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World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

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

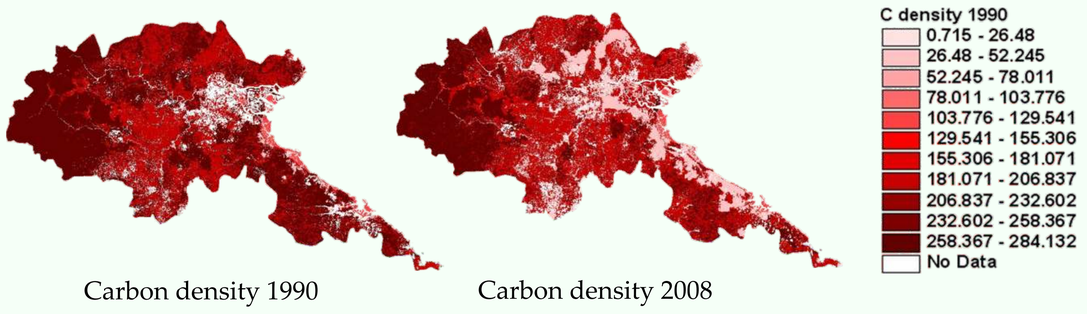
II. Option for setting up reference emission level for REDD+ within REALU in Berau, East Kalimantan

Sonya Dewi and Andree Ekadinata

Background

In respond to the opportunity of developing REDD pilot areas in Indonesia, the district government of Berau has formed a task-force to discuss the potentiality of district-level involvement in developing pilot areas. Our previous study showed that the overall annual emission of Berau in 1990-2008 is 9.2Mg CO_2-eq/Ha.Year, with more than 50% emission came from forest zone. The remaining question is how to set up a reference emission level for Berau under the lack of policy and guidelines for national and local government.

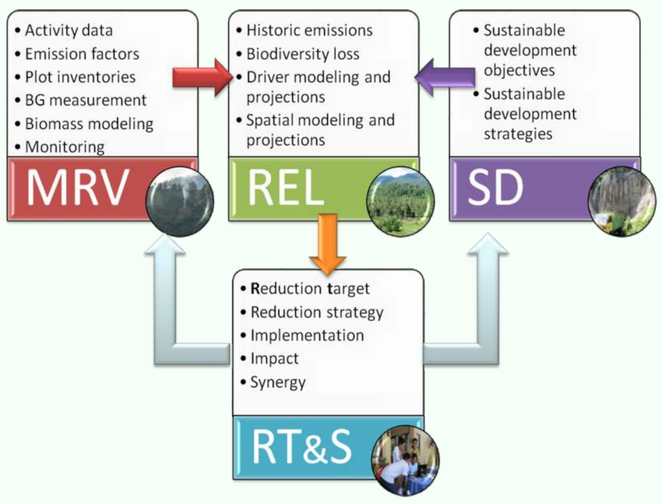
Sub-sector land use activities	Net emissions (t CO2-eq)	Area of changes (ha)	Emission factor (t CO2-eq/ha)	Contribution to total emission (%)
Degradation	**7,264,449.71**	**21,050.27**	**345.10**	**36.10**
Logging concessions	4,299,985.25	6,884.63	624.58	21.37
Protected forest	1,616,716.40	4,666.16	346.48	8.03
Conversion to forest plantation (concessions)	3,961,058.16	5,803.66	682.51	19.68
To shrubs	3,191,469.39	4,536.21	703.55	15.86
Conversion to oil palm	1,953,560.26	2,872.21	680.16	9.71
Conversion to mixed tree	848,451.86	1,434.67	591.39	4.22
Changes to road, settlement, annual crop, grassland	2,470,368.08	3,550.08	695.86	12.27
Sub-total	**19,689,357.44**	**39,247.10**	**501.68**	**97.83**
Others	436,262.00	82,506.83	5.29	2.17
Total	**20,125,619.44**	**121,753.94**	**165.30**	**100.00**



