Resilience, Rights and Resources: Two years of recovery In coastal zone Aceh

Village level analyses of poverty and land use/cover in West Aceh

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Background

How people use land is always an integral question to ask in order to understand rural livelihoods, even though the degree of importance of land based income may vary from place to place and from households to households. Land uses change from time to time as a response to opportunity and constraints arisen both by internal and external triggers. Choices of land uses combined with skills, natural hazard, market trend, infrastructure and policy result in livelihoods outcome such as income, well-being and sustainability, and environmental services such as watershed protection, biodiversity conservation and carbon sequestration.

The coastal area of West Aceh was struck badly by the Indian Ocean tsunami in December 2004. The direct impact of the wave has been severe, especially livelihood-wise. The direct impact on the environmental services was mostly of short term nature, however there are evidences of permanent damages in tree crops and changes in micro-landscape. The second wave of change has been taking place, which most likely will lead to a much longer term impact. Beyond the immediate pasca-tsunami aids for fast recovery that external agents bring into the area, the long term changes in the five-capital landscape are inevitable. West Aceh, with its rich mineral resources and vast forested areas is an attractive area for the investors to bring in financial capital for natural resource extraction. Non-profit organizations target on developing human and social capitals, while the government works on the physical capitals. These together will inevitably increase pressure on natural capital with no guarantee that sustainable livelihoods of the local people will be improved in the long run. There is no short of evidences in different places in Indonesia and other countries where investors displace local communities from their resources.

Unlike in Java and other places where the actual land use/cover reflect very little of land use plan developed by the government years ago, mostly based on biophysical characteristics, in West Aceh forest zone is still mostly covered by forest. Flat coastal zones are mostly allocated for non-forest uses and further along to the hinterland, as topography becomes rougher, land use allocation becomes stricter from forest that can be converted to other uses to limited production forest up to protected forest. These areas are at present still largely covered by forest. However, as tsunami incident induces less gradual changes, the government needs to anticipate some potential directions of change in order to develop effective and efficient policies in maintaining environmental services while improving people's livelihoods.

This study aims to help key decision makers by providing analysis on the following areas:

- long and short term patterns of land use/cover changes pre and post tsunami
- the relationships between poverty and land use/cover, health and education facilities with regards to road after tsunami

This bulletin will offer some preliminary results and discussions of our study followed by some recommendations.

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Land use/cover changes and land use plan

We use Landsat TM and ETM imageries of year 1990, 2002, 2005 and 2006 to study changes of land use/cover in West Aceh pre and post tsunami. However, at the time this bulletin is written, we have just finished processing up to the first three time series and therefore are not able to present the complete trajectory of changes. The land use/cover maps comprise the following classes: annual crop (rice field and other annual crop), perennial crop (rubber, cocoa, coconut, rubber on peat dome, oil palm), settlement, water body, natural regrowth (grassland, shrub), forest.

Figure 1 shows the time series of land use/cover maps. It is evident that there was a big change during the period of 1990 to 2002, in which more than 50,569 hectares of forest was cleared from about 181,793 hectares of total forest cover in 1990. The deforested area was then converted mostly into rubber. This area spread from north to south of the district along the coast line up to about 20-45 km to the hinterland. The deforested area during this period happened mostly under a 'legal' zone according to the land use plan, i.e., other uses (Area penggunaan lain) and forest that can be converted to other uses (Hutan produksi yang bisa dikonversi), even though more than a third of the total deforested area took place in the forest zone (Hutan negara bebas, Hutan lindung, Hutan produksi terbatas, Hutan produksi biasa).

