

Forest Applications in the Team Land Surface Dynamics

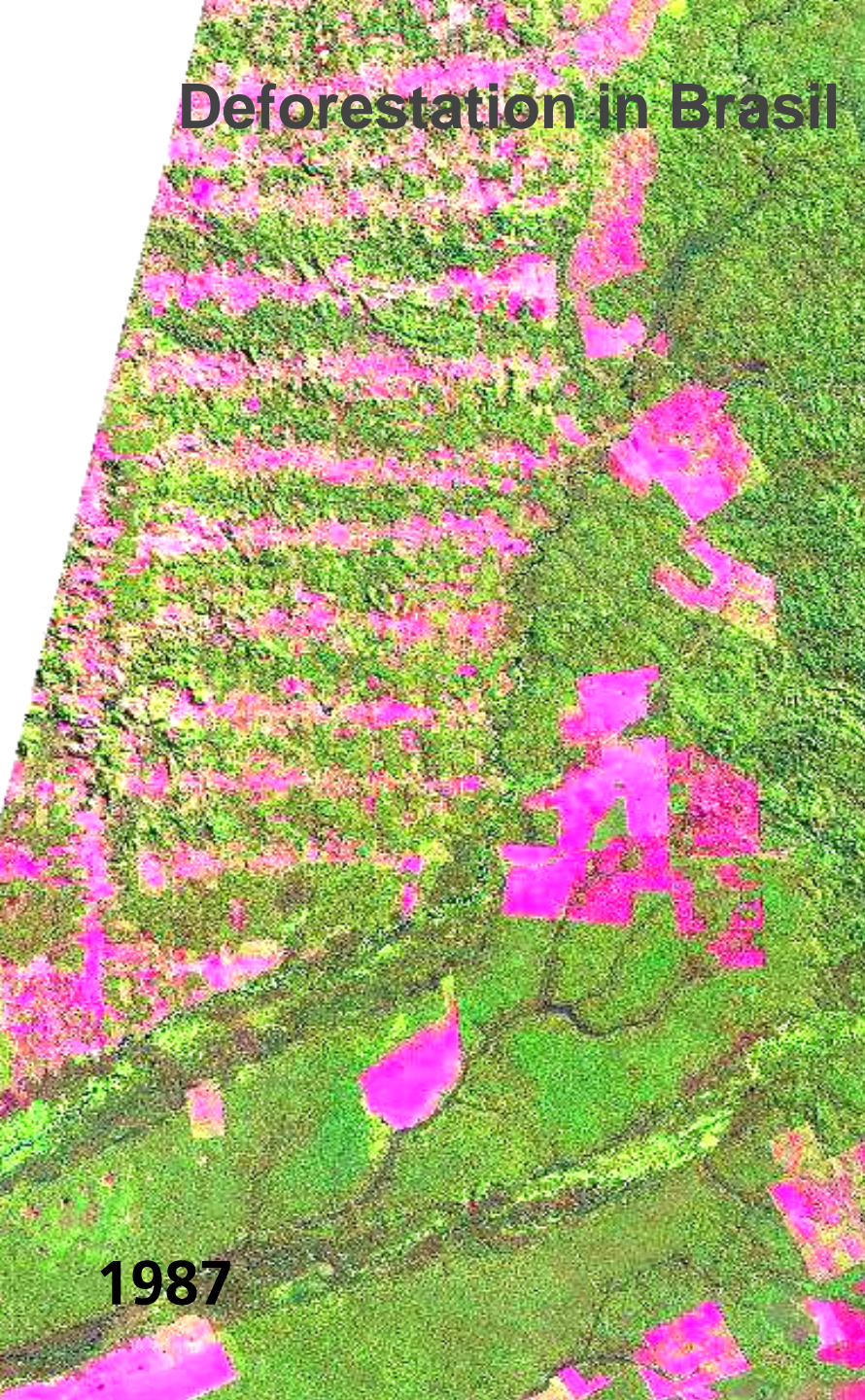
Dr. Claudia Kuenzer, Juliane Huth & Team Land Surface Dynamics
DLR-DFD



Knowledge for Tomorrow



Deforestation in Brasil



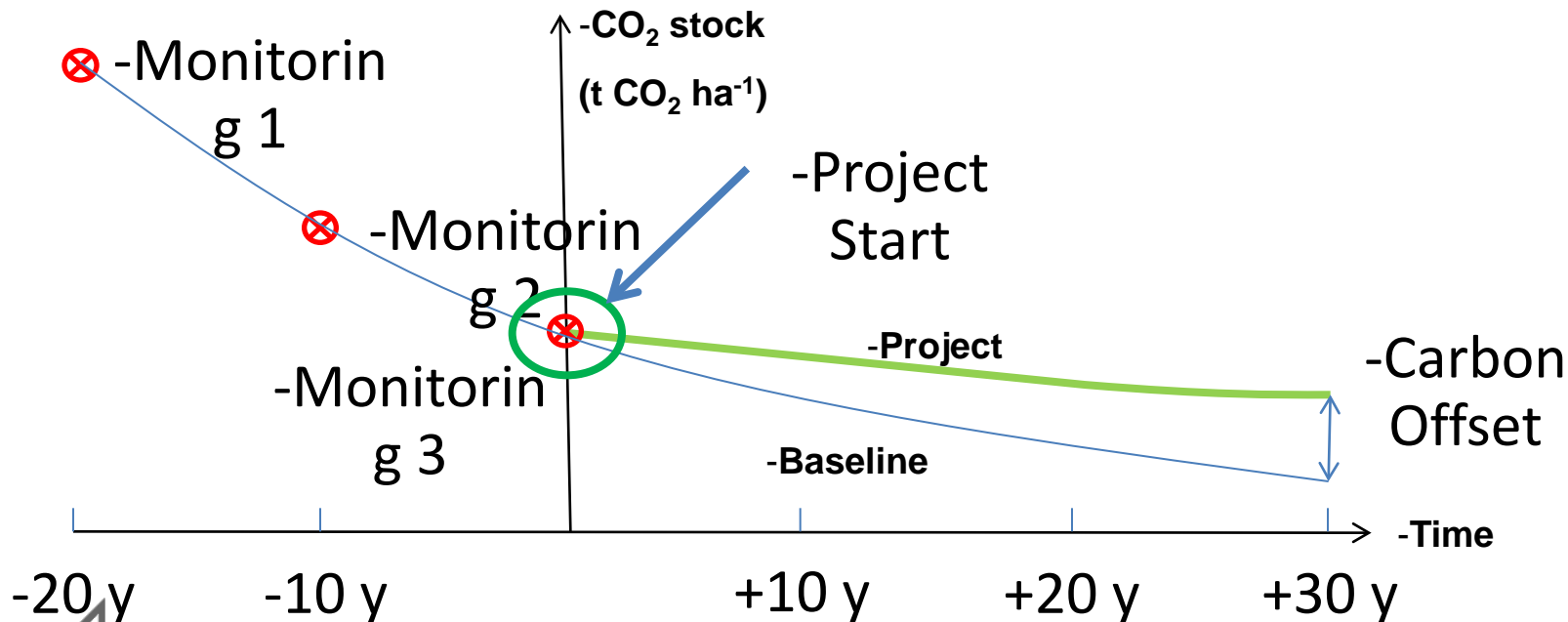
Agricultural Fragmentation in former Rainforest Areas



Bolivia

HOW DOES REDD+ WORK?

- **Aim: Estimation of avoided emissions due to REDD project activities**
- **Requirement: Estimation of forest carbon stock over 3 different time points/trajectories:**
 - Current forest carbon stock
 - Forecast of carbon stock change due to project activities
 - Forecast of carbon stock change due to baseline (business-as-usual) activities



What can remote sensing do?

- forest maps
 - forest change detection
 - deforestation and degradation
 - net primary production
 - biomass quantification
 - bioenergy potential
-
- long-term monitoring
 - mapping of external pressures on forest (e.g. urbanization)



NPP: Derivation with BETHY/DLR (daily, 12 years)

Land Cover, CAWa (1 km)

Precipitation, ECMWF (0.25°)

Temperature, ECMWF (0.25°)

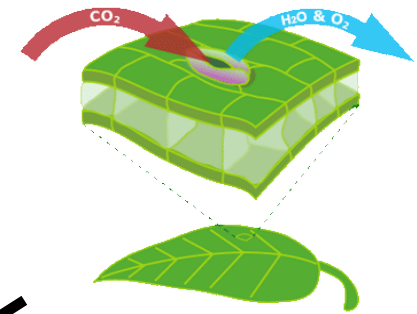
Wind Speed, ECMWF (0.25°)

Cloud Cover, ECMWF (0.25°)