Carbon density 1990 Carbon density 2008

Reference emission level-main points

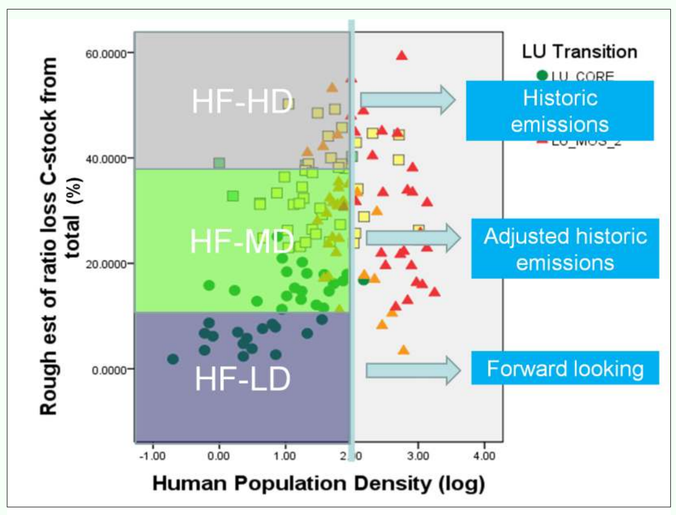
Reference emission level is a 'business as usual' emission projection for each sub-national areas based on local and national condition. Even though Indonesia has been actively involved in many REDD discussion, to date there are no formal guideline for REL setting. REL must be agreed by stakeholders from all level – negotiation process is the key to REL setting. Projection can be used as a basis for discussing and determining reduction target and strategy. REL has, among others, to be based on historical emission measurement, report and verification (MRV) and also developed in synergy to local sustainable development (SD) plan. Emission reduction target and strategy (RT&S) can developed.



We identify 3 key elements to set up a reference emission level: (1) setting reference region, (2) determining business as usual level, and (3)Identify location with high change/ potential threat. We propose the following multiscale approach::

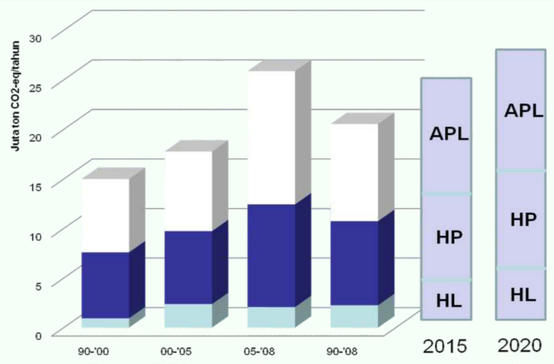
ELEMENTS	SCOPE	UNIT OF ANALYSIS	MODE	APPROACHES
Setting Reference region	National	District	Historic	Cluster analysis of drivers or land cover composition and configuration and land use trajectories
Determining BAU level	National, island, province	District	-Historic -Adjusted historic -Forward looking	- Apply past/historic emission level - Project areas of forest changes based on drivers (incl. underlying) - Predict areas of forest changes based on current plan and conditions
Identification of location with high change potential/ threat	District	Pixel/ arbitrary cell	Hybrid between adjusted historic - forward looking	Simple overlay or spatial modelling based on (proximate) drivers using Multi Layer Perceptron, Multinomial Logistic Regression, GEOMOD, etc

Proposed approaches for setting reference region for REL

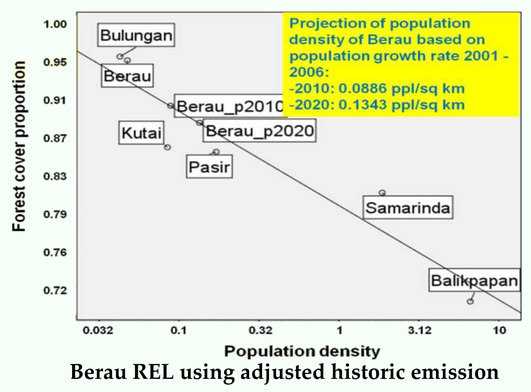


We use national wide land cover map to conduct cluster analysis of drivers or land cover composition and configuration and land use trajectories District with high forest cover-high deforestation (HF-HD) may set their REL at most the same with level of past emission (**Historic emission approach**) or certain percentage within their Reference Region. Districts with high forest cover-medium deforestation (HF-MD) can set their REL by projecting changes in drivers within their Reference Region (**Adjusted historic emission**).District with high forest cover-low deforestation may set their REL based on development plan and spatial plans (**Forward loking**) Berau district is classified as HF-LD district.

