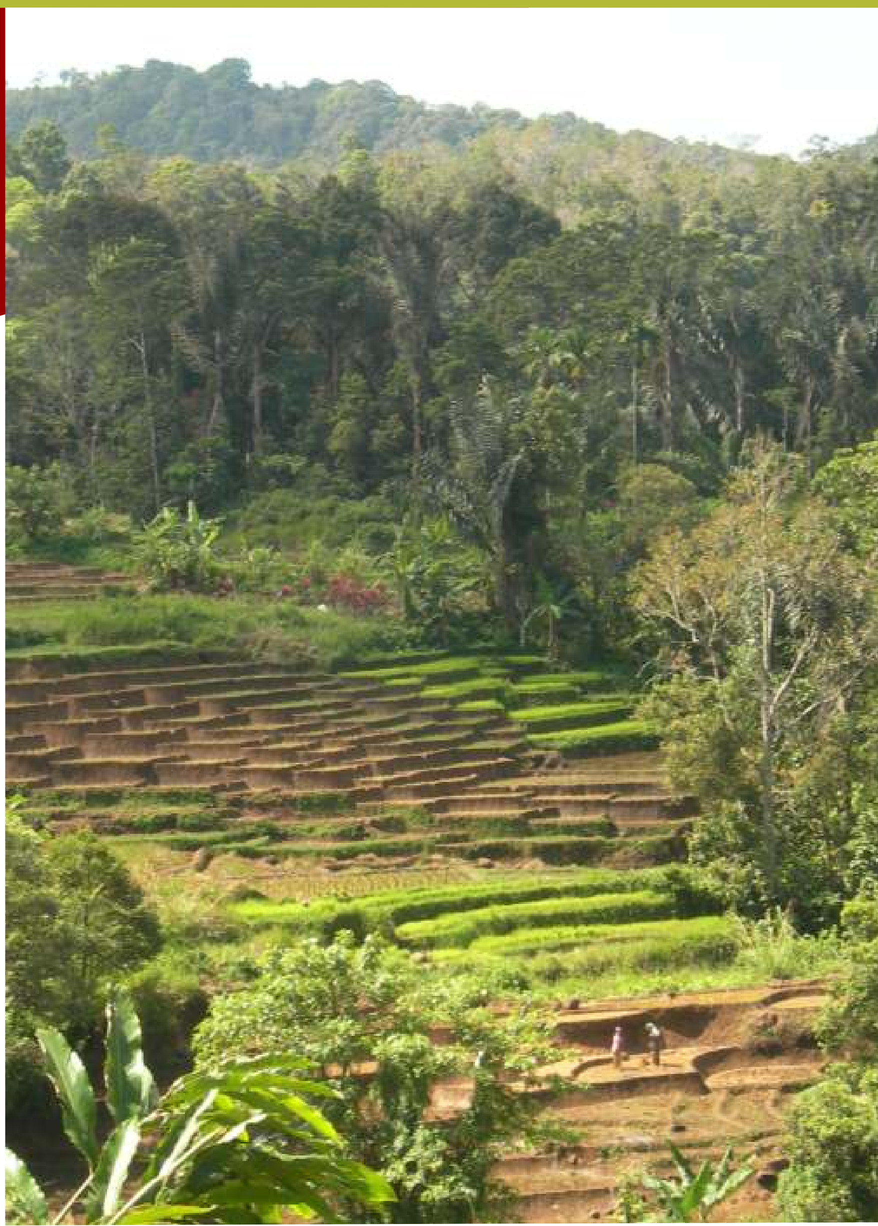
Accountability and Local Level Initiative to Reduce Emission from Deforestation and Degradation in Indonesia

This project is designed to contribute to the development of national carbon accounting and monitoring systems in Indonesia

Project Report



World Agroforestry Centre

Accountability and Local Level Initiative to Reduce Emission from Deforestation and Degradation in Indonesia

ALLREDDI
FINAL REPORT 2011

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Correct citation

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World Agroforestry Centre (ICRAF)
Southeast Asia Regional Program
Jl. CIFOR, Situ Gede, Sindang Barang, Bogor 16115
[PO BOX 161, Bogor 16001]
Indonesia
Tel: +62 251 8625415; Fax: +62 251 8625416
Email: icraf-indonesia@cgiar.org
Website: www.worldagroforestry.org/sea

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Acronyms

ALLREDDI	Accountability Local Level Initiative to Reduce emission from Deforestation and Degradation in Indonesia
BAPPENAS	National Development Planning Agency
BELSPO	The Belgian Federal Science Policy Office
COP	Conference of Parties
DNPI	National Council on Climate Change
Ditjen Planologi	Directorate General of Forest Planning
ICALRRD	Indonesian Centre for Agricultural Land Resources Research and Development
LIPI	Indonesian Institute of Sciences
LITBANGHUT	Forestry research and development agency
LULUCF	Land use, land-use change and forestry
NFI	National Forestry Inventory
PROSEA	Plant Resources of Southeast Asia
RACSA	Rapid Carbon Stock Appraisal
REDD	Reducing Emissions from Deforestation and Degradation
ROM	Result-Oriented Monitoring
RSPO	Roundtable for Sustainable Palm Oil
SPASI	Spatially explicit Planning and Assessment tool for land use Sustainability
STREK	Silvicultural Techniques for the Regeneration of logged over forests in East Kalimantan
UB	Universitas Brawijaya
UKP4	Presidential Working Unit for Development Supervision and Control
UN-REDD	United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation
UNFCCC	United Nations Framework Convention on Climate Change

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Preamble

This final report summarises the activities for the project on the Accountability and Local Level Initiatives to Reduce Emissions from Deforestation and Degradation in Indonesia (ALLREDDI) on the mitigation of climate change through reducing emissions from forest deforestation and degradation in Indonesia during three years (2009-2011) of implementation of the project.

Introduction

The Accountability and Local Level Initiatives to Reduce Emissions from Deforestation and Degradation in Indonesia (ALLREDDI) program is implemented by the World Agroforestry Centre (ICRAF) in partnership with the Directorate General of Forest Planning, Ministry of Forestry (Ditjen Planalogi), Brawijaya University (UB) and the Indonesian Centre for Agricultural Land Resources Research and Development (ICALRRD) through support from the European Commission (EU) under the Environment and Sustainable Management of Natural Resources, Including Energy program. The agreement was signed in December 2008 and ALLREDDI activities began in January 2009.

This project is designed to contribute to: the development of national carbon accounting and monitoring systems in Indonesia that are in compliance with the Tier 3 Intergovernmental Panel on Climate Change (IPCC) reporting guidelines; the development of technical capacities at sub-national and national levels; and the design of mechanism for Reducing Emissions from Deforestation and Degradation (REDD) in five pilot areas in western, central and eastern Indonesia.

In general the achievement and a summary of activities of the project can be described as follows:

1. Maintained the solid network with local stakeholders and partners at the five sites.
2. Actively consulted with credible institutions and attended several consultations at the provincial level for the national strategy for REDD, coordinated by several leading national REDD organizations.
3. Detailed 2010 land-cover maps were compiled for sites as well as for the national level.
4. Em powered local stakeholders and assessed spatial planning for sustainable low-emission development pathways in five sites (Jambi, Gorontalo, Papua, South Kalimantan and Pasuruan). The assessment aimed to understand local development planning and its impact on greenhouse gas emissions reduction and provide an alternative development strategy that could reconcile the need for economic growth and the need to reduce emissions from deforestation and degradation.
5. A final workshop was conducted on November 24th in Jakarta. Around 100 participants from various institutions attended the workshop.
6. The new REDD Abacus software was released into the public domain. This software calculates the opportunity cost of emissions reduction. The software will be used as a tool for land-use planning for a low-emissions development strategy.
7. The Rapid Carbon Stock Appraisal manual was launched in two versions (English and Bahasa Indonesia).
8. The Manual on Peat Carbon Measurement was launched with the Bahasa Indonesian version, while the English version is ready for printing.

9. The land-use planning for low-emission strategy (LUWES) tool was launched during the final workshop on November 24th in Jakarta.
10. External evaluation was completed in early December 2011 with the national consultant.

1. Description

1.1. Name of beneficiary of grant contract

The World Agroforestry Centre, legally incorporated as the International Centre for Research into Agroforestry (ICRAF)

1.2. Name and title of the cont act person

Dr. Ujjwal Pradhan

1.3. Name of partners in the Action

- Directorate General of Forest Planning, Ministry of Forestry, Government of Indonesia, Jakarta, DKI, Indonesia
- Brawijaya University, Malang, East Java, Indonesia
- Indonesian Centre for Agricultural Land Resources Research and Development (ICALRRD), Bogor, West Java, Indonesia

1.4. Title of the Action

Accountability and Local-Level Initiatives to Reduce Emissions from Deforestation and Degradation in Indonesia (ALLREDDI)

1.5. Contract number

DCI-ENV/2008/151-945

1.6. Start and end dates of the reporting period

1 January 2011-31 December 2011

1.7. Target country(ies) or region(s)

Indonesia, in five areas: Jambi, South Kalimantan, Gorontalo and Papua provinces and Pasuruan district in East Java province

1.8. Final beneficiaries and/or target groups

- Ministry of Forestry of the Republic of Indonesia
- Technical implementation units throughout Indonesia
- Stakeholders (2 million; approximately 50% women and 50% men) in five pilot areas in Indonesia

2. Assessment of Implementation of Action activities

2.1. Activities and results

2.1.1 Project Management

Project launching to the main collaborators and relevant stakeholders at the international, national and sub national levels. The workshop was attended by 45 people representing various institutions and organizations such as government offices, nongovernmental organization, research institutions, universities, European commission, JICA, GTZ and others. Venue: Manggala Wanabhakti, Jakarta (Headquarter of Ministry of Forestry). Planning meeting with partners of Action for 2009. Venue: ICRAF office

As the follow up, we had an in-depth technical meeting in February 25th, 2009 at Ditjen Planologi Kehutanan office. We discussed in detailed the data requirements re satellite imageries and National Forest Inventory (NFI) data. We divided further technical responsibilities between ICRAF and Ditjen Planologi and means to promote synergies. One the urgent requirement was the establishment of ALLREDDI office. The office was up and running by April 2009. This office was managed well by Ditjen Planologi.

In general, purchase of equipments to support project activities and established allreddi office in Gunung Batu has done. Roughly, budget spending lower than budget planned. Purchased of some equipments are under spent due to differences in currency exchange rates at the time of submission of the project and project implementation. Detailed report on budget spending during one year project will be sent separately through financial report.

We had a series of technical meetings in the ALLREDDI office and ICRAF office (March 6th, April 6th, 10th, 24th, May 20th, June 3rd, August 7th, October 5th, December 10th in 2009; 23 March 2010; and March and April 2011) in which both parties shared and reported progresses as compared to planned, evaluated what are needed, discussed how we overcome problems and planned the immediate actions.

2.1.1.1. First National workshop

The first national workshop was held on 12 November 2010 in Manggala Wanabakti, the Ministry of Forestry, Jakarta. The national workshop focused on the national carbon stock dynamic, methods, results and implications of past national emissions from land use changes from 1990 to 2005. The results of this study were produced through joint activities among partners. In addition to the above, the workshop also aimed to explore the input and experiences of workshop participants as part of efforts to respond to the need for collaboration and the importance of close coordination in the determination of reference levels of emissions from Indonesia. As expected, through a general spirit of collaboration, large amounts of coordinated information were able to improve substantially the data generated by the independent research activities. There were 45 participants at the workshop from different institutions (Ministry of Forestry, national and international non-government organizations, universities, research institutions and donor agencies).

2.1.1.2. Final Workshop

A one day workshop on "Supporting Local Preparation on the Development of a Regional Action Plan for Reducing Greenhouse Gases Emission from the Land-Use Sector" was held on November 24, 2011 in the Menara Peninsula, Jakarta. The workshop was organized by The World Agroforestry Centre, Southeast Asia Regional Office with support from the Directorate General Forest Planning, Ministry of Forestry.

The Workshop was opened by the Director General of Forest Planologi, Mr. Bambang Soepijanto, who welcomed the participants and remarked on the importance of this workshop in linking the activities of his Department and ICRAF. The representative of the European Union and the Chief Scientist of ICRAF stressed that they were very honoured to deliver several ALLREDDI outputs to the participants. Mr. Meine van Noordwijk thanked all participants and invited them to be attentive during each session.

Each of the four sessions was opened by 3-4 keynote speakers. Presentations and subsequent discussion occurred on the following issues as they related to reducing emissions and to the development strategy to reduce emissions: the methods and strategies for monitoring emissions; the application of REDD ABACUS software in supporting emission calculations; and the book launch. The fourth and last session explained to the participants the launching of the book produced by the ALLREDDI project . Mr. Suyanto chaired the opening and closing sessions, while Mr. Ngaloken Ginting, Mr. Jusupta Tarigan and Mr. Ruanda Sugardiman chaired the working sessions in Sessions I, II and III of the workshop.

In session I, the first PowerPoint presentation, by Ibu Tri Dewi Virginiati from The National Development Planning Agency (BAPPENAS), pointed out the current status of the National Action Plan to reduce greenhouse gases (RAN-GRK) and the link between national and regional action to reduce greenhouse gases. The second presentation on land use planning for low emission strategy (LUWES) was delivered by Mr Suyanto. The tool developed by the project was tested and implemented in two districts in Jambi province. To introduce this session, Mr Suyanto explained the implementation of this tool in helping two districts in Jambi to calculate a low emission strategy based on their local spatial planning.

The third presentation was delivered by Mr. Andree Ekadinata on the Opportunity Cost of REDD. He gave a detailed presentation on the importance of opportunity costs in calculating the economic benefit from REDD+. As in all sessions, there were questions and discussion following the presentation.

In session II, the four presenters focused on local level initiatives to reduce emissions from the land-use sector. The first presenter was the head of Papua Low Carbon Development, Mr. Augustinus Rumansara. He was followed by representatives of the Tanjung Jabung Barat district, the Merangin district and the Satu Daun foundation (a local NGO from Pasuruan district, East Java province).

In session III, four presenters talked about land use and land-use changes in Indonesia from 1990 to 2010. Mr. Saipul Rahman from the Ministry of Forestry highlighted the amount of forest lost in Indonesia during 1990-2010. He pointed out that his analysis of the forest lost from 1990 to 2010 was similar to the ICRAF estimate. The second presenter was Dr. Atiek Widayati from ICRAF. Her presentation focused on the deforestation rate in Indonesia from 1990 to 2010. The third presenter was Prof. Kurniatun Hairiah from Brawijaya University. Her presentation was on developing local capacity building as a part of working package 2 within the ALLREDDI project. The last presenter was Dr. Sonya Dewi, an ecologist. Her presentation covered the deliverables on the synthesis of the overall activities under work package 1 and how these could be linked with the two other work packages.

Following the discussion session on several topics related to reducing emissions from land use, Dr. Meine van Noordwijk (ICRAF Chief Science Advisor) closed the workshop by thanking the participants and donors for their contributions to the sessions, and invited them to participate in the farewell coffee break.

2.1.1.3 Develop website for communication and dissemination

The ALLREDDI website has been operated and managed on an ongoing basis by ICRAF (http://www.worldagroforestry.org/SEA/projects/allreddi/). Besides the website, the project also has a list server (alumni-icraf-racsa-training@googlegroups.com) to maintain communication with all trainees and partners from the five sites of the project. The list server has 134 active members across five sites. The website is functioning as the media center for dissemination to broader stakeholders. Through the website, we are updating each activity and all of training material that has been used is available on the website. The ALLREDDI website can provide further support to existing national carbon dynamics by updating information such as the national forestry inventory, the carbon database and related events and activities. The existence of these aids is helping effective communication among our stakeholders in Indonesia. There is potential for our website to become a resource of information for the public and other projects. By supplying useful data, articles and events that are relevant to carbon and REDD, our website will give visitors a reason to return to it and convert them into additional stakeholders. Our website consists of the project profile, information on our partners and donors, the research carried out and publications and events.

2.1.1.4. Writeshop

The writeshop was conducted December 14-16 at the Pinewood Lodge and Organic Farm in Cisarua, Bogor.The purpose of the writeshop was to identify and complete the project outputs contained in the framework. Nine researchers participated in this activity which produced four ALLREDDI briefs (written in Bahasa Indonesia), the final project report, a completed brief on livelihoods and the development of two final papers targeted for scientific journals.

2.1.2. WP1. Development of a national carbon accounting and monitoring system that is in compliance with Tier 3 IPCC reporting guidelines

2.1.2.1. WP1.1. Compilation and analysis of data assembled by forest regional offices

It is well understood that Indonesia has experienced fast and extensive land-cover changes over the last few decades. Deforestation and forest degradation, in particular, have drawn global attention owing to the potential impacts on climate warming of the associated carbon-stock loss. Indonesia's pledge to reduce emissions by 26 to 41% by 2020 was stated at the G-20 summit in September 2009 and reiterated at UNFCCC COP 15 in December 2009 in Copenhagen. To ensure a valid measurement, reporting and verification scheme, a credible national carbon accounting system is crucial, which requires two basic datasets (Figure 1): 1) activity data on historical land-use change; and 2) emission factors for each trajectory of land-use change.

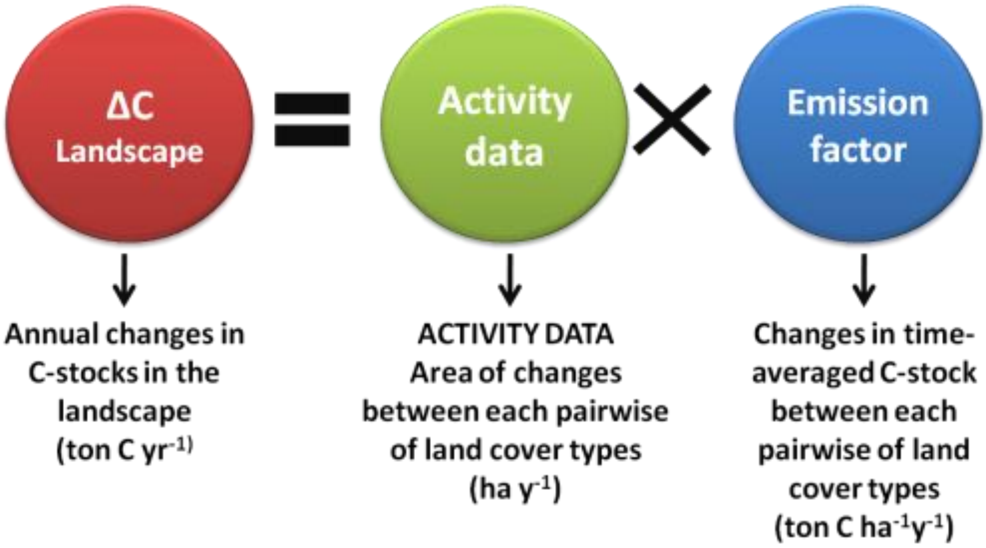


Figure 1. Generic method of carbon stock dynamics measurement (modified from IPCC 2006 Guidelines for national greenhouse gas inventories – volume 4: Agriculture, land use and forestry (GL-AFOLU)

To gather the required activity data, time series data in national land-cover maps of Indonesia were needed, which were created through the ALLREDDI project. The main objective of this activity within the project was to provide historical land-use change and trajectories data that were eligible to be extracted as activity data to estimate emissions from land uses, land-use changes and forestry. The data had to fulfill three requirements: 1) cover at least three periods considered to be significant in climate change mitigation actions, in particular, for REDD mechanisms in Indonesia; 2) legend categories to be in sufficient detail to reflect the variations of carbon stock while generic enough to represent land-use and land-cover changes nationally; and 3) reach an acceptable level of accuracy (better than 80%) for the most recent maps. The time series of land-cover maps of Indonesia are shown in Figure 2. The total area of each land-cover type across the three time series (1990–2000–2005) are presented in Figure 3. Two main trajectories across Indonesia are clear: 1) decreased undisturbed forest cover; and 2) increased degraded forest and monoculture estates. Other than that, to a lesser degree, agroforestry areas have contracted, while settlement and cropland have expanded.

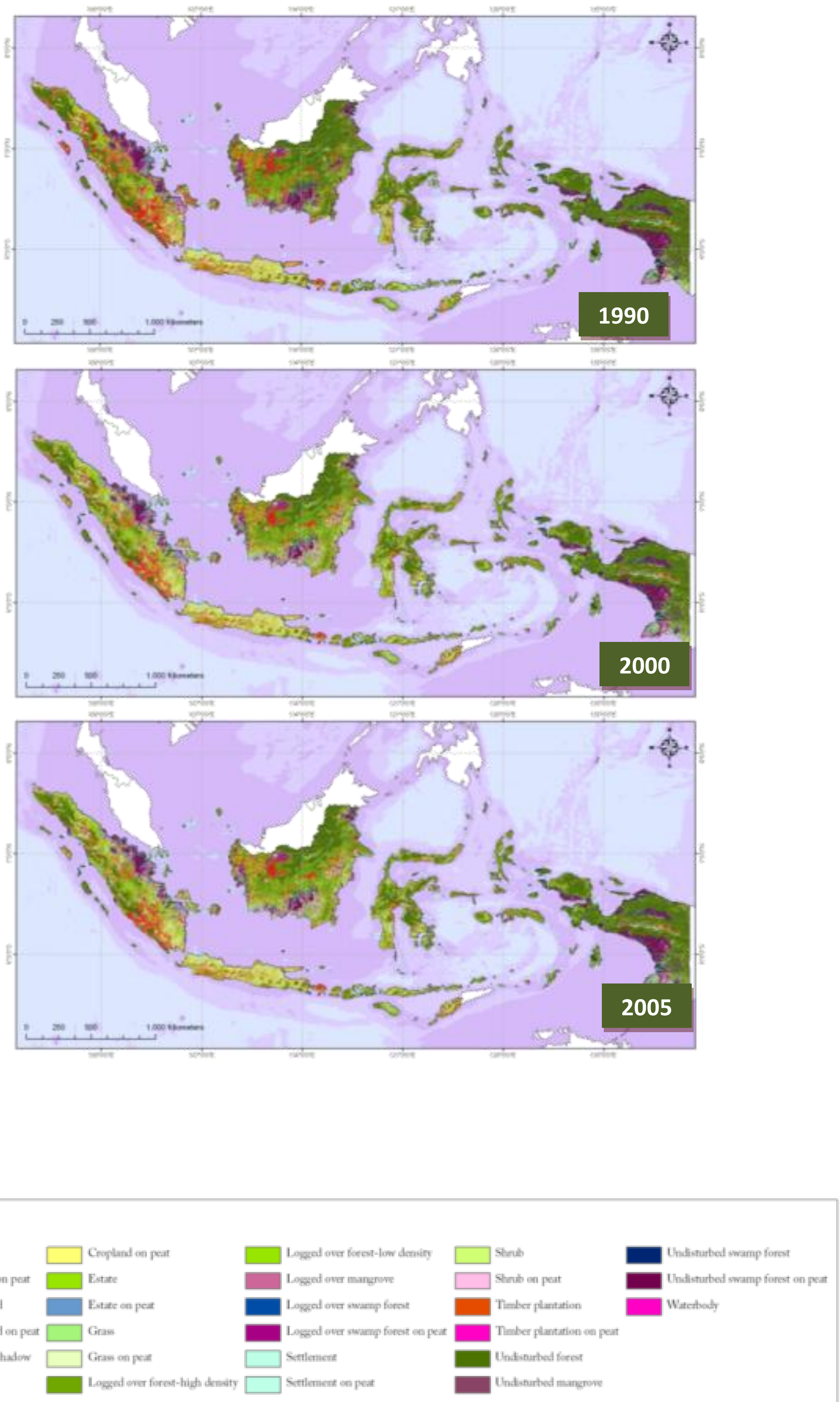


Figure 2. Time series land cover map of Indonesia 1990-2000-2005

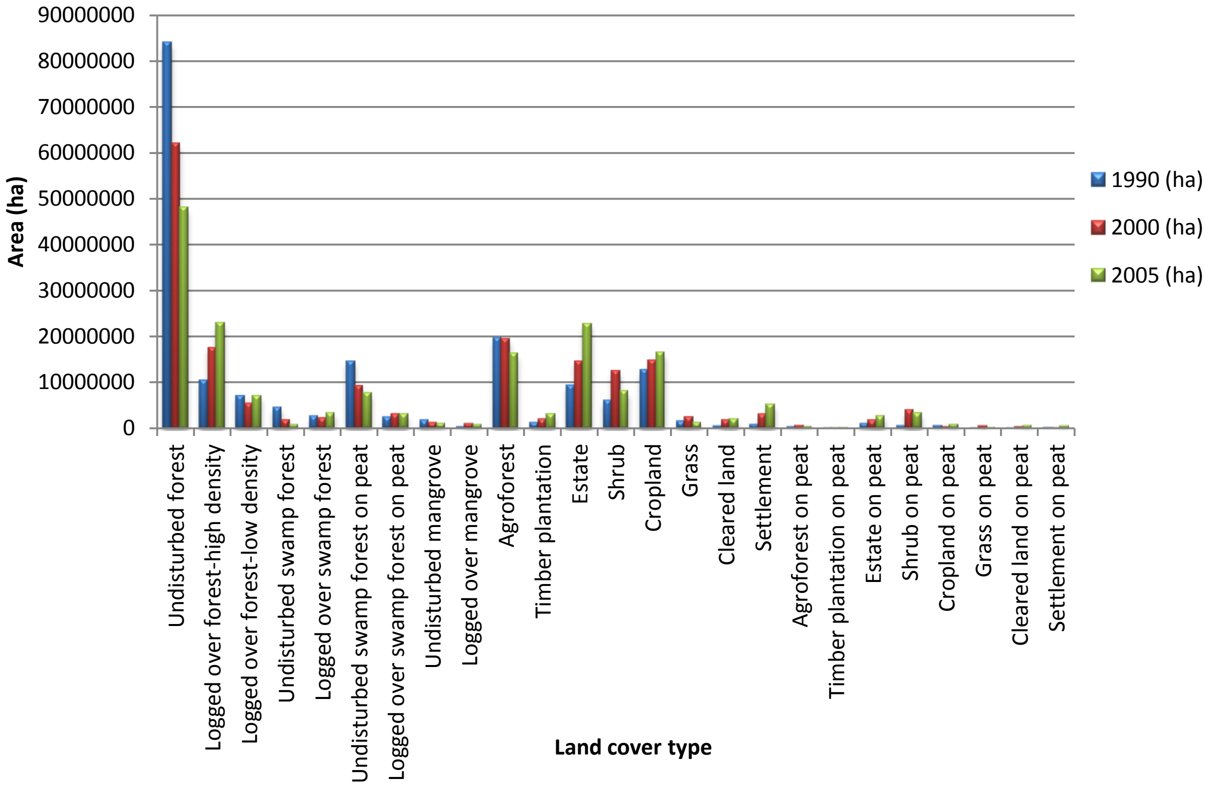


Figure 3. Overall land cover change in Indonesia 1990-2000-2005

Forest cover in Indonesia decreased from 128.72 million ha in 1990 to 99.6 million ha in 2005. The 2005 land-cover map shows that 40% (38.5 million ha) of forest cover was logged-over forest, demonstrating that the decrease of forest cover was owing to logging and other timber extraction activities. The total fraction of forest in 2005 was 51.5% (from 68% in 1990); the extent of timber plantation increased over time but up to 2005 it only comprised 1.7% of the total land area. Annual forest loss decreased from 2.26 million ha/year during the period 1990–2000 to 1.28 million ha/year during the period 2000–2005.

