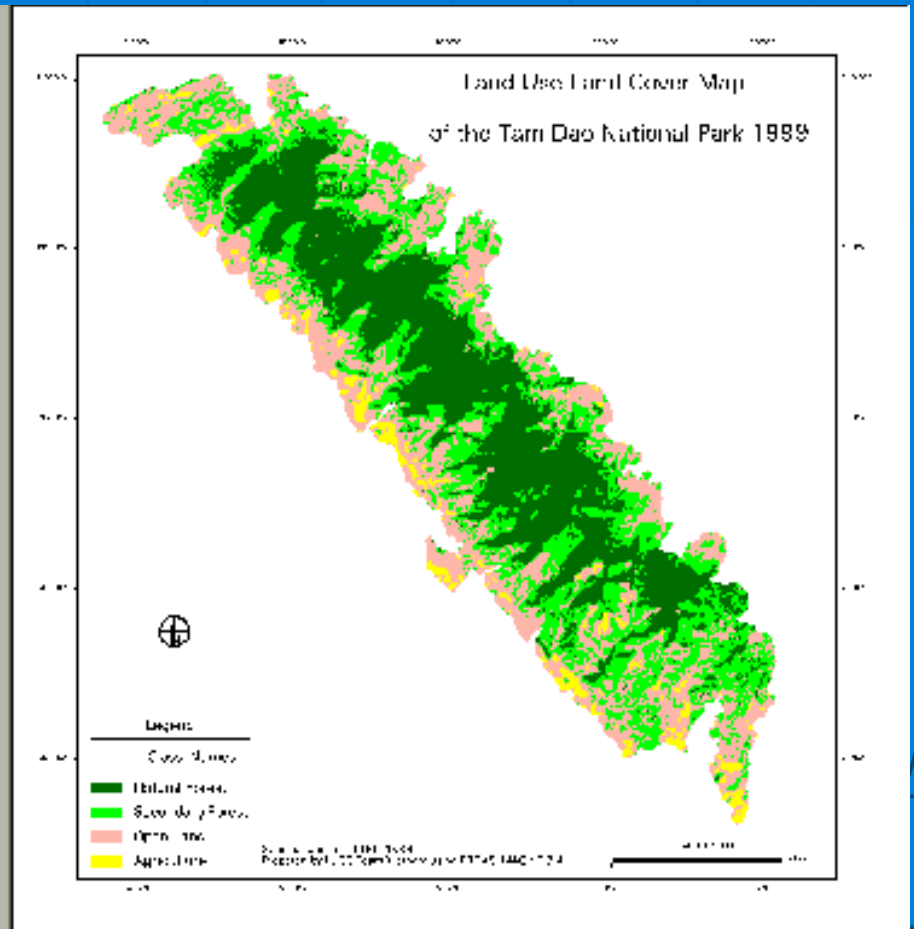
Forest Inventory and Planning Institute(FIPI)