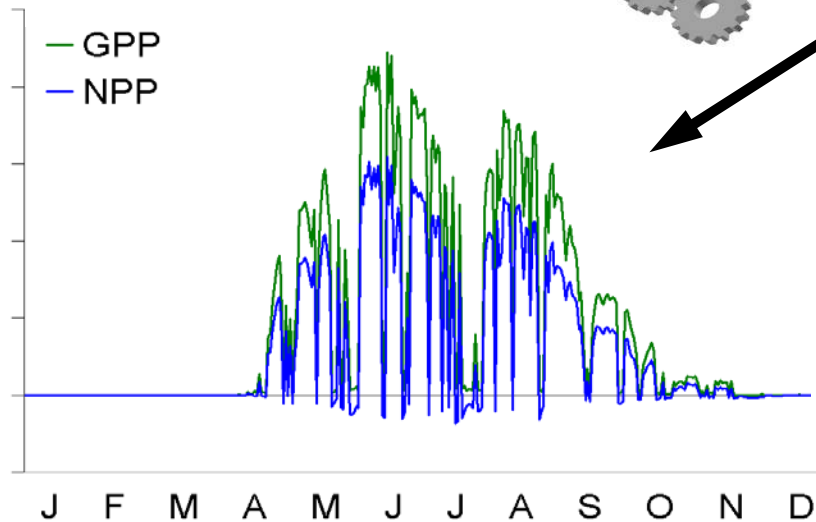
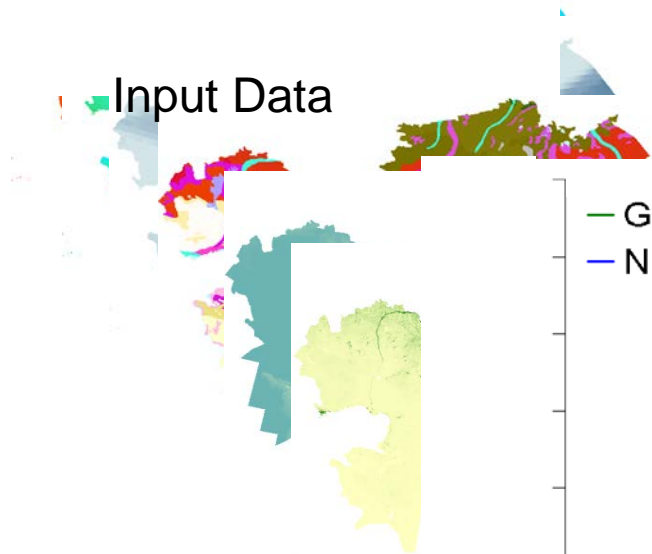
Soil types, FAO/IIA (km)