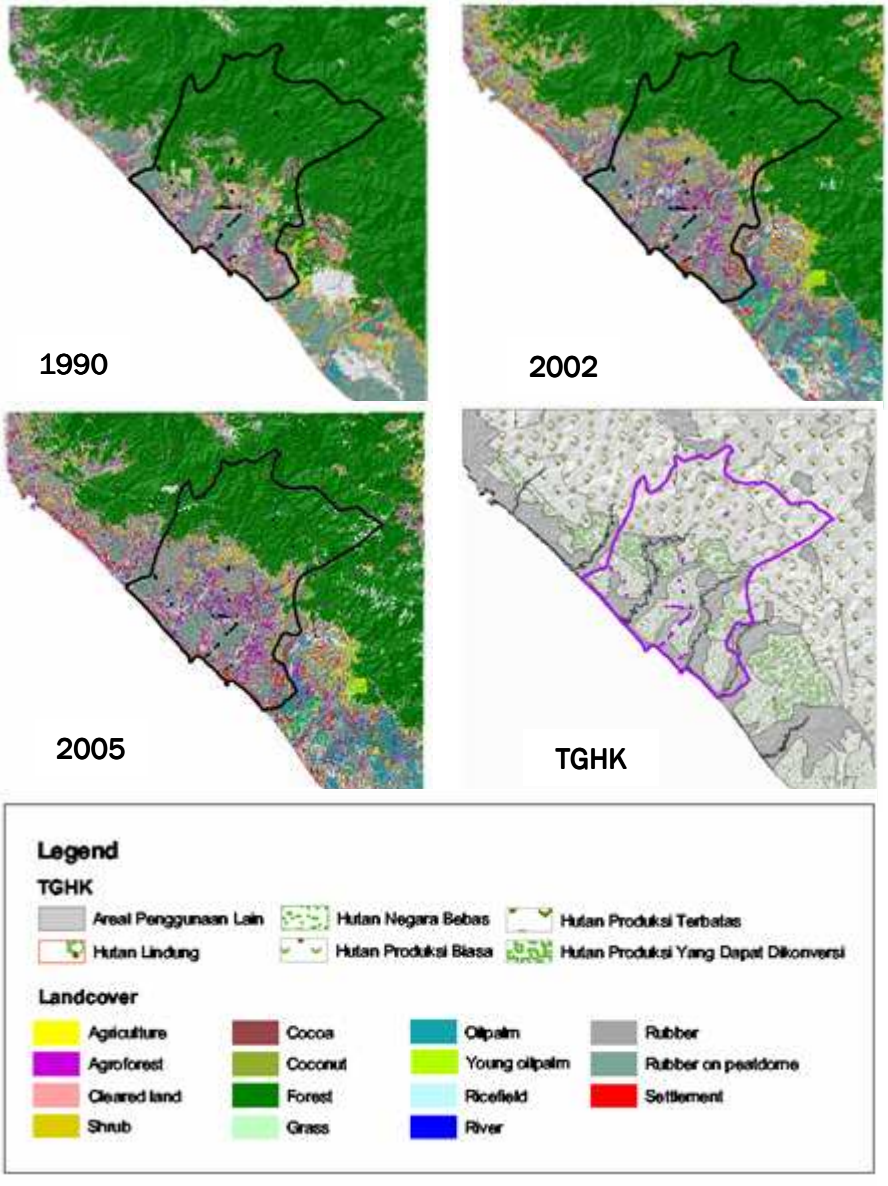

Figure 1. Time series landcover map and TGHK (land use plan) maps (lower right panel) of West Aceh District

In the second, shorter period of the study, 2002-2005, forest loss was in the area deeper to the hinterland, in the fringe of big block of primary forest. Even though the absolute loss of forest is smaller (3684.5 ha), the critical issue is the zone under which the deforestation is happening. Compared to the earlier period, in this period two third of the forest loss was under forest zone. And by 2005, only about 5000 ha is left under area of non-forest use zone or forest that can be converted to non-forest uses (Figure 2a). This shows that the area starts to face some land pressure issues and it is contradictory to common perception so far that forest land is vastly available in the district area, and this problem will be even magnified with the 2004 tsunami incident. Therefore more careful decision on land uses and forest management should be made. Land-based livelihood activities should aim for productive, multi-use rather than extensive system. Rejuvenating low productive plantation and agroforestry trees are better options than clearing and converting forests into other uses.