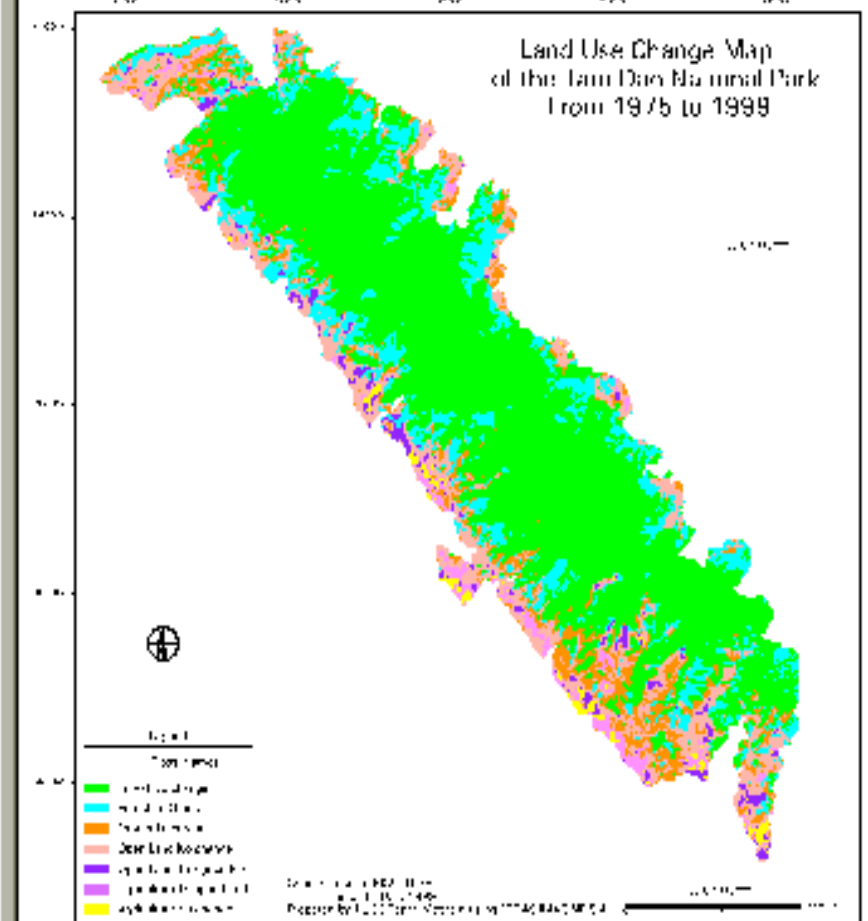
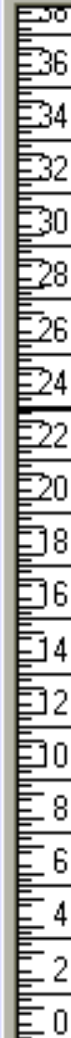
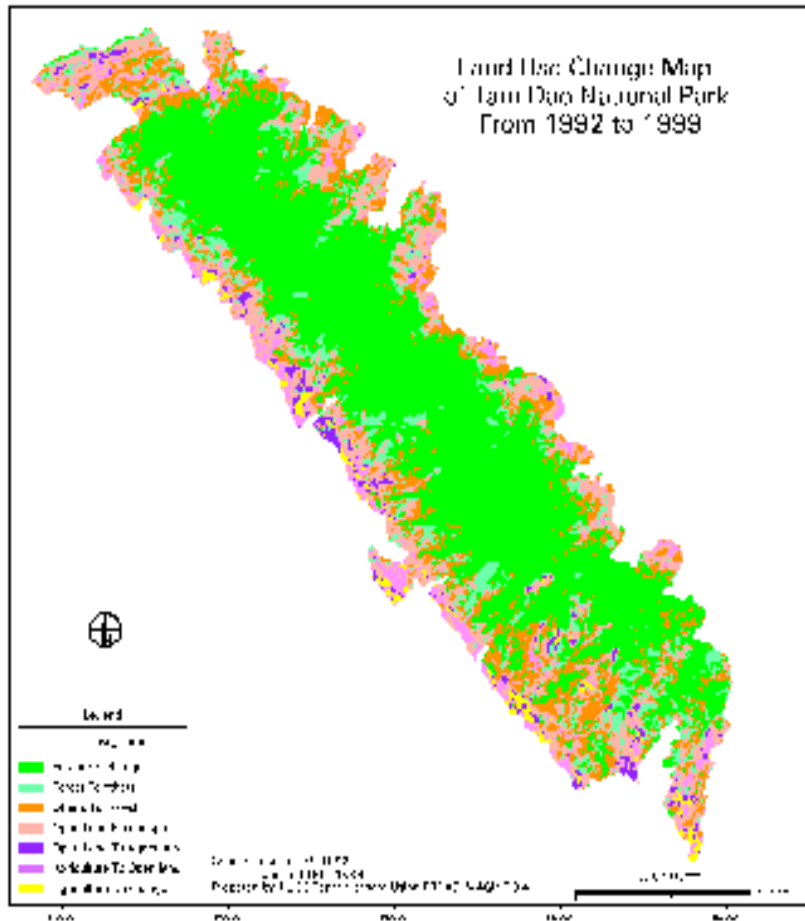
Land use map of Tam Dao National Park 1992



Land use map of Tam Dao National Park 1999



Land use changing of Tam Đảo National Park



From 1992 to 1999

From 1975 to 1999

Forest Inventory and Planning Institute (FIPI)



Software

- ❖ **Image processing: ERDAS/IMAGINE, ILWIS**
- ❖ **Analysis: ARC/GIS, ARC/VIEW**
- ❖ **Digitizing: Microstation, ARC/GIS, ARC/VIEW**
- ❖ **Map edition: Map/ Info, ARC/VIEW**
- ❖ **Egonetion**