The calculation of carbon stock and emissions from deforestation and forest degradation was carried out following the IPCC method presented in Figure 1. Land-cover maps for 1990–2000–2005 were used as activity data and National Forest Inventory data were used to determine emission factors. Three carbon stock maps (1990, 2000 and 2005) have been produced by the project (Figure 4) as well as the emissions totals during the periods. It was found that the average rate of emissions from land-use change and the forestry sector during 1990–2000 was 0.79 Gt CO_2e/year. The rate slowed during 2000–2005 to 0.47 Gt CO_2e/year (Table 1).

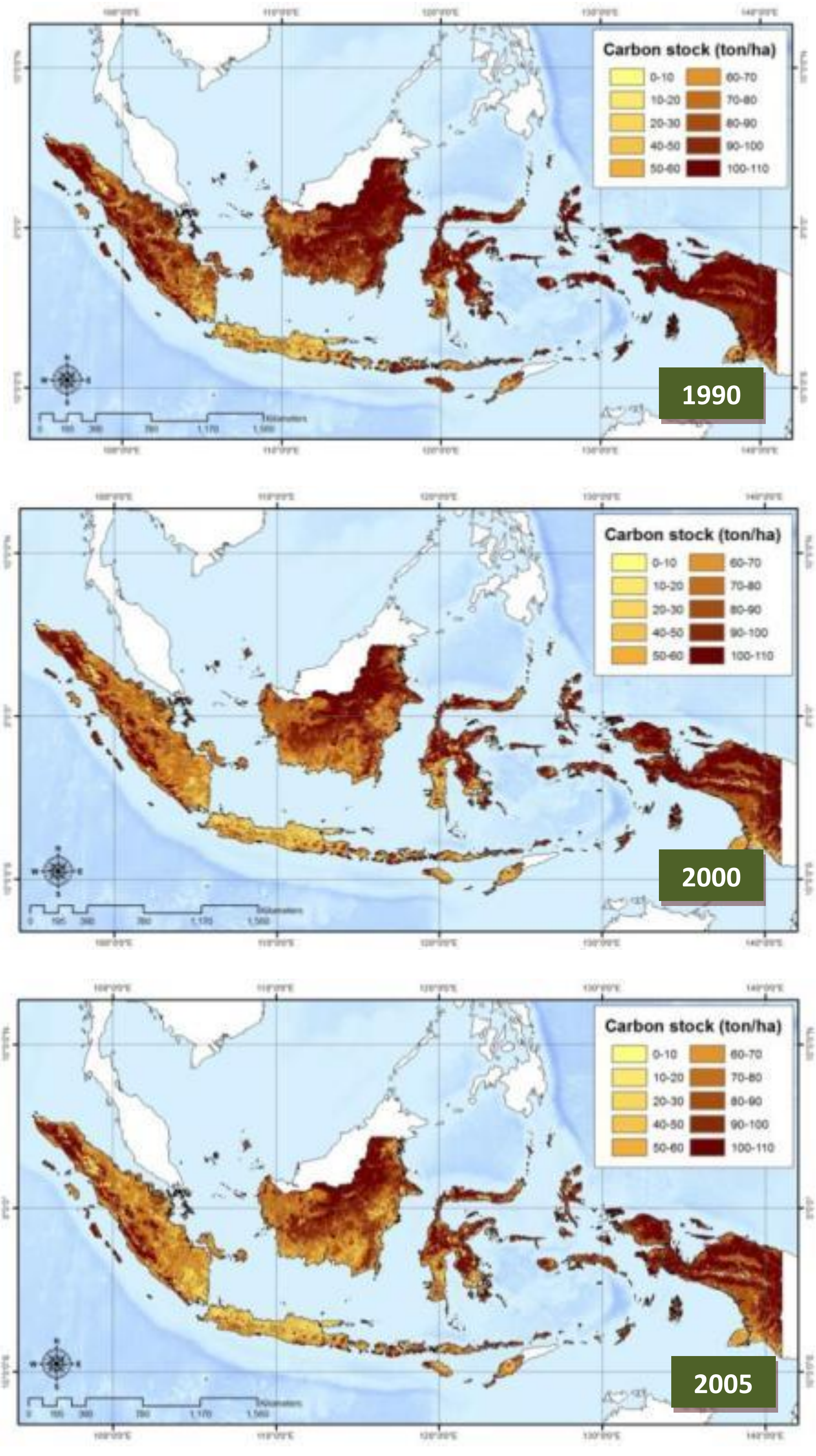


Figure 4. Time series of above ground carbon stock of Indonesia: 1990-2000-2005

Table 1. Above ground carbon stock dynamics of Indonesia 1990-2000-2005

	1990-2000	2000-2005	1990-2005
Total Emission (Gton CO2 eq)	7.93	2.35	10.27
Sequestration (Gton CO2 eq)	0.93	1.10	1.04
Net Emission (Gton CO2 eq)	6.99	1.25	9.23
Rate (Gton CO2 eq/yr)	0.79	0.47	0.68

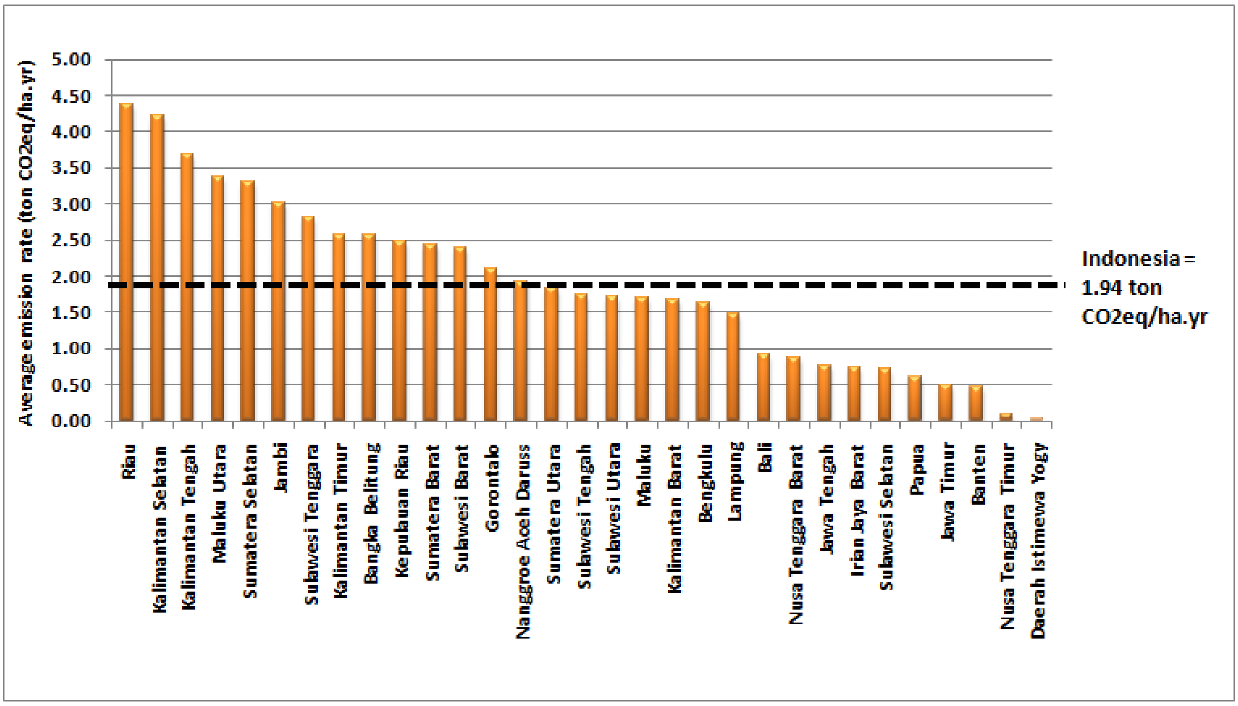


Figure 5. Average emission rate 1990-2005 for all provinces in Indonesia

In the third year of the project, we also produced a single national land-cover map for 2010 that will be much more useful for all partners and other stakeholders in order to capture the current land uses and land cover across Indonesia as well as to quantify the changes for the past 20 years, with their associated emissions. The production of the national map was supported by the Ministry of Forestry through the Directorate General of Forest Planning. The land-cover map of 2010 is available and can be used to support policy development at the national level, however, at the time of writing, the final map and analysis are not yet complete. Therefore, the numbers presented here are tentative even though we think that the revision will not be too far from the current version.

Figure 6. Land cover map 2010 of Indonesia

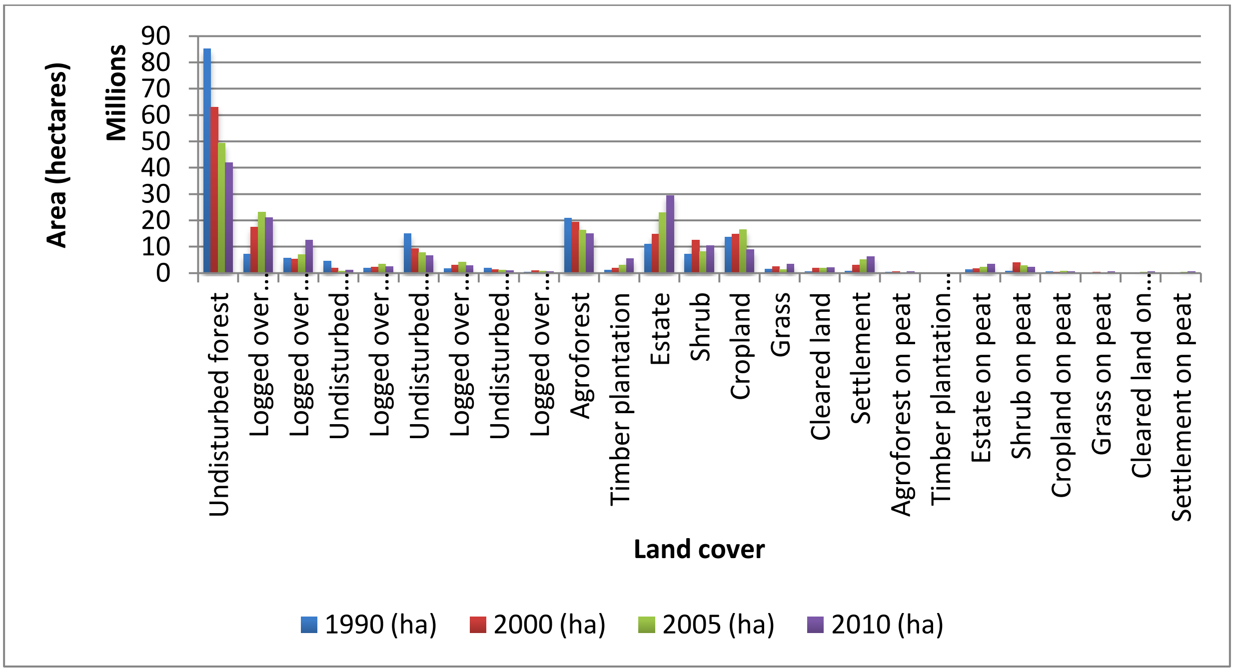


Figure 7. Overall land use/cover changes in Indonesia in 1990 to 2010

In general, during the past two decades Indonesia showed a continuous decline in undisturbed forest cover. High density, logged-over forest cover had been increasing up to 2005 but during the past five years the area declined, even though the low density, logged-over forest area continued to increase. The agroforestry area declined even further in the past five years and the estate area increased even more sharply. Table 2 shows that undisturbed forest has been reduced to half in 20 years but annual forest loss has also been reduced to less than half in the past five years compared to the first ten years (1990 to 2000). Figure 8 shows the changes in forest areas using multiple definitions of 'forest'. With more relaxed definitions of 'forest', the rate of deforestation or the loss of forest is much lower. In fact, if estate can be considered as forest, Indonesia has already changed its tangent from deforesting (1990– 2005) to reforesting (2005–2010) (orange line in Figure 8).

Table 2. Changes in forest areas and forest losses in 1990-2010

	1990	**2000**	**2005**	**2010**
Undisturbed	106.58	75.60	58.94	50.99
Logged over	17.10	29.22	38.63	39.71
Timber plantation	1.27	1.98	3.24	5.87
	124.95	1.6.80	100.81	96.57

	1990-2000	2000-2005	2005-2010
Forest Loss (Mha/yr)	**1.82**	**1.20**	**0.85**

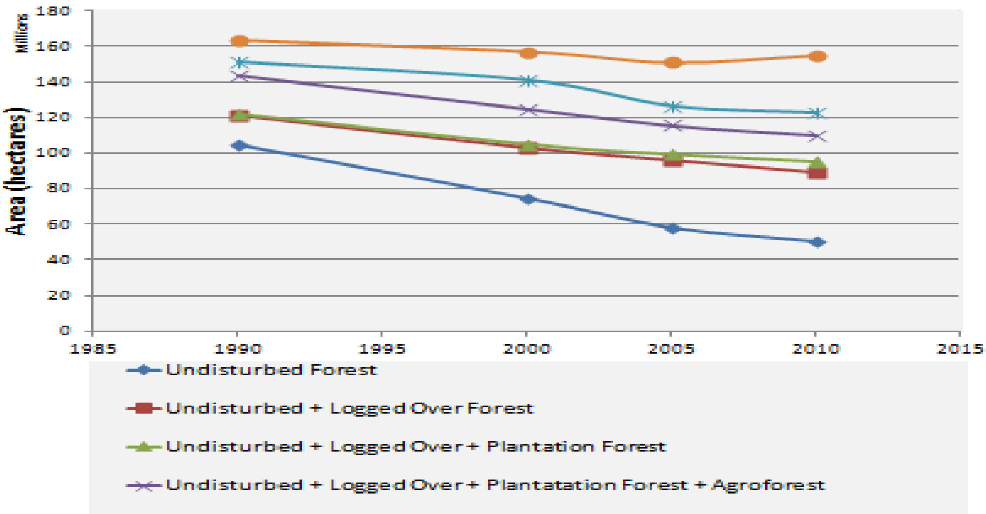


Figure 8. Changes in forest cover under multiple definitions of forests

2.1.2.1.1. Towards setting up a reference emission level at sub national level

The easiest method to allocate the emission reduction target at the sub-national level or to set a reference emission level (REL) is to use historic emissions. However, this will be unfair on some provinces that have a large fraction of natural forest and a low rate of deforestation, for example, Papua. On the other hand, in the case of provinces with a higher deforestation rate, it is easy for them to reach the target emission reduction in the future, for example, Riau. The allocation of an emission target or setting an REL at the sub-national level needs to follow the efficiency and fairness principle. We proposed a different method for setting the REL for different forest transition stages.

Across Indonesia, variations among districts are huge with regards to levels of development, shown on the left hand side of the series of maps in Figure 5, and forest transition stages (current state of land use/cover composition plus past trajectories of land use/cover, and therefore LULUCF emission levels) shown on the right hand side of the series of maps in Figure 5. These reflect variations in needs, potential and constraints in aligning REALU into sustainable development planning.

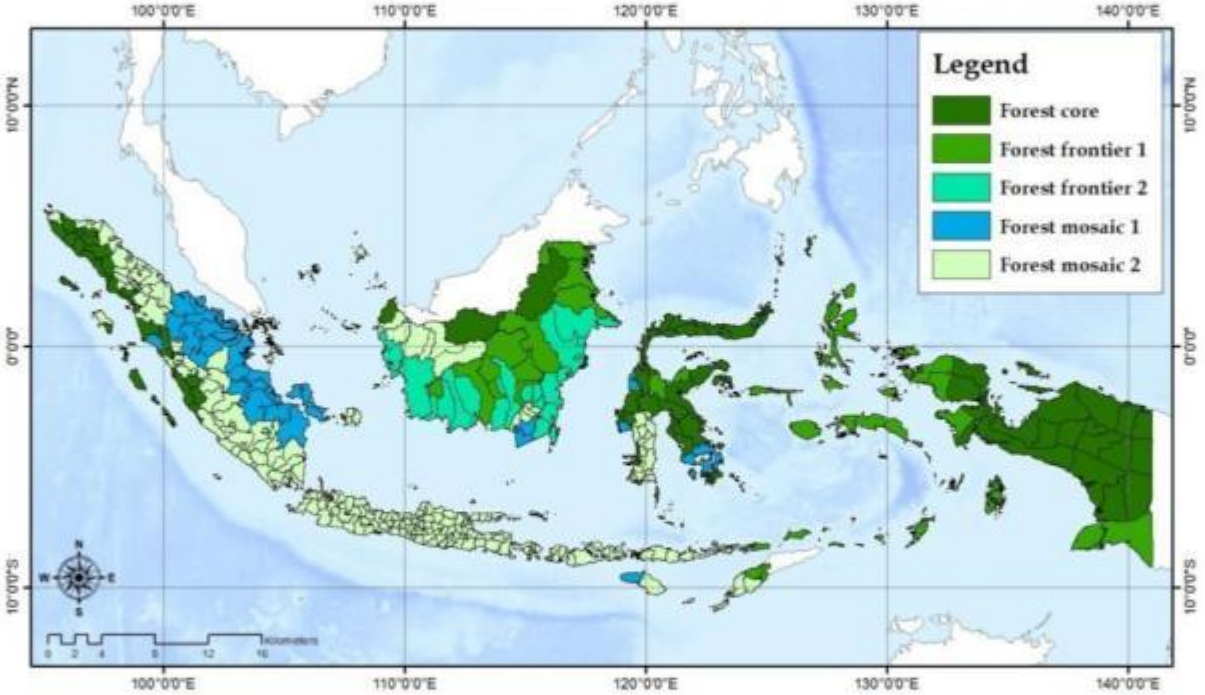


Figure 9. Five stages of forest transition for districts in Indonesia

1. Forest core: a large fraction of natural forest in a large block is found with small subsistence agricultural activities for staple food and some logging activities in lowland areas. Population density is low; the presence of external drivers is limited with minimal interactions between internal and external drivers.

2. Forest frontier 1: these areas are largely forested, but fragmented, with a mixture of degraded forest due to logging, and some large scale conversion of degraded natural forest to estate and forest plantations, along with small subsistence agricultural activities and smallholder plasma. Population density is low; external drivers dominate the dynamics, with labor brought in from outside and interactions between internal and external drivers are driven by the external drivers.

3. Forest frontier 2: areas of natural forest are less than half the total area and highly fragmented, most of the forest remaining is in rough terrain. Large scale conversion and smallholder conversion of forest to harvest export commodities are common. Population density is medium; external drivers dominate but much less so compared to the Forest frontier 1 stage. Interactions between external and internal agents are more equal.

4. Forest mosaic 1: areas of natural forest are very low and only found in the roughest terrain or are nonexistent, with some extent of tree cover existing within agricultural landscapes. Population density is higher than 100 people/km sq. Greater land use intensities and larger settlements dominate the trajectories of land use/cover. Population density and competition for land is increased and leads to high land rents. Land tenure is not clear in many places; markets for local agricultural products are accessible.

5. Forest mosaic 2: areas are similar to the Forest mosaic 1 stage in terms of natural forest and population density, but the extent of tree cover (estate, forest plantation and agroforestry areas) is higher than that of the natural forest. Opportunities for income from non land-based sectors increase. Land tenure is clear and markets for export commodities are accessible.

Within each stage of forest transition, the low carbon development path could be defined, including the target, strategy and cost of investment of the baseline, along with anticipated emissions. Fairness and efficiency should be the guiding principles in setting reference levels. Based on a forest transition approach, five sites have been selected at the provincial and district level–namely: Papua, Gorontalo, South Kalimantan, Jambi and Pasuruan (Figure 10). The grouping of districts will guide the setting of reference emission levels, as discussed in detail in Dewi et al. (2010).

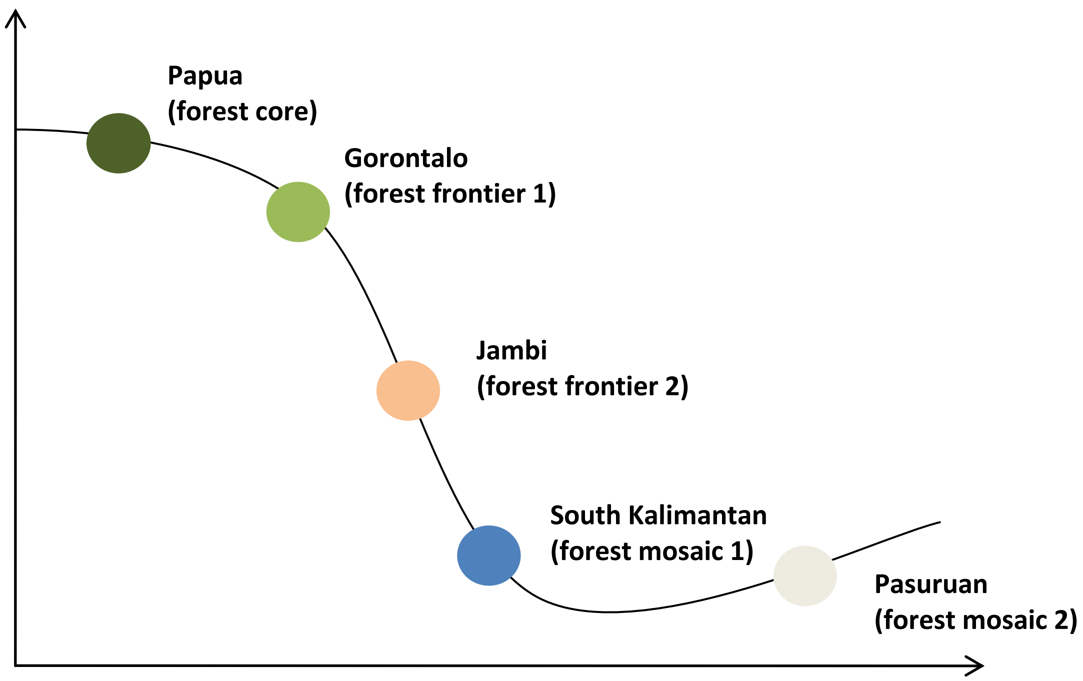


Figure 10. Forest stage transition

2.1.2.2. WP 1.2 Compilation and data analysis produced from Forest Resource Monitoring and from different resolution by different institutions

We compiled the National Forest Inventory (NFI) data from Ditjen Planologi Kehutanan and developed a database system, integrated with GIS, and developed a system to validate the data. ICRAF and Ditjen Planologi Kehutanan have been working together on this, including the Ditjen

Planologi Kehutanan staff who has been heavily involved with the data collection many years ago. It has been a challenge to find the insights of what have really been done in the field and since this inventory process was conducted in 1990's most people are scattered already. The on-going process now is data cleaning, which we done it to some extent. We have converted NFI data into C-stock data

In line with that, we also have a botanist working with us in compiling wood density data which has been collected by Ditjen Planologi Kehutanan since 40 years ago and has been under-used (in the format of piles of books). This valuable database, once it is developed, will be invaluable in estimating C-stock from NFI data. The data entry and database development takes long time since it has to be done manually. Currently we have compiled more than 3800 species from various sources (PROSEA, Worldwide Wood, Brown, Fearnside, Directorate General of Planalogi and Research and Development Agency Forestry, etc.) that cover region specify into our wood density database. The database we build based on a scientific name as well as local names.