Photosynthesis

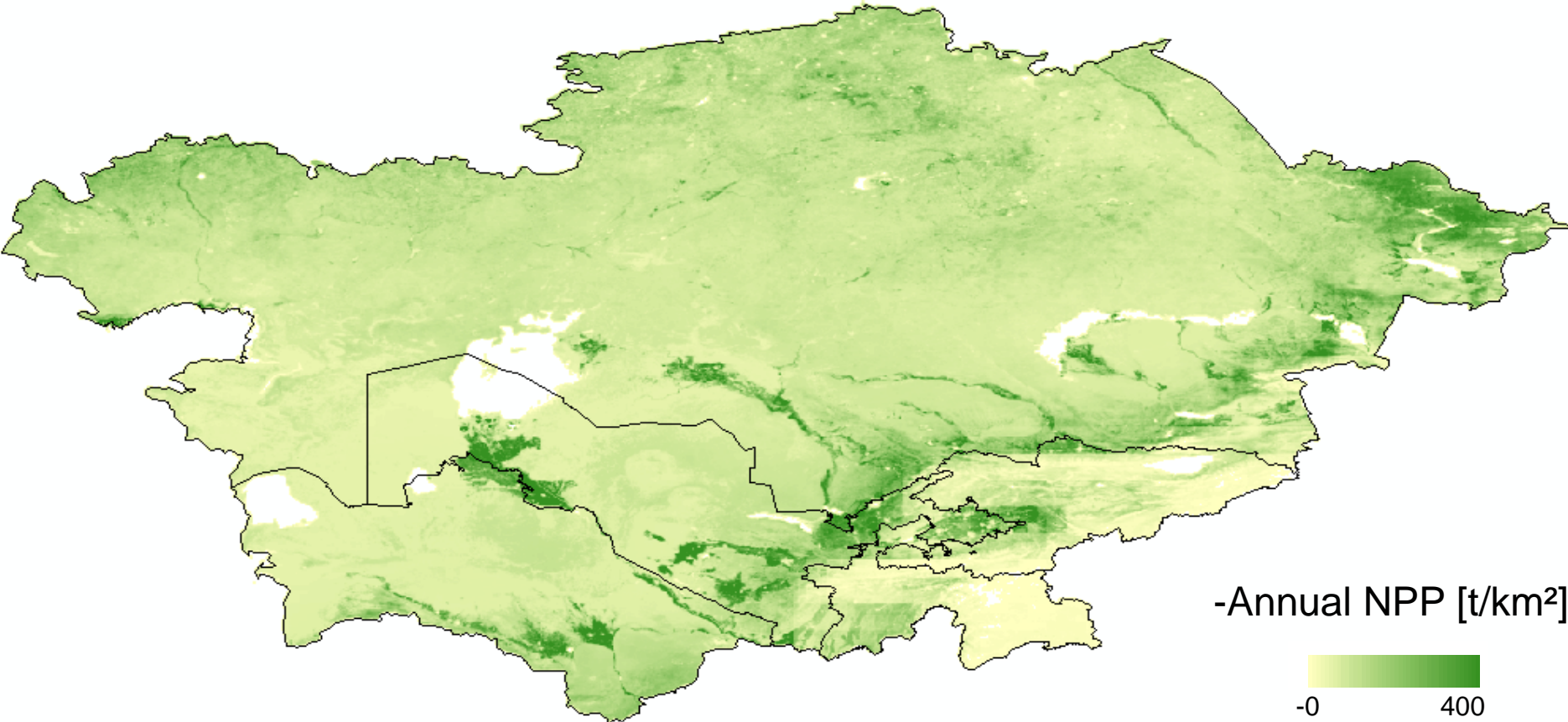
BETHY/DLR



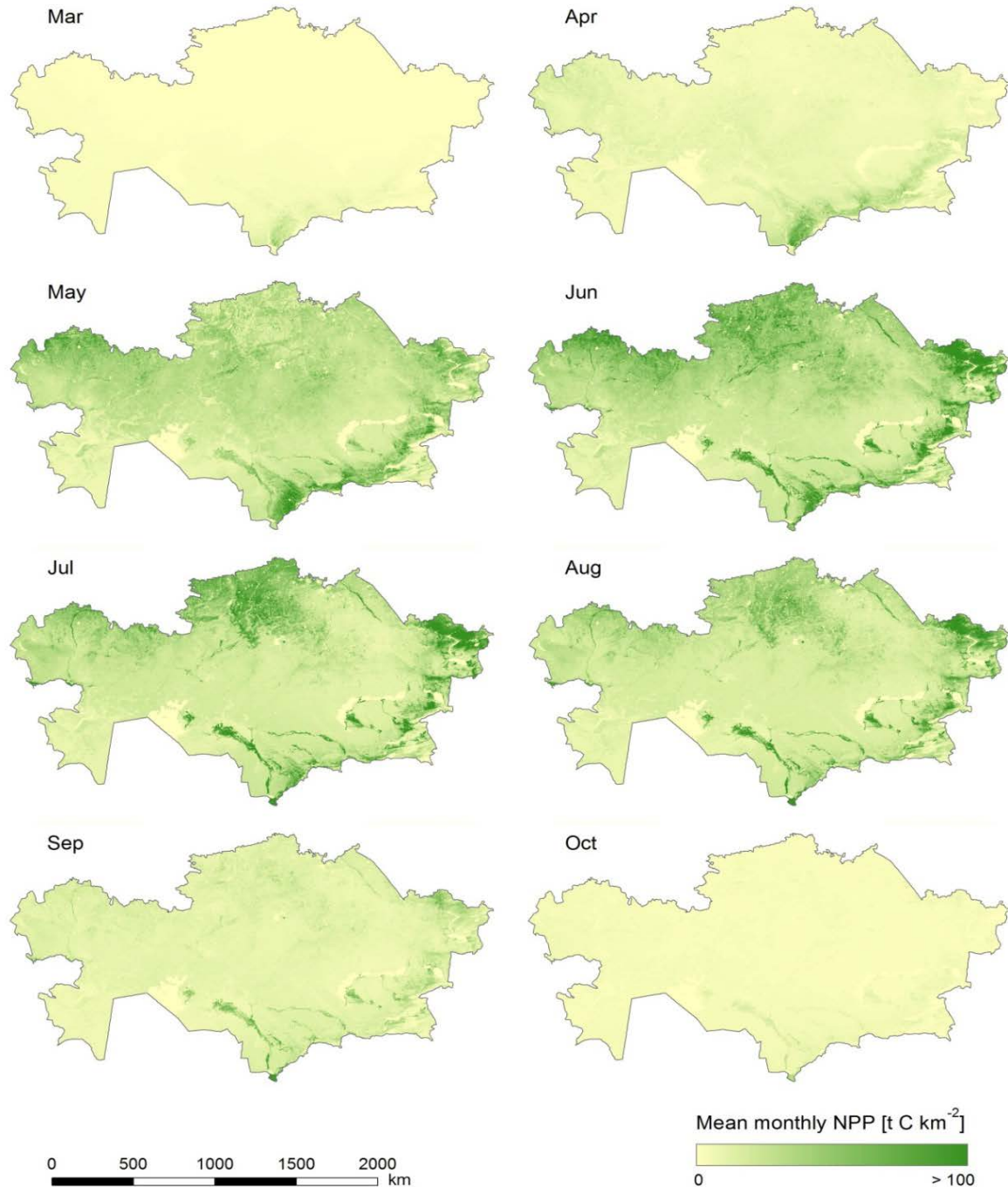
Input Data



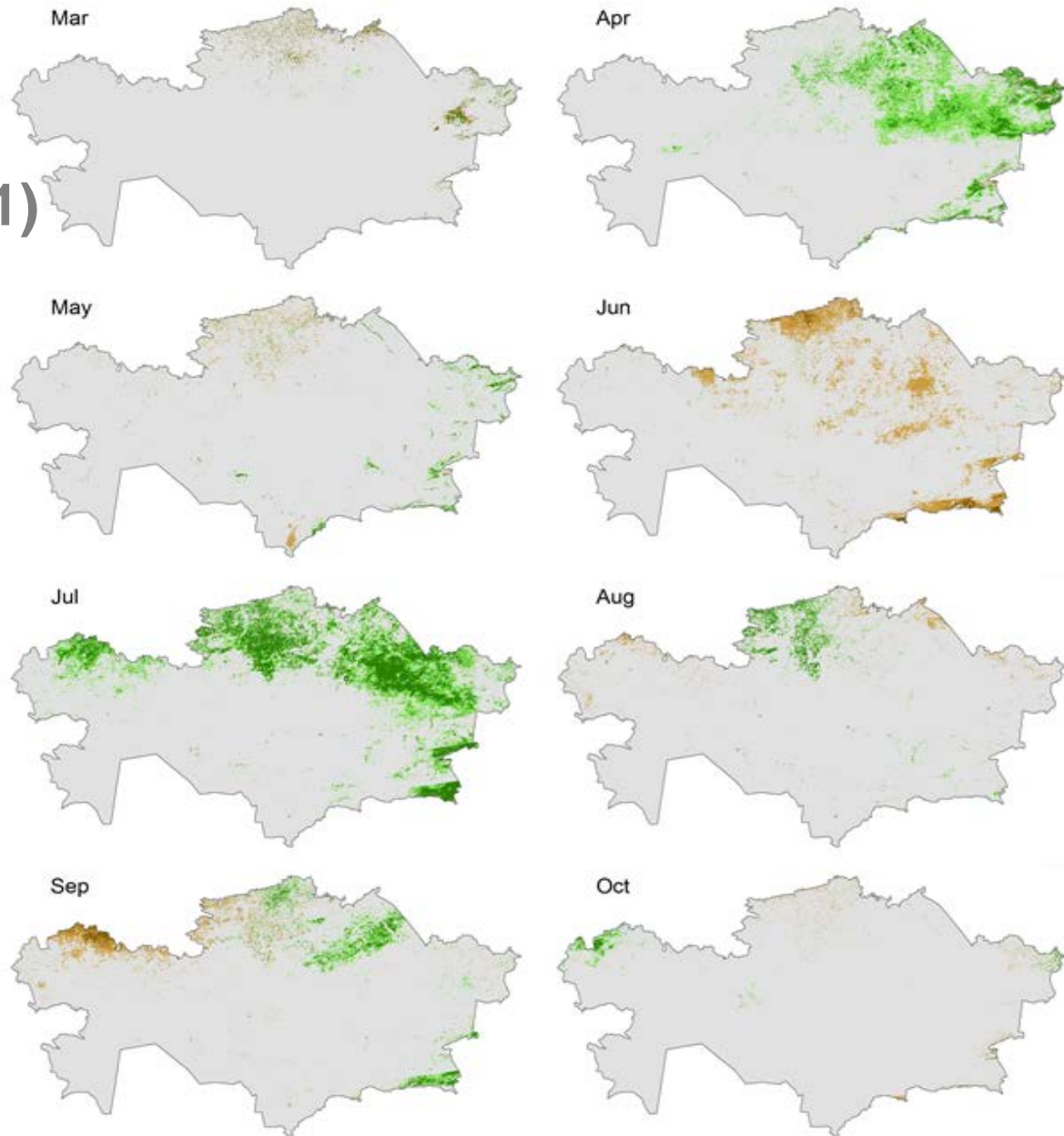
BETHY/DLR – Annual NPP 2010 for Central Asia



Monthly Mean Net Primary Productivity (NPP, 2000-2011)



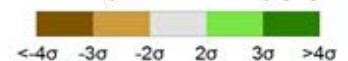
Monthly NPP Anomaly in Year 2011 (related to av. 2000-2011)



0 500 1000 1500 2000 km

2011

Monthly NPP anomaly [%]









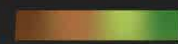
2010 JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC



DLR

Net Primary Productivity (NPP)

derived by BETHY/DLR

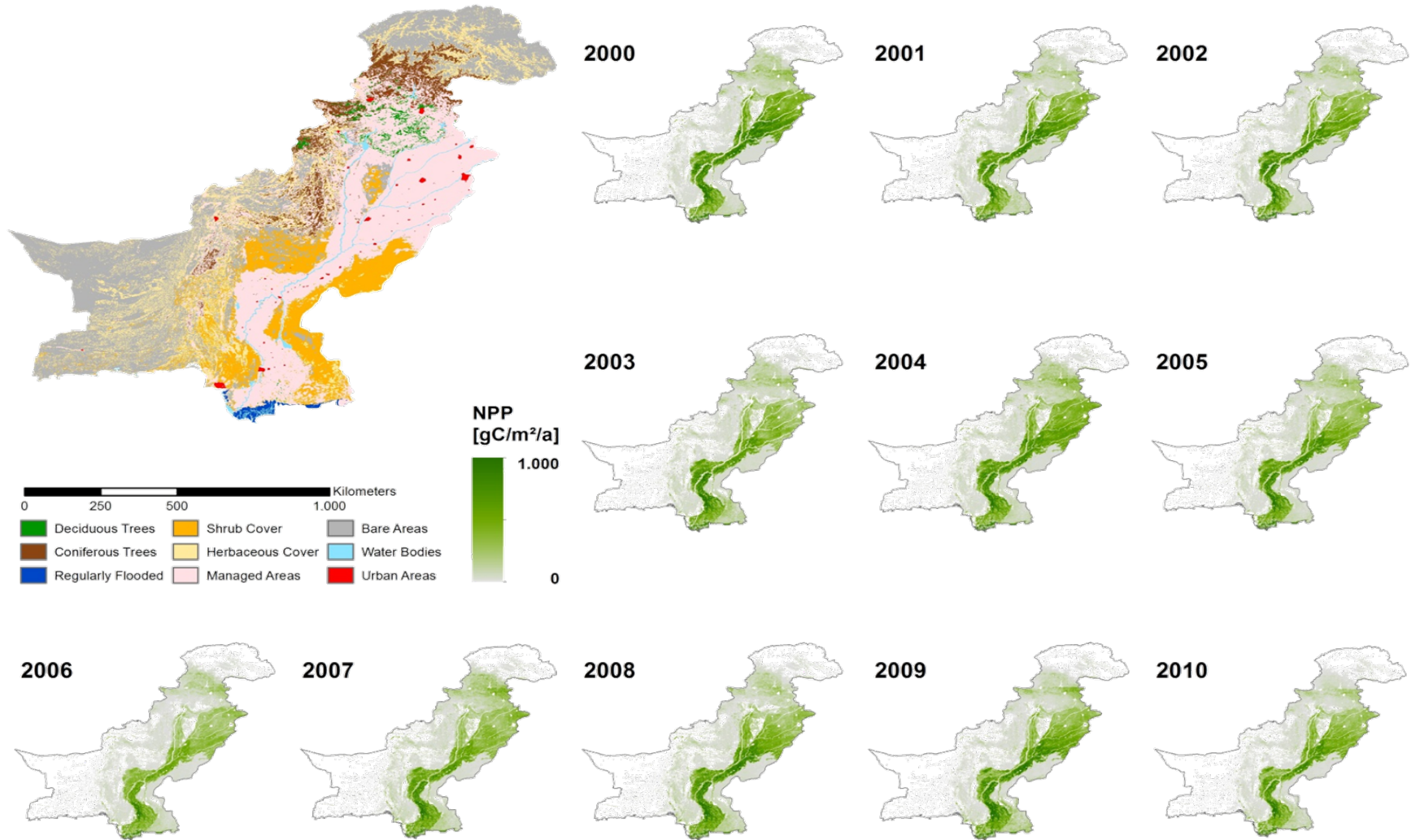


NPP [tC/km²/a¹]



500 km

Net-Primary-Productivity – Pakistan



From NPP to Straw-Energy

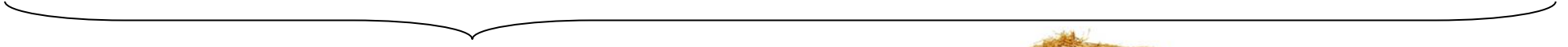
NPP



Tuber
Forage plants

Roots

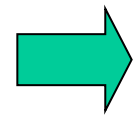
Grain



Water
Nitrogen etc.