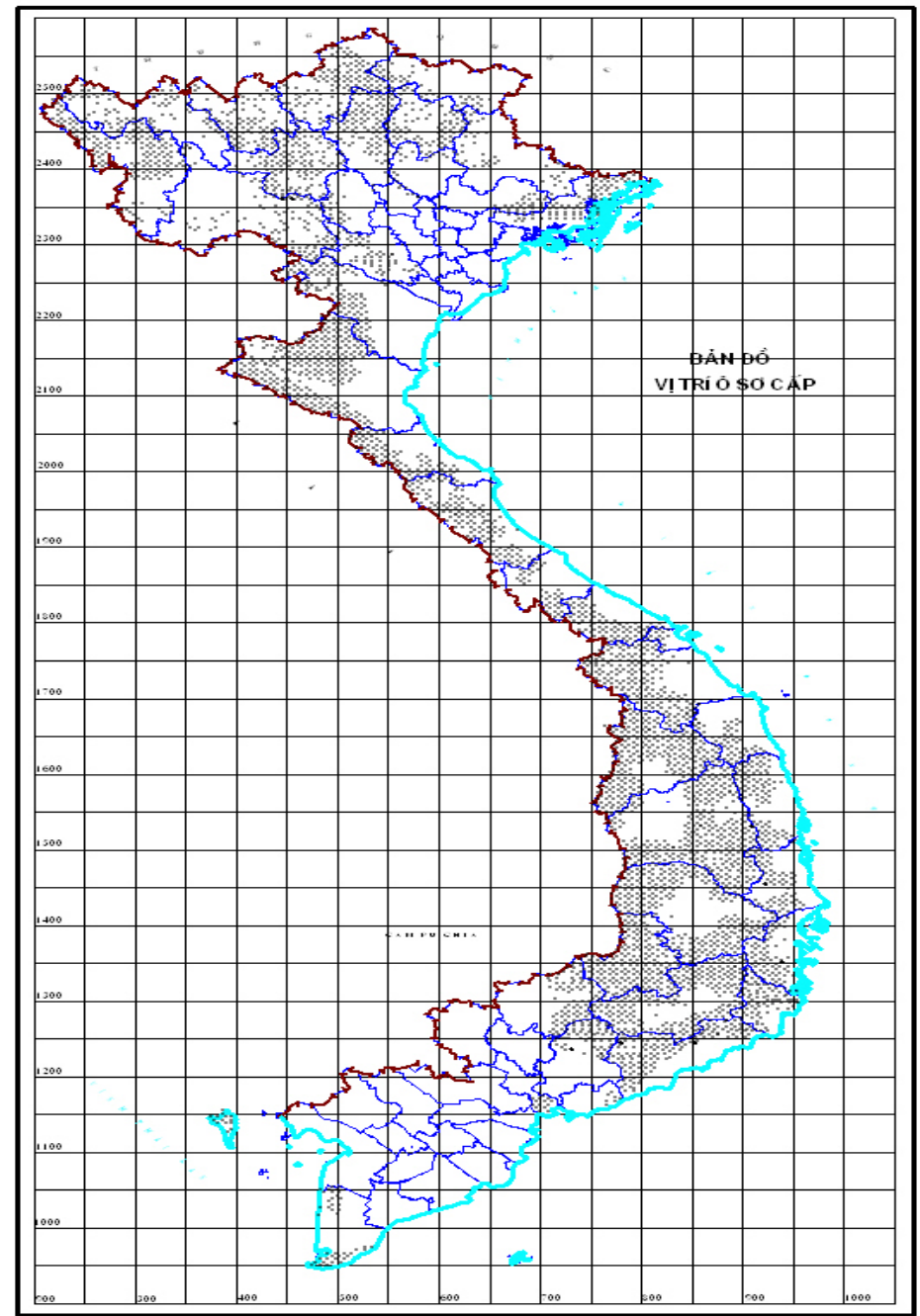
B. Monitoring of forest quality

Since 1990: Vietnam has established a sample plot system for long-term monitoring of forest quality such as:

- By the changing level of:
 - + Species composition
 - + Forest structure
 - + Forest growth
 - + Ecological status and conditions related to forest regeneration
 - + Other forest ecological conditions such as land, vegetation, socio-economic conditions nearest to the sample plots.
 - + Forest volume

- The quantity of sample plots by cycles:
 - + Cycle 1 1990-1995: 2679 (8x8km)
 - + Cycle 2 1996-2000: 3690 (5.6x5.6km)
 - + Cycle 3 2001-2005: 4200 (5.6x5.6km)
 - + Cycle 4 2006-2010: 2100 (8x8km)
- Plot size: 1x1km
- The quantity and size of enumeration plots in a permanent plot: 40 x 500 m²