Ditjen Planologi Kehutanan and ICRAF have set up all the infrastructures needed to perform image processing for the whole Indonesia, wall-to-wall for three time steps, which are highly demanding computationally. External hard-disks, servers, laptops, desktops and software have been purchased. Ditjen Planologi Kehutanan has set up an office in Bogor which hosts the hardware and software and is up and running as a proper office, including availability of internet connection;

Ditjen Planologi Kehutanan have hired two assistants to work on the technical sides of image processing and the two people have been trained by ICRAF staff in ICRAF office for 2 weeks.

To produce land cover maps of three time steps, we combined the archives of satellite imageries from different time and resolution of ICRAF and Ditjen Planologi Kehutanan, set up the standard processing steps; imported into ready-to-process files, conducted radiometric correction, perform orthorectification, and started with the first step of classification process, i.e., segmentation. The classification steps using object-based image analysis was then conducted. We have produced the first version of the land cover maps of the three time series and still now in the process of refining them. A close coordination between the two offices that run the activities (Ditjen Planologi Kehutanan and ICRAF) has been made through a series of meetings and other means of communications.

Compiled data from National Forest Inventory conducted by DITJENPLAN and other sources of data including STREK (Silvicultural Techniques for the Regeneration of logged over forests in East Kalimantan), ICRAF and etc.

We have integrated several databases of different sources into a restricted web based information system using MySQL database server, which is an open source database software. SQL is a powerful script for data querying with some filtering function and grouping and for some basic data explorations. To increase the usability, simple interfaces for SQL are to be developed. The interface will be using graphical interaction instead of scripting. For time being, the query and data analysis was also carried out using the Navicat software. This software can predefine a function, e.g. biomass or carbon calculation, as queries.

Through GIS software we also have compiled the plot data (Carbon data) with land use/cover maps. We now have an integrated database between the NFI database, wood density database, plot level

C-stock and land use/cover maps. Further data cleaning and reorganization are necessary. Uncertainty assessments are yet to be conducted on the final products.

2.1.2.3. WP1.3. Analysis of the uncertainty of carbon-stock estimates in different land-cover types in determining classification schemes for satellite imagery-based mapping

Reliable estimates of carbon exchange between terrestrial ecosystems and the atmosphere owing to land-use change have become increasingly important. Such information will have a large impact on the quality of management of carbon stocks and the related policy decisions.

Current estimates of forest and tree-based systems as carbon sinks have uncertainties because of inaccurate data, inadequate methods and gaps in understanding of the physiological processes and relationships among carbon, plants and soils.

In this activity, we set out to assess the uncertainty inherent in evaluating landscape carbon-stocks, calculated on the basis of plot carbon-density estimates (using forest and non-forest inventory data) and land-cover maps.

From this, we will be able to assess the uncertainty derived from

1. Errors in classification of land cover types; and
2. Variation in plot carbon-density estimates.

The aim of the study was to provide a picture of the uncertainty surrounding carbon landscape estimates and to identify the sensitive components in these estimations. The uncertainly analysis was carried out using the Monte-Carlo approach as recommended in the Tier 3 method section of the IPCC Good Practice Guidance for LULUCF.

Currently, the analysis is conducting, using Tanjung Jabung Barat district, Jambi province, as the study site. The uncertainty analysis focuses on the main trajectories of land-use change to ascertain a reliable estimate of carbon emissions in the area. When carbon-stock estimates at the plot level differed significantly, the land-cover map was able to classify these land-use types ‘almost’ correctly. When the land-cover map was unable to ‘well’ classify two land-use types, the carbon-stock estimates at the plot level did not differ significantly. Thus, our current hypothesis is that the two types of errors (land-cover maps and carbon-stock estimates at plot level) may compensate each other and, therefore, the uncertainty around landscape carbon-stock (emissions and sequestration) based on these two sources of errors may be low.

Preliminary results on land-use changes in the area revealed that during the period 1990 to 2008, the main land-use change occurred in swamp forest, amounting to 1330 km2 or roughly 27% of the district. Most of the swamp forest was converted to oil palm systems.

Combined with carbon-stock data, there has been a loss of aboveground carbon of approximately 3.5 Pg.ha-1 in 18 years (carbon loss from mineral and peat soil not included).

The estimated landscape average of aboveground carbon stocks in Tanjung Jabung Barat in year 2009 was 77.2 Mg.ha-1 (excluding waterbody and settlements). The estimates was based from the following distribution of land use: m 24% of forest, 22% of agroforest, 39% of tree monoculture systems (i.e. oil palm, rubber and Acaccia mangium), 1% agriculture and 14% other land use systems (i.e. cleared land, grass and shrub). The distribution of the expected error of landscape carbon estimates appears to be symmetrical with bout 75% chance that this estimated value is correct (i.e. expected deviation from average carbon stocks equals to 0), 7% chance that the estimated value overestimated up to 50 Mg.ha-1 and 9% that the estimated value underestimated as much as 50%. The full paper of this study is currently in preparation.

2.1.2.4. WP1.5. Consultation with national experts on carbon accounting within IFCA; way of moving forward is formulated

Consultation with national experts on carbon accounting was undertaken through several activities and on the whole, we have presented our results through seminars, workshops, and conferences across Indonesia. Since IFCA has not been active, we expanded our consultation with a larger group and with credible institutions—namely: UKP4 (The Presidential Working Unit for Development Supervision and Control); Bappenas (National Development Planning Agency Republic of Indonesia); DNPI (National Council of Climate Change); UNDP; and UN-REDD. Consultation with UKP4 and Bappenas was mostly about land cover change produced by the project and it was used as one dataset for calculating the provincial historical rate of deforestation at the national strategic level for REDD consultation. Last year, we attended two regional consultation sessions on the REDD+ strategy with the national planning agency (Bappenas) and UKP4 in Papua and Jambi. From several consultation sessions we undertook last year, we saw there were many obstacles raised by and much criticism from local stakeholders with regard to the national strategy on REDD. Several recommendations that need to be prioritized are: encouraging policy on the recognition of indigenous people and land tenure, financial and institutional interventions related to MRV, socialization at the community level about data and all components, set up REDD+ institutions at the sub national level, and increase capacity for local stakeholders. Lastly and essentially, it is very important to synergize efforts among agencies (Bappenas-UKP4-DNPI-related Ministries) for better communication and processing.

Taking national consultation in Jambi as an example, there were many stakeholders who questioned the level of participation of the stakeholders involved. National strategy consultation on REDD was more like information dissemination from the national level government to the local stakeholders rather than a consultation process. Also at this venue, the Bappenas and UKP4 asked local government to identify the drivers of land use change, and analyzed them using a fishbone diagram. One outcome was that local government wanted to prepare its own reference emission level (REL).

2.1.2.4.1. Contribution and linkages of project to national policy development

Dr. Meine van Noordwijk and Dr. Sonya Dewi were invited to be part of the international and national expert team to provide feedback and comments on the National Strategy on REDD+ in Bali in 2010. The strategy was drafted by a team working under the coordination of UKP4, led by Bappenas (the national development and planning agency) and was comprised of people from relevant ministries (Forestry, Environment, Agriculture, Finance, and Internal Affairs). The input we gave was well received. However, within the process, there was a parallel effort from the Ministry of

Forestry to also draft a national strategy, on which we were also invited to comment. Currently, as far as we know, it is not clear which and whose strategy is being adopted. In addition to this, ICRAF was also appointed by UKP4 to be part of a small team to review REDD+ pilot proposals from eight provinces.

2.1.3. WP2. Development of technical capacities at national and sub-national levels to contribute to the national carbon accounting and monitoring systems

2.1.3.1. WP2.1. Gap-filling between existing data and data required to fulfil Tier 3 IPCC reporting guidelines

In February 20th, 2009, we had a meeting discussed technical work plan, identification of gaps re national forest inventory, gaps on technical skill and infrastructure, finalizing budget and general discussion on technical aspects. Meeting was attended by all of partners (Ditjen Planologi, ICALRRD and Brawijaya University-UB). Venue: ICRAF office

We held a technical workshop entitled “shared learning of ALLREDDI Project results” on December 1st in CIFOR Campus, Bogor, Indonesia. The objective of the workshop is to share and discuss of our project in measuring emission of CO_2 from LULUCF using stock difference method. We shares and discussed the preliminary results of land use and land cover trajectory analysis of Indonesia 1990-2000-2005, C-stock at plot level compiled compiled form different sources. During the workshop we discussed the gaps in data and steps and ways to move ahead. We are benefited a lot from input and feedback provided by Dr Ari Wibowo and Dr Haruni from FORDA, who both have been active in preparing the Second National Communication (SNC), which is the only official reporting of C-emissions to UNFCCC at the national level.

2.1.3.2. WP 2.1 Stratification of land cover and forest cover

During a technical meeting held on March 6th, 2009, Ditjenplan expressed the importance of having time series wall-to-wall mapping of Indonesia to support Indonesian delegation on COP 15 in Copenhagen. Contribution of ALREDDI in this matter was considered strategic, so it was in this meeting that we decided to aims to have a first draft of national level land cover maps by December 2009. Ditjenplan and ICRAf also decided on three criteria regarding the land cover maps: (1) The maps should cover at least three time period that considered significant in REDD discussion: 1990, 2000, and 2005 (2) it should have sufficient details of land cover classes that reflects the variations of carbon stock at national level (3) sufficient level of accuracy (>80%) for the most recent maps had to be achieved to ensure the quality of land cover change information.

To achieve the objectives, a remote sensing and image interpretation team was formed in April 2009, it consists of 5 remote sensing/GIS researcher, 2 persons from Ditjenplan and 3 persons from ICRAF. The initial issue that the team should solve was the availability of time series satellite image covering the whole country in the required time period. Total of 611 scenes of Landsat images were required for this purpose. This data requirement was fulfilled by combining initially-separate Landsat data collection owned by Ditjenplan and ICRAF into one single database of satellite images. The database compilation was finished in May 2009, and currently shared together between ICRAF and Ditjenplan.

The national level land cover map was produced through four general steps: (1) stratification of land cover/forest cover type, (2) image pre-processing to rectify radiometric and geometric error contain in satellite image, (3) image interpretation to translate spectral value in satellite image into land cover information and, (4) post processing to assess the accuracy of the land cover maps. The land cover/forest cover stratification phase produced a list of land cover classed to be interpreted in satellite image (figure 9). The list was discussed among all project partners and agreed upon before classification process was implemented.

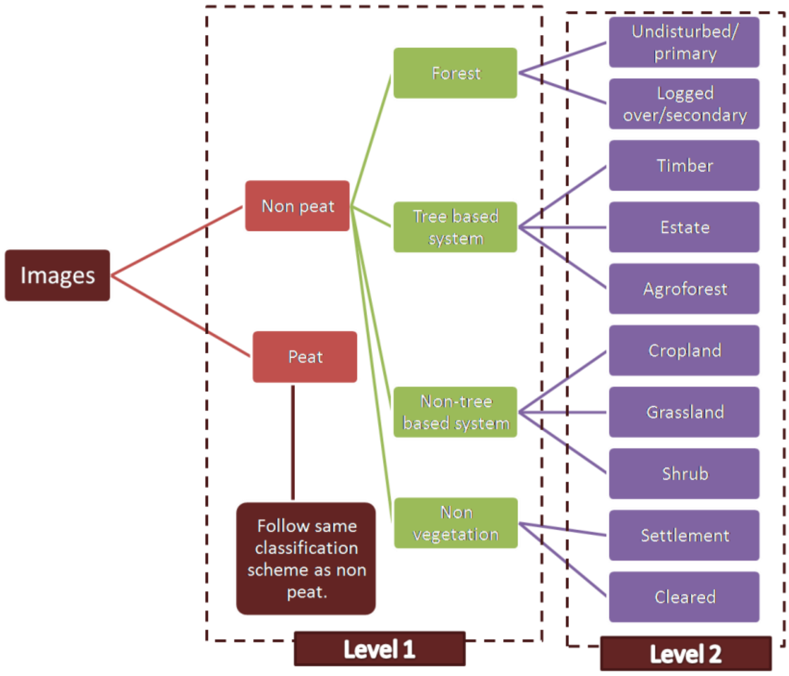


Figure 11. Classification scheme for land cover mapping and land cover change analysis

Image interpretation phase was conducted using object-based hierarchical classification method. Object-based classification method is one of most current innovations in remote sensing and image processing. It offered more in term of spatial information used in image interpretation and flexibility in developing hierarchy of land cover that are relevant in a region. Object based classification method has been used by ICRAF in various research activity and gave improved quality and accuracy compared to conventional image interpretation method. Since this method was relatively new for Ditjenplan, a series of training was conducted in August 2009 for the remote sensing and image interpretation team.

The combine team of Ditjenplan and ICRAF was working rigorously to fulfill the target. During the process, routine technical meeting was held to share working progress and difficulties. In November 2009, the team finished their task and successfully produced three time series land cover map of Indonesia covering the period of 1990, 2000, and 2005 (Figure 2). The accuracy of the most recent land cover map was checked using Global Positioning System (GPS) point collected from previous research activity in ICRAF, and resulted in 80% overall accuracy. The maps and preliminary land cover change result was shared to project partners through a half day seminar held in December 2009. However, in the current stage the data still has several limitations: (1) High cloud cover of 6-

10% which produces a lot of no data area in the land covers maps, (2) Limited number of reference GPS point for each land cover types. This limitation is planned to be solved in the second year of the project through the use of radar remote sensing image and additional fieldwork to collect GPS point in several location of Indonesia.

These have been achieved; the land cover maps are not yet in the final versions. A substantial work still needs to be done before it reaches the stage of ready-to-use for policy making or any other applications. Therefore after several internal consultations, we decided not to release the products yet for the COP15 negotiations.

2.1.3.3. WP2.1. IPCC reporting

As part of the attempt to contribute to IPCC reporting by Indonesia, ALLREDDI has established a network of external partners to help review current results and identify future follow up on the methodology and data produced. Technical discussions on methods and processes of carbon measurement were held between representatives from the Ministry of Forestry with Dr. Danillo Moliccone, an expert from FAO headquarters, regarding the requirements of the IPCC methods on basic land use data, surveys of land use and land use change, and geographically explicit land use data. It is recommended to have at least 20 years of remote sensing monitoring to cover the equilibrium of the forest. In the ALLREDDI project, the starting year of monitoring was 1990. Mapping the most recent land cover would be an advantage in terms of the IPCC method.

2.1.3.3.1. Contribution to COP-UNFCCC 16 side events

The ALLREDDI project also participated in COP 16 in Cancun, Mexico December last year. Dr. Fahmuddin Agus from the Indonesian Center for Agricultural Land Resources Research and Development (ICALRRD) and Meine van Noordwijk attended COP 16 in Cancun, Mexico. They participated in Agricultural Day, Forest Day and various side events as well as having booths and presenting at Expos. In addition, they were panelists in the Forest Day 4 learning event in the Session "REDD+ and agricultural drivers of deforestation". They addressed developing strategies for oil palm plantations under the Roundtable for Sustainable Palm Oil (RSPO) as well as implementing action on greenhouse gas emission reduction in particular and environmental protection in general.

He was also a panelist in one of the sessions on the Agricultural and Rural Development Day on "How can intensification of agriculture contribute to climate change mitigation and greater food security, as well as be sustainable?" in Roundtable 1. He highlighted how intensification of rice paddy, oil palm, and slash and burn agriculture has improved food security. However, the intensification does not necessarily reduce the pressure for deforestation. In the CIFOR side event, he gave a presentation on "Progress and information gaps in peat land research in Indonesia in relation to MRV". He highlighted the carbon accounting methods and the proxies that can be used to support the measurement, reporting and verification (MRV) of REDD+ on peat land based on the RACSA method that has been used for several training sessions at four project sites.

2.1.3.3.2. Workshop and training in collaboration with Belgium REDD Initiative (Be-REDD-I)

Be-REDD-I is a research project funded by the Belgian Science Policy (BELSPO) which aims to: (1) assess methodological issues regarding monitoring land use changes (deforestation, degradation and re-greening) using low and high resolution satellite imagery; (2) test a framework to assess the sustainability of REDD+ mechanisms regarding environment (carbon sequestration), economics (leakage) and the social aspects (livelihoods and local perspectives); and (3) integrate and link Belgian expertise on REDD-related issues with selected international institutions. Cooperation between ALLREDDI and Be-REDDI was developed to compare methodologies of carbon stock measurement and assess mutual possibilities to enhance the approach that was currently being implemented by both projects.

Two activities were arranged in December 2011: a workshop on ALLREDDI nationwide data, and training on the use of SPOT vegetation to measure carbon increment. The main topic of the training was the use of the SPOT vegetation image to estimate net primary productivity (NPP) from vegetation cover. NPP is defined as the net flux of carbon from the atmosphere into green plants. The value refers to a rate of process, which in this case is the amount of vegetation matter produced (net primary production) per unit of observed time. As part of the activity, data sharing between ALLREDDI and Be-REDDI was conducted at the end of the session. ALLREDDI shared its collection of Landsat images and time series land cover maps for three provinces (Jambi, Lampung and Gorontalo). In return, BeREDI shared its collection of SPOT vegetation images and estimation of NPP from 2000 to 2009. An example of the NPP calculation for Indonesia is shown in Figure 12.

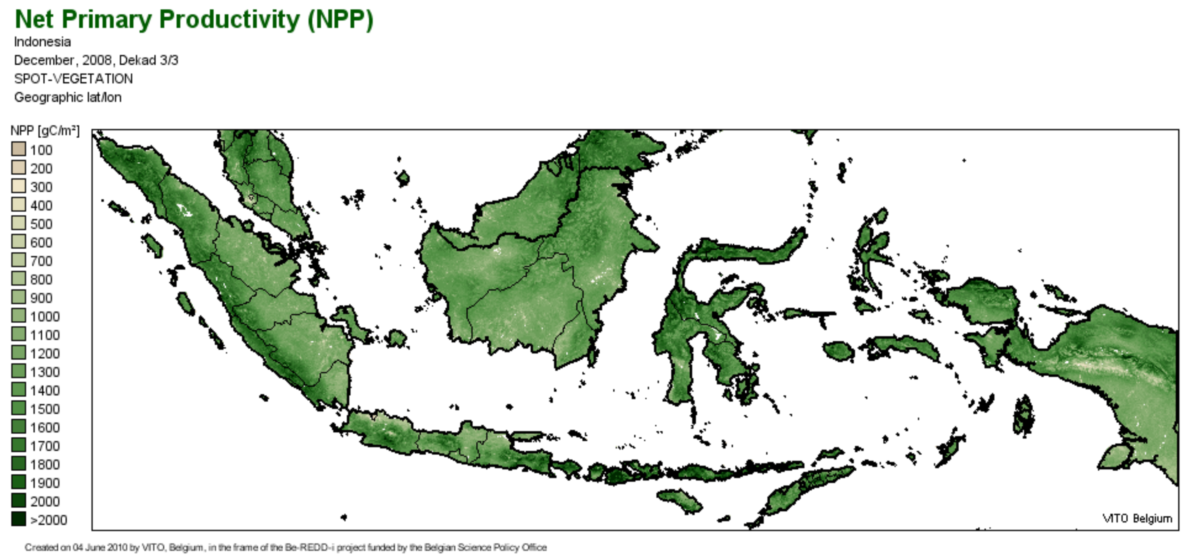


Figure 12. Sample of net primary productivity map

2.1.3.4. WP 2.1. Inclusion of necromass and belowground biomass in field measurements, peatland carbon measurement and developing curricula for the education centres of the forestry department and universities.

2.1.3.4.1. Peatland carbon measurement

Peat soil (Histosols) has a very high carbon stock which is conserved under natural conditions, but is easily emitted under nonforest and drained conditions. The highest pressure to convert peat forest to agriculture and other uses calls for strategies for conversion reduction. The efforts of emission reduction must be accompanied with a database on the carbon stock and its changes.

The lack of detailed peatland surveys creates high uncertainties in the various data and information, especially on the total area, thickness, distribution and carbon stocks of the peatlands of Indonesia. This is reflected by the varying estimates of national peatlands area by different authors, ranging from 13.5 to 26.5 million ha (Wahyunto et al., 2004). Hooijer et al. (2006) based on Wahyunto et al. (2003, 2004, 2005) estimated the area of peatlands in Indonesia to be around 20.6 million ha, mostly found on the three major islands—namely, Sumatra (35%), Kalimantan (32%) and Papua 30% (Wibowo and Suyatno, 1998; Wahyunto et al., 2005).

In one dome, peat farther from the river tend to be thicker and mainly composed of the fibric or hemic maturity stage and was mostly classified as oligotrophic (very acidic and poor in nutrients). Peat soil in small depressions or near the river is likely to be eutrophic, which is relatively more fertile because of enrichment from the adjacent river sediment or the influence of the mineral layer at the bottom of the peat.

The mineral soil layer underlying the peat (substratum) influences the natural fertility. The substratum can be derived from the marine clay sediments, quartz sand, and nonmarine clay (river sediment). In the peat soil with marine sediment substratum, there is a potential danger of sulphuric acid toxicity as a result of oxidation of pyrite, a sulphidic material. The quart substratum indicates that the peat soils have a low fertility, because they are mainly formed from the vegetation that grew on the nutrient-poor quartz substratum. Peat soils with a clay mineral substratum located in the hinterland are relatively more fertile, as long as the substratum is not very thick (less than 3 m).

Under natural forests, peatlands sequester carbon that contributes to reducing greenhouse gases in the atmosphere, although the process is very slow, i.e. as much as about 0-3 mm per year (Parish et al., 2007) or equivalent with a sequestration of about 0 to 5.4 tonnes CO_2 ha/year (Agus et al, 2009). If the peat forests were cut and drained, then the carbon stored in the peat is easily oxidized to CO_2 (one of the most important greenhouse gases), and the peat surface easily subsides as the result of emissions and consolidation.

The variation in peat properties is determined by the process of peat formation and the peatland position in a dome. In addition, it is also influenced by the system of land management. Information on variation in the nature and properties of peat is very important as a basis to develop strategies for the sustainable management of peatlands with a management system that can reduce subsidence and greenhouse gas emissions, and at the same time, can support local livelihoods.

With scanty data on many peatland areas, any additional data gathering based on peat surveys will contribute to the enrichment of the peatland database. The objectives of this collaborative work were: (i) gap filling of carbon stock data in several locations, especially in Jambi Province and in Mimika in Papua Province; (ii) revision of the manual on peat soil carbon stock measurement; and (iii) capacity building in sub-national institutions (particularly in Papua Province) on belowground carbon stock measurement in peatland.

This activity aimed at producing the following outputs:

- Compilation of data on peat properties and carbon stock in several locations in Jambi and Mimika
- A manual on soil carbon stock measurement (versions in English and Bahasa Indonesia)
- Improved skills of local level institution in carbon stock measurement on peatland

2.1.3.4.2. Revision of the manual for the measurements of soil carbon storage

A first-draft of the manual was prepared in 2009 and has been used as the main reference in ALLREDDI training on peatland belowground C stock measurement. The same draft was also used in 2010 for similar training conducted by the Ministry of Agriculture under the Indonesian Climate Change Trust Fund (ICCTF) project. In the fiscal year 2011, the Indonesian version was revised and launched during the final workshop with versions in both Bahasa Indonesia and English being ready to print for a wider audience.

2.1.3.4.3. On-the-job supervision of peat carbon storage

This supervision was the main task scheduled mostly in 2010. However, only BPKH Papua was ready for this kind of interaction in 2011, and no other BPKH, the intended partner, allocated their matching resources in 2010 and 2011 for this activity. Therefore most of resources were reallocated for the carbon stock gap filling activity in Jambi. This activity included a briefing on the method of peat soil sampling, supervising the initial stage of sampling, analysing the peat samples mainly for bulk density (BD) and ash content at the Indonesian Soil Research Institute Laboratory, and interpretation of these data for peat carbon stock determination. Eight middle- and senior-level technicians from BPKH Papua were involved in this activity in September 2011.