Determining BAU Level to set REL



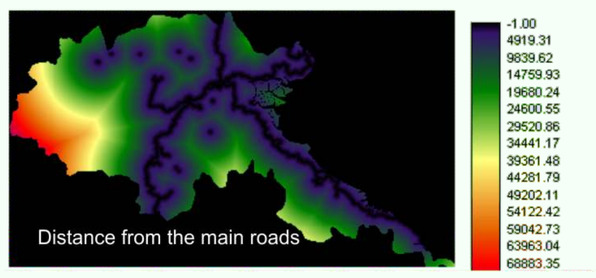
Berau REL using historic emission approach

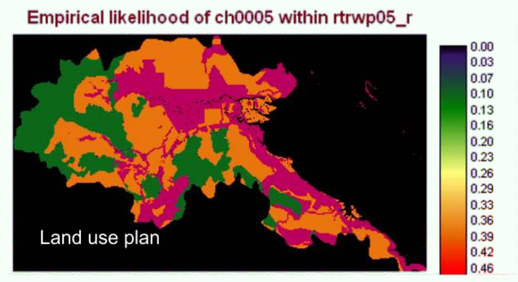


Berau REL using adjusted historic emission

- REL can be calculated using linear projection of historical emission approachand assumption that emission contribution from each land allocation remains constant.
- The adjusted historic emission approach calculates REL by projecting land use changes by driver modeling such as population, poverty, agricultural productivity. The example above was calculated using: regression modeling of forest cover with population density, projecting of population density in the future (e.g., 2010, 2020) and projecting forest cover 2010 and 2020.
- Based on development and spatial plan, calculate the projected emission. E.g. to develpp oil palm plantation in APL as big as 200.000ha etc.

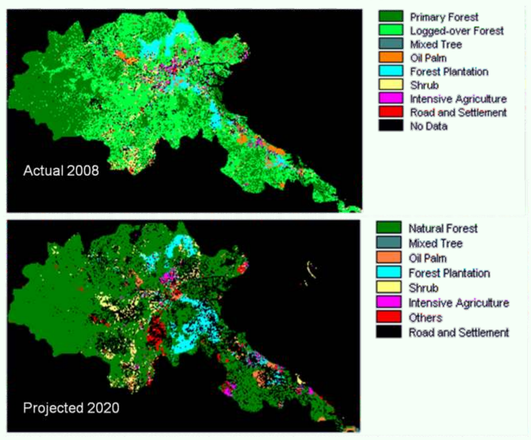
Modelling deforestation, forest degradation and land use change



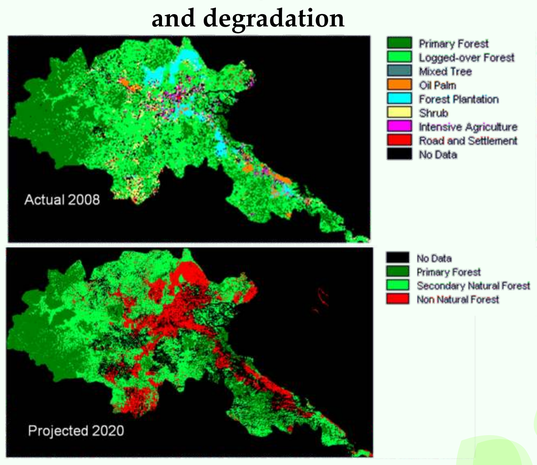


Land use change projection can be conducted using Modelling with Neural Network (Multilayer Perceptron) in IDRISI. The proximate drivers includes land suitability, elevation, spatial plan/RTRWP, distance to road, river, settlement, logging concession, forest plantation, distances to forest and changed area, population density. Model 1 inclusive all possible conversion from natural forest to any other land uses. Model 2 only take into account changes within natural forest (degradation) and conversion from natural forest to non-forest (deforestation)

Model 1: Probability of natural forest converted into other land uses



Model 2: Probability of deforestation and degradation



More info: **Sonya Dewi** (s.dewi@cgiar.org)
World Agroforestry Centre
Southeast Asia Regional Office