

## Are conditional and realistic REDD + mechanism feasible? A case of a rich forested district in Indonesia

# I. Estimation of land use, land use change and forestry carbon emission of Berau District, East Kalimantan

Andree Ekadinata, Zuraidah Said and Sonya Dewi

### Background

From UNFCCC COP-13 meeting in Bali in 2007, countries agreed that there was an urgent need to take further meaningful action to reduce emissions from deforestation and forest degradation. The demonstration activities of REDD (Reduction Emission from Deforestation and Degradation) is being implemented by many tropical countries worldwide. Measurement/ monitoring, Reporting and Verification are the integral part of implementing REDD. Historical emissions are needed to assess the additional of REDD implementation as well as in setting up Reference Emission Level or Reference Level. Prior to any REDD implementation, estimates of historical emissions are useful to assess whether a REDD project or program is feasible or not.

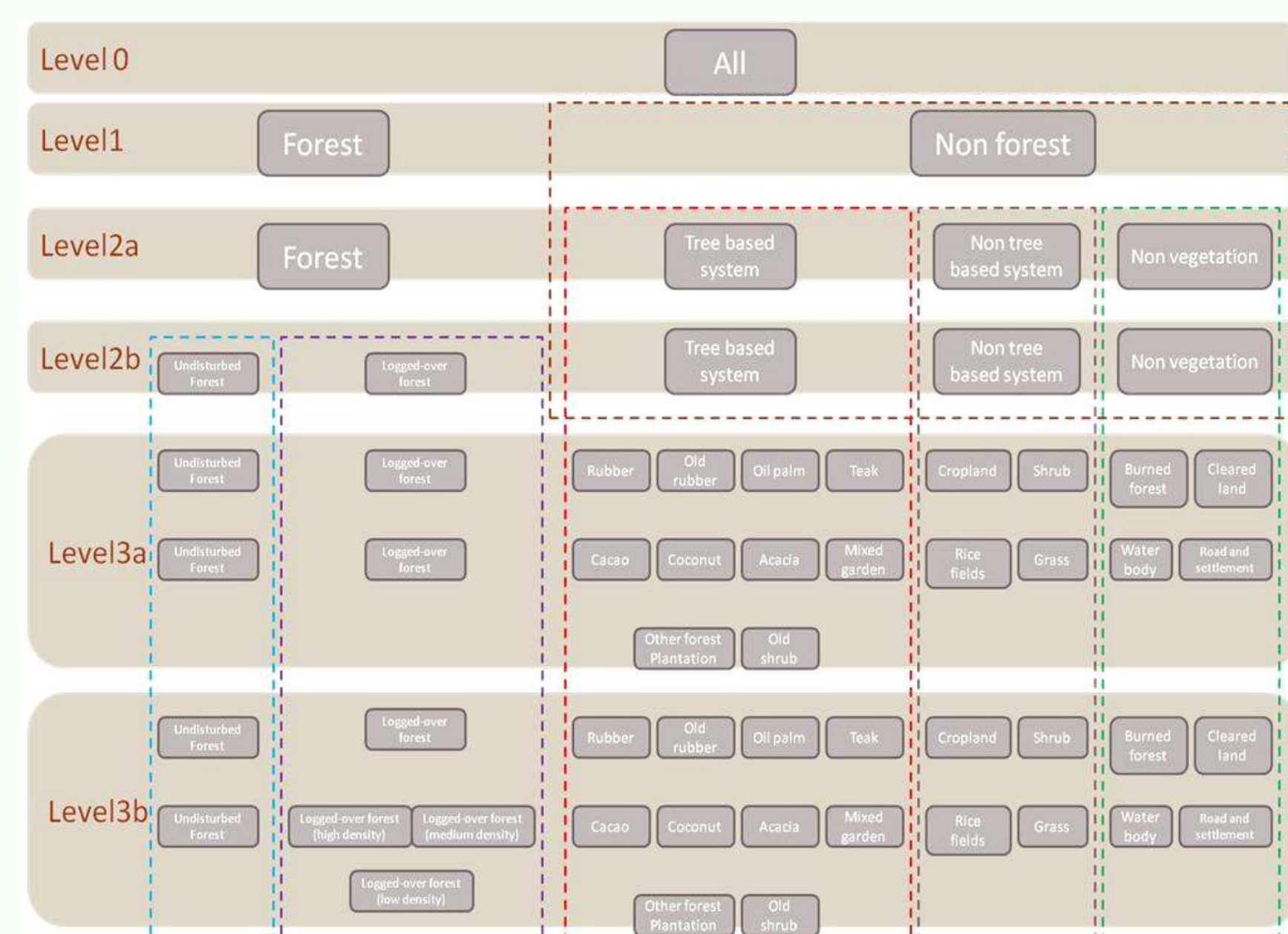
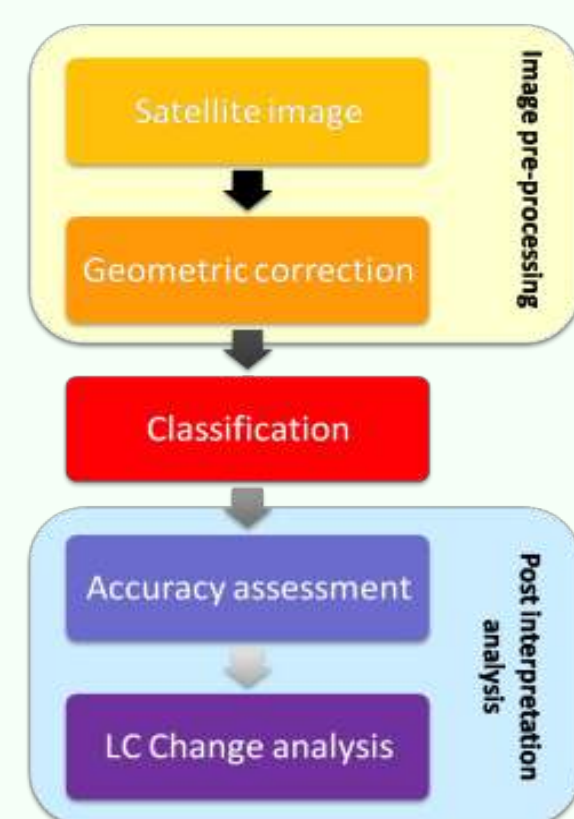
### Objectives