Gap-filling activity started with the identification of previous peatland data surveys and prioritising the areas for the current activity. Previous studies conducted by various projects include Sei Bram Itam (by ALLREDDI and REALU, 2009), Petaling and Berbak National Park (by REDD-ALERT, 2009), Arang-arang, Muara Jambi, (by Jeni Farmer, REDD ALERT, 2010) and Arang-arang, Muara Jambi ICCTF site (by ICALRRD, 2010). The activities were conducted on sites where past data were sparse.

For the site in Mimika, Papua, 16 points were observed, and the dominant land use was sago crops and forest. A total of 500 samples in Jambi from the 51 observation points and 84 samples in Mimika, Papua from the 16 observation points were analysed for carbon content, bulk density and soil fertility.

The peat carbon-stock was measured based on the method developed by Agus et al . Observations were conducted on each land unit where data of the peatland profile were not available. Priority was given to major land-cover types, especially forest, oil palm and rubber. Soil samples were collected using a peat auger (Eijkelkamp model).

Peat samples were taken at 0–20 cm, 20–50 cm and 50 cm depth increments downwards to the substratum for bulk density (BD) by the gravimetric method and organic carbon (Corg) determinations by the loss on ignition (LOI) method. Composite bulk samples at depths 0 20 cm, 20

50 cm and 50 100 cm were taken for Corg and organic N contents by a C and N Auto-analyzer and for other chemical soil properties including P, K, Ca, Mg, Na, Mn, Cu, Zn, Fe and pH.

Other properties observed during the sampling included peat thickness, peat maturity of each layer by visual observation, sub-stratum type, drainage system, land-cover type and the presence or not of charcoal and clay layers.

Based on the LOI analysis, the organic matter content was calculated as

% Ash = 100% - % organic matter

Corg = % organic matter /1.724

Carbon density, C density, Cd,

Cd = Corg * BD

C stock = Cd x L x H

Where: Cd = carbon density (Mg/m3)

L = peatland area (m2)

H = peat thickness (m)

Supervision of peat carbon-storage measurement by regional forestry officers should have been carried out in 2010 and 2011. However, it appears that only BPKH Papua will be ready for this kind of interaction. This activity will include briefing in the method of peat sampling, supervising the initial stage of sampling and analysing the samples mainly for BD and Corg at the Indonesian Soil Research Institute Laboratory.

2.1.3.4.4. Conformity of peat properties with those in peat atlas

A peat atlas (Wahyunto et al. 2003; 2005) was used as a base map for selecting the observation points. Comparing the result of the current peat observation with that in the atlas, only 15 of the 51 points (30%) in the current study at the Jambi sites matched those in the atlas in terms of peat thickness and only 14 points (30%) matched in terms of peat maturity. For 31% of the points there was less peat than described in the atlas and 49% of the sample points had an observed peat depth greater than that in the atlas. Two of the 51 points within the peat area in the atlas turned out to be mineral soil based on our survey. On the other hand, four points indicated as mineral soil in the atlas, tuned out to be peat soil with a thickness ranging from 120 to almost 600 cm.

In Mimika district, from the 16 observation points, only about 65% had a peat thickness that conformed with the atlas. In 37% of cases, the observed peat thickness was shallower than that given in the atlas. Four of the 16 points fell in the mineral soil area. A major mismatch was also observed for peat maturity between the two datasets.

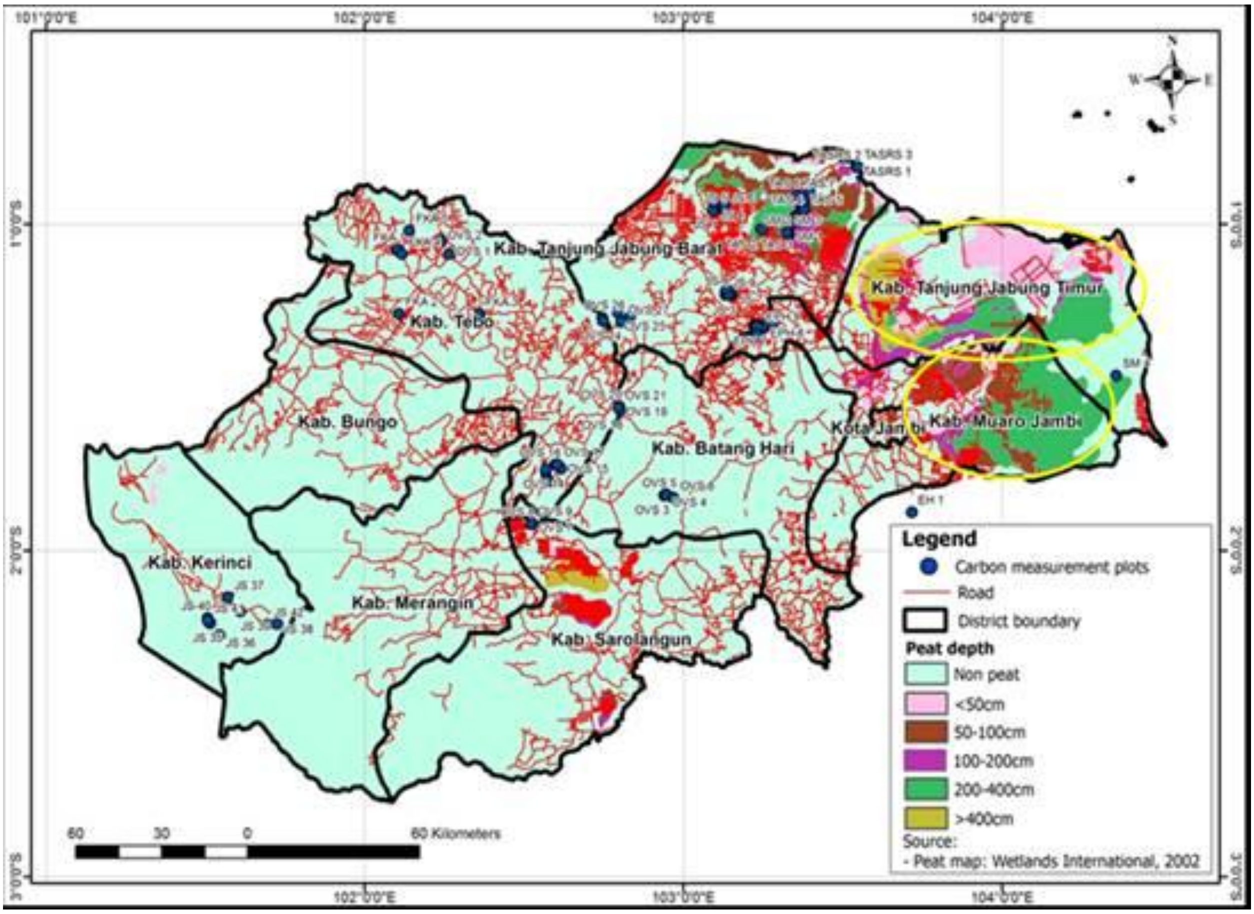


Figure 13. Distribution of previous carbon stock observation points conducted by ICRAF (blue solid circles) mostly on mineral soil and the priority area for the current study (yellow circled regions) in Jambi Province.

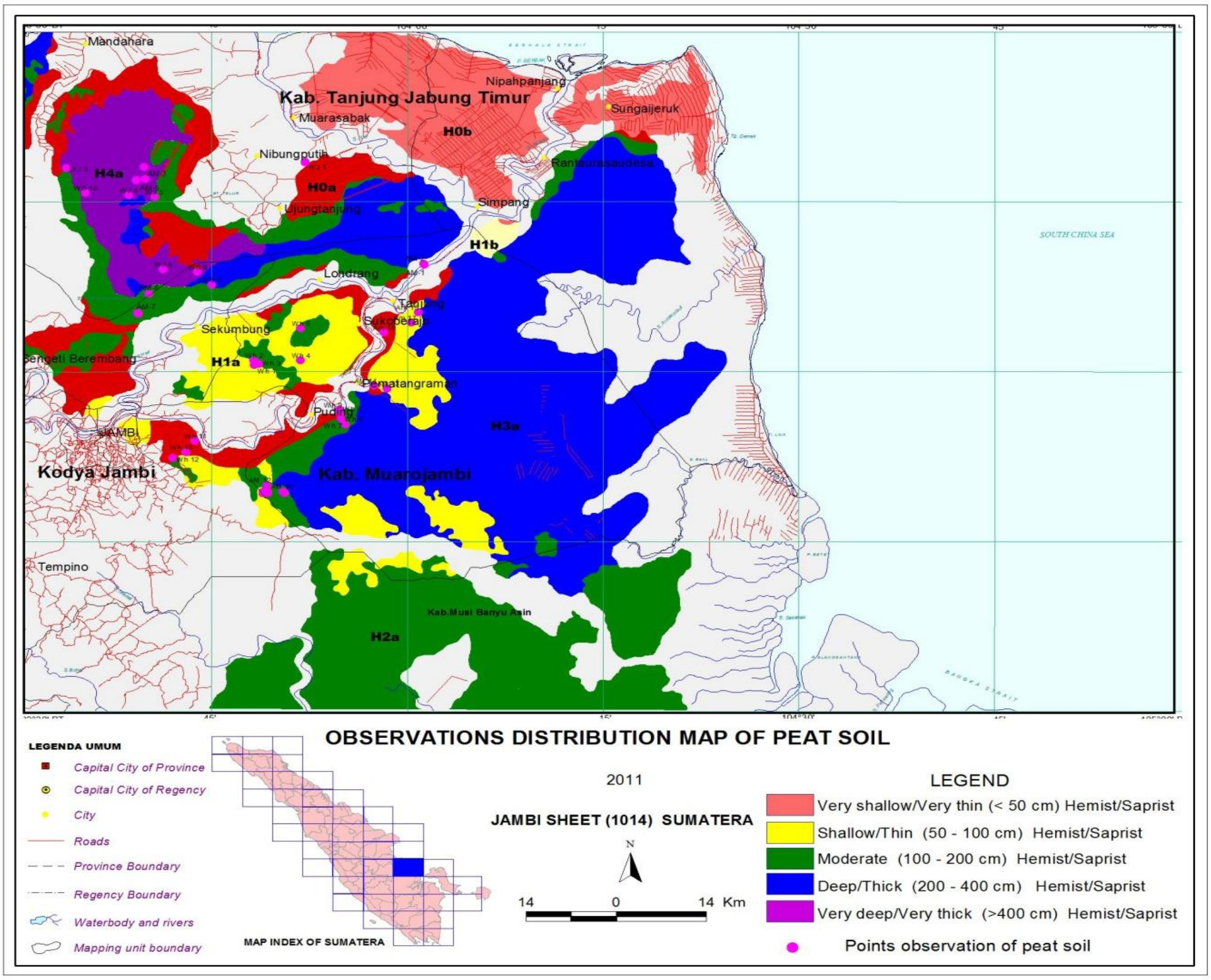


Figure 14. Observation points for peat soil in Muara Jambi and Tanjung Jabung Timur districts, Jambi province

2.1.3.4.5. Progress on filling gaps in peatland data

Samples were taken in May and June 2011 at 38 points (Figure 13). The thickness and maturity results from the 38 points varied widely. The thickness ranged from 50 to 1100 cm, which resulted in very different levels of carbon stock.

Peatlands that had been already cleared and planted with oil palm and rubber had thicknesses from less than 1 m to more than 3 m, while the degree of decomposition in the upper 50 cm was mostly sapric and hemic. No fibric maturity was found in the upper layer. During the observation period, the water table was less than 1 m deep.

Comparing the results of our peat observation with the atlas of Wahyunto et al. , only 11 of the 38 points (29%) matched those in the atlas (Table 3). This indicates that the atlas needs to be updated if it is to be used as part of the monitoring, reporting and validating system of REDD+ at the sub-national level.

Table 3. Comparison of soil maturity classification and peat depth between that in the atlas of Wahyunto et al. (2003) and the current survey

Initial Code	Geographic Position South	 East	Wahyunto et al. (2003) Atlas Soil classification	 Peat depth (cm)	Current study Soil classification	 Peat depth (cm) Red figures indicate mismatches
AM1	01°20'34,1"	104°01"19,0"	hemist/saprist	200–400	saprist	332
AM2	01°20'29,1"	104°01'16,7"	hemist/saprist	200–400	saprist	400
AM3	01°13'01,8"	103°39'53,3"	hemist/saprist	> 400	saprist	242
AM4	01°11'58,6"	103°39'45,5"	hemist/saprist	> 400	saprist	257
AM5	01°13'08,7"	103°39'103"	hemist/saprist	> 400	saprist	328
AM6	01°13'06,2"	103°39'10,9"	hemist/saprist	> 400	saprist	318
AM7	01°24'51,3"	103°39'17,0"	hemist/saprist	100–200	saprist	315
AM8	01°23'10,5"	103°40'09,7"	hemist/saprist	100–200	saprist	687
AM9	01°24'59,3"	103°39'21,2"	hemist/saprist	100–200	saprist	120
AM 10	01°40'41,3" S	103°50'28,1" E	hemist/saprist	100–200	saprist	626
AM 11	01°40'49,4" S	103°50'38.3"	hemist/saprist	100–200	saprist	759
AM 12	01°41'13,2" S	103°49'16,3" E	hemist/saprist	100–200	saprist	222
AM 13	01°31'32,6" S	103°58'27,4" E	hemist/saprist	50–100	fibrist	520
AM 14	01°31'18,4"S	103°57'28,9"E	hemist/saprist	50–100	fibrist	240
AM 15	01°24'47,6"S	104°00'52,1"E	hemist/saprist	50–100	hemist	110
AM 16	01°26'38,7"S	103°58'13,5"E	hemist/saprist	< 50	hemist	1100
AM 17	01°25'41,7"S	104°00'20,0" E	hemist/saprist	50–100	hemist	660
WH 1	1°29'29,8"S	103°48'16.7"E	hemist/saprist	50–100	mineral	0
WH 2	1°29'4,2" S	103°48'14,2"E	hemist/saprist	100–200	saprist	128
WH 3	1°29'24,0"S	103°48'39,0"E	hemist/saprist	100–200	mineral	25
WH 4	1°29'4,4" S	103°51'50,1"E	hemist/saprist	50–100	fibrist	367
WH 5	1°26'14,0"S	103°51'49,7"E	hemist/saprist	100–200	fibrist	283
WH 6	1°34'43,0"S	103°55'15,2"E	hemist/saprist	100–200	hemist	582
WH 7	1°34'13,1"S	103°54'59,8"E	hemist/saprist	100–200	hemist	490

WH 8	1°33'46,2"S	103°54'52,4" E	hemist/saprist	< 50	hemist	460
WH 9	1°33'28,0"S	103°54'50,3"E	hemist/saprist	< 50	saprist	40
WH 10	1°37'14,7"S	103°43'3,8"E	hemist/saprist	< 50	hemist	739
WH 11	1°36'14,2"S	103°43'45,4"E	hemist/saprist	< 50	saprist	230
WH 12	1°37'43,8"S	103°42'4,6"E	hemist/saprist	100–200	hemist	70
WJ 1	1°11'31,8"S	103°51'70,4"E	Mineral	0	hemist	125
WJ 2	1°11'29,1"S	103°51'69,6"E	Mineral	0	fibrist	223
WJ 3	1°11'63,4"S	103°33'49,9"E	hemist/saprist	> 400	hemist	63
WJ 4	1°14'28,0"S	103°38'36,9"E	hemist/saprist	> 400	hemist	144
WJ 5	1°14'37,9"S	103°40'35,2"E	hemist/saprist	100–200	mineral	0
WJ 6	1°20'61,8"S	103°41'14,6"E	hemist/saprist	> 400	hemist	136
WS 8	1°22'22,1"S	103°45'0,6"E	hemist/saprist	200–400	hemist	316
WS 9	1°21'15,3"S	103°43'54,4"E	hemist/saprist	> 400	hemist	206
WS 10	1°14'15,3"S	103°35'17,2"E	hemist/saprist	> 400	hemist	180

2.1.3.4.6. Carbon stock

From the 38 points where soil was sampled, to date, only nine points have been analysed for BD and ash/organic matter content (Table 4), while the remainder are in progress. The peat maturity at the observation points was predominantly sapric and the underlying substratum was clay. Carbon density varied from 0.051 to 0.1125 Mg m-3. This was mostly higher than the values of about 0.06 Mg m-3 suggested by Page et al.1. The carbon stock varied from 972 to 4115 Mg ha-1. For comparison, the average carbon stock in Sumatra, based on Wahyunto et al., was around 3000 Mg ha-1.

[1] Page SE, Siegert F, Rieley JO, van Boehm HD, Jaya A. 2002. The amount of carbon released from peat and forest fires in Indonesia during 1997. *Nature* 420: 61–65.

Table 4. Peat properties and carbon (C) stock at nine sample points in Jambi

Code	Land-use type	Peat Maturity	Peat thickness cm	Ash Content %	COrg %	Bulk Density (BD) Mg m-3	C density Mg m-3	C stock Mg ha-1	Average C stock Mg m-1
AM1	Rubber	Sapric	350	24.78	39.14	0.254	0.0613	2067	590
AM2	Secondary forest	Sapric	400	25.34	38.85	0.235	0.0493	2296	510
AM3	Secondary forest	Sapric	242	26.18	38.41	0.315	0.0953	2465	986
AM4	Secondary forest	Sapric	275	30.19	36.32	0.406	0.1097	3376	1125
AM5	Conservation forest	Sapric	328	17.91	42.71	0.247	0.0802	2694	770
AM6	Conservation forest	Sapric	318	23.30	39.96	0.321	0.0880	3204	915
AM7	Acacia	Sapric	315	25.42	38.80	0.289	0.0781	2745	784
AM8	Acacia	Sapric	687	9.49	47.09	0.153	0.0615	4115	588
AM9	Acacia	Sapric	120	29.25	36.81	0.318	0.0695	972	648

For the Papua site, where most of the areas were not influenced by drainage, the peat maturity was fibric and the peat depth ranged from 50 to 400 cm. The ash content was somewhat higher, while the BD was lower than in Jambi. The average volume-based C content for the Papua sites was only about half that in Jambi (Table 5), resulting in a low value for the average carbon stock of 846 Mg ha-1 for the Papua sites compared to 2282 Mg ha-1 at the Jamb sites (due to the combined effects of thinner peat and a low BD). The average C-stock measurement at the Papua sites was higher than the average of about 500 Mg ha-1 reported in Wahyunto et al. (2005) (Table 6, 8 and 9).

Table 5. Profile average peat properties and carbon stock at 47 points in Tanjung Jabung Timur and Muaro Jambi, Jambi Province and 12 points in Timika, Papua Province.

No.	Code	Land Use	Peat Maturity	Peat Thickness (cm)	Ash Content (%)	COrg (%)	BD (g/cm3)	Corg (volume based) (t/m3)	C-stock (t/ha)
Tanjung Jabung Timur and Muaro Jambi Districts, Jambi Province									
1	WJ3	Bare land	hemic	63	31	40	0.40	0.16	763
2	AM5	Conservation Forest	sapric	328	12	51	0.18	0.08	2,676
3	AM6	Conservation Forest	sapric	318	16	49	0.21	0.10	3,241
4	WJ6	Timber Plantation	sapric	136	10	53	0.23	0.12	1,852
5	AM7	Timber Plantation	sapric	315	11	52	0.18	0.09	2,800
6	AM8	Timber Plantation	sapric	687	3	57	0.12	0.07	4,500
7	AM9	Timber Plantation	sapric	120	15	49	0.16	0.08	846
8	WS8	Timber Plantation	fibric	316	13	50	0.15	0.08	1,717
9	WS9	Timber Plantation	fibric	206	23	45	0.20	0.09	1,513
10	AM15	maize/cassava	hemic	110	19	47	0.16	0.07	849
11	WH10	Mix Garden	hemic	739	27	43	0.19	0.08	6,737
12	M2	Mix Garden	sapric	66	20	46	0.20	0.09	587
13	M4	Mix Garden	sapric	116	11	52	0.15	0.08	853
14	M5	Mix Garden	hemic	60	9	53	0.15	0.08	432
15	AM10	Oil Palm	fibric	626	3	57	0.11	0.06	3,921
16	AM17	Oil Palm	fibric	660	15	49	0.14	0.07	4,226
17	AM18	Oil Palm	hemic	657	2	57	0.10	0.06	3,888
18	AM19	Oil Palm	hemic	600	3	56	0.08	0.05	2,749
19	WJ14	Oil Palm 1,5 th	hemic	88	31	40	0.22	0.08	377
20	WH4	Oil Palm 12th	fibric	367	19	47	0.16	0.08	2,757

21	AM20	Oil Palm 1997	hemic	213	9	53	0.09	0.05	988
22	M1	Oil Palm 2 th	hemic	175	25	43	0.10	0.04	720
23	M3	Oil Palm 2 th	Sapric	67	46	31	0.23	0.06	440
24	AM21	Oil Palm 2003	Hemic	595	5	55	0.11	0.06	3,552
25	AM22	Oil Palm 2008	Fibric	483	10	52	0.15	0.08	3,582
26	AM23	Oil Palm 2010	Fibric	455	4	56	0.11	0.06	2,321
27	WH5	Oil Palm 5 tahun	Fibric	283	14	50	0.11	0.05	1,373
28	WJ2	Oil Palm 5 th	Fibric	223	30	41	0.12	0.06	646
29	WJ4	Oil Palm 6 th	Fibric	144	16	49	0.20	0.10	1,453
30	WH2	Oil Palm 6th	Sapric	128	27	42	0.20	0.08	1,088
31	WS10	Oil Palm 7 th	Fibric	180	22	45	0.14	0.07	1,054
32	M6	Oil Palm 8 th	Sapric	50	14	50	0.17	0.08	413
33	WJ12	Paddy field	Sapric	120	37	37	0.22	0.08	947
34	WH12	Pineapple	Sapric	70	45	32	0.30	0.09	580
35	AM1	Rubber	Sapric	332	17	48	0.15	0.07	2,199
36	AM12	Rubber	Hemic	222	16	49	0.16	0.07	2,104
37	WH11	Rubber 30 th	Hemic	230	34	38	0.25	0.09	2,106
38	WH6	Rubber 4 th	Fibric	582	7	54	0.10	0.05	2,819
39	AM11	Secondary Forest	Fibric	759	3	57	0.11	0.06	4,887
40	AM14	Secondary Forest	Fibric	240	12	51	0.13	0.07	1,701
41	AM16	Secondary Forest	Fibric	1100	37	37	0.19	0.07	7,455
42	AM2	Secondary Forest	Sapric	400	18	48	0.12	0.06	2,295
43	AM3	Secondary Forest	Sapric	242	16	49	0.23	0.10	2,675
44	AM4	Secondary Forest	Sapric	275	17	48	0.28	0.13	3,496
45	AM13	Shrub	Fibric	520	6	55	0.10	0.06	2,781
46	WH7	Shrub	Fibric	490	5	55	0.14	0.08	3,700

47	WH8	Shrub	Hemic	460	11	52	0.11	0.05	2,573
Mimika, Papua									
1	MW1	Sagoo Forests	Fibric	400	27	43	0.09	0.031	1249
2	MW 2	Sagoo Forests	Fibric	216	9	53	0.07	0.036	776
3	MW 3	Sagoo Forests	Fibric	296	10	52	0.08	0.040	1198
4	MW 4	Sagoo Forests	Fibric	178	8	53	0.07	0.035	62
5	MW 5	Sagoo Forests	Fibric	118	10	52	0.14	0.063	738
6	LM 1	Sago Forests	Fibric	300	52	28	0.20	0.05	1,336
7	LM 2	Sago Forests	Fibric	350	22	45	0.12	0.04	1,535
8	LM 3	Mixed Forests	Fibric	72	52	28	0.19	0.04	259
9	LM 4	Sago Forests	Fibric	250	10	52	0.06	0.04	909
10	LM 5	Sago Forests	Fibric	375	13	50	0.07	0.03	1,106
11	LM 6	Sago Forests	Fibric	50	48	30	0.11	0.03	155
12	LM 7	Sago Forests	Fibric	50	13	51	0.11	0.05	266

Table 6 . Summary of carbon stock-related peat properties at the observation points in Jambi and Papua.

Location	Peat Thickness (cm)	Ash Content (%)	COrg (%)	BD (g/cm3)	Corg (volume based) (Mg/m3)	C Stock (Mg/ha)
Jambi						
Max	1100	46	57	0.40	0.16	7455
Min	50	2	31	0.08	0.04	377
Mean	332	17	48	0.17	0.08	2282
Papua						
Max	400	52	53	0.20	0.06	1535
Min	50	8	28	0.06	0.03	155
Mean	221	23	45	0.11	0.04	846

Recently, attention on emission reductions from land use/land-use changes has focused on Papua as a potential area for future agricultural development. The few samples at the Mimika site do not represent the condition for all of Papua (Figure 15). Therefore, this initial result identifies the need for a wider survey of Papua to provide a better representation of the actual conditions.

