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C-stock change assessment

SOURCES OF UNCERTAINTY:

- **Technical**: Plot level (carbon measurement, sampling, model errors), upscaling (sampling space, classification error), and propagated error.
- **Institutional and operational**: lack of infrastructure, lack of resources, lack of coordination.
- **Political**: definition of forest, scope of REDD, gaps between expectation and reality.

Technical uncertainty due to resolutions in the upscaling

- **Information resolution:** different level of details in the information to be discriminated in classifying land use/cover
- **Spatial resolution:** size of area on the earth surface that is represented by one value in the map/pixel
- **Temporal resolution:** frequency of assessment conducted during one period of time

Case Studies
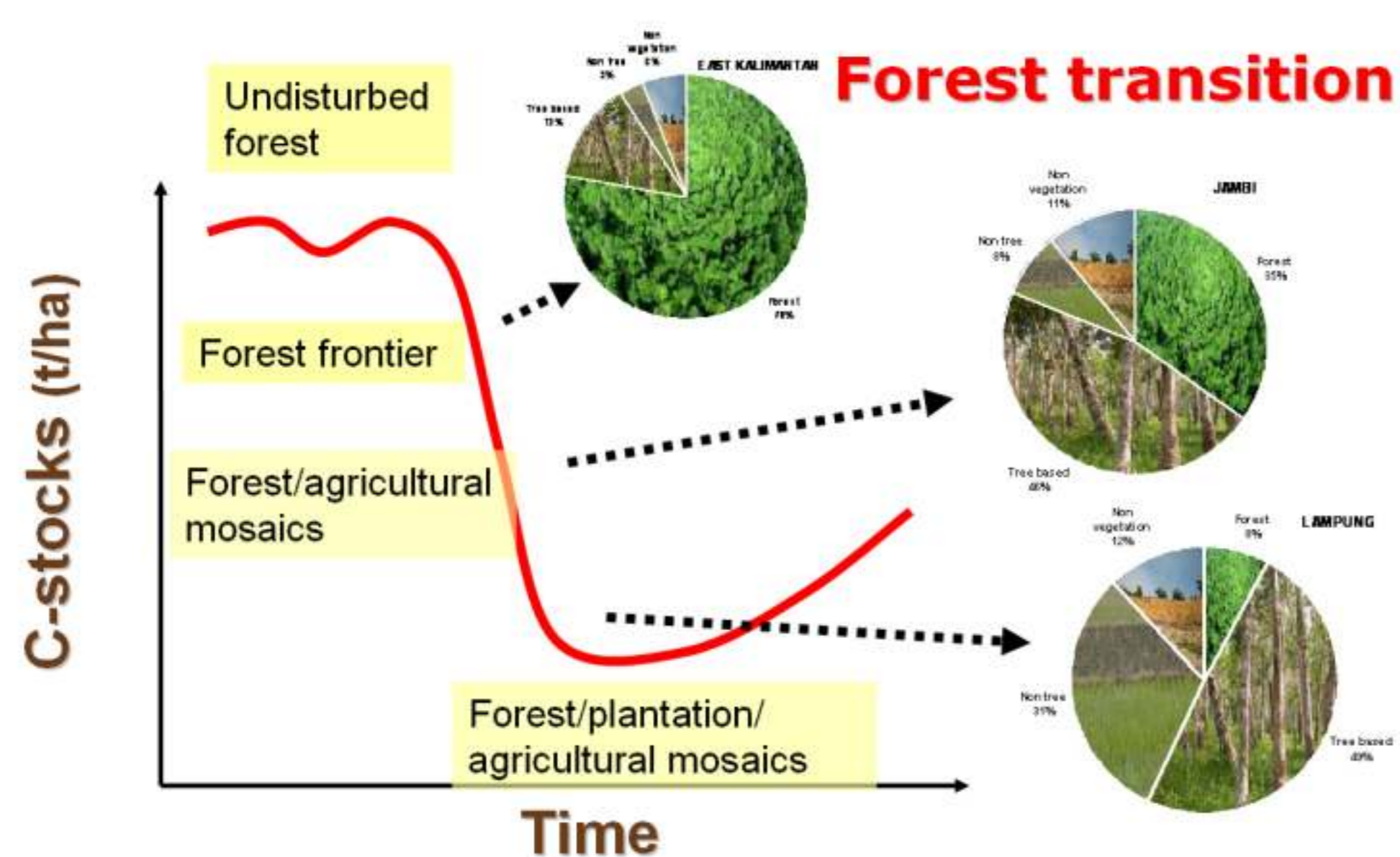
- East Kalimantan: Area of forest declined from 89.5% to 79.4%; area of undisturbed forest declined from 73.8% to 51.7%; area of logged over forest icreases from 13.7% to 27.7%
- Jambi: Area of forest declined from 54% to 34%; currently rubber area > forest; oil palm increased from 3% to 11%
- Lampung: Area of forest declined from 14% to 8%, under national park; coffee cultivation dominates