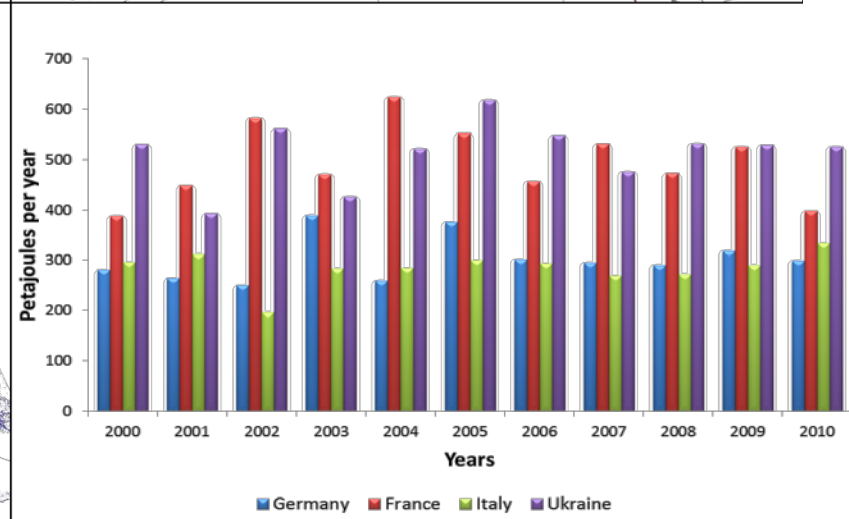
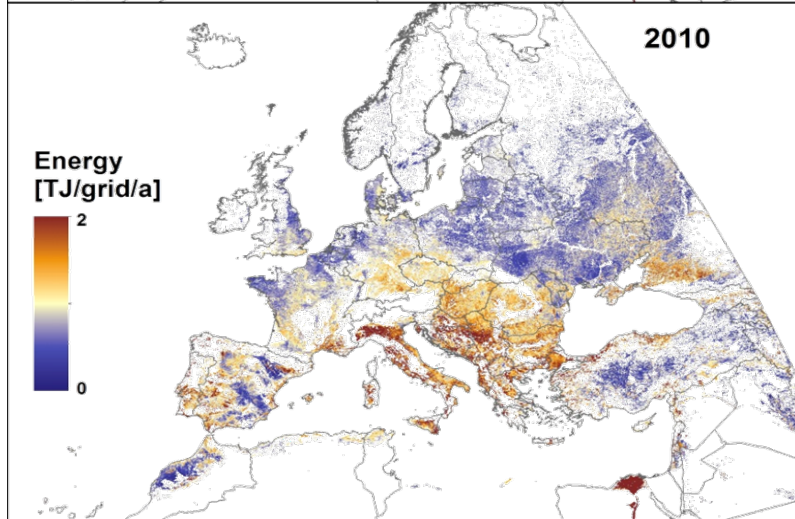
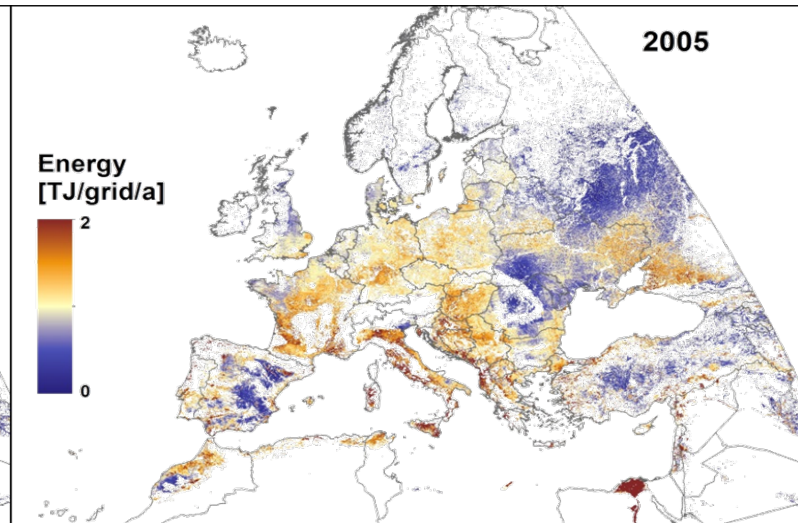
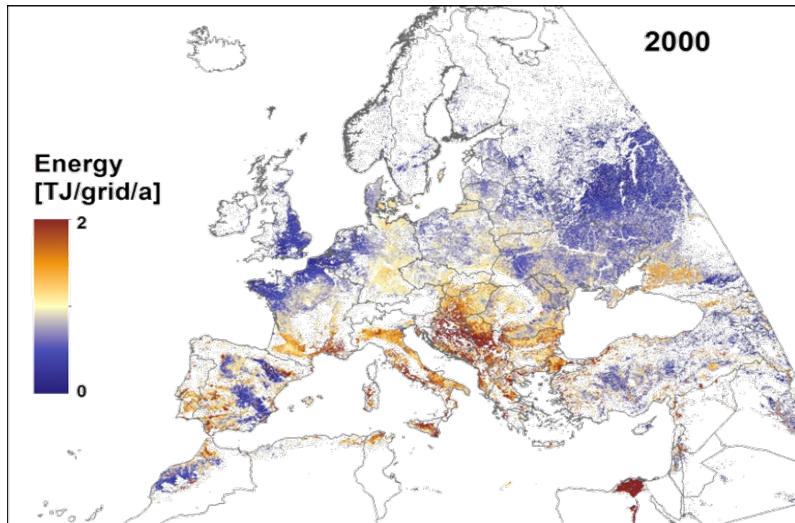
Straw



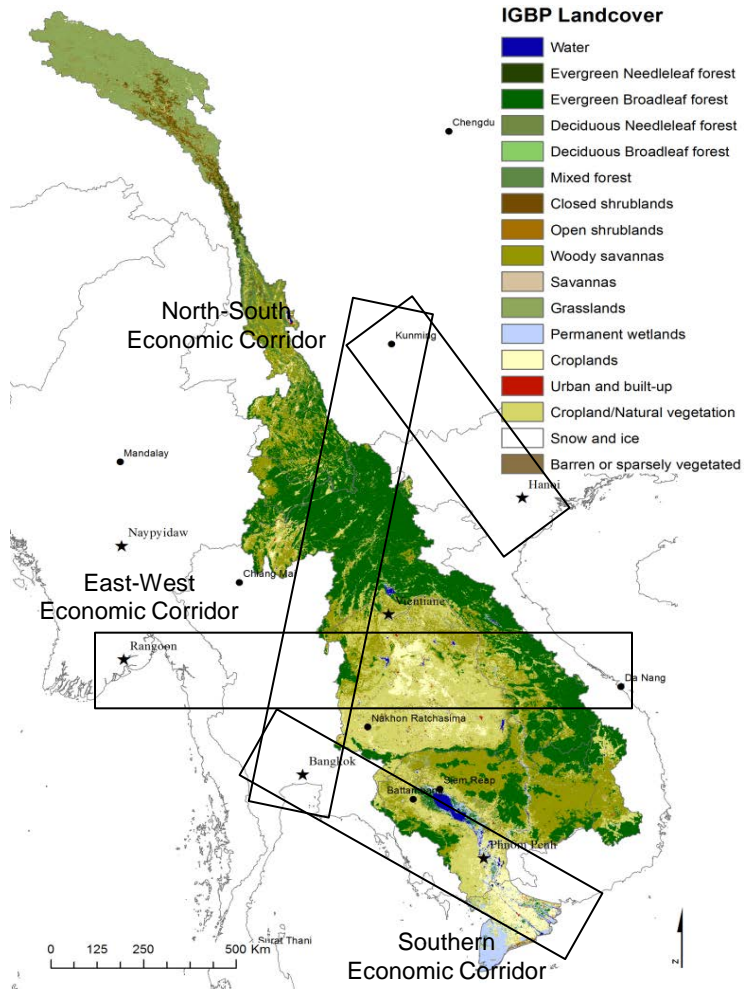
Energy



Energy Potential of Straw (grid=km²)