Figure 1: sample plots system of Vietnam



BẢN ĐỒ Ô SƠ CẤP CHU KỲ IV

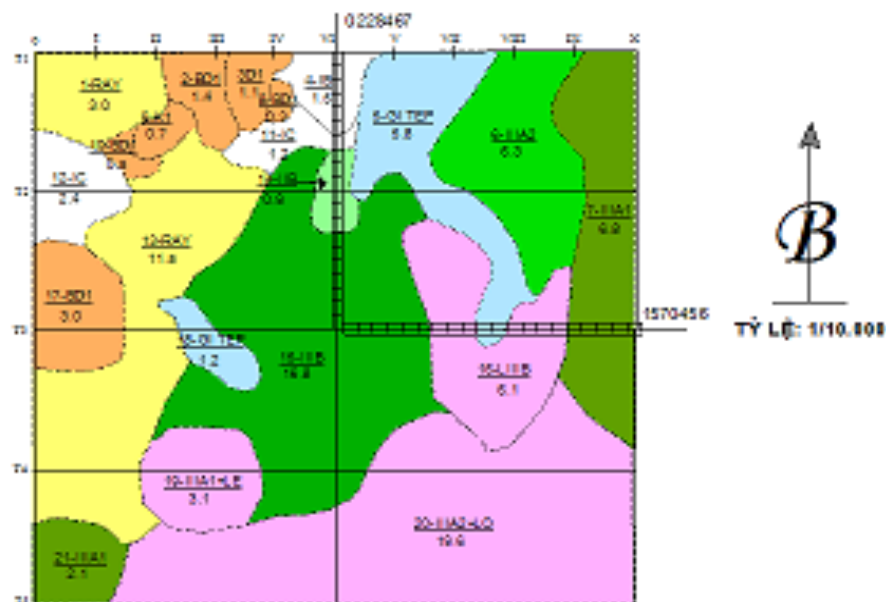
Số hiệu ô: Toàn quốc: 128-92

Nội tỉnh: 54

Điều tra lần thứ: 3

Tọa độ tâm ÔSC theo bản đồ UTM: -X: 0229.152 Y: 1569.037

Tọa độ tâm ÔSC theo bản đồ VN 2000: -X: 0228.467 Y: 1570.456



CHỈ DẪN

| | |
|----------------------|--------|
| Rừng trung bình | |
| Rừng nghèo, cằn | |
| Rừng non | |
| Rừng HQ gỗ +TN | |
| Rừng trảng | |
| Rừng tre nứa | |
| Đất trống | |
| Đất nông nghiệp | |
| Ranh giới lô | |
| SHIA - Trang thời IA | 1 - 18 |
| Diện tích | 32.0 |

Người điều tra: Trần Đình Hưng

Ngày điều tra: 12 - 10 - 2007

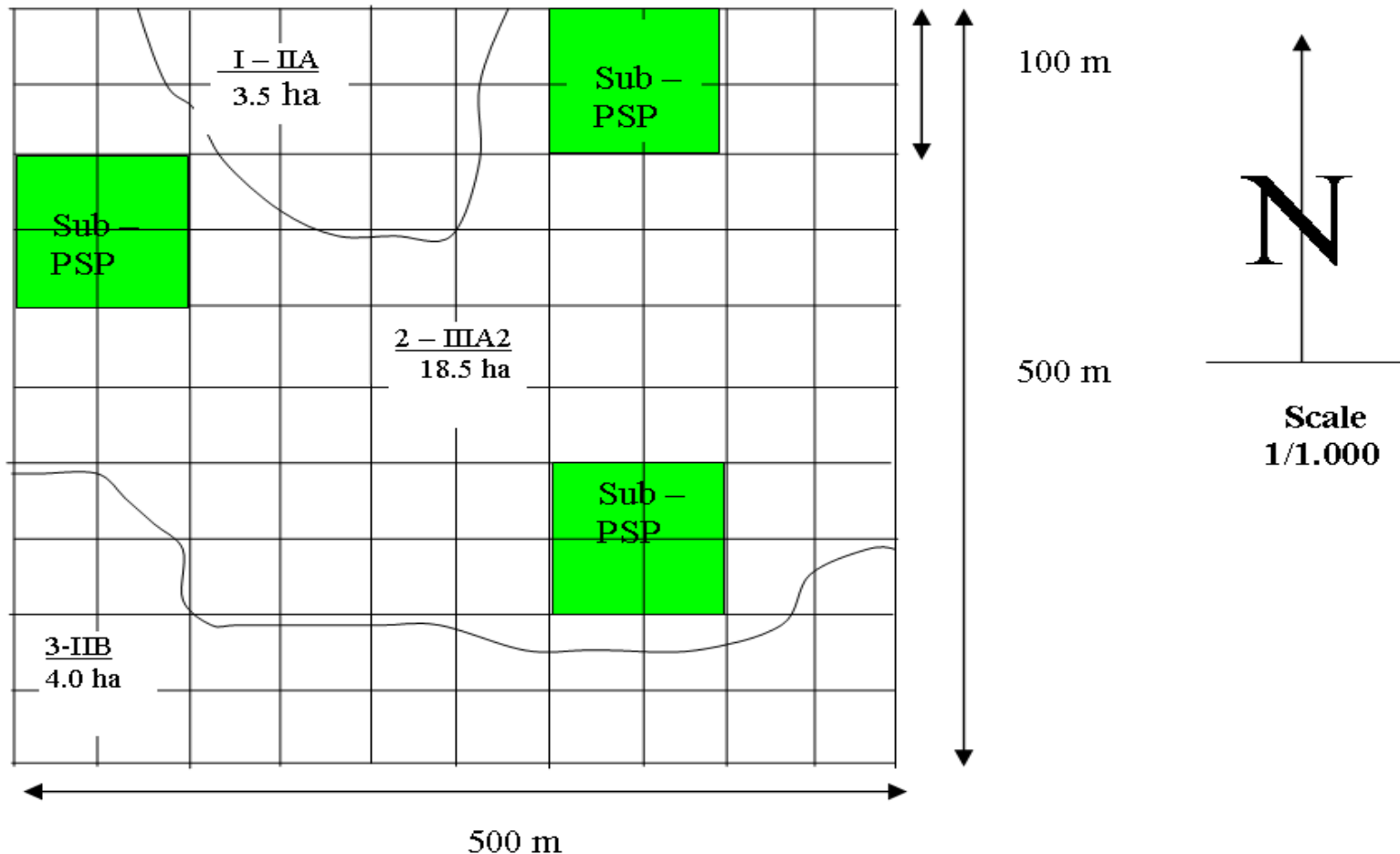
Đơn vị: TTSTR & TVLN - Phân viện ĐTQHNTB & TN