Information resolution to emission level

- 3 levels of forest classification: general (I), ecozone specific (II), and management (III), are combined with:
- 2 sublevels of non-forest classification: woody (tree) vs non-woody (non-tree) vegetation differentiation (A) and type of woody vegetation (B)
- Subsets of the combination explored: I, II, IIA, III, IIIA, IIIB
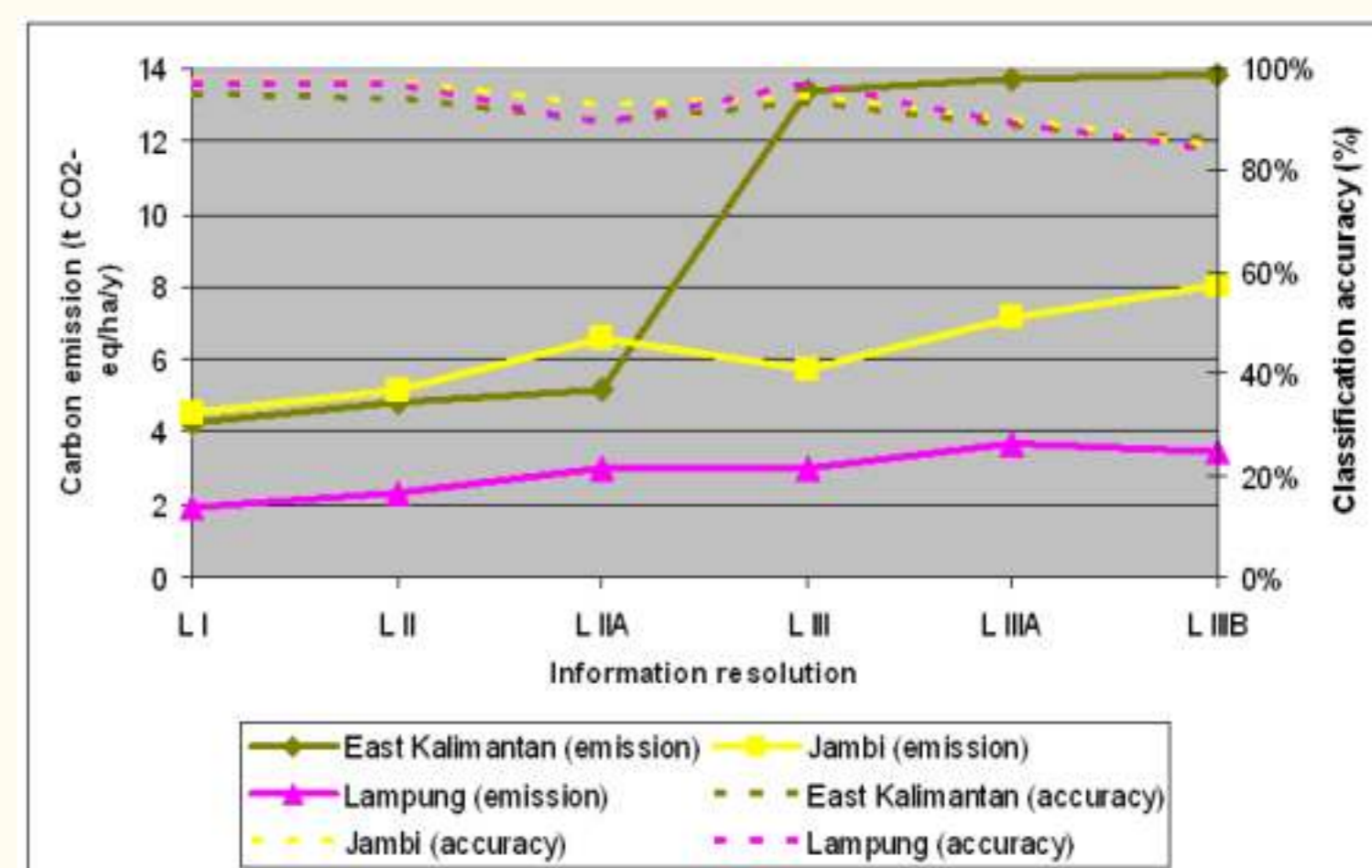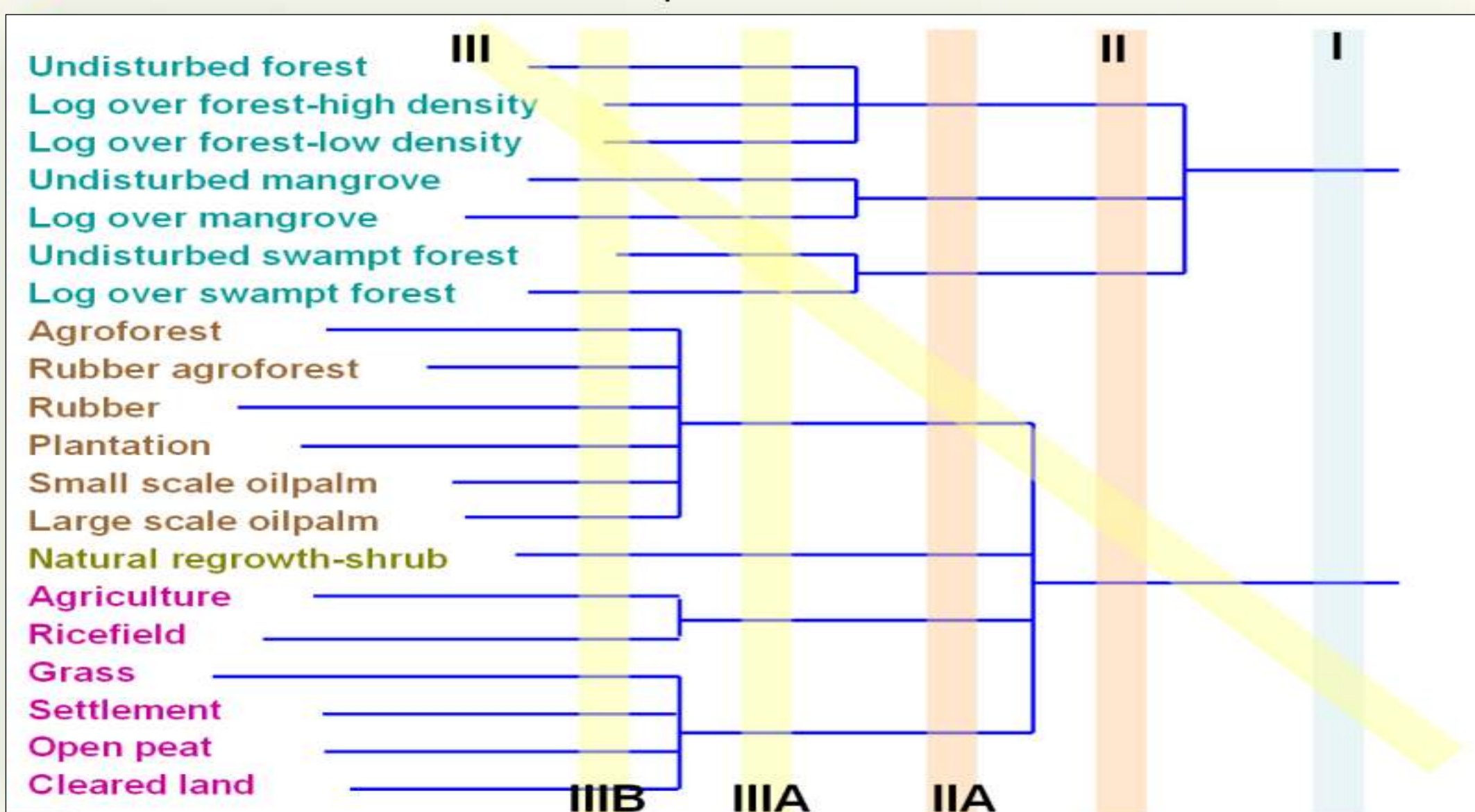
- In early FT, when forest degradation is more marked than forest conversion, forest should be discriminated based on types, quality and management.
- In the intermediate FT, when forest conversion and plantation development take place, discriminating between tree-based systems with other non-forest areas is important
- In the advanced FT, when agricultural intensification is active and there are conversion from one tree-based systems to others and also to croplands and others, differentiating vegetation type within the tree-based systems leads to a noticeable difference