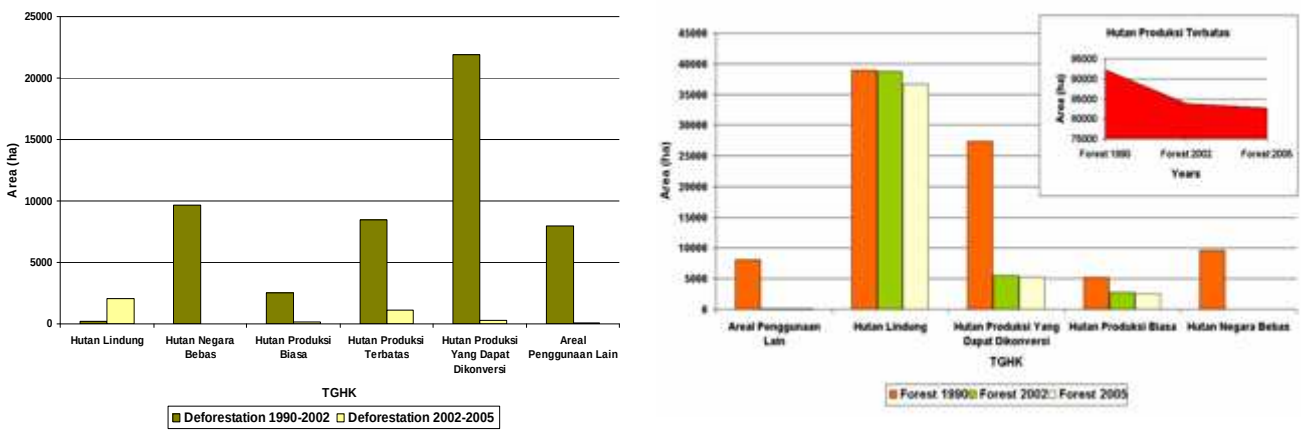

Figure 2. a) Total deforestation, **b)** total forest cover in West Aceh 1990-2005

Poverty and land use/cover within the contexts of infrastructure

Secondary data from PODES 2005, comprised of demographic data, number of poor household, number of farming household, road types, health services, education facility, and topography, is used in addition to our land use/cover map of 2005 to explore the relationships between poverty, land use/cover and infrastructure at the village level. Through a common georeferencing system, we compile and generate a single data sheet out of different data from different sources. The resulting data sheet was analyzed using SPSS 9.0. The best fit model was resulted by splitting the data set into two sets; one comprises only villages with asphalted road and the other is without. This is not very surprising for two reasons: 1. road infrastructure is very limiting in the area such that it plays a key role in determining poverty; and therefore, 2. determinants of poverty can not be expected to be the same in the areas with and without good road access.

Table 1 below presents the Ordinary Least Square regression models of the two subsets of the data, with poverty rate (number of poor households over total households) as dependent variables, and land use/cover, access to education facilities, access to health facilities, topography, demography and tsunami effect as the independent variables. For villages with asphalted road (model 1), larger rice field per capita associates with higher poverty rate, while more diverse land use/cover relates with lower poverty rate. These imply that when access to market is good, planting commodity of higher economical values or maintaining multiple use of land in an agroforestry system-like are more beneficial. This goes in line with the positive correlation between the proportion of farming (mostly food crop) households with poverty rate. However, population density has a positive, significant correlation, which indicated that there is some land pressure in this rural area of West Aceh. People should look more at ways to effectively use their lands rather then expanding; e.g., increases benefit by changing commodity, increases productivity by rejuvenating or by technology, increases multifunctionality by planting more than one species. Figure 4 shows where each current land use/cover is with regards to land use plan at present. Partially each one of non-forest use/cover occupies areas allocated for forest. Tsunami effect does not show any significant relationship with poverty rate. This implies that despite of the devastating impact of tsunami hit in the coastal area, poverty spreads in other areas as well. Distance to the closest primary school that associates positively with poverty rate begs for government attention to provide better public education facility.