Người kiểm tra:

1. PSP design:

The PSP was chosen from SP system in previous period, the design of PSP as follow:

Fig. 4: Design of permanent sample plot



C. Thematic report system

- 1/ Assessment on changes in forest fauna/ pestilent insects
- 2/ Changes in forest structure
- 3/ Non-timber forestry products
- 4/ Impact of social factors on forest changes

III. PROGRAM ORIENTATION IN NEW PERIOD

With the support of FAO/Finland that is implemented by the Project:

- 1/ Assessment on the method, solution to implement the program in the past periods.
- 2/ Research carried out in combination with FORMIS to re-identify the information demand serving REDD.
- 3/ Review on contents of previous programs.
- 4/ Proposal of forest monitoring program to meet the requirements of REDD in the future.
5. It is necessary to carry out forest inventory and develop database serving REDD Program.
6. From 2015, forest change inventory, assessment and monitoring will be carried out basing on the information demand for FES.

IV. PREPARING FOR REDD AND REED⁺

Organization activities

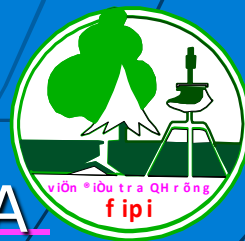
- 1/ Establishing the REDD office by MARD for the coordination program related to REDD
- 2/ Establishing the REDD network with more than 30 international and national organization from government and private institution
- 3/ Decision No 99 of Government about the policies for Payment of Environments Services (PES) in the forest sector inclusive Carbon credits.

Ongoing project

- 1/ Using SPOT 5 for forest inventory in national wide level by producing of the maps scale 1/10.000 for every communes
- 2/ Using different satellites images for estimation of biomass and carbon stock on the forest (carried out the research on the calculation of convert factor in the mangrove in the north of Vietnam and some natural forest types
- 3/ Cooperation with our colleagues from JAFTA-JICA to estimation of forest base line in Vietnam for supporting of REDD - Vietnam

4/

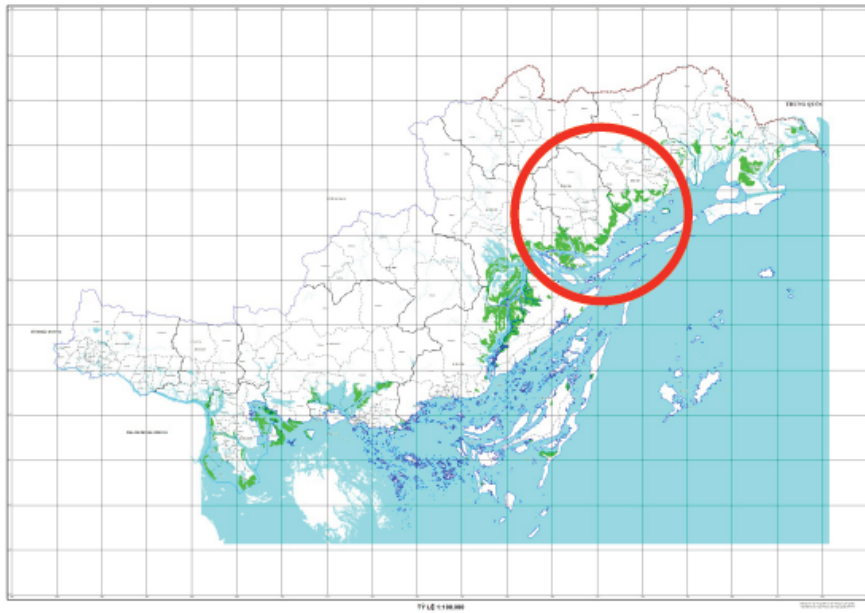
Estimation of Carbon stock and biomass of mangrove forest in the North of Vietnam in cooperation with University of Tokyo and JAXA