Environmental Issues in the Mekong Basin



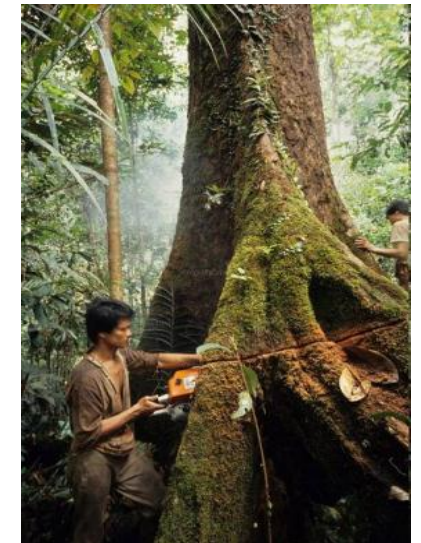
Cash crop cultivation



Dam construction

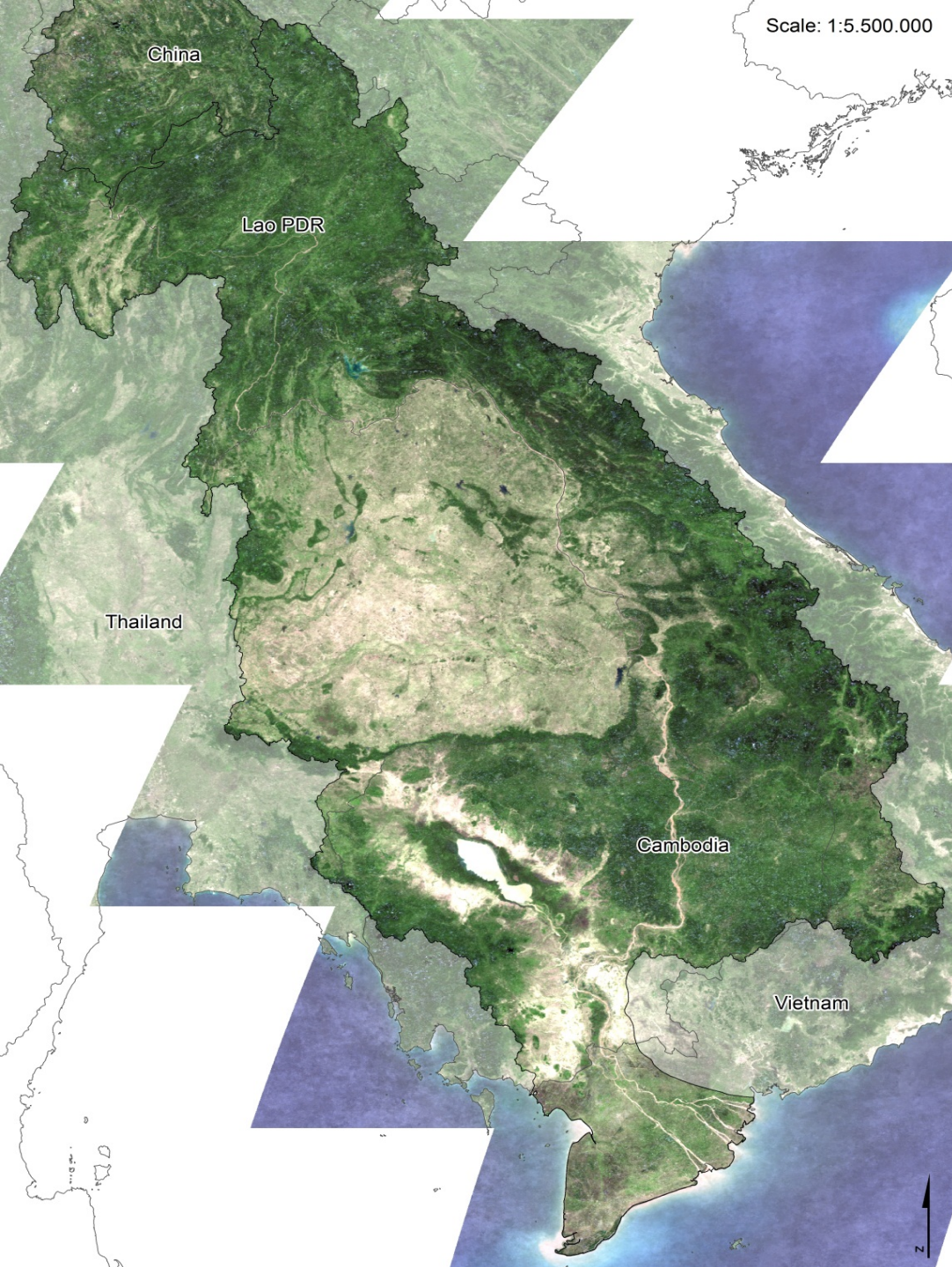


Deforestation



Infrastructure development



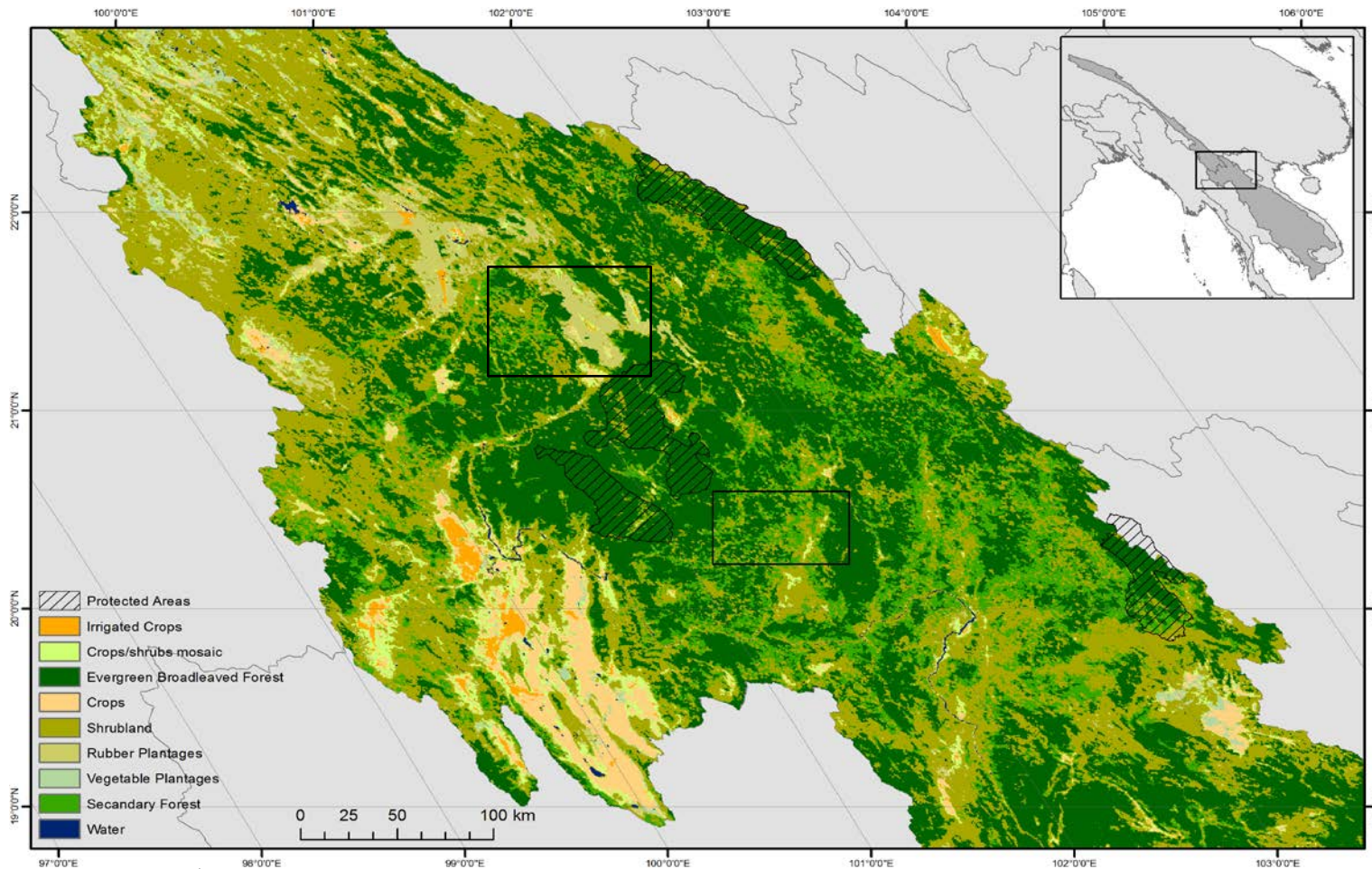


Lower Mekong Basin in the rainy season 2010

Satellite mosaic based on daily images between April and October



Lack of thematic differentiation: global vs. regional



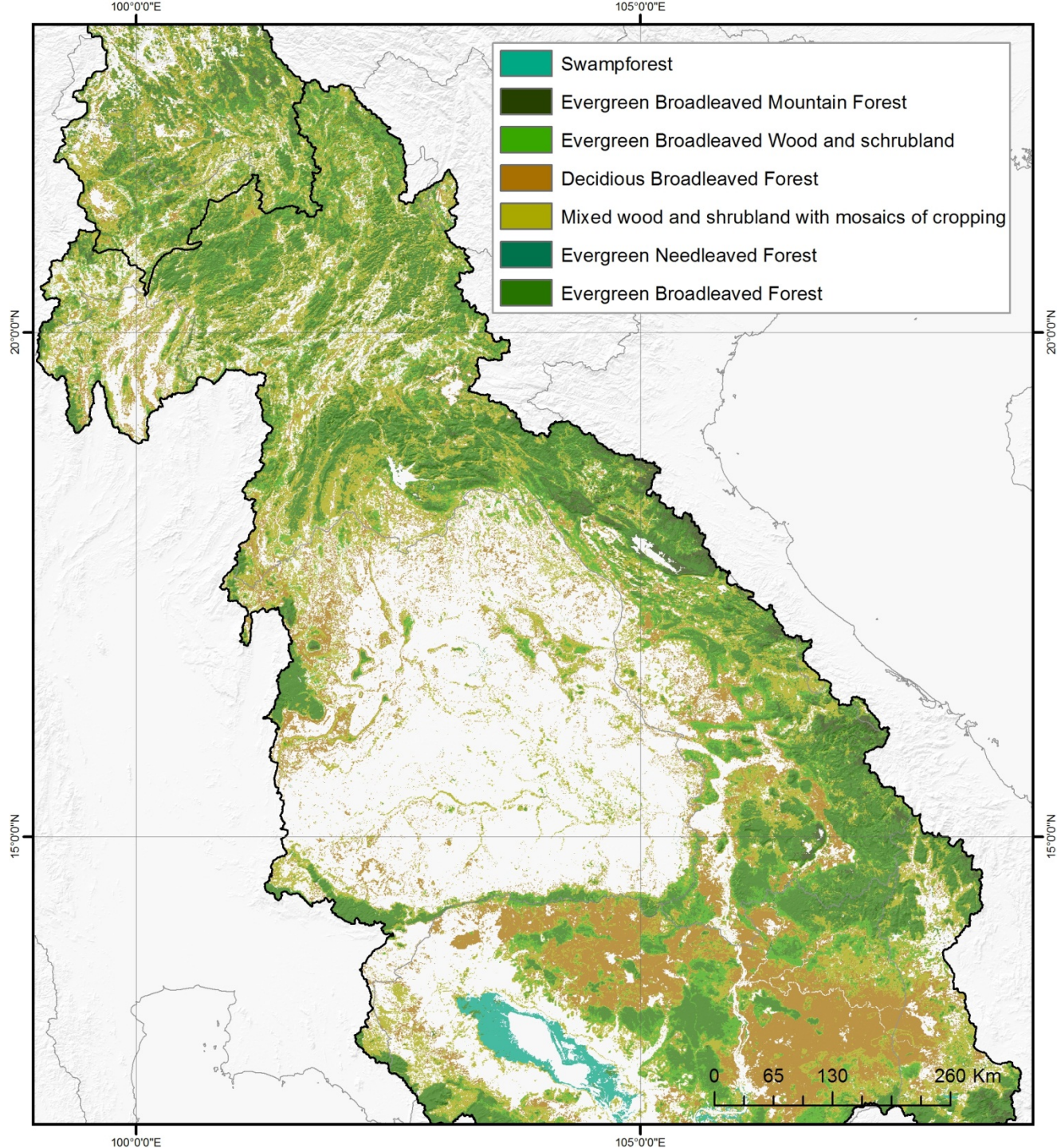
Random Forest classifier

Input features:
Monthly composites (Nov-Feb) Bands 1-7

+
Smoothed 16-day composites

+
Ampl, Mean, Base level (=54 features)