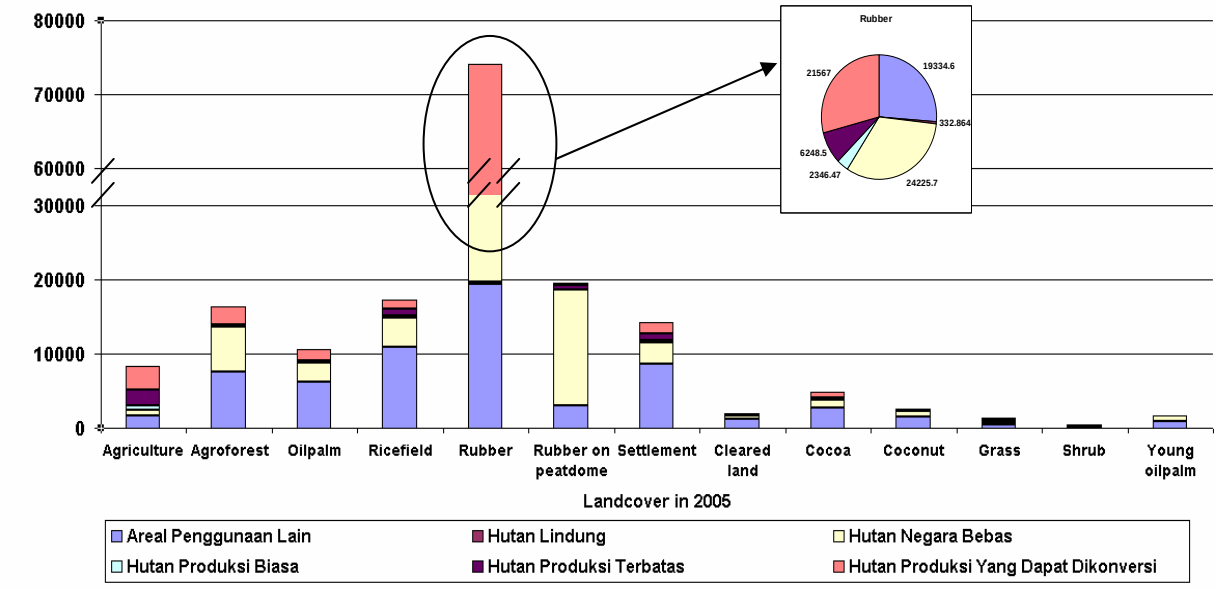

Figure 4. Current land use/cover is with regards to land use plan

In contrast to the villages with asphalted road, those without (model 2) show less strong relationships between land uses and poverty rate. The only land use related variable which shows significant association is oil palm area per household. The larger the oil palm area per household, the higher the poverty rate. This seems like a counter-intuitive situation. However if we assume that the oil palm belong to smallholder, then consider the marketing condition of oil palm fruit, the input required to maintain the plantation, and the single functionality of the land use, this becomes understandable. If, in the other hand, the oil palm plantation belong to some companies, the pattern is even less surprising since it may create competition for land. Improving education facility and health service provision by the government seem to be a logical way to increase well-being in these villages. Being in the coastal area helps a lot in lowering poverty rate in area without any good road access, since marketing agricultural and other products can take place in the port, and off-farm and non-farm income opportunities are also higher. Population associates negatively with poverty rate; the higher the population, the lower the poverty rate is. This indicates the importance of economy of scale; without enough mass of people, when facility if lacking, collective action will not be effective, agricultural and forest products will not reach a quantity level that is attractive enough to bring traders/collectors to visit the village. It is evident that a minimum level of public investment is needed before other development program can start to make impacts on livelihoods. As in villages with asphalted road, tsunami impact does not show any significant correlation with poverty rates, which is on the contrary of the common perceptions.