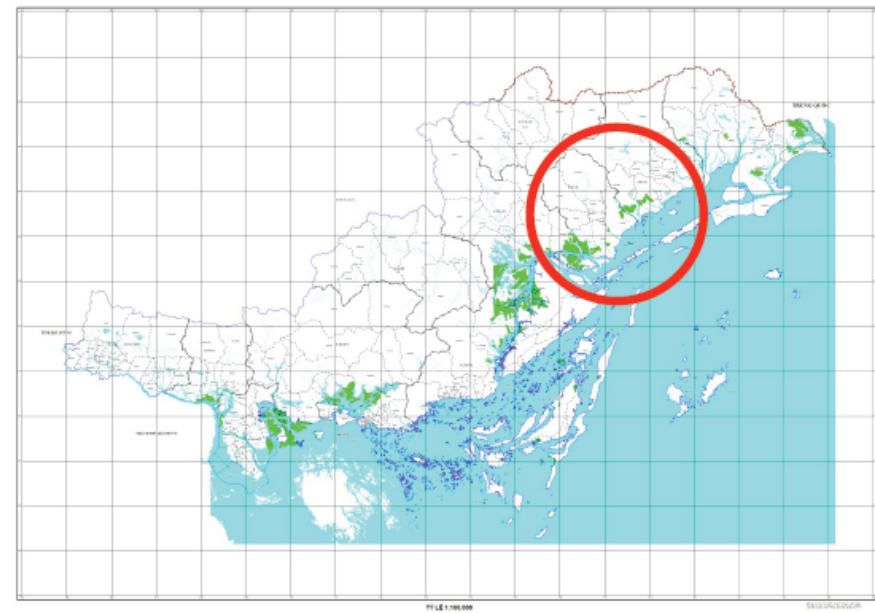
Carbon Stock Calculating and Forest Change Assessment Towards REDD+ Activities for the Mangrove Forest in Vietnam

Collaboration between FIPI (Vietnam), JAXA and the University of Tokyo (Japan)
2011-2012 under JAXA-SAFE Prototype

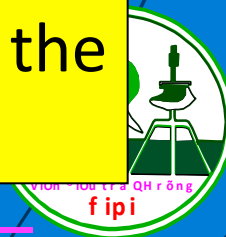
MANGROVE FOREST MAP 1990
QUANG NINH PROVINCE



MANGROVE FOREST MAP 2000
QUANG NINH PROVINCE



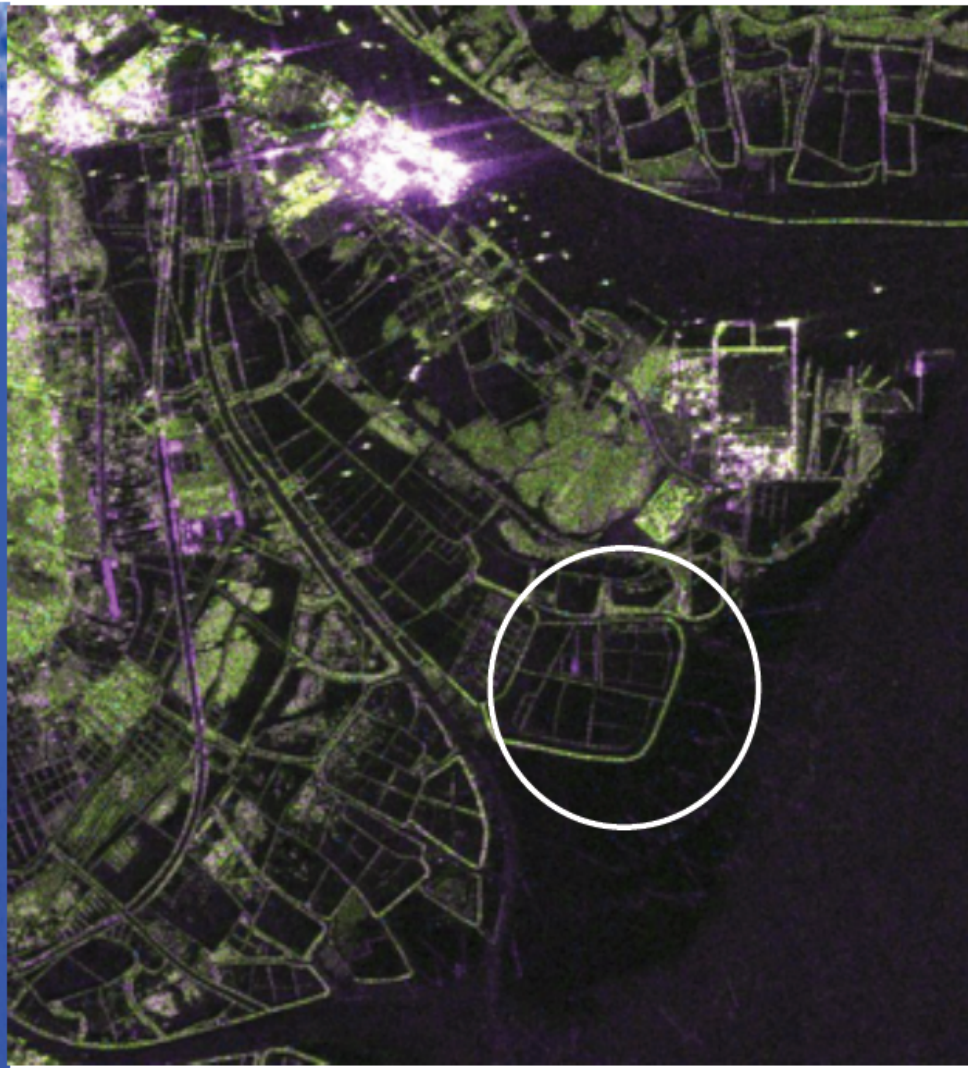
To provide the basic data on Carbon stock volume of the
mangrove forest in Vietnam and its change
Forest Inventory and Planning Institute(FIPI)