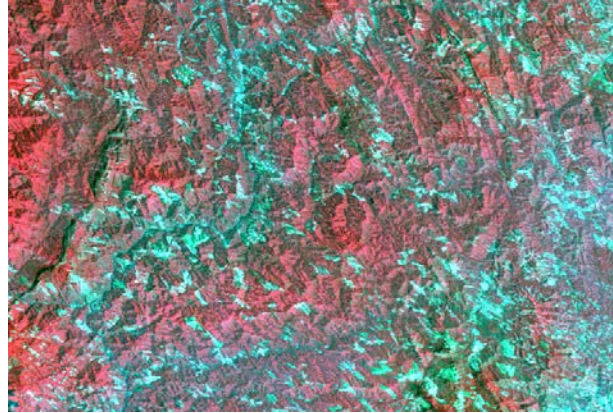


Lack of thematic differentiation: global vs. regional

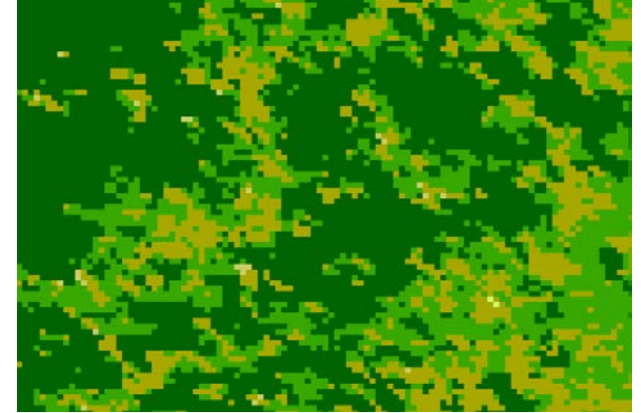
MODIS land cover 2009



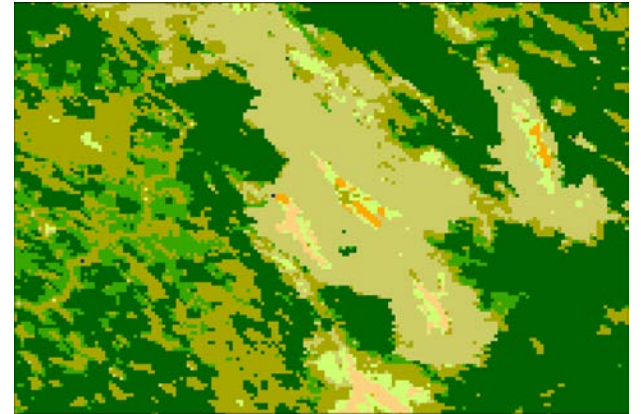
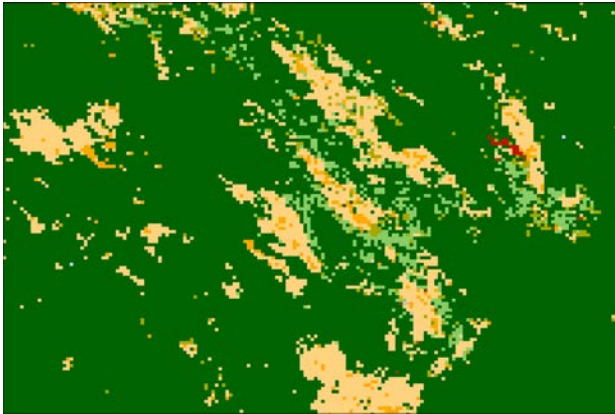
Landsat 5 TM



Regional land cover 2009



Example 1



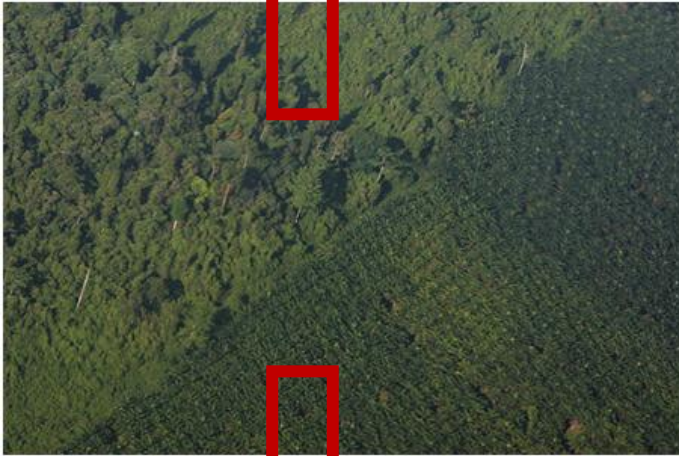
Example 2



REDD+ activities in the Mekong region



Source: www.recoftc.org



Source: Rainforest converted to palm oil plantations (R.A. Butler)

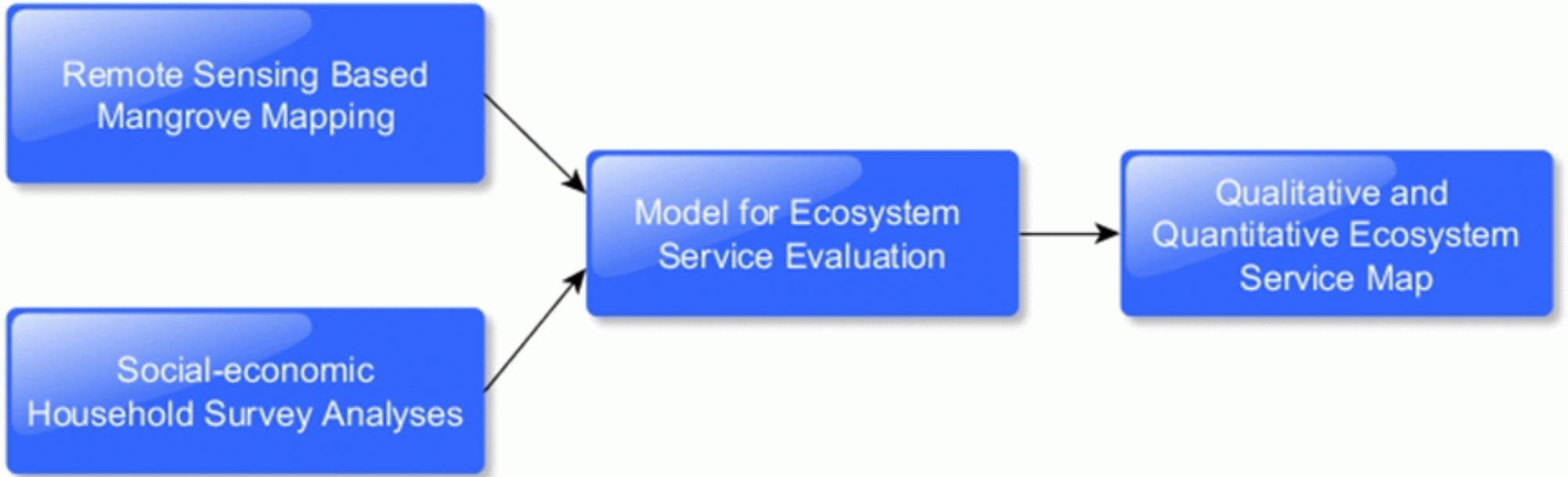


Source: www.plant-talk.org

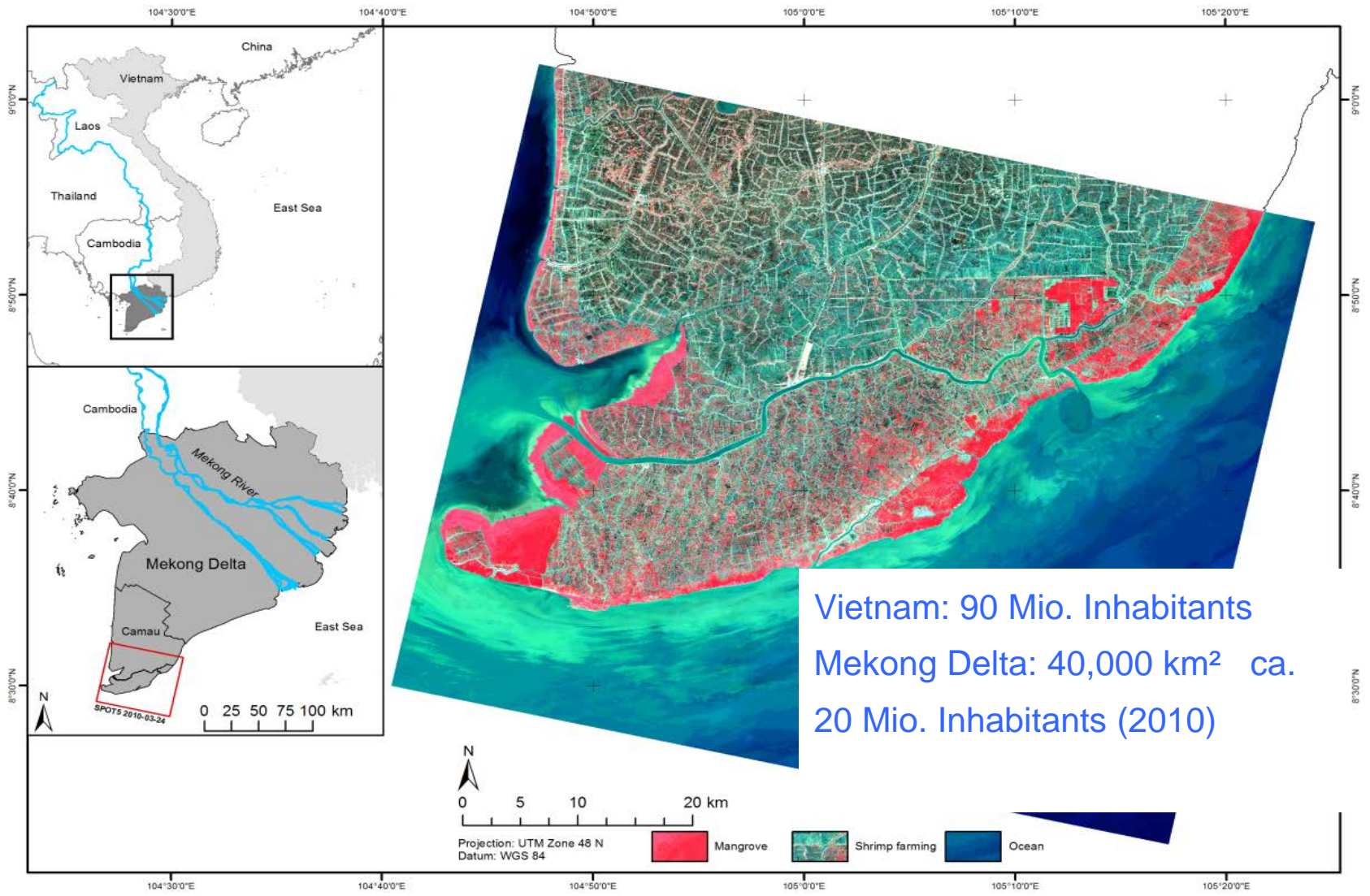
- Example Countries: Lao PDR and Vietnam
 - **Lao National Forest Inventory and REDD+ Assessment and Implementation Projects** – supported by WB, Gov. of Finland, JICA, GIZ, ESA etc.
 - **National Forest Inventory, Monitoring and Assessment Program (NFIMAP) of Vietnam** – conducted by national forest authority (since 1991) in 4 year cycles – using SPOT5 data since 2006