Temporal resolution
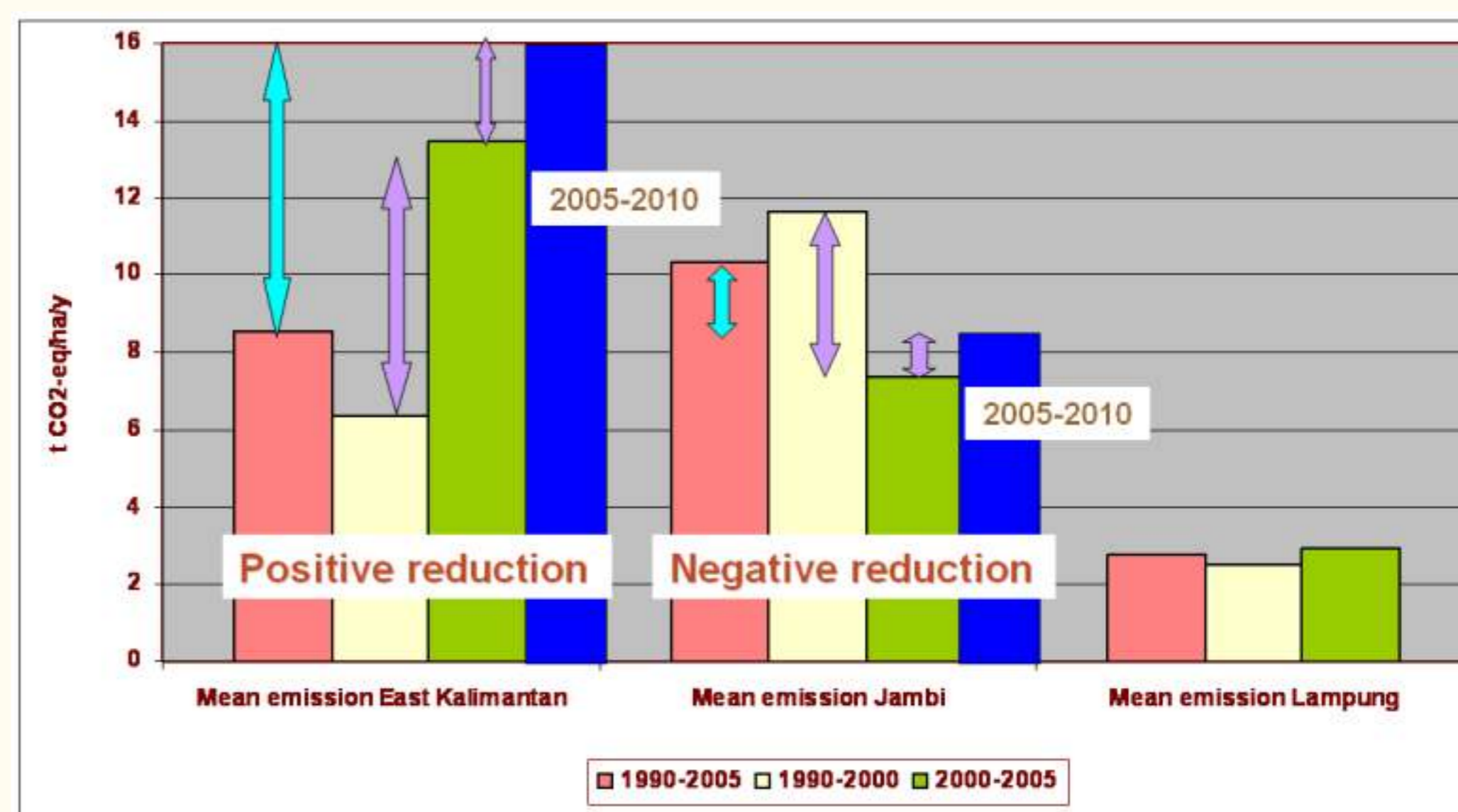
- Reference period matters when setting reference level.
- In most advanced stage of FT, more frequent assessment is not necessary since annual emission has been stabilized (e.g., Lampung Province)
- In the intermediate stage of FT, where annual emissions have declined from period 1 to period 2, rate of declines matters in setting up how much further declines of annual emissions are eligible for compensation compared to BAU rate of decline, otherwise the reduction of emission in the future will be overestimated (e.g., Jambi Province)
- In the early stage of FT, annual emissions have increased from period 1 to period 2; in setting reference line one has to consider the reduction of rate of increase from BAU rate for compensation, otherwise the emission reduction will be underestimated (e.g., East Kalimantan Province)

Conclusion

- Information resolution: early FT stage needs to differentiate natural forest ecozone and quality, intermediate FT stage needs to differentiate tree-based systems from other non-forest area
- Temporal resolution: there is a need to calculate the rate of change in annual C emission in different periods in addition to the annual C emission only; landscape with different FT stages might be affected differently if the reference period and temporal is not determined properly. Those in early FT stages will be disadvantage.
- As part of REDD mechanism, carbon accounting and monitoring should consider forest transition stages at sub-national level in determining the appropriate resolution.