Land use change in Quang Ninh province

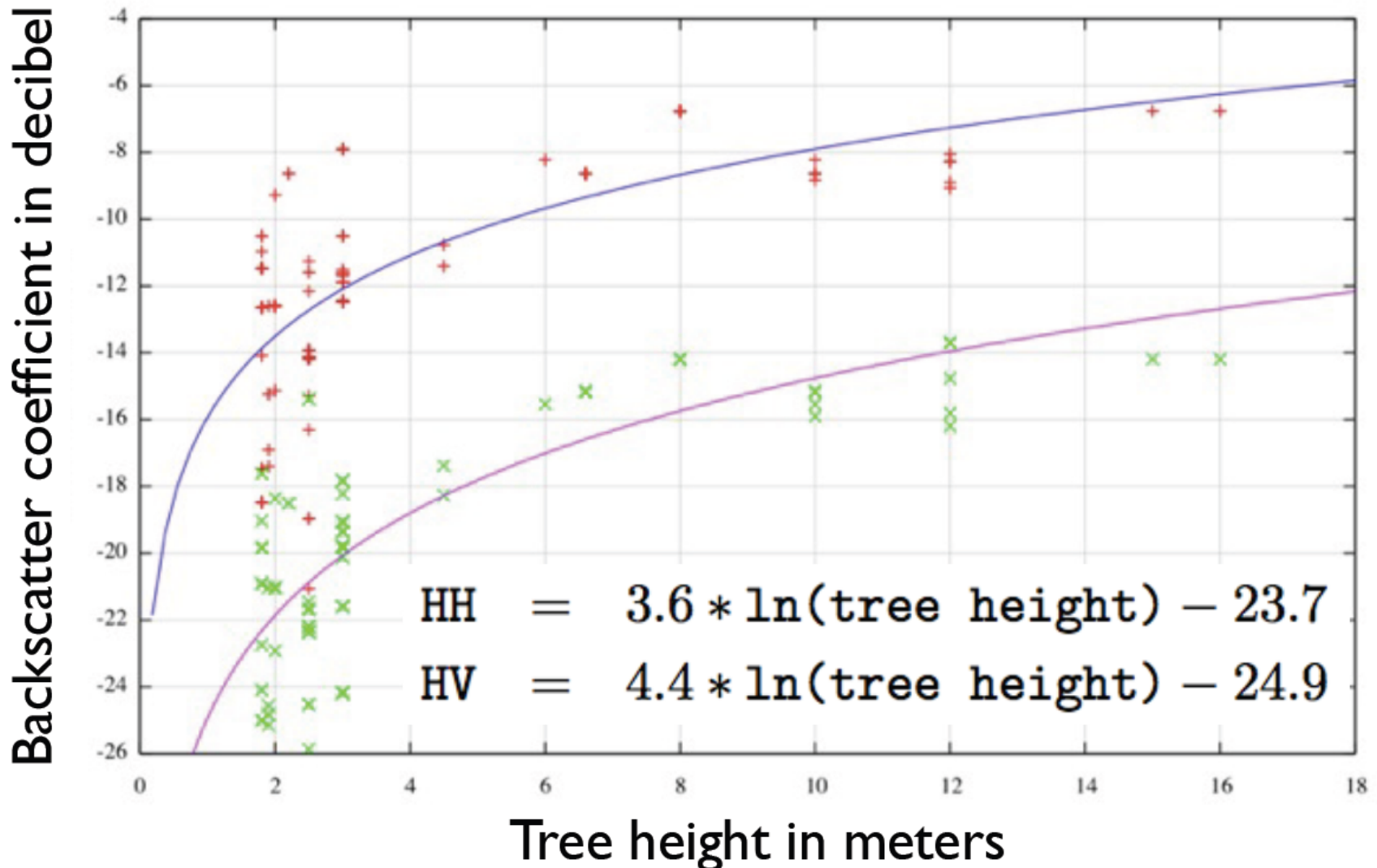


Landsat ETM(2001/09/29)