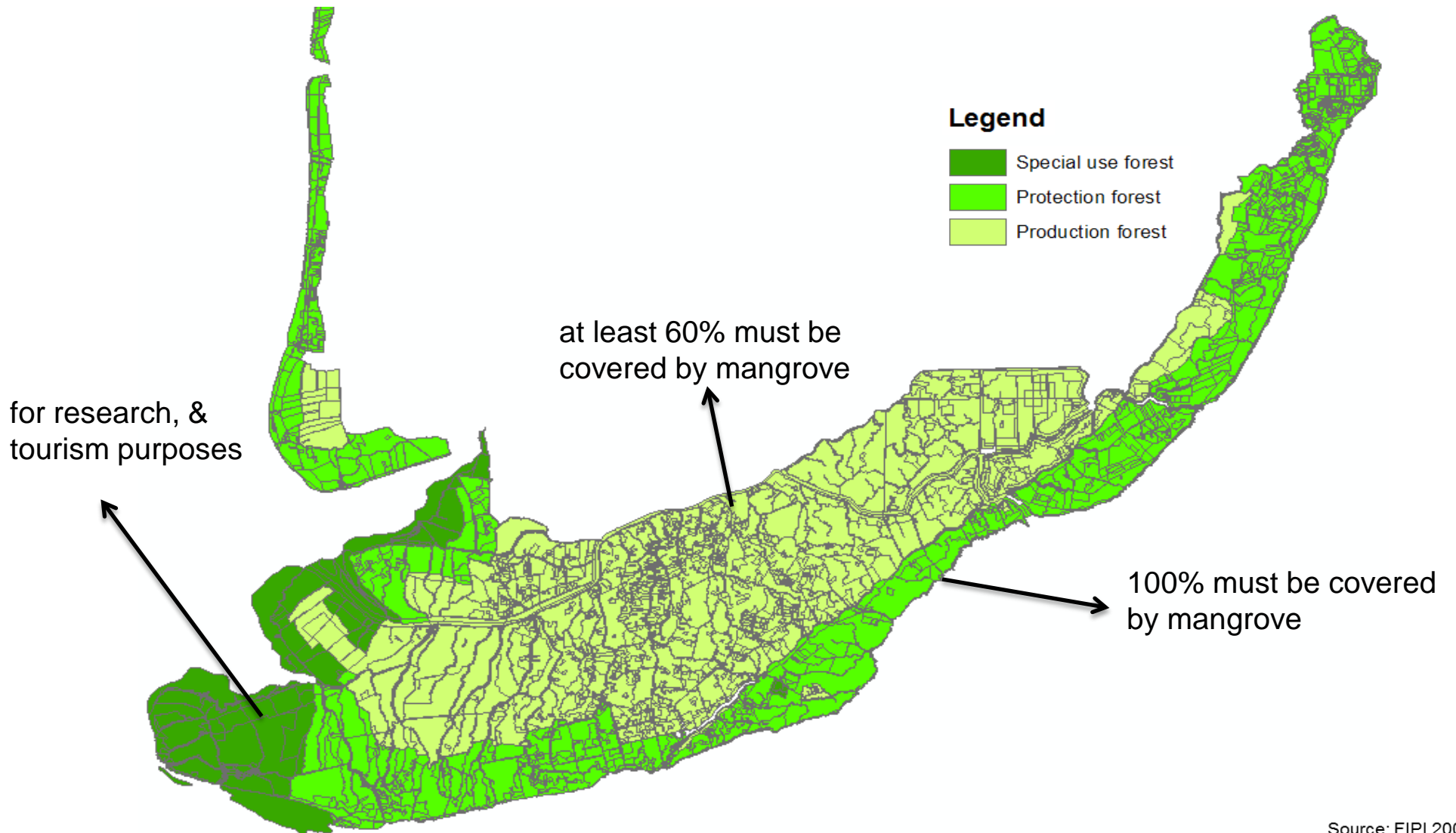
Evaluation of Mangrove Ecosystem Functions along the Southern Coast of Vietnam



Mekong Delta, Vietnam – General Information



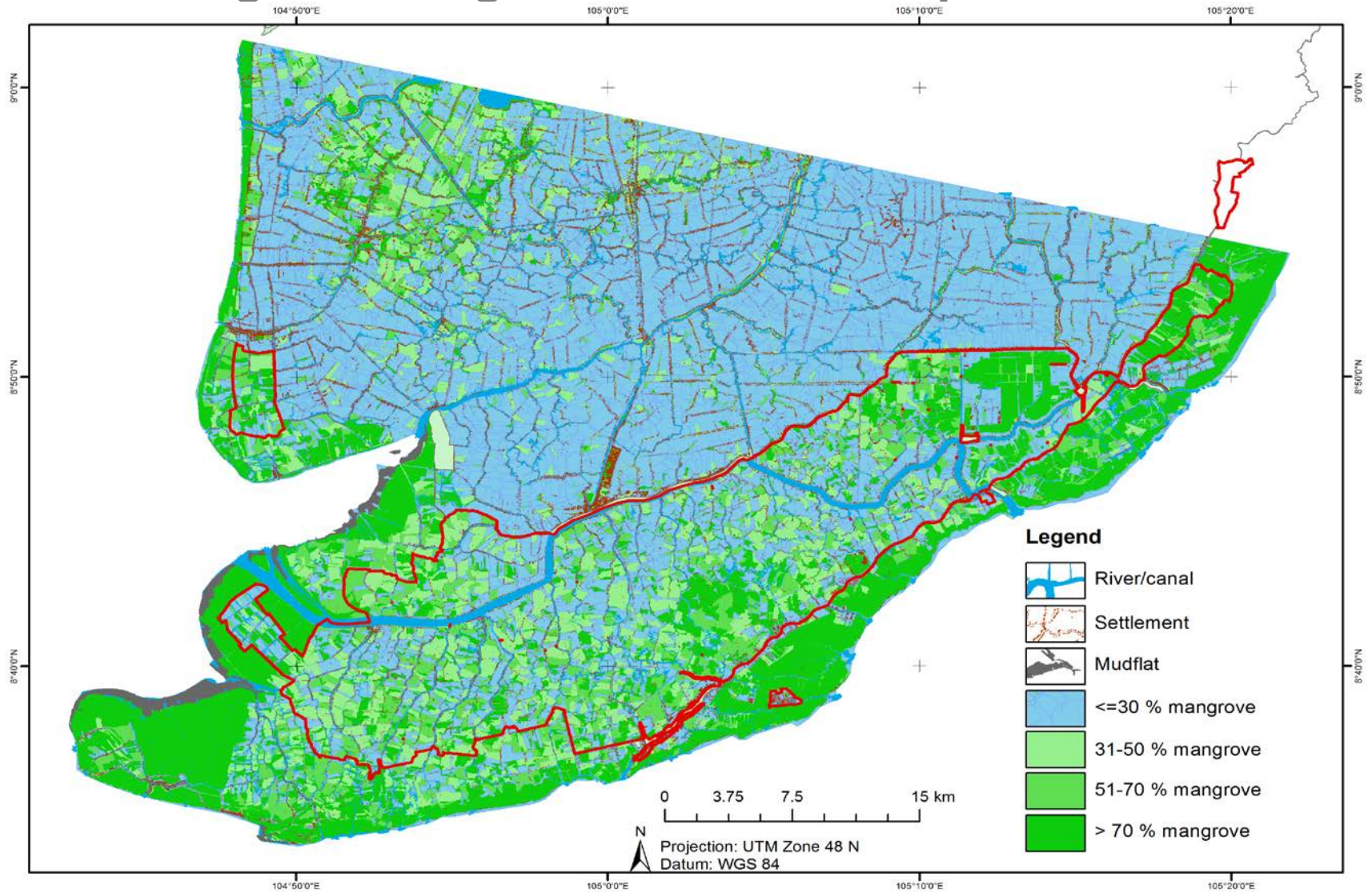
Mangrove Management Program of Vietnam



Source: FIPI 2006



Percentage of Mangrove Forest vs. Aquaculture Areas



Mangrove Forests provide...



Fish



Charcoal



Recreational Purposes



Natural crab



Construction materials



Recreational purposes



Medicinal products



Water filtration



Carbon sequestration



Socio Economic Survey: Household Questionnaires

Code:.....028.....
 Surveyor:.....T. Van..... Date: 24/11/2010
 Coordinates (UTM48N-WGS-84): X: 484786..... Y: 973628.....
 Accuracy:.....7.0.....
 Household's name:.....Nguyễn Văn Đức..... 1. Householder
 Age:.....52..... Sex: 1. Male 2. Fe
 Education level:.....6/12.....
 Experiences on mangrove management: 26 years
 Address: Village.....Việt Khê..... District:.....Đầm..... Province:.....C.M.....

Q3. Understanding

Q31. What do you understand by the term n

Mangrove + w

Q43. How much you think would be one hectare of land full of mangrove?