Estimating land use change and time average of carbon stock from different type of land use/ cover for emission and sequestration estimation in Berau district.

### Materials and method

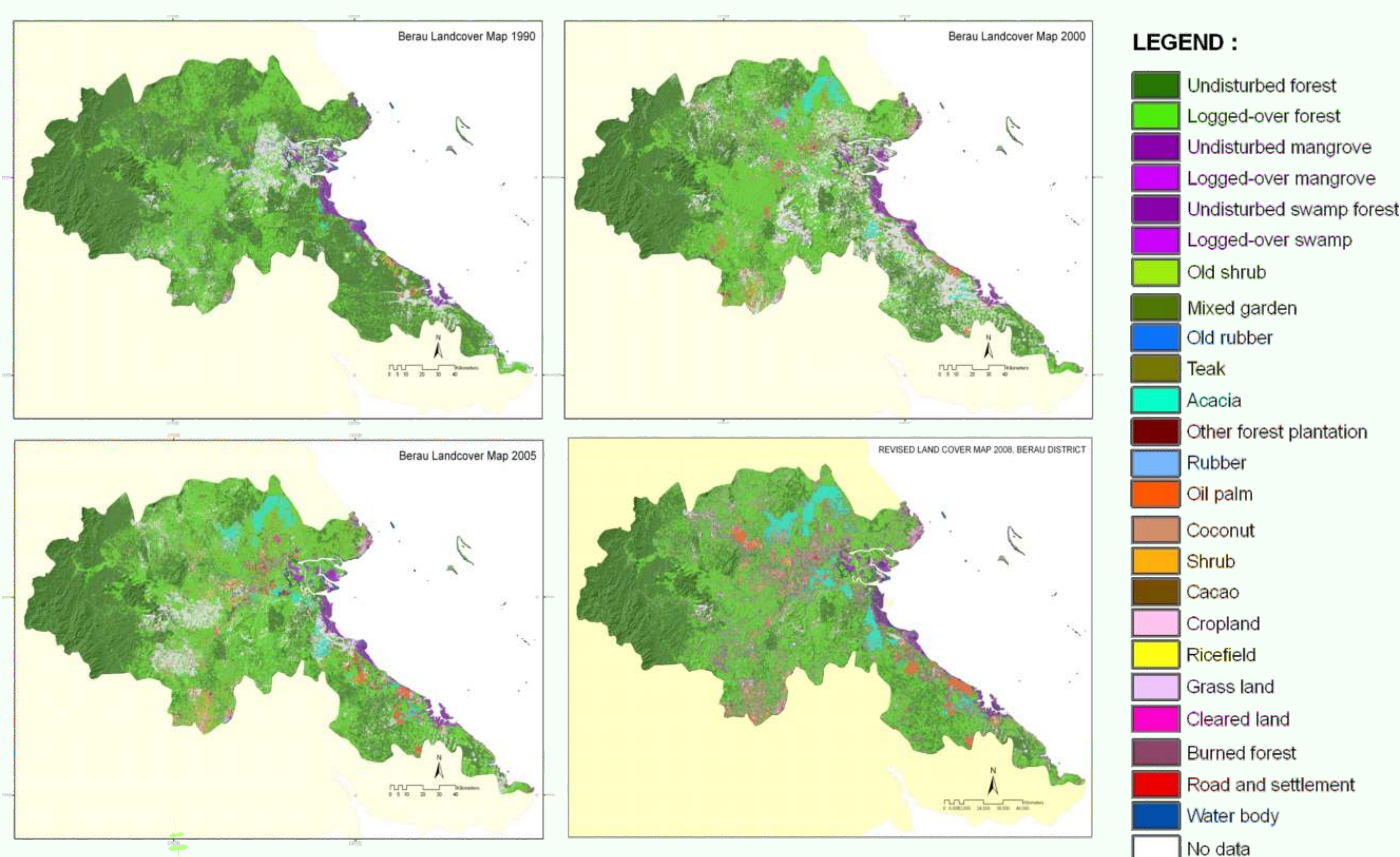
ALUCC or analysis for land use trajectory consists of tree main steps which aims to produce land use change analysis from satellite image:

- **Image pre-processing** which consists of satellite image radiometric and geometric correction aims to correct satellite image from atmospheric error and make satellite image become geometrically corrected.
- **Classification** process aims to produce land use/cover maps from corrected satellite image for several time series.
- **Accuracy assessment** aims to assess how accurate the land cover map produce from satellite image. It is conducted by comparing reference data (GPS points) with land use/cover maps, the acceptable number of accuracy is 80%.
- **Land use/cover change analysis** aims to observe the changes of land use/cover across the period of study.