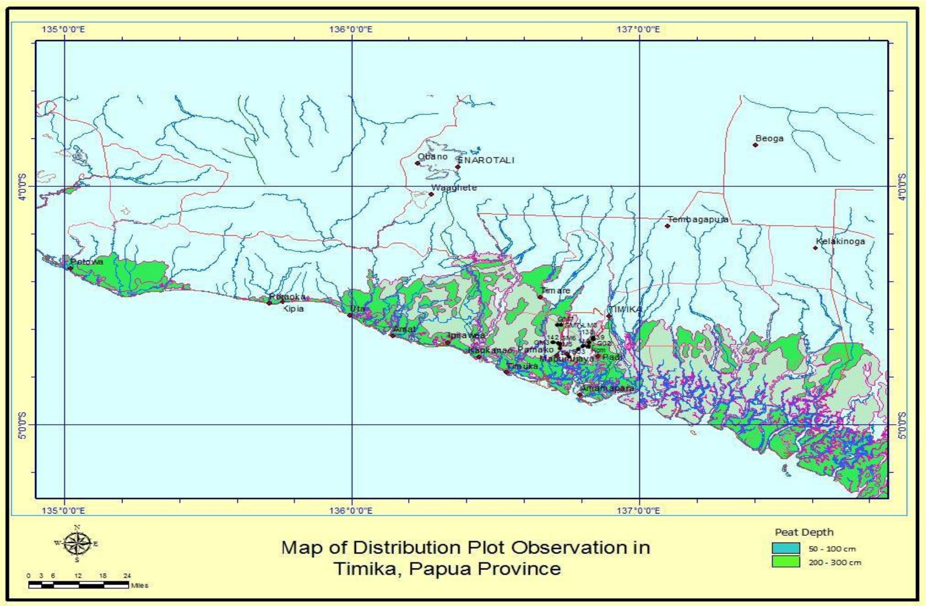


Figure 15. Peat thickness distribution in Mimika District, Papua Province (Wahyunto et al. 2005

Table 7. Carbon-stock-related peat properties for the study sites by peat depth in Muaro Jambi and Tanjung Jabung Timur, Jambi Province

Peat maturity	Basic density (g/cm3)	Ash content (%)	COrg (%)	Corg (Mg/ha)
FIBRIC (n = 143)				
Average	0.124	14	50	0.061
Standard Deviation	0.054	14	8	0.025
HEMIC (n=139)				
Average	0.154	13	50	0.072
Standard Deviation	0.097	16	9	0.035
SAPRIC (n=142)				
Average	0.175	14	50	0.080
Standard Deviation	0.105	16	9	0.030

Table 8. Carbon stock related peat properties for Sumatra and Kalimantan (Agus et al. 2011).

Peat maturity	Basic density (g/cm3)	Ash content (%)	COrg (%)	COrg (Mg/m3)
FIBRIC (n=756-788)				
Average	0.097	7	53	0.049
Standard Deviation	0.059	11	7	0.025
HEMIC (n=998-1023)				
Average	0.124	10	52	0.060
Standard Deviation	0.078	13	8	0.028
SAPRIC (n=321-341)				
Average	0.175	11	49	0.083
Standard Deviation	0.079	14	8	0.032

2.1.3.4.7. Peat chemical properties

Various variables associated with soil chemical properties, ranging from macro- to micro- elements were analysed, but not all showed a clear pattern. An example of the soil chemical properties by soil depth is presented in Figure 16. Bray 2 P in the 0-20 cm layer was higher for the cultivated peatlands (oil palm plantation, acacia and rubber). The pattern was rather unclear for deeper soil depths. The N content was highest in the surface layer of oil palm plantation and this may be attributed to nitrogen fertilisation.

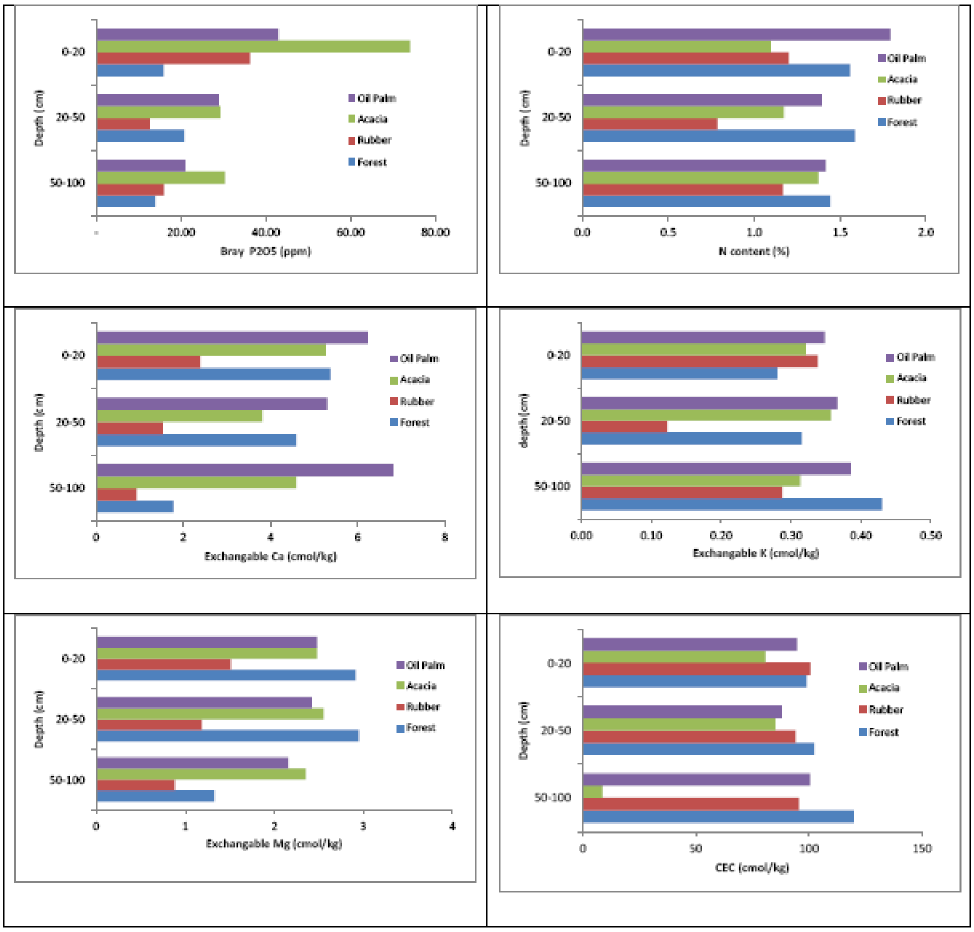


Figure 16. Selected chemical properties of peat under different land uses

2.1.3.4.8. Peat thickness, maturity and water table under different land uses

The peat at the study site in Mimika, Papua was relatively thinner (50-400 cm) and relatively immature (fibric) compared to that in Jambi Province where the thickness ranged from 300 to 600 cm and the peat was relatively more mature, especially in the surface layer. At some sample points in Jambi, the peat thickness exceeded 11 m (Table 5, point AM 15). There was a tendency for peat that had been under oil palm and rubber plantations for several years to become more mature (sapric and hemic) in the upper 50 cm layer.

2.1.3.4.9. Jambi sites

Among the observed areas in the two districts of Jambi, oil palm plantation coincided with 19 observation points (sites) and 21% of these points fell on sapric peat with a thickness of less than 200 cm, 32% on hemic peat with a thickness of 40-650 cm and 47% on fibric peat with a thickness of 140-600 cm. In general, fibric and deep peat under plantation were associated with relatively new oil palm plantation development (less than six years old). Older plantation usually had more mature peat in the surface layers.

It appears that the previous development of oil palm plantation has not conformed to Presidential Instruction No. 32/1990 which limits the use of thick peat (more than 300 cm) to conservation. A more recent regulation, Agricultural Minister Decree No. 14/2009, allows oil palm plantation to be established on sapric and hemic maturity peats less than 300 cm thick. This study shows that some oil palm plantations were developed on deep and fibric maturity peat. During the time of the survey, the water table depth in the primary and secondary drainage canals of oil palm plantations ranged from 20 to 80 cm below the soil surface while at the sample points in Jambi, the water table ranged from 20 to 65 cm below the soil surface. The primary and secondary canals appeared to be 1.5-2.5 m deep, but field drainage was between 50 to 80 cm depth which is close to the best management practices as stipulated in Ministerial Decree No. 14/2009.

Rubber plantations were also found on peatland with the thickness varying from 200 to 580 cm and maturity ranging from fibric to sapric. The instantaneous water table depth at the time of survey ranged from 5 to 80 cm. The drainage depth of the rubber plantations in general was shallower than for oil palm plantation. This keeps the water table relatively higher.

Most of the observed peat within the protection area had sapric or hemic maturity with more than 2 m thickness and a water table at about 50 cm at the time of survey. Peat maturity within the secondary forest ranged from sapric to fibric and the thickness ranged from 240 to 1100 cm and the water table was 5-120 cm below the soil surface. Timber plantations had fibric to sapric maturity, a peat thickness of 100-687 cm and the water table was about 60 cm due to the influence of a tertiary drainage canal with water table of no more than 80 cm.

Peat under shrubs had hemic and fibric maturity with the thickness ranging from 460 to 520 cm and the water table varied from 40 to 120 cm. This area seemed to be located in the peat dome with naturally smaller tree stands due to poor soil fertility. Peat under home gardens and annual food crops (pineapple, maize, cassava, rice, and mixed garden) had hemic or sapric maturity in the surface layers and a peat thickness of 60-739 cm and a water table that was less than 100 cm. Under the mixed farming system, we found a deeper water table depth (110-150 cm), but the number of samples representing this land-use type was small.

2.1.3.4.10. Papua Sites

Most areas at the study sites in Mimika, Papua were used for traditional sago plantation which is adaptable to the flooded, undrained conditions. As a result, the water table was less than 40 cm below the soil surface and one observation point (MW1) was submerged under 30 cm of water.

This research has increased the data availability for peatland in Tanjung Jabung Timur and Muaro Jambi, Jambi Province and to a lesser extent in Mimika, Papua Province. The maps at a 1:250,000 scale that were based on Landsat TM data almost a decade old compared to the current situation, coupled with the limited field checks, showed discrepancies with the actual field measurement in terms of peat depth, maturity and carbon stock. Therefore, this older map should only be used for planning field surveys. For the sub-national level assessment of carbon stock, intensive measurement of peat thickness and maturity by depth and a less intensive sampling scheme for peat depth, maturity, bulk density and carbon content will be imperative. Time series inventory of carbon stock can be done using peat thickness and maturity as proxies.

This C-stock estimate can be improved as the databases on peat maturity and volume-based C-stock are developed for each representative site.

In general, peats on the study sites in Jambi had been consolidated and thus had a higher bulk density and volume-based C-content compared to the average values of these two variables for Sumatra and Kalimantan. Peats in Mimika were mostly used for sago which does not require drainage. This has kept the peat at a very low bulk density with a low carbon content per unit volume. There was a slight improvement in the soil fertility (especially in terms of N and Bray 2 contents) in the upper layer of peat in Jambi that was used for plantation or timber plantation. However, most other chemical properties did not show a clear pattern.

Figure 17. Peat survey in Jambi (a) Uploading survey tools to a canoe on the Batang Hari River in Jambi. (b) Water transportation on a canoe to the site, (c) Carrying the tools to the sample site, (d) Operating the peat auger, (e) Sample in the peat auger showing the transition of peat with white clay underlying material, (f) Evaluating peat maturity and packaging the samples

2.1.3.5. WP 2.2 Formal Training for NGO and Government partners

One of the major activities during the first year of ALLREDDI implementation is conducting the five formal trainings on Rapid Carbon Stock Appraisal in five regions:

1. Banjarbaru, South Kalimantan province, 13 - 18 April 2009
2. Gorontalo, Gorontalo province, 27 -30 April 2009
3. Palembang, South Sumatera province, 15 – 19 June 2009
4. Pasuruan, East Java province, 26 – 30 October 2009
5. Papua province, 26 -30 October 2009

These trainings are implemented under work package 2 (WP2) that is coordinated by Brawijaya University. Ditjen Planologi Kehutanan under its coordination with the hosting Regional Offices organized the trainings. Within these activities we conducted class lectures, exercises in the fields and data analysis. The methodology that is shared is packaged under Rapid Carbon Assessment (RaCSA) tool which has been developed by ICRAF and widely applied in tropical countries, especially where mosaic lands are extensive. RaCSA embraces all carbon pools as specified by IPCC: above-ground and below-ground biomass, necromass (dead organic matter), soil organic matter and soil carbon. In Indonesia, which borne most tropical peatland in the world, measurement of carbon stock in peatland is extremely important. Therefore, the RaCSA guidelines were complemented with guideline on C stock assessment for peat. The trainings cover measurement both for mineral soils and peatland, with field exercises on the two ecosystems wherever the field condition allows. In Banjarbaru and Palembang the trainings included peatland field exercises but in Gorontalo, since there is no peatland exist, the subject on peatland was only provided in the classroom but the field exercises were only conducted on mineral soils.

In measuring C-stock at landscape level, understandings of landscape level such as portfolios of land use/cover that are dominant in the regions, the land use/cover changes and the drivers of the changes was discussed. In addition to that, factors that significantly determine C-stock other than land use/cover per se, such as agro climate and management types of tropical landscape areas are important to note in terms of designing the sampling to minimize uncertainty. A proper stratification and sampling scheme will be essential in determining the plot samples. A working group discussions and presentations were used as a mean of learning as input to WP1 in terms of deciding on classification schemes to be used for satellite image interpretation. All the sessions encourages active discussions and information and experience sharings among participants and resource persons.

Training on C-stock measurement conducted at provincial level, organized by Forest Regional Offices (BPKH) under the Directorate General of Forest Planning, Ministry of Forestry and coordinated in the technical aspect by Brawijaya University. Participants came from various organizations as follows: officers of BPKH from the closest regions, relevant NGO around the sites, representatives from forest office (Dinas Kehutanan) and agriculture office (Dinas Pertanian), local universities and other interested parties, e.g., research institutions, with their own source of funding support.

Table 9. Number of Participant at Rapid Carbon Stock Assessment in 5 areas

Location	Female	Male	Total Participant including trainers	Participating institutions
Banjarbaru	10	16	26	11 government offices, 1 university
Gorontalo	13	23	36	11 government offices, 1 university, 2 local NGO's
Palembang	15	26	41	14 government offices, 1 university, 1 local NGO
Pasuruan	13	22	35	12 government offices, 2 universities, 1 local NGO
Papua	11	28	39	10 government offices, 2 universities, 3 local NGO's

A team of resource persons consists of people from different institutions with various complementary expertises. Three resource persons from ICRAF (led by Dr. Sonya Dewi) covered the spatial landscape assessment component, four resource persons from Brawijaya University (led by Prof Kurniatun Hairiah) focused on carbon measurement above ground and below ground in mineral soil, two resource persons from ICALRRD (led by Dr. Fahmuddin Agus) provided the detailed carbon measurement methodology on peat land and Ditjen Planologi Kehutanan (led by Mr. Saipul Rahman) contributed to satellite image analysis methodologies. During the training, one GPS receiver was distributed to each BPKH office at the region, one set of Peat Auger for each region (except for Gorontalo and Pasuruan that do not have any peatland areas in their regions), and manuals on carbon assessment on mineral soils and peatland written by colleagues from Brawijaya University and ICALLRD.

In general the training course in every location was successful. Within four to five days participants learned the RaCSA tool and able to estimate the carbon stock from plot level into landscape level, although, some participants indicated that further training on spatial analysis is still needed. Most participants highly appreciated the training content and methods with a friendly atmosphere. The field exercise played an important role in helping participants to further understand the introduced tools and methods. From three trainings, the participants identified three important achievements: (i) improvement of technical capacity in C accounting and monitoring, (ii) awareness on climate change, climate change mitigation mechanisms and carbon trading issues such as REDD and CDM and (iii) establishment of network and linkages of networks within and between sub-national and national communities who are active in climate change issues.

From our evaluation for all areas, mostly participants stated that the materials given during training were usefull, up-to date and it was delivered clearly. The technique introduced to participants was relatively easy and do able, but for carbon measurement and carbon accounting they participant stated still very new issue. The participants indicated themselves that they need more time to understand about carbon stock related to climate change and hopefully there will be following activity after the course.

Hence, those participants from all areas suggested to established national carbon network to facilitate participants with up to date issue related to carbon sequestration, sharing research results to avoid any repetition.

Most participants highly appreciated the training content and methods with an informal and friendly atmosphere. The field exercise is important to clarify theory given in the class resulting better understand of participants to the new tool. During evaluation of the training by participants useful lessons learnt were drawn after the field work.

In general, below are several suggestions from all participants from whole areas:

1. Duration of traning was too short as compare to the number and complexity of topics reviewed during the training
2. Provides a simple, complete and comprehensive manual of carbon training
3. Definition of relevant variables should be included

4. Taxonomist and local resource persons who are experts in tree identification are needed for finding wood density from data base
5. Broader participants to other relevant departments (e.g. mining, estates and agriculture)
6. Training on spatial analysis with using geographic information system and remote sensing (GIS/RS) suggested to be conducted in the future separately from carbon measurement at plot level
7. Develops mailing list for participants and trainers is needed for better communication for future
8. To reduces uncertainty in peat classification either fabric (young), hemic(medium) or sparic (old), it suggested to be done by one person
9. Measurement C stock in peat land is expensive, using simulation model in combination with field measurement may help to reduces budget for chemical analysis

Figure 18. Carbon Training in Pasuruan

Figure 19. Plot setting and measuring tree biomass as part of field activity on mineral soils

In relation to WP1, in-house training on remote sensing interpretation was conducted for partners from Ditjen Planologi. The training was focused on the use of object based-hierarchical classification method for land cover mapping. Object based method, which is one of the most progressive image interpretation approaches in remote sensing discipline, were used in the process of producing wall-to-wall time series land cover maps of Indonesia. The training was not only successful in introducing advanced method of image interpretation to partners, but also necessary in providing two Ditjen Planologi staffs some technical skills to work with the specific software, eCognition, to design image interpretation schemes and to assess of the quality of land cover map produced. The skill is pre-requisite towards work synergy between ICRAF and Ditjen PLanologi and consistent joint products.

2.1.3.6. WP2.3. Developing curricula for the education centres of the Forest Department and universities to ensure long-term sustainability

After the project was approved by EU in January 2009, there were 6 steps that were followed (Figure 8).

Step 1: Organizing a meeting on 20 February 2009 at the ICRAF office to discuss the technical work plan, identify gaps in technical skills and infrastructure, finalize the budget and general discussion on technical aspects. The meeting was attended by all partners (Ditjen Planologi, ICALRRD and Brawijaya University-UB). During the meeting, participants from Ditjen Planologi identified that their staff needed to improve their knowledge and skills with regards to climate change, causes and impacts of climate change, solutions and carbon measurement. As a meeting output, the curriculum/TOR of the training was developed.

Step 2: Preparation of training material involved collecting publications and research reports included the manual on carbon measurement i.e. Rapid Carbon Stock Appraisal (RaCSA) which had been developed by ICRAF and was widely applied in tropical countries, especially where mosaic lands are extensive.

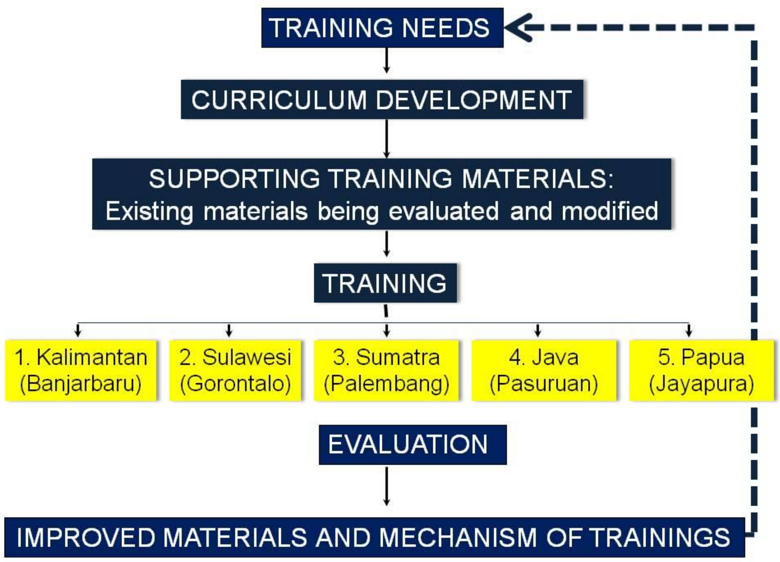


Figure 20. Mechanism of development of technical capacities at national and sub-national level

Step 3: Training on carbon stock (C-stock) assessment was implemented at five sites—namely, Papua (held in Jayapura), Sulawesi (Gorontalo), Kalimantan (Banjarbaru), Sumatra (Palembang) and Java (Pasuruan). Training on C-stock measurement was conducted at the provincial level, organized by regional forest offices (BPKH) under the Directorate General of Forest Planning, Ministry of Forestry with technical coordination by Brawijaya University. Participants came from various organizations: BPKH in the closest regions, relevant NGOs around the sites, the forest office (Dinas Kehutanan) and the agriculture office (Dinas Pertanian), the local university and other interested parties, e.g., research institutions, with their own source of funding support. The total number of participants at each training course ranged from 30 to 50 people.

In the context of national C accounting and monitoring systems, skill improvement on the estimation of carbon emissions at the landscape level was needed. The three subjects taught were spatial landscape carbon assessment (led by ICRAF), estimation of carbon stocks at the plot level on mineral soil (led by UB) and peatland (led by ICALRRD). Within these activities, we conducted class lectures, field exercises and data analysis. RaCSA embraces all carbon pools as specified by IPCC: aboveground and belowground biomass, necromass (dead organic matter), soil organic matter and soil carbon. The training covered measurement of both mineral soils and peatland, with field exercises on the two ecosystems wherever the field conditions allowed. At three sites (Jayapura, Banjarbaru and Palembang), the training included peatland field exercises but this was not possible at Gorontalo and Pasuruan, because there was no peatland nearby. Therefore, at the latter two sites, the subject on peatland was only provided in the classroom. Detailed activities in each training course were reported in 2009.

Step 4: Based on the results of the training evaluation by all participants, it was found that within four to five days, participants were able to estimate carbon stocks at the plot level and extrapolate to the landscape level. However, some participants indicated that further training on spatial analysis was still needed. Most participants greatly appreciated that the training content and methods were simple and "do"able with a friendly atmosphere. The field exercise played an important role in helping participants to further understand the introduced tools and methods. From the five training sessions, the participants identified three important achievements: (i) improvement of technical capacity in C accounting and monitoring, (ii) awareness on climate change, climate change mitigation mechanisms and carbon trading issues such as REDD and CDM and (iii) establishment of a network and linkages of networks within and between sub-national and national communities who are active in climate change issues.

Step 5: Developing training material.

The sustainability of this activity is dependent on the availability of clear guidelines, competent resource persons and training material. Some teaching material has been developed already and a list of products is presented in Table 10. A soft copy (written in Bahasa Indonesia) has been developed of the four series of lecture notes—namely, climate change; its impact on humans and the environment; and solutions for reducing emission of green house gasses.

Table 10. List of teaching materials developed through WP2 activity

No	Materials	Authors	Status
1	Four series of lecture notes related to climate change, its impact on humans and the environment, and solutions for reducing emission of green house gasses		Completed
2	Petunjuk Praktis Pengukuran cadangan karbon. Dari tingkat lahan ke bentang lahan	Kurniatun Hairiah1, Andree Ekadinata2, Rika Ratna Sari1 dan Subekti Rahayu2	Published. Book launch held in Jakarta, 23 October 2011 (Figure 8)
3	A manual. Measuring Carbon Stocks across Land Use Systems	Kurniatun Hairiah1, Sonya Dewi2, Fahmuddin Agus3, Sandra Velarde2, Andree Ekadinata2, Subekti Rahayu2 and Meine van Noordwijk2	Published. Book launch held in Jakarta, 23 November 2011 during final project workshop
4	Pengukuran cadangan karbon tanah gambut	Fahmuddin Agus3, Kurniatun Hairiah1, Anny Mulyani3	Published. Book launch held in Jakarta, 23 November 2011 during final project workshop

1): University of Brawijaya, Malang; 2): The World Agroforestry Centre, ICRAF; 3): ICALRRD, Bogor

Figure 21. Book launch of the Manual on Carbon Stock Measurement held in Manggala Wanabakti, Jakarta, 23 September 2011

2.1.4. WP3. REDD mechanisms in five pilot areas in western, central and eastern Indonesia

2.1.4.1. WP3. Towards REDD mechanism in 5 pilot sites in western, central and eastern Indonesia

Post Indonesia's commitment to reduce national emissions by 26% by 2020, the Indonesian government has been putting effort nationwide into developing strategies towards achieving the target. Being the third largest world emitter in the LULUCF sector, there are big challenges facing the country to cut emissions and to incorporate emission reductions in "low emission development planning" throughout the country, including at the sub-national level. To ensure appropriate planning at the national as well as sub-national levels, strong commitments from the related stakeholders and in-depth knowledge on mitigation efforts such as Reducing Emissions from Deforestation and Forest Degradation (REDD) are crucial. The ALLREDDI project, through its activities in WP3, has tried to make a contribution to both national and sub-national government activities in preparing strategies to cut emissions from the LULUCF sector, while also trying to embed understanding that national and local development and the welfare of the people should still be well recognized.