ALOS PALSAR (2010/07/10)

Tree height, HH and HV



6.4 (t/ha) at 2m-height tree to 16.0 (t/ha) at 8m-height tree

- 5/ Implementation of REDD project in case study supporting of UN REDD by using of Spot 5 in Province Lam Dong will be extended into 6 provinces
- 6/ Using Spot 5 in combining with field checking for the REDD project of two district in Lam Dong Province.
- 7/ Conduction of proposal of REDD program and send to WB asking for supporting by realizing of REDD program in Vietnam
- 8/ Join together with Mekong wide countries in the Project Forest Cover and Carbon Mapping in the Greater Mekong Sub-region and Malaysia funded by APFNet

DIFFICULTIES BY THE ESTIMATION OF BIOMASS AND CARBON STOCK IN THE FOREST

- 1/ Tropical condition
- 2/ Information of forest is only focus on Timber volume
- 3/ For the calculation of convert factors is very costly
- 4/ Until now only defining of timber volume of forest above ground and the defining of under ground biomass and carbon stocks?
- 5/ Need supporting of international organization for developing countries for realizing the good ideal in REDD and REDD+ Program in future

SOME PICTURES OF FOREST INVENTORY AND MEASUREMENTS IN THE FIELD

16480
IV

0870
2





10
10

1. DÀNH 11 NGHÌN CÂY SÂM TRÁI
2. MỤC ĐÍCH: TRỒNG VÀ GIỮNG BẢO VỆ MỘT SỐ
3. LOẠI CÂY QUÝ HIẾM VÀ CÓ GIÁ TRỊ DƯỢC HỌC
4. VÀ MÔI TRƯỜNG. (TRUNG ƯƠNG) (TRUNG ƯƠNG)
5. VÀ MÔI TRƯỜNG. (TRUNG ƯƠNG) (TRUNG ƯƠNG)
6. VÀ MÔI TRƯỜNG. (TRUNG ƯƠNG) (TRUNG ƯƠNG)
7. VÀ MÔI TRƯỜNG. (TRUNG ƯƠNG) (TRUNG ƯƠNG)
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9. VÀ MÔI TRƯỜNG. (TRUNG ƯƠNG) (TRUNG ƯƠNG)
10. VÀ MÔI TRƯỜNG. (TRUNG ƯƠNG) (TRUNG ƯƠNG)





Ổ ĐỊNH VỊ NGHIÊN CỨU SINH THÁI
SỐ HIỆU Ổ ĐỊNH VỊ: 1 TIỂU KHU: 104 KHU BTTN VÀ DT VĨNH CỬU
TỌA ĐỘ ĐÀ LẠT (UTM): 11° 18' 07" N - 107° 05' 20" E KẾT RỪNG: LA RỘNG THƯỜNG XANH
TỌA ĐỘ ĐÀ LẠT (VN 2000): 11° 18' 11" N - 107° 05' 20" E KẾT RỪNG: LA RỘNG THƯỜNG XANH
Xã. MÃ ĐÀ HUỖN: VĨNH CỬU TỈNH ĐỒNG NAI
ĐƠN VỊ QUẢN LÝ: VIỆN ĐIỀU TRA QUY HOẠCH RỪNG (BỘ NN & PTNT)
ĐƠN VỊ LẬP HỒ SƠ SỐ THỢ DỒI TRƯNG TÂM ST & TNLX (PHẦN VIỆN ĐTQHR KINH BỘ)





24

22

23



26



152m
QSC
152-81
IV

Mangrove forest in Quang Ninh Vietnam

A high-angle photograph of a mangrove forest in Quang Ninh, Vietnam. The image is dominated by lush green vegetation. In the foreground, there is a distinct cluster of mangrove trees with bright, vibrant green leaves, possibly Rhizophora species, which are more densely packed and appear to be in a different growth stage or species compared to the surrounding forest. The rest of the image shows a vast, dense expanse of mangrove forest stretching towards the horizon, with varying shades of green and some darker shadows indicating the depth of the canopy. The overall scene is a healthy, thriving mangrove ecosystem.

Mangrove forest in Quang Ninh Vietnam



Mangrove forest in Quang Ninh Vietnam



Mangrove forest in Quang Ninh Vietnam



Mangrove forest in Nam Dinh



Mangrove forest in Nam Dinh



*Thank you
for your attention!*