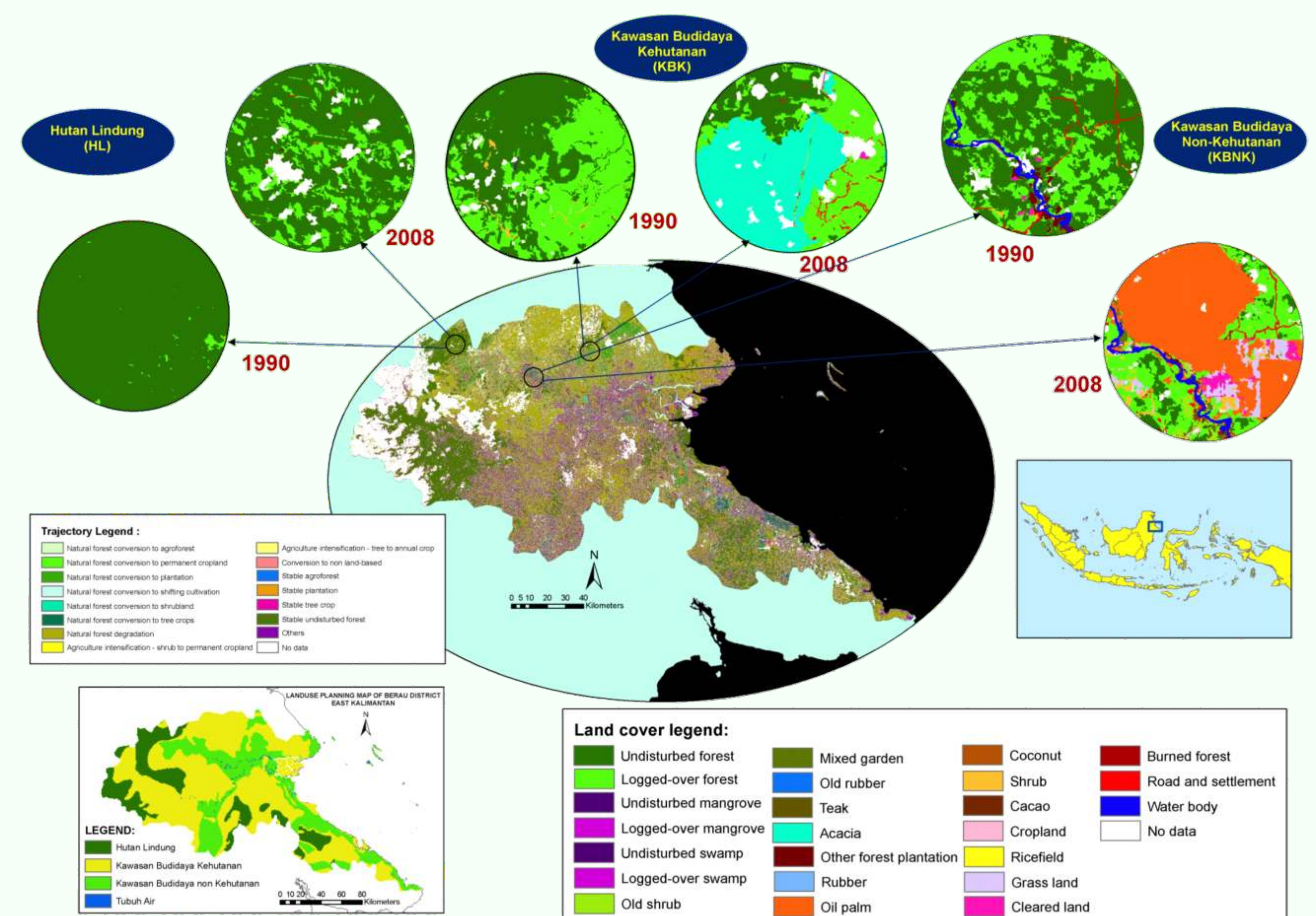
Hierarchical land use type of Berau

### Results and discussion

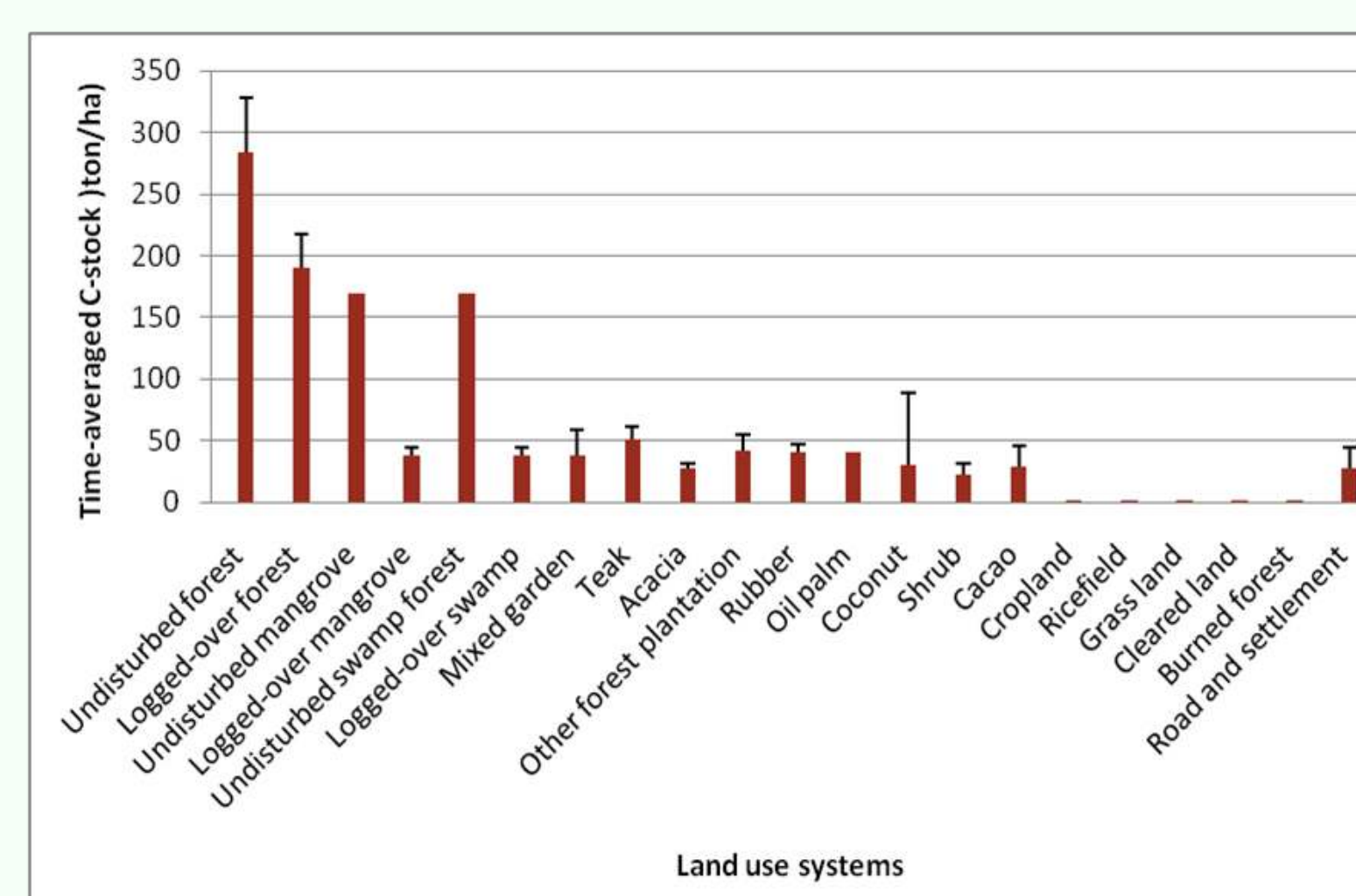


Land cover maps 1990, 2000, 2005, and 2008

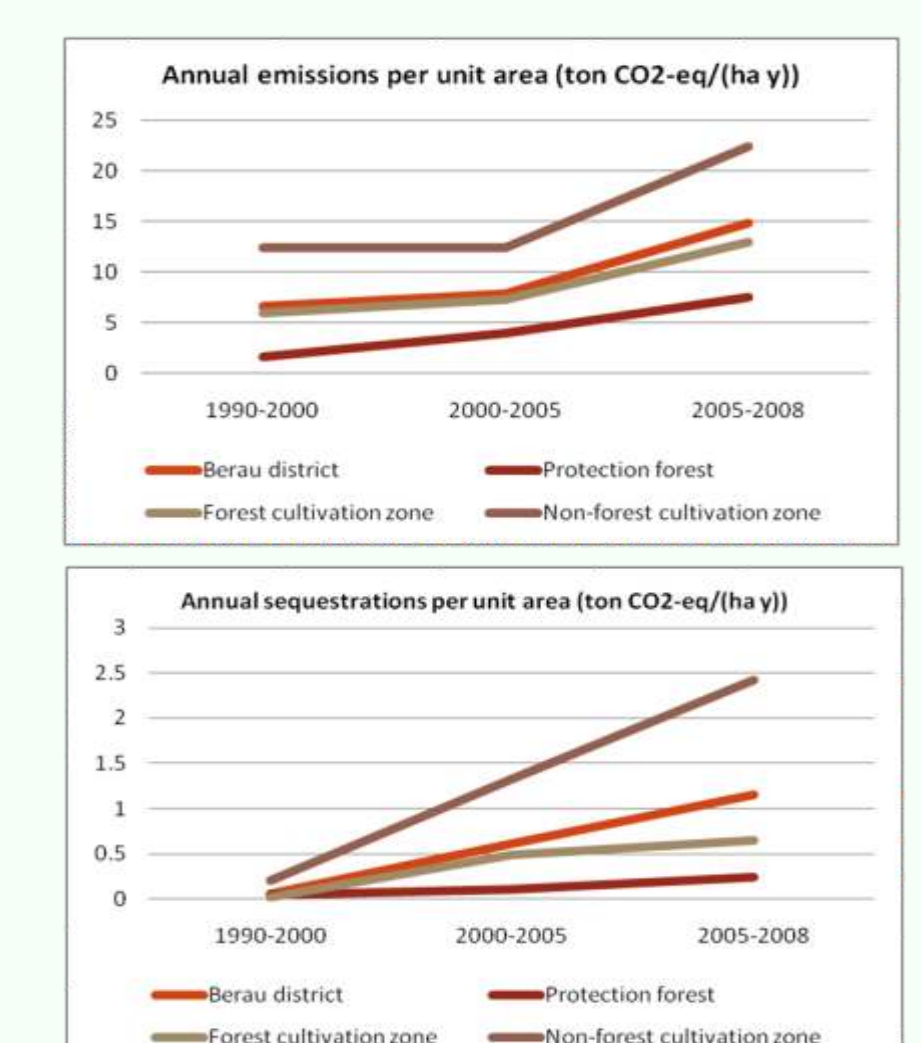
- Overall accuracy of 2008 land cover map is 78%. The land cover change analysis result showed that forest degradation happened mostly, during 1990 to 2000, while since 2000 the expansion of oil palm and acacia timber plantation had been taking places especially in the coastal area (eastern part) toward the middle area. The undisturbed forest area remains in rough topography area where is difficult to be accessed (west area).
- Forest degradation, and forest conversion into large scale plantation such as oil palm and Acacia, mainly occurred in non forest cultivation zone (Kawasan Budidaya Non-Kehutanan) along with the development of road infrastructure, settlement, and other facilities to support the operation of plantation and logging activity.