To achieve the overall objective, a capacity building workshop was conducted at the five sites which aimed to: 1) improve the understanding of different stakeholders on various issues and strategies pertaining to REDD policies at the national level and the impact on the provincial and district levels; 2) obtain common understanding on the drivers and underlying causes of land-use change in the respective areas; 3) achieve common understanding on the strategies and scenarios for low emission development planning; and 4) achieve understanding on the synergies between emission reduction targets and current provincial/district medium-term development planning (RPJMD).

Workshops were held from June to October 2010 and were mainly organized by ICRAF's partners in the respective provinces/districts, for both government officials as well as local NGOs. We tried to engage as many stakeholders as possible to participate in the workshops, and as a result, a wide range of stakeholders have participated, from local government officials (provincial and district level), university communities (academics and researchers), NGOs, business associations and the private sector.

The workshop was structured into three major activities: (1) presentations from key speakers; (2) simulation of low emission development strategies in the form of an REDD game; and (3) focus group discussions (FGD) for different objectives.

2.1.4.1.1. Presentations

Presentations from the ICRAF speakers mainly touched on the current issues related to climate change and REDD, the methodology of carbon accounting (RACSA), results on the land use change analyses of the respective province/district and also on GAMA-NAMA-LAAMA.

Figure 22. REDD strategy workshop in Papua

2.1.4.1.2. Exercise on emission reduction simulation

After the series of presentations, a training session on the simulation of low emission development strategies was conducted for the purpose of improving participants' understanding on how carbon and emissions can be accounted for in land-use change activities. The materials used in the training involved a miniaturized landscape of simplified land use types in two time series datasets (2000 and 2010), as well as emission factor data for each type of land use change. Participants were asked to calculate areas of land use change and the amount of carbon stock accumulated/emitted. Participants were then challenged to simulate emission reduction plans in response to the national emission reduction commitment. This step involved calculations and manipulation of the previous plan so that "business as usual" (BAU) was in line with achieving the emission reduction target.

2.1.4.1.3. Discussions on the drivers of land use change and towards REDD feasibility

A focus group discussion (FGD) methodology was used to facilitate rapid gathering of information, to stimulate effective discussion, to crosscheck information and to build partnerships among stakeholders. Two main sessions of FGD were conducted in the workshop as explained briefly below.

- The first FGD was conducted to identify the drivers of land-use change with the specific objectives to: 1) identify historical land use/cover changes and the underlying causes of changes; 2) understand the major sub-sectors of land-use activities related to land cover change; and 3) identify future changes based on the current trends and/or planning. In order to facilitate common perspectives and opinions on addressing the FGD objectives, the groups were formed based on participants' institutional background (government officials, university community, etc.). Panel discussions across groups were conducted.
- The second FGD was on "Low-emission Development Strategies" at the local level. Groups were formed similar to those in the first FGD, and based on the results of the Drivers of Land Use Change session, participants were engaged in further discussion focusing on emission reduction and feasible REDD scenarios. The exercise utilized visual aids of the 'REDD Feasibility Quadrant' to assist participants in their assessment and strategy-building activities. Roles of certain land use activities were connected not only to economic importance and the consequences on CO_2 emissions, but also to ecological importance, livelihoods of local or indigenous people and sustainable forest management of the areas where the development was planned.

In the final session of the workshop, the provincial/district planning agency (BAPPEDA) was invited to present the medium-term development plan (RPJMD) and the local level spatial plan (RTRWP). These presentations were very useful to get an understanding and initial sense of how low emission development pathways could be implemented through mitigation action such as REDD+ that could be synergized into the local development plan.

2.1.4.1.4. Statistics on participation

In total, 184 participants from non-government offices, government universities and private companies attended (Table 11). In general, the participants were very pleased with all of the workshop programs. Participants considered that it was very useful for them to understand climate change and REDD issues, since they are relatively novel ideas for local stakeholders and information on them has not been properly disseminated through the formal structures. In addition, participants also perceived that the workshops had brought them new insights on how local-level development should be planned and implemented in the future.

Table 11. Number of participants at workshops held at the five sites

Site	LSM	Government	University	Private Company	Total
Gorontalo	5	32	6	2	45
South Kalimantan	6	18	6	-	30
Pasuruan	2	18	4	8	32
Papua	17	21	4	2	44
Jambi	2	23	6	2	33
Total	32	112	26	14	184

2.1.4.2. WP3.1 Identification of the drivers of land use/cover changes in different forest transition stages in Indonesia, with attention to the local representation of global drivers (including trade regimes) and to in-country migration in response to unequal economic opportunities

2.1.4.2.1. Land use changes in different forest transition areas and the drivers of changes

As presented in Section WP1.1, different parts of Indonesia belong to different forest transition stages. Some areas are well advanced on the gradient, such that they have reached the reforestation/afforestation stage, and some are in the early stages, where deforestation and forest degradation are predominant. The five sites within the ALLREDDI project were selected to represent the various stages along the gradient (Figure 23).

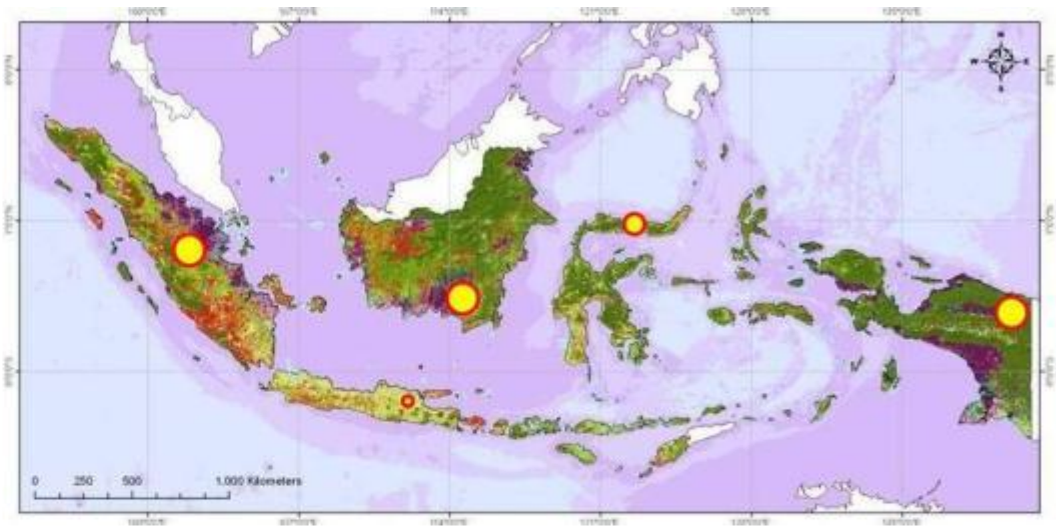


Figure 23. Five sites in the ALLREDDI project

Forest transition is normally a response to the drivers of the changes which can be constituted into endogenous socio-ecological feedback as well as exogenous triggers (Rudel, 2005; Lambin and Mayfroidt, 2009). Within the forest transition gradient, land cover changes serve as internal dynamics which might lead to forest recovery.

Land cover change analyses have been conducted at the five sites and were presented to and discussed with local stakeholders through workshops at the sites (section WP3.1). Within the ALLREDDI project, drivers of land use changes were analyzed both by a participatory approach as well as based on empirical evidence. In this report, the results of driver analyses are presented based only on the participatory approach from the FGD activity conducted at the five sites. The specific foci of the FGD were to: 1) identify historical land use/cover changes and the underlying causes of changes; 2) understand the major sub-sectors of land-use activities related to land cover change; and 3) identify future changes based on the current trends and/or planning (see FGDs in section WP3.1).

2.1.4.2.2 Land covers changes and identification of drivers at the five sites

Land cover change analyses were conducted based on the three-time-series land cover maps of 1990, 2000 and 2005 (see section WP1.1). The preliminary results of land cover changes along with the drivers of the changes identified by the various stakeholders are presented in the following section.

2.1.4.2.2.1. Papua

Papua province represents the early stage of forest transition as it has the largest span of forest as at 2005 (26 M ha), covering more than 80% of the province. Forest loss, or deforestation, in Papua, is marked by the low rate of forest loss (less than 1% per year) throughout the 15 years of observation (1990-2005). Forest degradation increased in the two change periods, with annual rates of 0.5% for 1990-2000 and 2.6% for 2000-2005. (Figure 24). Areas of shrubby vegetation also indicate an increase.

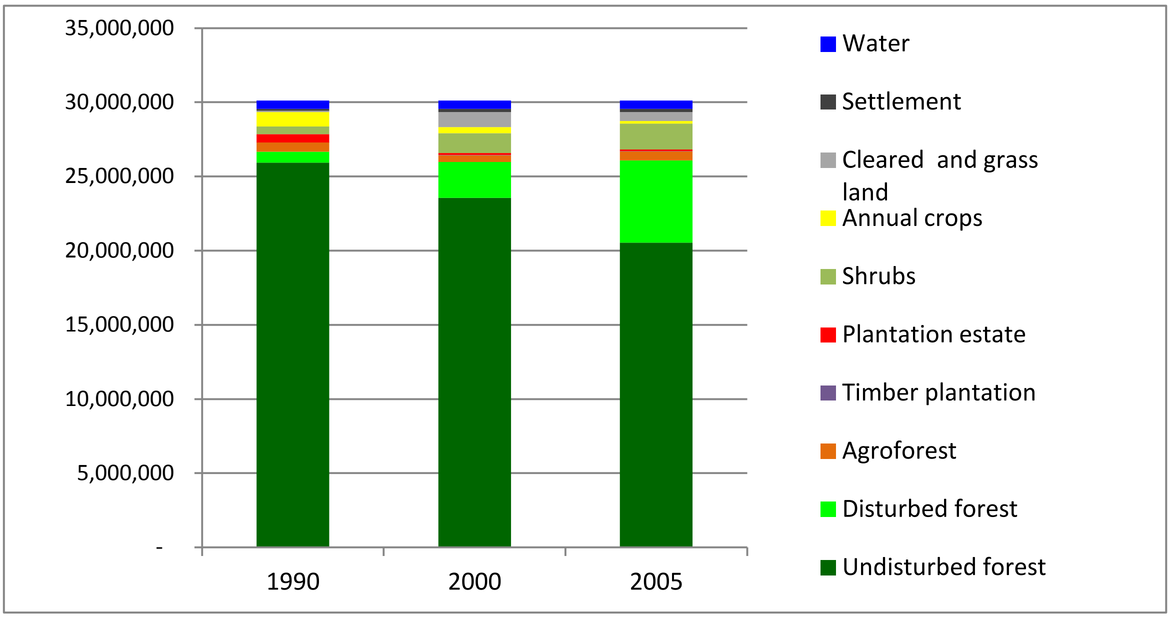


Figure 24. Time series of land cover areas and proportions in Papua

The major driver of changes to the forest in Papua as suggested by all stakeholders was regional revenue, which has led to concession permits for timber extraction/logging. Major activity since the 1980s was large scale logging, while in the 2000s, development of timber plantations started to dominate. Oil palm plantation establishment was also identified as a major development activity since the 1990s. Despite the arguments, evidence shows that such plantations only occur in small areas in this province, relative to the growing areas of logged forest. Another development activity that has captured discussions among the stakeholders was the development of built-up areas due to the sub-division of the current administrative areas (*pemekaran*). The establishment of new districts *(kabupaten)* has triggered various development plans, for both the economic sector and for infrastructure, which have been at the expense of forest areas through clearing and/or conversion.

2.1.4.2.2.2. Gorontalo

In Gorontalo, the 2005 forest cover was approximately 57%, totaling 739,000 ha. Annual forest loss was 2.3% for 1990-2000 and 0.9% for 2000-2005. The major changes in this province have been the establishment of agricultural crop areas (dominated by maize) and plantation estates. The area under agroforestry has been relatively stable throughout the periods of observation.

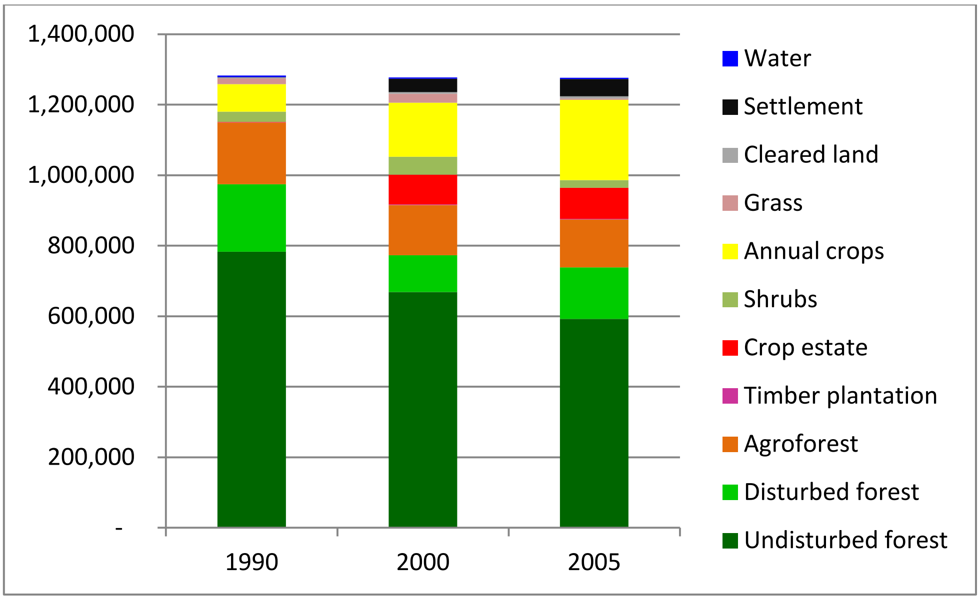
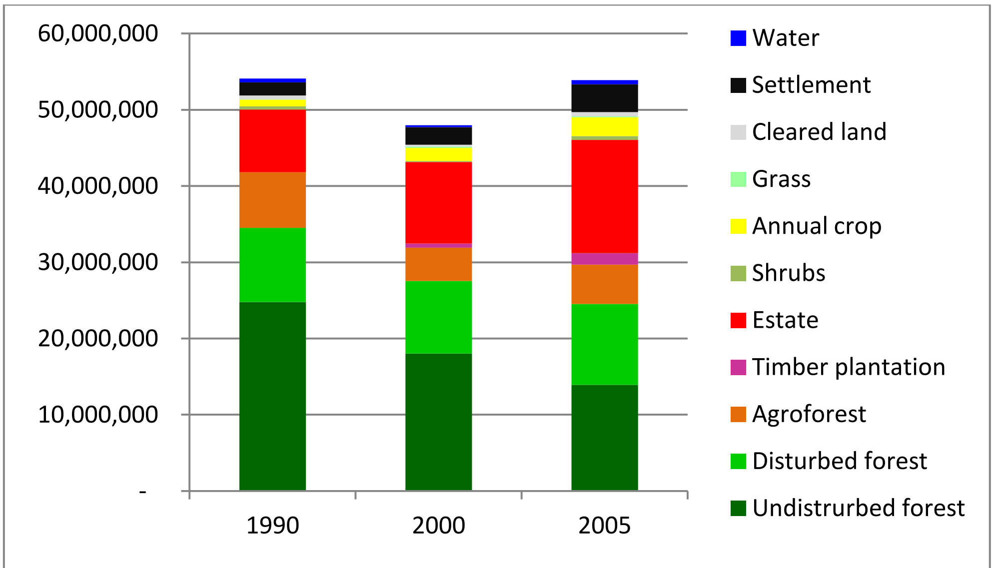


Figure 25. Time series of land cover areas and proportions in Gorontalo

Large establishments of maize-based cropland were part of the regional economic strategies during the 1990s and early 2000s. The promotion of maize was accompanied by other related infrastructure allowing direct export trade to Thailand as the biggest market. A large proportion of cropland establishment was from disturbed forest, presumably from the logged forest areas.

2.1.4.2.2.3 Jambi

In Jambi province, forest covers 45% of the total area and the annual rate of deforestation was 2% for the two change periods and the rate of forest degradation was between 1.4% and 1.9%. Land cover changes in Jambi have been dominated by plantation estates, mainly rubber and oil palm.



Lower total area in 2000 is due to the large 'no data' areas in 2000 land cover map

Figure 26. Time series of land cover areas and proportions in Jambi

Stakeholders in Jambi identified logging concessions as the major forest extraction activity which was driven by the export trade for logs. Plantation establishment (mainly oil palm) was another major cause of forest clearing and it was both as a result of the regional policy to increase revenues as well as market mechanisms whereby private land owners were renting/selling their land to oil palm companies.

2.1.4.2.2.4. South Kalimantan

South Kalimantan has undergone more severe deforestation and forest degradation compared with the sites discussed above. As at 2005, the remaining forest was 28% of the total province area and the annual rate of forest loss was between 3.6% and 9.4%. The major types of land cover change have been the increase in shrubs for 1990-2000 and the increase in estates for 2000-2005 (Figure 27).

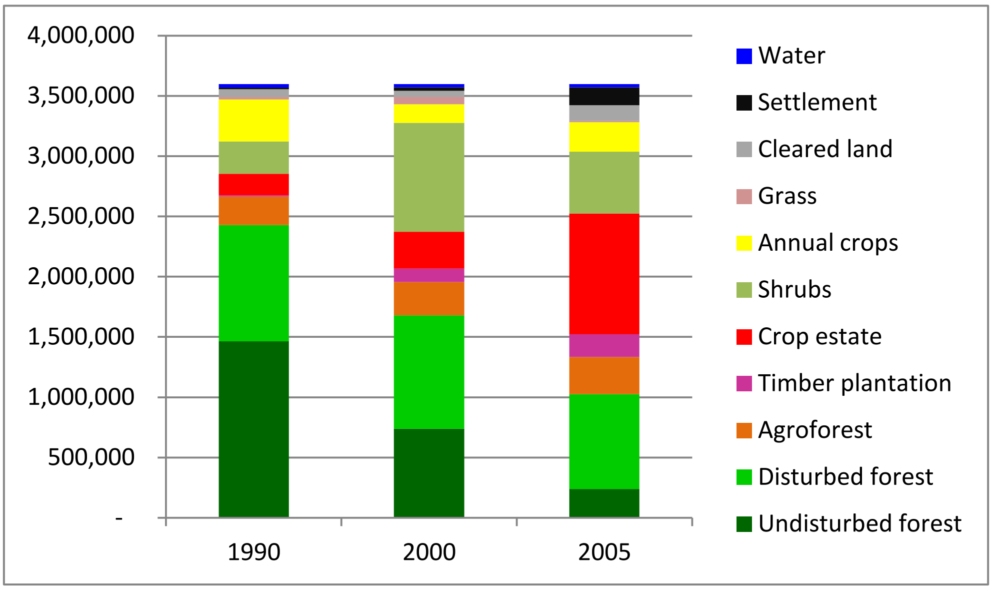


Figure 27. Time series of land cover areas and proportions in South Kalimantan

The increase in shrubs is likely to be associated with 'open' coal mining, while the increase in estates is dominated by the expansion of oil palm plantations. As identified by all stakeholders in the workshop, mining and oil palm plantations have been the source of the largest changes in many parts of the province. Coal deposits in South Kalimantan are some of the most extensive in Indonesia (Geological Resources Centre, 2006) and the establishment of coal mining is mostly undertaken as part of the national policy for national revenue as well as to supply electric power generation in Java. In addition, the establishment of oil palm plantations was considered as part of the strategies to increase provincial revenue in response to the CPO demands and the promising price/market.

2.1.4.2.2.5 Pasuruan

Pasuruan, which is located on the highly-populated island of Java, was the most advanced site with regards to the gradient of forest transition. Unlike the other four sites, it is the only site at the district (kabupaten) level, whereas the rest are at the provincial level. The dynamics of land cover changes at this site have passed through the period of deforestation and forest conversion at the primary stage, as this district is mostly undergoing intensification of agricultural land uses and the development of ‘built-up’ industrial areas. In some areas, planting of different timber species within the industrial forest plantation concession is also developing. For comparison purposes with the other sites, the remaining forest cover in Pasuruan is 6% of the district area and the average annual rate of forest loss ranged between 1.6% and 5.3% throughout the period of observation.

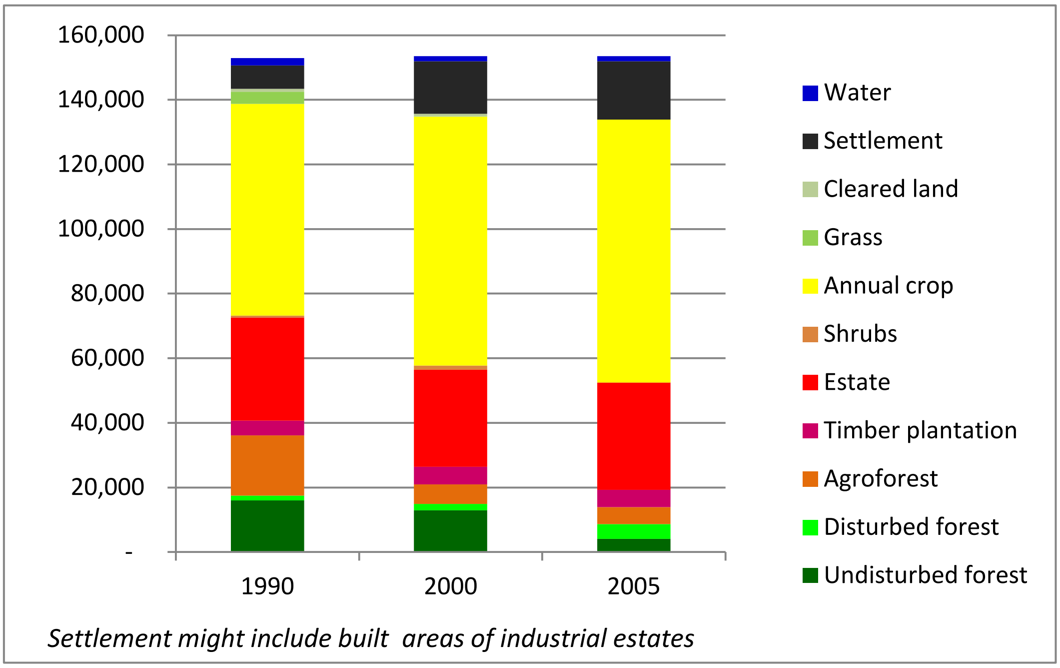


Figure 28. Time series of land cover areas and proportions in Pasuruan

As expressed by the various stakeholders in the FGD, during the 1990s, land use changes were driven by the need for cropland areas for food security, hence the expansion and intensification of agricultural crops. Population pressure, which is very common in Java, was a major cause for the increases of settlement areas. The industrial sector was also largely expanding, and since it needed cheap lands for estates, much agricultural land was converted into industrial estates. During the 2000s, land use change was driven also by various forestry policies which resulted in the development of timber plantations as well as forest rehabilitation, the latter being in the form of social forestry, mostly in the degraded areas.

2.1.4.3. WP3.2.Reconciliation of existing national and local development plans with emission scenarios

2.1.4.3.1. Participatory approach in the reconciliation for low development plan

Preparation of a national strategy to reduce emissions at the national level will also affect the sub-national strategy that requires an analysis of land use and land cover change incorporated with many aspects. The land cover change drivers for land developments vary locally. The drivers of emissions can include many land use-related activities such as forest degradation, mining, resettlement, infrastructure development, plantation expansion and others.

Considering the complexity of the problems in determining a reference emission from the national level down to the sub national level, it is necessary to create a strategy of reconciliation between the national and sub-national levels.

To seek understanding of the REDD strategy at the sub national level and to see how the strategy could reduce the conversion of high carbon land use at the five sites, FGD was conducted involving participation by the different relevant stakeholders (see general description in the main WP3).

Participants in each group would develop a matrix of changes/activities that identified the largest emitter(s) from land use change sectors accompanied with a map showing the location, time of change and driver factors. The next step was to create a ranking list of emission activities in all provinces.