.....100M.....(VND)

Q44. Are mangrove worth to be protected

1. No I don't think so
2. Yes I think so
3. I don't know

Q45. It will be better in my area if more mangroves are cut down and we have more space for aquacultures

1. Agree
2. Disagree
3. Others

Q46. I will be better in my area if more mangroves will be planted

1. Agree
2. Disagree
3. Others

Q47. I know that mangroves have a protection value, but I cannot make money with them

1. Agree
2. Disagree
3. Others

Q48. I have observed that decrease in mangroves led to more coastal erosion

1. Yes
2. No

Q49. Fish variety in mangrove areas is larger than in areas without mangroves

1. Agree
2. Disagree
3. Others

Q1. How many members in your family?

Order	Full name	Q11 Sex (*)	Q12 Age	Q13 Education level	Q14 Status (**)	Q15 Position (#)	Q Major (@)
1	Phạm Văn Ngân	1	52	6/12		1	2
2	Tiền Thị Ngọc	2	52	3/12		2	2
3	Phạm Hoàng Tài	1	26	9/12	0	2	2
4	1	2	2

Q32. Which mangrove species do you know

1. Mắm trắng (Avicennia alba);
2. Mắm biển (Avicennia marina);
3. Đước đôi (Rhizophora apiculata)
4. Dừa nước (Nipa fruticans)
5. Others: (Local name)



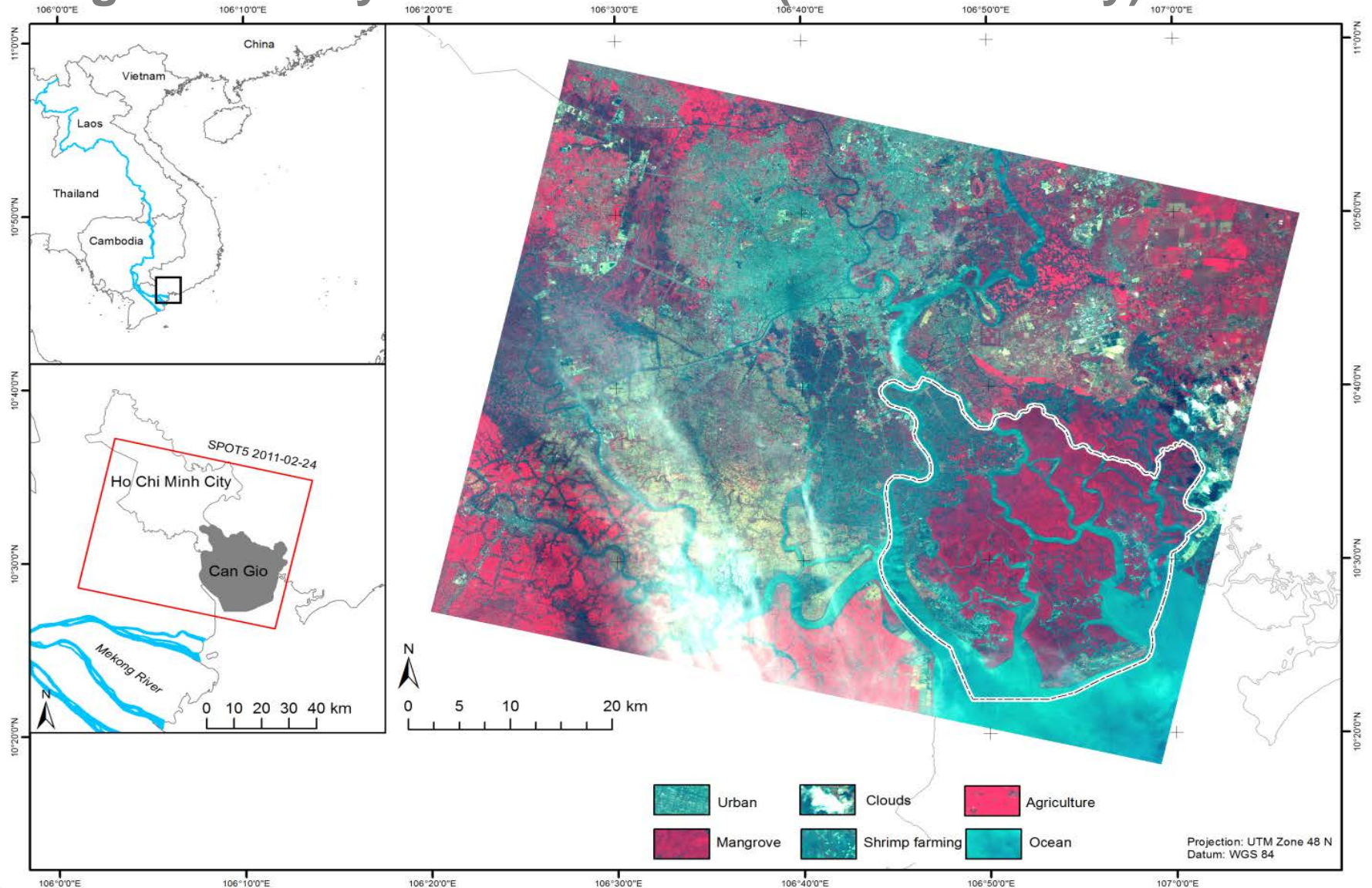
Notes: (*) Land use type; (**) Percentage per total area; (***) 1. High; 2. Medium; 3. Low

5. Non

1. CS

2. NO

Mangrove Ecosystem of Can Gio (near HCM City)

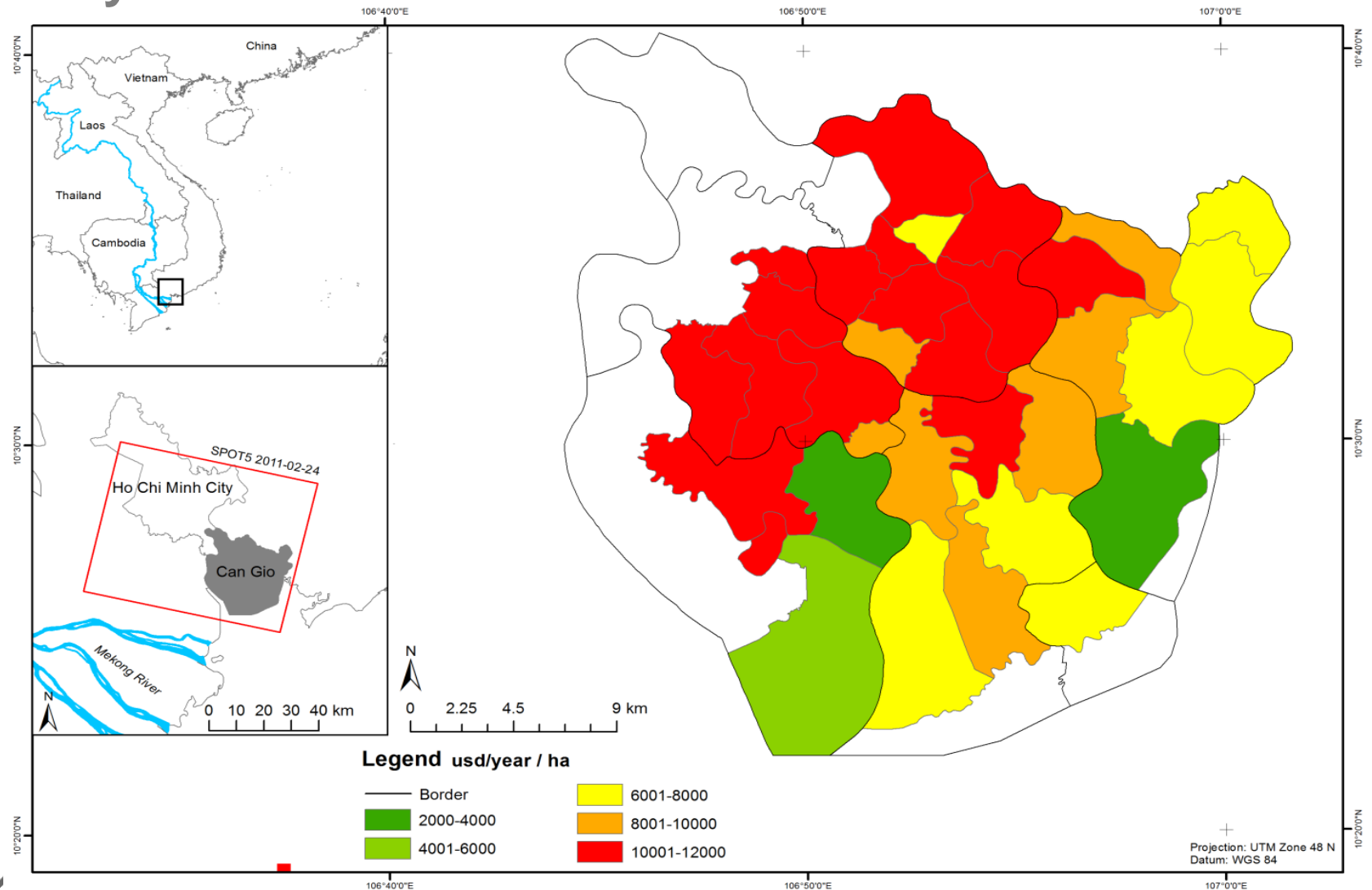


Derivation of multiple direct and indirect Values (in USD)

	highest estimates
	larger area 38,293 ha
timber related	12.727.623,00
fish direct	14.780.000,00
fish indirect	81.344.100,00
tourism	176.059.997,00
erosion control	149.217.542,00
carbon sequest.	68.890.000,00
SUM	503.019.262,00
value per ha	13.136,06
	smaller area 35,265 ha
timber related	12.727.623,00
fish direct	14.780.000,00
fish indirect	74.911.900,00
tourism	176.059.997,00
erosion control	137.421.827,00
carbon sequest.	63.450.000,00
SUM	479.351.347,00
value per ha	13.592,84



Ecosystem Service Value Map: all of Can Gio about 1 Bio. USD/yr



Thank you for your attention !



email: claudia.kuenzer@dlr.de