- Based on annual emission per unit area, the emission in Berau area steadily increased from period I (1990-2000) to period III (2005-2008) with much sharper increases recently. The highest emission per unit area was in non forest cultivation zone, and the lowest emission was in protection forest zone.
- The annual sequestration per unit area was quite small compared to annual emission, but it increases from period to period especially in non forest cultivation zone where recent plantation area such as oil palm kept on growing. It had been more than half (51%) of the emission from period I occurred in forest cultivation zone, 45 % occurred in non-forest cultivation zone, and 4% occurred in protection forest zone.
- In period II (2000-2005) the increase of emission occurred in both forest cultivation zone (53%) and protection forest zone (8%), while in recent period the emission proportion was quite the same. In another hand, more than 88% of total sequestration occurred in non-forest zone in period I, but became more distributed in recent period with almost 40% of the sequestration occurred in forest cultivation zone.



Time-averaged C-stock of various land use systems estimated from primary and secondary data



Annual Emission and Sequestration per unit area based on land allocation (RTRW)

### Conclusion

- In early period (1990-2000) the dominant land use/cover change occurred in Berau district was forest degradation. Reduced impact logging and improved forest management is part of REDD strategy. However accounting this is difficult mostly since it needs a lot of field work.
- Forest conversion into plantation became more dominant in the recent period (2000-2008). Land use/cover change mostly happened in non-forest cultivation zone, where infrastructure and other facilities supported the logging and plantation activities. Oil palm land swap might be a way to go. Avoiding forest conversion and use of degraded land instead can be a strategy.
- Sequestration, although small compared to emission also occurred in Berau mostly in non-forest cultivation zone.