In general, most stakeholders from the sites agreed that those activities that affected land cover change should be reviewed by the local government if they were going to be able to reduce emissions from the land use sector in future. Furthermore, based on those activities, the discussions involved local stakeholders' perspectives on how they would negotiate with the current level of emissions through the REDD feasibility quadrants. We divided the quadrant into four as follows:

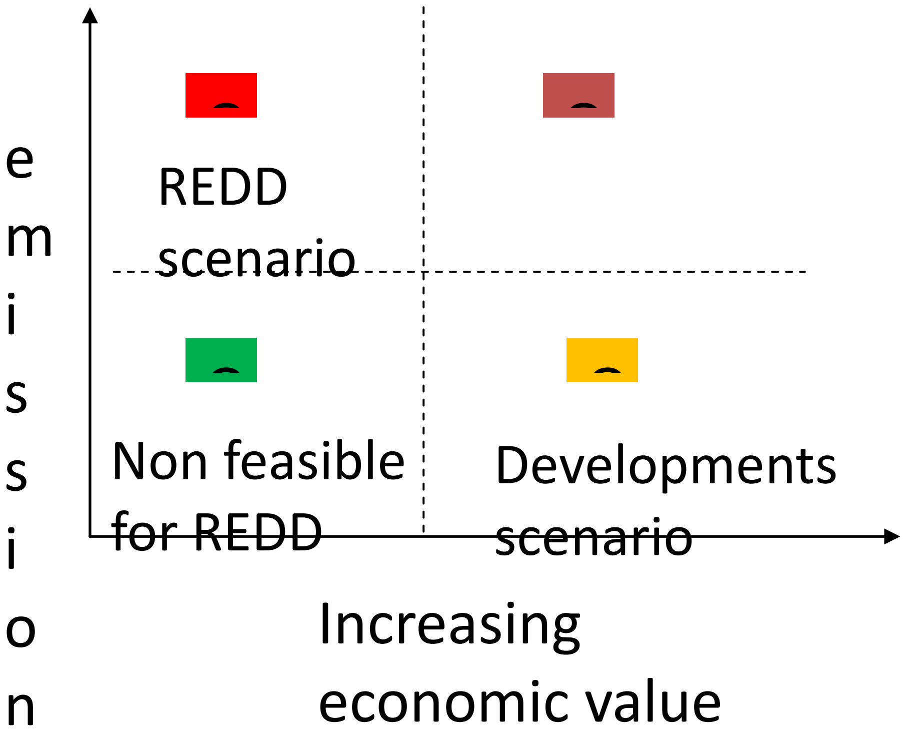


Figure 29. REDD quadrants

Q1= "Non-feasible for REDD", but may be negotiated to have REDD potential (due to the high emissions).

Q2= REDD feasible activities, high emission reduction is a must and the incentives are foreseen to be beneficial for increasing economic values.

Q3= "Non-feasible for REDD" but there is a need to increase economic value.

Q4= "Ideal" for development, both from the emission and economic perspectives.

Prior to the discussions on the REDD feasibility quadrant, it was important that the carbon content and economic value of each of the major land use types was understood by the participants. Carbon stock values used a rough estimate based on the ICRAF carbon database, and the economic value used hypothetical scores of 1-5. In addition, participants were encouraged to consider other values such as ecological values (other than carbon), local livelihood, values for the local indigenous community, and consideration of sustainable forest management.

2.1.4.3.2. The results of FGD in reconciling low emission plan

The first step towards reconciling the low emission development approach at the sub national level involved identifying the biggest sources of emissions as expressed by the stakeholders in the workshop. A summary is provided in Table 12.

Table 12. Sources of emissions at the five sites of the project

No	Source of emissions (Activity factors)	Jambi	South Kalimantan	Pasuruan	Gorontalo	Papua
1	Plantation	*	*		*	*
2	Mining	*	*		*	*
3	Logging		*		*	*
4	Industrial forest plantation	*	*		*	*
5	Food crop land		*	*	*	
6	Shifting cultivation	*	*		*	*
7	Swamp fishpond	*	*	*	*	
8	Oil palm	*	*			*
9	Infrastructure	*				*
10	Rubber plantation	*				

Furthermore, those results were brought up in further discussions on identifying major land use change activities and assessing them based on the REDD Feasibility Quadrant. The results of the discussions for each site are briefly discussed in the following section:

2.1.4.3.2.1. Papua

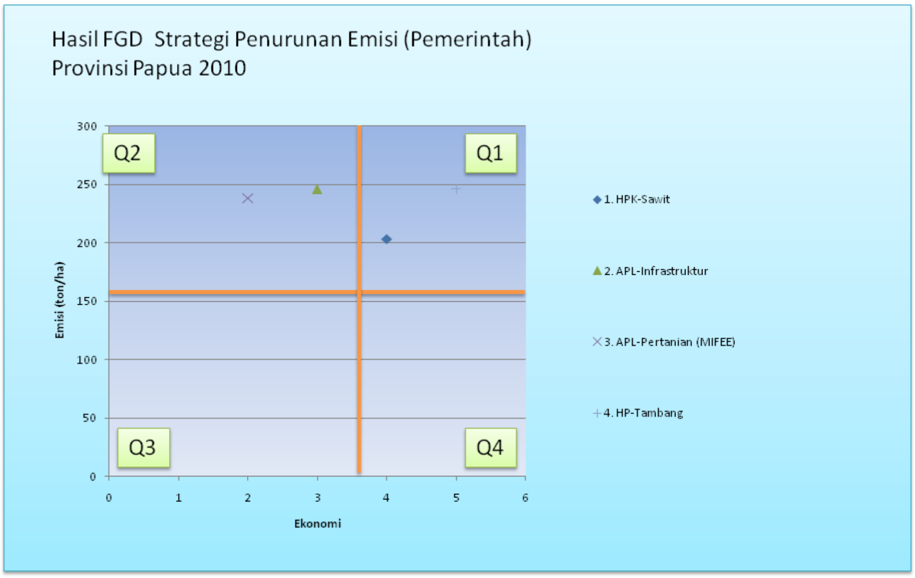


Figure 30. REDD Feasibility Quadrant of governmental group

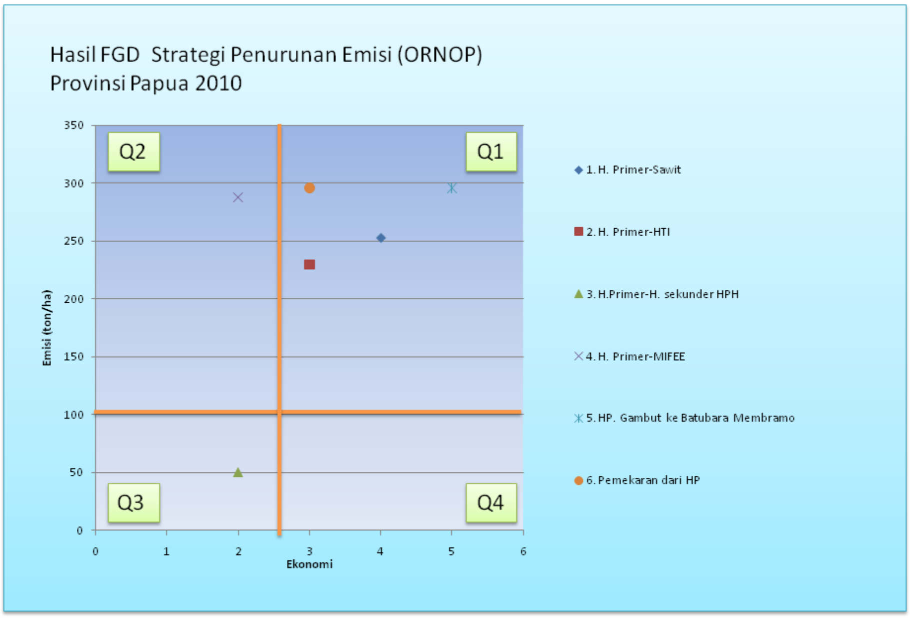


Figure 31. REDD Feasibility Quadrant of non-governmental group

Major land use changes in Papua could be classified into a few activities; changes to timber and forest plantation (HTI), development of infrastructure, mining, transmigration, logging concessions, and agriculture. The process of land use change involved government, private and communities. In proposing a low emission development pathway, both the government and NGO groups agreed that forest clearing for large scale agricultural estates in the Merauke area (MIFEE = Merauke Integrated Food and Energy Estate) belonged to the Q2 quadrant which means they are eligible for the REDD areas (Figure 31). MIFEE has been considered as a massive large-scale project that is not particularly beneficial for the local people.

2.1.4.3.2.2. Gorontalo

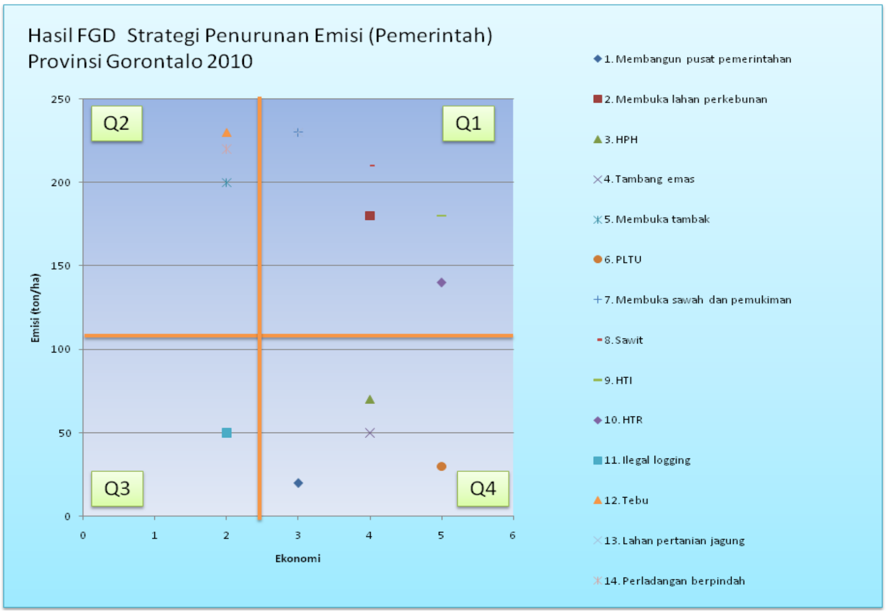


Figure 32. REDD Feasibility Quadrant of governmental group

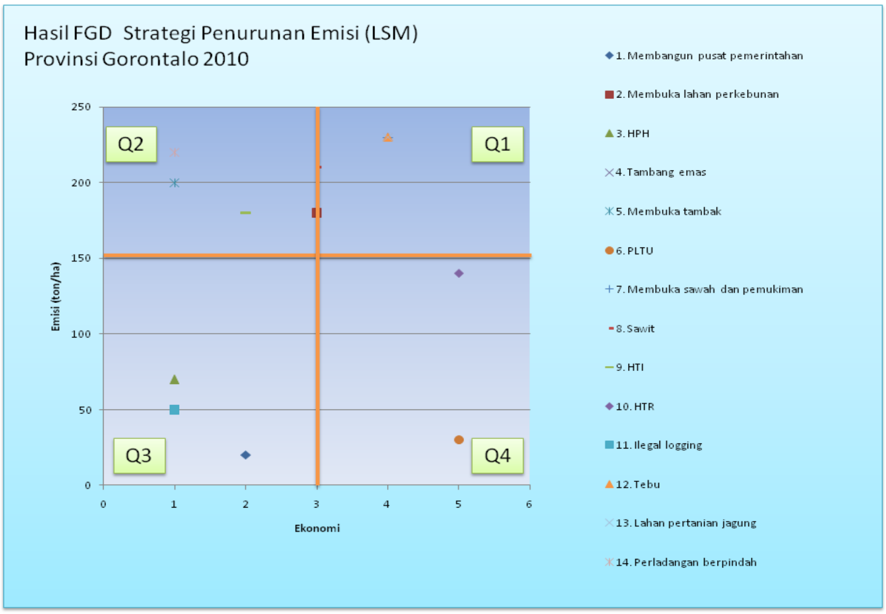


Figure 33. REDD Feasibility Quadrant of non-governmental group

In Gorontalo, major land use changes that are proposed to be eligible for REDD areas include the development of fishpond areas and sugarcane plantations, although the latter was only proposed by the government group. The NGO group also considered timber plantation to be replaceable by an REDD mechanism, since they consider the economic benefit to be limited to the investors/companies and the benefits do not reach the local people.

2.1.4.3.2.3. Jambi

Figure 34. REDD Feasibility Quadrant of governmental group

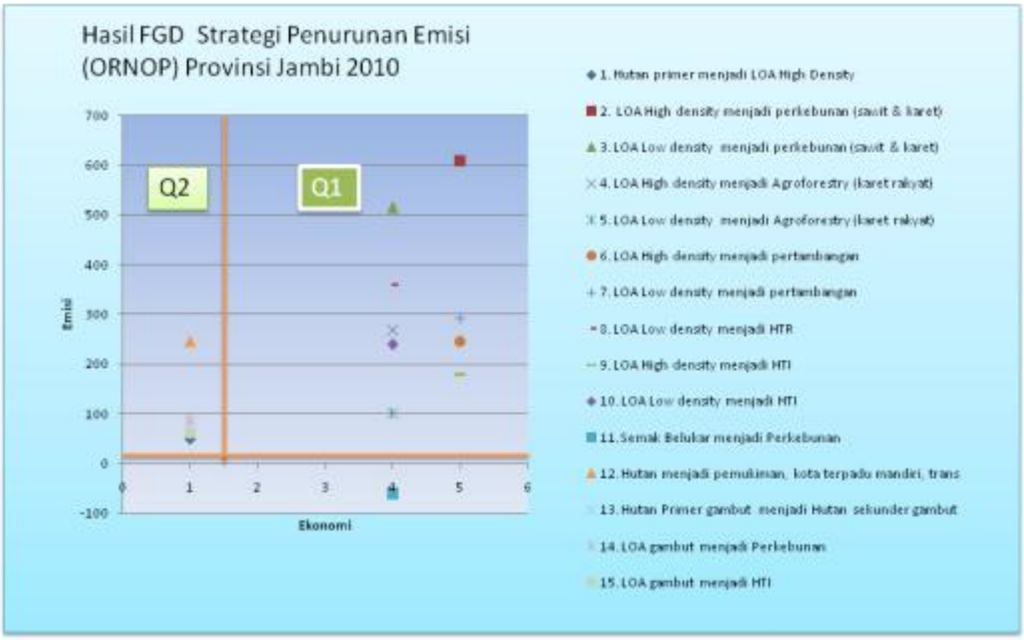


Figure 35. REDD Feasibility Quadrant Produced of non-governmental group

For Jambi, in proposing a low emission development scenario for the Q2 activities, slight differences were found between the government group and the NGO group. In the government group, two land-use activities were considered eligible for the REDD scenario quadrant (Q2), that is, conversion from forest to settlement/transmigration area, and logging in peat areas. What was included in Q2 by the NGO group was quite similar to the government group, especially after the discussion continued to the post REDD feasibility quadrant debate. The main difference was in the future strategy of the conversion of logged over areas into agroforestry. In the government group, this activity was considered eligible for the REDD scenario (Q2), but in the NGO group this kind of activity was thought not suitable to be promoted via the REDD mechanism.

2.1.4.3.2.4. South Kalimantan

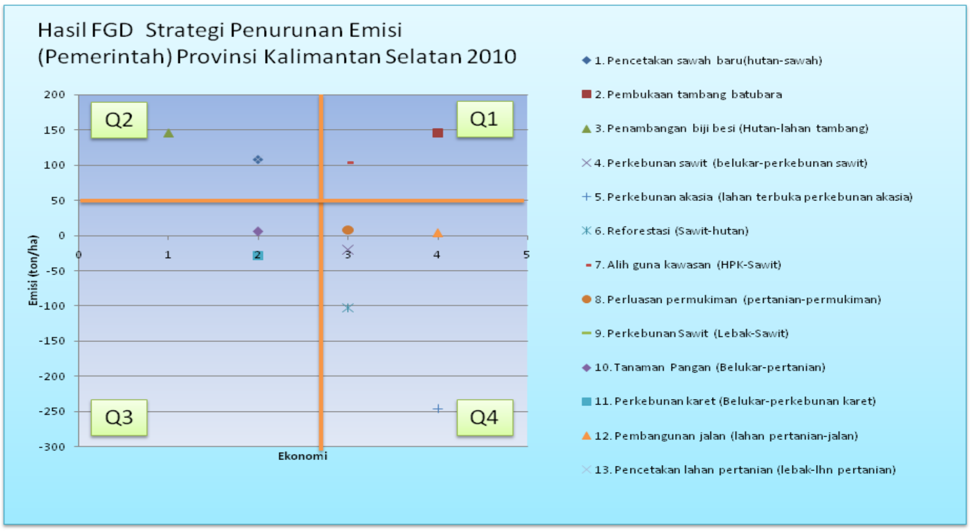


Figure 36. REDD Feasibility Quadrant of governmental group

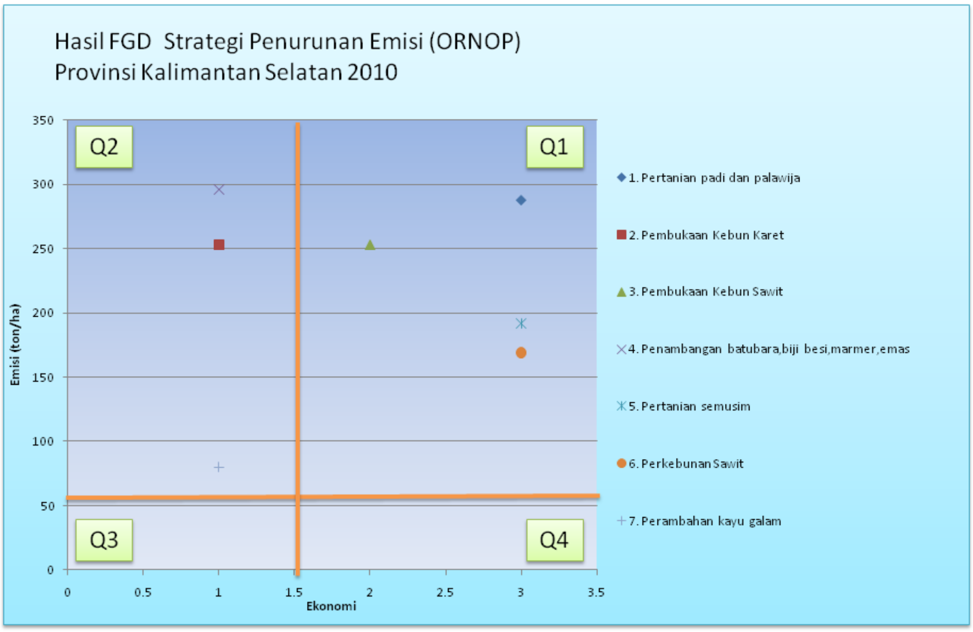


Figure 37. REDD Feasibility Quadrant of non-governmental group

In South Kalimantan, both groups considered that the mining areas should be eligible areas for REDD. The reason behind this might relate to the biases of those receiving the benefit of the mining activity, since the companies (the main beneficiaries) are mostly from outside the province. Another activity considered eligible for REDD proposed by the government group was the allocation for paddy rice field from forest. For the NGO group, rubber plantations and extraction from peat swamp forest (kayu gelam) were also proposed to be eligible for REDD.

2.1.4.3.2.5. Pasuruan

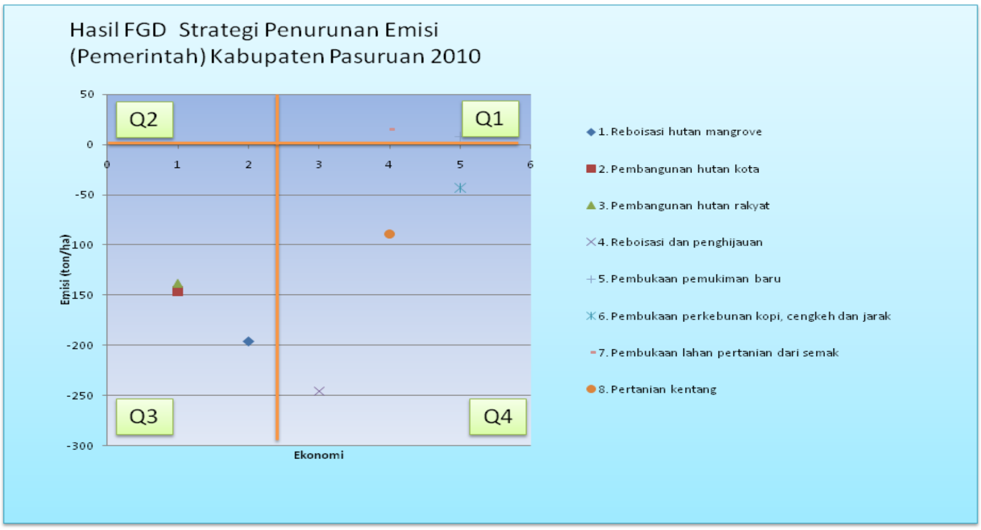


Figure 38. REDD Feasibility Quadrant of governmental group

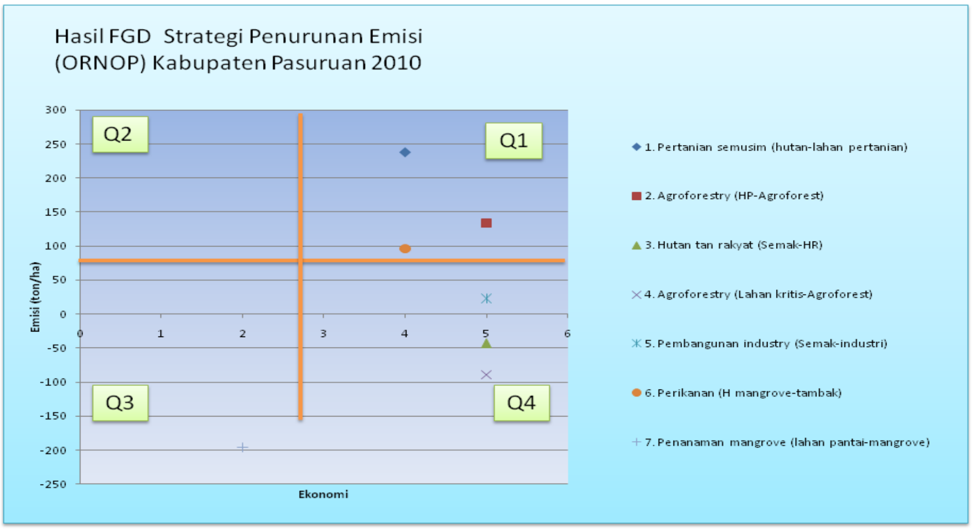


Figure 39. REDD Feasibility Quadrant of non-governmental group

The application of the REDD Feasibility Quadrant in Pasuruan didn't result in REDD feasible areas, as both government and NGO groups proposed no activities in the Q2 zone. The development of both social forestry and timber plantations are quite advanced in this district and they are considered to be beneficial economically as well as having potential for carbon stock sequestration.

Another hope expressed by all stakeholders in our area was that the implementing agencies should guarantee that REDD or REDD+ action would be based on the recognition of rights over the use of resources and that customary rights will be respected. The implementing agencies should show that processes can be transparent by providing timely information and ensuring that communities are able to participate actively. Finally, mechanisms that are put in place to share benefits must be transparent and accountable and should not create conflict within communities.

2.1.5. WP3.1.Linking local baselines for emissions to detailed analysis of rights and lack of control over illegal activities under different baseline scenarios

Land ownership in many forest landscapes in Indonesia remains contested between the state and local communities. Emission reduction is measured as a change in carbon stocks over time, relative to an agreed baseline or expected change, after any corrections for leakage or displacement of emissions to other locations. These alone, demand clarity and procedural justice if the 'legal basis' of property rights and governance over forested land and resources is to be resolved. The interaction of these various 'carbon rights', with existing or emerging rights, authorities and power over land use decisions is not easily understood. Land 'ownership' is only one of several elements influencing the feasible levels of emission reduction. Key issues in the REDD debate on carbon rights are: 1) who has, or can claim the right to cause carbon emissions ('emission rights'); 2) who has, or can claim the right to ask for co-investment in emission reduction efforts ; 3) who has, or can claim the right to receive payments for avoided damage to local or global environmental values ('sell foregone carbon emission rights'); 4) who has the right to agree on or set a baseline of 'business as usual' or 'emission rights'; and 5) who has the right to measure and verify carbon stocks and determine 'additionality' and 'leakage'? The contest for these rights has led to a power struggle for authority among the government layers in many countries.

Hence, 'carbon rights' come as an addition to the already complex layers of unresolved property rights. The complexity extends from the relationship between individuals and local communities, between both of these and local government, between sub-national entities and Indonesia as a state, and in Indonesia's relations with global negotiation platforms on mitigating climate change. Below are some findings on the analysis of rights and governance of issues related to the carbon rights across the five provinces in Indonesia. The analysis will provide an understanding of what is a carbon right in Indonesia.