Table 1. Regression model for villages with asphalt road (R2=0.556) (model 1) and without asphalt road (R2=0.491)

	Model 1				Model 2			
	Coefficients				Coefficients			
	B	Std. Error	t	Sig.	B	Std. Error	t	Sig.
(Constant)	37.844	21.05	1.798	0.08	12.976	30.577	0.424	0.67
Forest (ha/household)	-1.005	1.551	-0.65	0.52	-0.79	1.429	-0.55	0.58
Ricefield (ha/household)	16.412	4.876	3.366	0	-1.687	1.573	-1.07	0.29
Rubber (ha/household)	-0.516	1.345	-0.38	0.7	-0.685	0.473	-1.45	0.15
Oilpalm (ha/household)	0.899	3.466	0.259	0.8	4.579	1.962	2.333	0.02
Agroforest (ha/household)	1.614	10.641	0.152	0.88	3.648	3.436	1.062	0.29
Diversity of land use/cover (Shannon-Waver index)	-15.962	7.029	-2.27	0.03	1.807	6.329	0.285	0.78
Distance to primary school (km)	1.928	0.89	2.168	0.03	-0.243	1.493	-0.16	0.87
Distance to junior high school (km)	0.669	0.577	1.159	0.25	0.11	0.673	0.164	0.87
Distance to senior high school (km)	-0.572	0.386	-1.48	0.14	0.957	0.252	3.802	0
Frequency of health services	0.668	3.738	0.179	0.86	-8.336	3.773	-2.21	0.03
Distance to district capital (zone)	1.903	5.472	0.348	0.73	7.163	6.799	1.054	0.3
Coastal area (0=non-coastal;1=coastal)	5.403	8.5	0.636	0.53	-17.253	9.153	-1.89	0.06
Topography (0=rough;1=flat)	-19.737	11.36	-1.74	0.09	0.242	8.408	0.029	0.98
Percent of farming households	0.253	0.101	2.507	0.01	0.232	0.193	1.202	0.23
Population density	1.24E-02	0.007	1.845	0.07	-1.33E-02	0.032	-0.41	0.68
Population	-4.88E-03	0.004	-1.15	0.25	-3.19E-02	0.017	-1.88	0.06
Tsunami hit (0=not affected;1=severe)	-4.257	7.544	-0.56	0.57	16.914	10.363	1.632	0.11

Recommendation

Tsunami has started to induce changes, directly and indirectly, in the coastal area and further. Decision makers should be able to use data, information and analysis to anticipate these changes, to look for opportunities within the situation and to decide on how to move forward under the existing constrains.

Within the preliminary results, we conclude that at the district level, West Aceh does not really have the flexibility of expanding land-based economic activities to new areas by converting forest into other uses, unless the current land use plan is not anymore looked as suitable. In this case a careful, multistakeholder review based on some strong negotiation platform is necessary. In areas with good road access, improving agricultural technology, introducing some commodities with high economic value by converting low productive land uses, helping to set up pro-poor market mechanism, and maintaining some multifunctional and diverse landscape will be ways to decrease poverty rates. For areas without good road access, it is clear that infrastructure development, health service and education facility provision should be prioritized.

KEY MESSAGE

- Considering that very little area of forest remaining under non-forest zone of land use plan (TGHK), forest conversion and land-based economic activity expansion should not be a choice;
- In anticipation of new natural resource-based big players in the area, an appropriate set of instruments, like regulations, capacity of government officers, data and information, and community-based management scheme, must be set;
- In areas of good road access, improving mechanisms to increase returns of small holder farming system and maintaining multifunctional and diverse landscape seem to be ways to go in addressing poverty;
- For those with poor road access, infrastructure development, health service and education facility provision should be prioritized.

World Agroforestry Centre (ICRAF) is one of 15 organizations under the CGIAR (Consultative Group on International Agricultural Research) umbrella. ICRAF aims to stimulate and conduct innovative research, development and capacity building to promote and support agroforestry for both human and environmental benefits. ICRAF has its headquarters in Kenya and six regional offices in the tropics and now cover 21 countries in Africa, Asia and Latin America.
The research bulletins are summary results of collaborative activities of ICRAF and partners in the "Recovery and Resilience of Livelihood and Natural Resources", mainly in West Aceh, after the Tsunami of 26th December 2004. These bulletins were prepared, first in Indonesian language, for a workshop in Meulaboh on 30 November 2006. The primary objective was to share relevant result findings and observations among government and non-government organisations and individuals involved in the post-tsunami recovery in West Aceh. The workshop and preceding research activities were supported by Ford Foundation Indonesia, EU Asia Pro-Eco Program and CGIAR.

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