1. The dynamics of forest allocation and land use change at the provincial level not only changed the existing property rights, but also put customary institutions into disarray and created higher-level conflict among multiple stakeholders. The introduction of political and administrative decentralization in 1999 significantly increased the authority of district and provincial governments over natural resources.
2. The ambivalence of the definition of forest and of the property rights of institutions is an artifact of the historical change in government laws and public administration; as government regulations change, so do the actual rights and practices of local communities and state bodies and with growing attention to carbon markets, the issue of 'carbon rights' has added another layer of confusion to property rights.
3. Here, carbon rights are at least as complex as the set of actors and agents that interact during the process that starts with a natural forest and ends with a landscape with few trees but high carbon stock. Along this process, many actors and agents have de jure and de facto rights, power and authority, and all are stakeholders based on the benefits currently derived from 'business as usual'.
4. Landscape dynamics determine the dynamics and changes of actors and claims to use the area. Here, the carbon rights under the context of REDD are interpreted by the central

government as 'economic use' of 'rights to not-use' the physical resource. Access to these new property rights enhances rather than reduces the conflict over natural resources.

5. Legal arguments are not always decisive in settling a dispute. Legal argument is only one of the discourses used to sustain a claim and was recognized by all disputants more clearly after the decentralization era in 1999. The outcomes of decentralization policies changed the nature of the power relations between the central and local government. These policies and their legal acts influence ongoing discourse regarding the contest of rights between the central and local government, and reconfigurations of local property rights.

2.1.5.1. WP3.3. REDD payment and distribution mechanism in five areas

Facilitating negotiations among stakeholders was linked to the legal and illegal drivers of change to determine a reward mechanism that can provide sufficient material and immaterial benefits to be attractive and effective. We have developed and tested a tool, called SPASI, to help local stakeholders to understand the integration of spatial data and emissions.

2.1.5.1.1. SPASI: Spatially explicit Planning and Assessment tool for land use Sustainability and Integration

During several workshops conducted at the provincial level, we identified that one of the crucial factors that affects negotiations among local stakeholders in the context of REDD is the lack of awareness on carbon measurement, the calculation of emissions/sequestration from LULUCF, and the identification of impacts from an emission reduction plan. While a local development plan is available, reconciling it with a provincial REDD strategy is still beyond the capability of most local stakeholders. ALLREDDI developed a tool called SPASI (Spatially explicit Planning and Assessment tool for land use Sustainability and Integration). SPASI is a simple learning tool that provides an easy way to learn how to calculate a LULUCF emission, how to reduce it, and how to observe the consequences of emission reduction on local economic activity.

Figure 40. A trial of SPASI in Papua

Basically, SPASI is a generic simulation tool that provides its user with an overview of all the important factors related to the estimation of carbon stock dynamics at the landscape level: (1) landscape composition in terms of land use; (2) land use changes; (3) the economic impacts related to land use changes; (4) ecological impacts in terms of carbon stock dynamics related to land use changes; and (5) the impacts of land use planning on ecological and economic factors. The core of SPASI is a 10 × 10 grid that represents a time series of the landscape at different land use transition stages. The initial configuration can be set to mimic a land use transition stage as displayed in Figure 41.

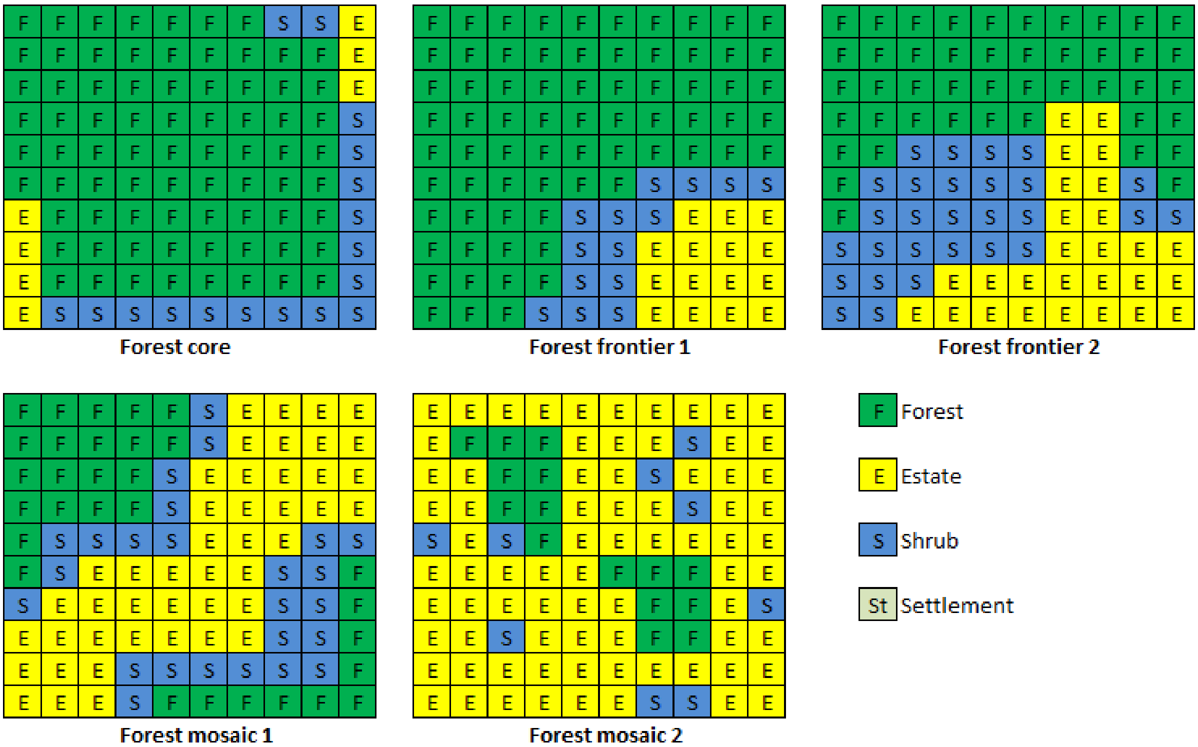


Figure 41. Variation of initial landscape configuration in SPASI

Using the grid, SPASI conducts several steps:

1. Quantification of land cover change

The first step is for the user to understand the changes in the land use composition and configuration over time and space. Changes of land use are analyzed through two sets of 10 × 10 grids representing different observation years. This process is a miniaturization of the land use change analysis required within carbon dynamics estimation methods to produce a list of activity data. The user will learn several important factors in assessing activity data: (1) overall changes in a landscape; and (2) dominant land use trajectories within a landscape.

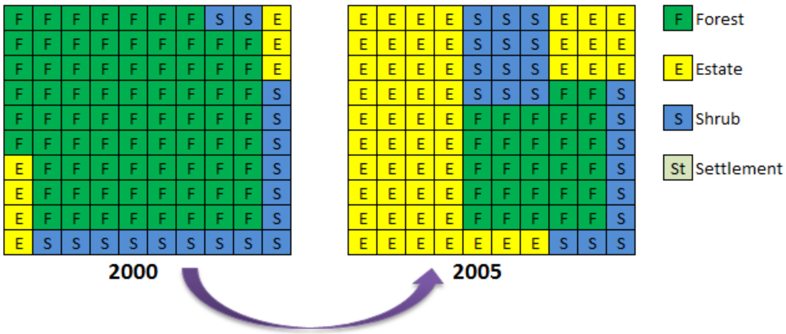


Figure 42. Step 1 of SPASI: quantification of land use change

2. Quantification of historical emissions

The second step of SPASI involves the quantification of historical emissions using predefined emission factor data. At this stage, the user will be introduced to emission calculations using the stock-difference approach.

3. Planning land use configuration for emission reduction

The third step is a case study where the user is asked to provide a future scenario of land use planning which might be able to reduce emissions from the landscape

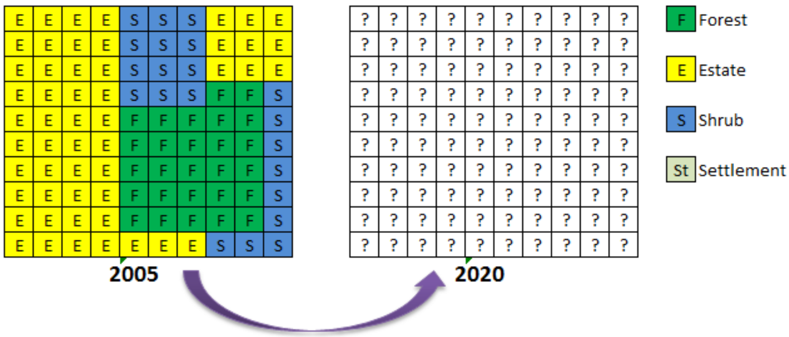


Figure 43. Step 3 of SPASI: planning future landscape configuration

4. Estimating future emission

Based on their own planning, the users will then be asked to calculate their own prediction of future emissions. Users will then learn about the factors of spatial planning that are important for emission reduction.

2.1.5.1.2. Level of Stakeholder knowledge on REDD in five provinces in Indonesia

To measure the level of stakeholder knowledge on REDD in the five provinces, we developed a questionnaire that consisted of 10 questions that related to the REDD concepts. The questions were:

1. What is meant by Greenhouse effect?

2. What is meant by Climate change?
3. What is meant by carbon sequestration?
4. What is meant by carbon trading?
5. What is meant by REDD (résumé and meaning)?
6. What is meant by CDM (résumé and meaning)?
7. What is the different between REDD and CDM?
8. What is meant by leakage?
9. What is meant by climate change adaptation?
10. What is meant by mitigation?

We conducted the survey during the ALREDDI workshop in five provinces. There were 146 respondents consisting of 23 from NGOs, 86 from government officers, 24 scholars from universities, and 13 from private companies. Table 13 shows the number of respondents by site and type of stakeholder.

Table 13. Number of survey respondents by sites

Site	LSM	Government	University	Private company	Total
Gorontalo	4	18	5	1	28
South Kalimantan	2	11	6	1	20
Pasuruan	7	12	4	7	30
Papua	7	24	4	2	37
Jambi	3	21	5	2	31
Total	23	86	24	13	146

The percentage of correct answers can be used as an indicator of the level of stakeholders' knowledge on REDD (figure 44). There were some observations that could be made on the level of knowledge of respondents:

1. The level of stakeholders' knowledge on REDD was low, with only 33% providing correct answers
2. The level of knowledge differed among the sites. The respondents in Pasuruan and Papua had a higher level of knowledge (more than 35% correct answers) than in Gorontalo, Jambi and Kalsel (less than 35%)

3. The level of knowledge differed among the type of respondents. Scholars from university had the highest level (38% of correct answer), followed by private companies (35%) and government officers (32%), while NGOs had the lowest level of knowledge (29%).

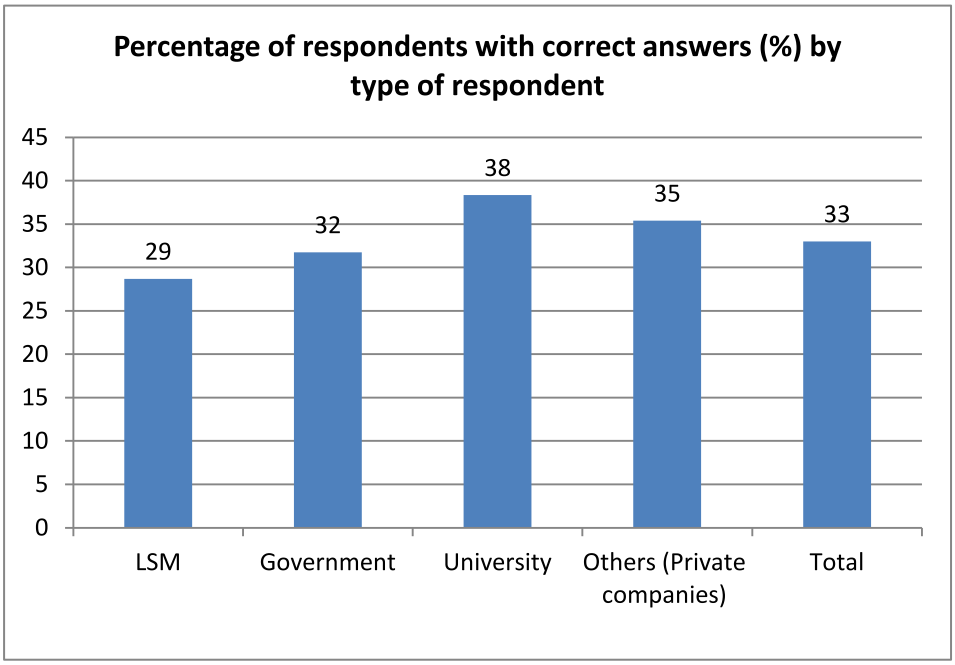
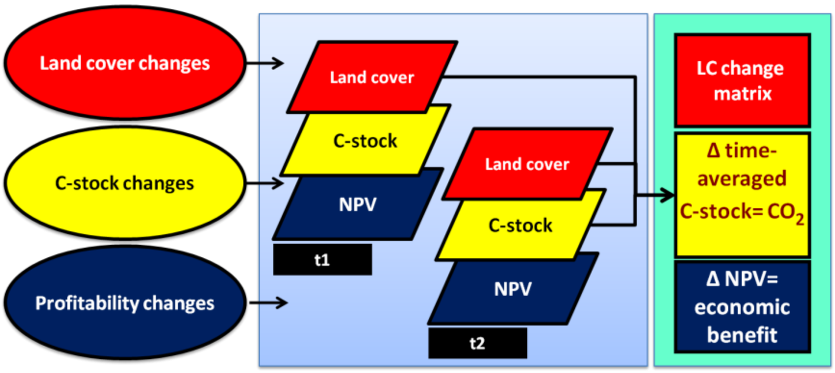


Figure 44. Percentage of correct answers by type of respondent

2.1.5.1.3. Retrospective Analysis of Opportunity Costs for Emission Reductions

This section incorporates the initial steps toward developing a REDD mechanism in five pilot area, namely to assess the opportunity cost of emission reduction in Papua, Gorontalo, South Kalimantan and Pasuruan. Three types of data were compiled during the third year of project activity, namely C-stock change estimation from LULCF, driver of land use and cover changes and profitability analysis of land use systems in Indonesia. The aim is to estimate the opportunity costs for reducing emissions through a retrospective analysis. Figure 43. shows the schematic diagram of the calculation.



$$\textit{Opportunity cost} = \frac{\Delta NPV}{\Delta CO_{2\text{-}eq}}$$

Figure 45. Schematic diagram of Opportunity Cost Estimation

In analyzing the abatement/opportunity cost for carbon emission from land use and land cover changes, one has to consider at least 3 different cost components, namely:

1. Opportunity costs for reducing emissions
2. Transaction costs for awareness raising, contractual costs, monitoring and evaluation cost, brokerage
3. Operational cost of agreed actions

The implications and options for policies and interventions to reduce emissions are then discussed.

Within this study we only cover the first component of the opportunity cost estimation. We incorporate the results of Estimation of LULUCF carbon emissions of Indonesia (figure 45) with the results of profitability analysis of Land Use Systems (figure 46). For each pair of changes in land use and land cover categories per unit area per year, time-averaged C stock differences can be estimated. Correspondingly, the differences in NPV per unit area (can either be private or social profitability) can be calculated. Therefore changes in NPV per ton of C emitted can be calculated by dividing up changes in NPV with changes in C-stock, which is the opportunity cost of the avoiding the particular changes in land use and land cover.

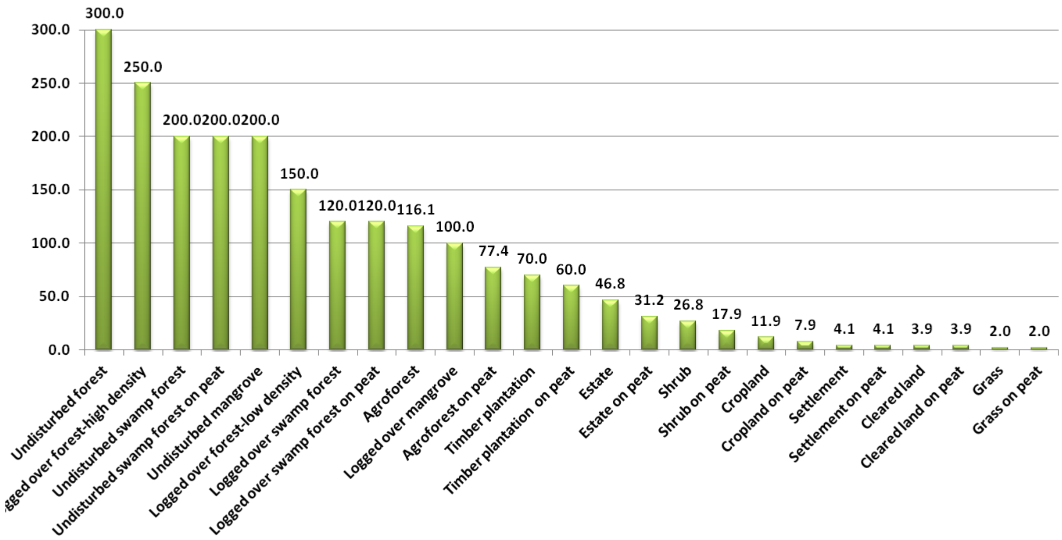


Figure 46. Typical carbon stock across land use systems in Indonesia

Due to time limits and technical difficulties in conducting profitability analysis, not all of land use systems in Indonesia are covered. Therefore we need to take some assumptions in assigning NPV in each of the land use and land cover systems that is a stand-alone class within the legend categories from satellite image interpretations, but not covered by profitability analysis. Vice versa, those land use systems that are studied by profitability analysis but cannot be separated through satellite imageries are aggregated when assigning the NPV.

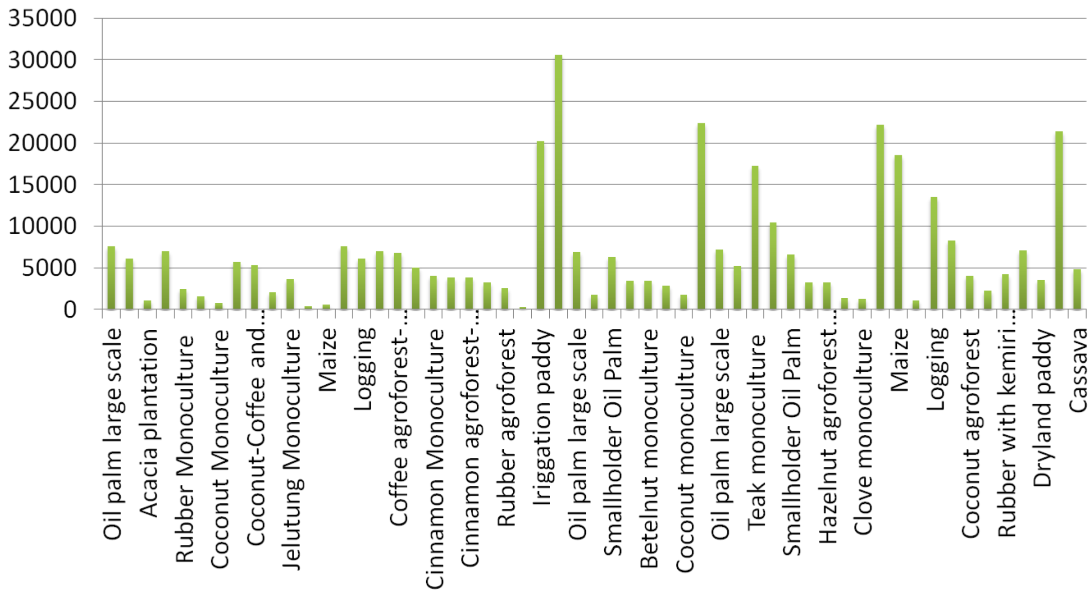


Figure 47. Estimated profitability of land use systems in Indonesia

The result of opportunity cost analysis in five pilot areas are summarized in the form of opportunity cost curve. Some of the result showed that some of the green house gas emission in the past only provides small amount of economic benefits. Potential for emission reduction are obvious in most of project areas that was analyzed. Figure 48, 49, 50, 51 and 52 presents the opportunity cost curve for each pilot area.

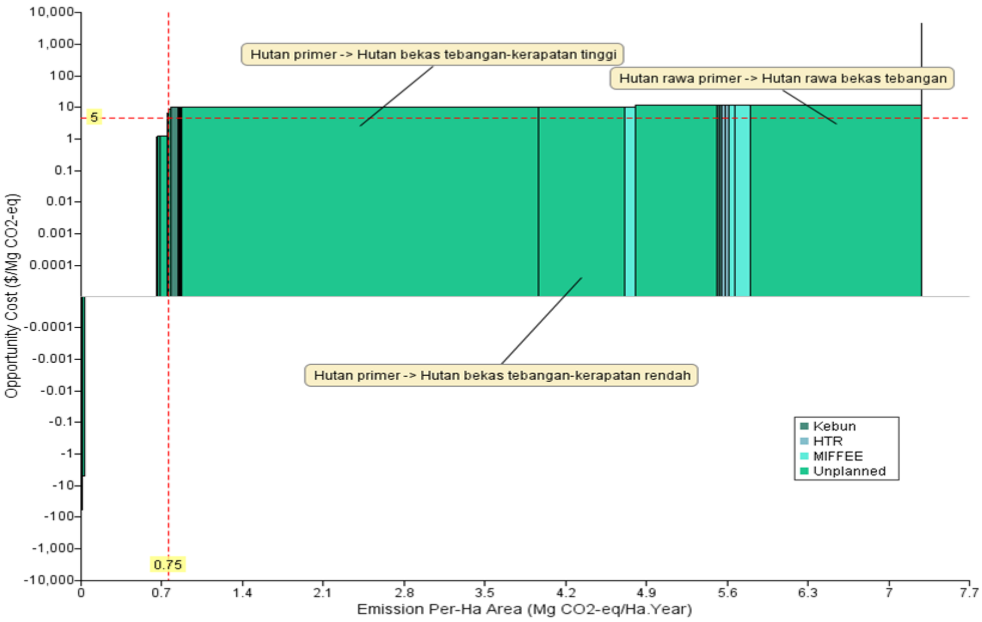


Figure 48. Opportunity cost curve of Papua

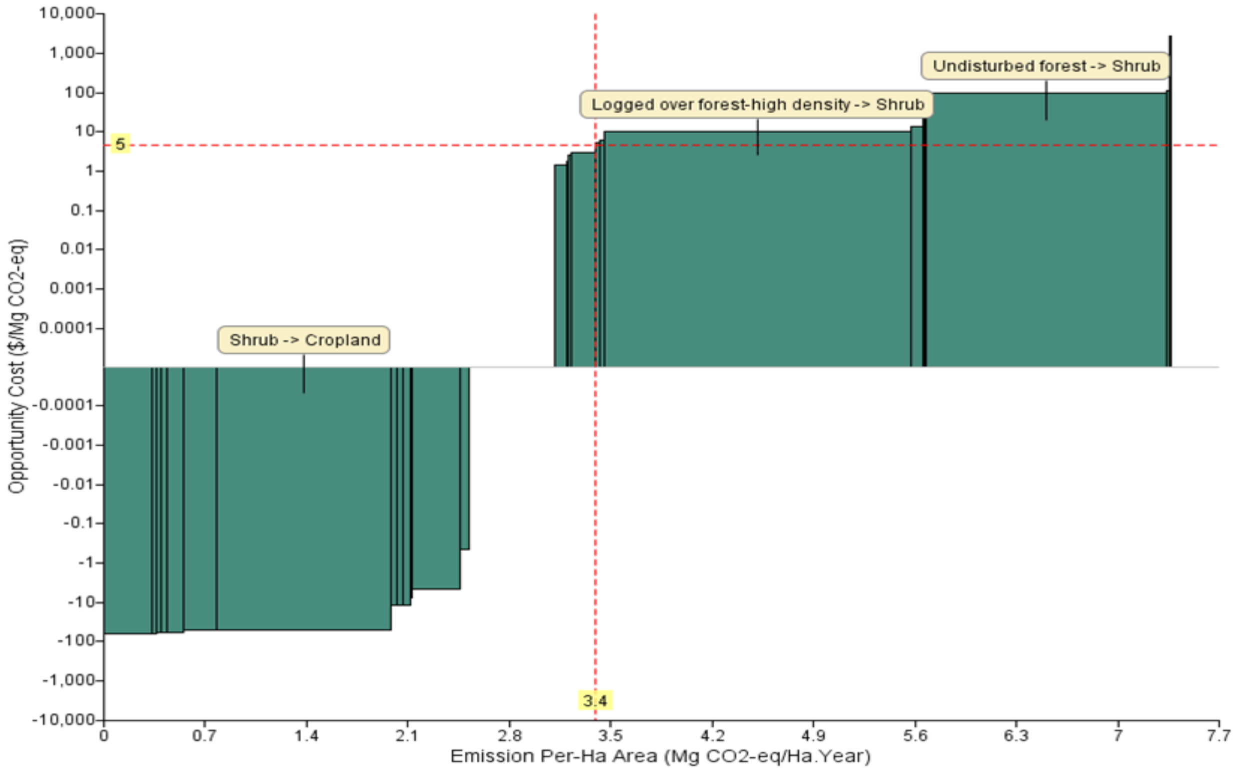


Figure 49. Opportunity cost curve of Gorontalo

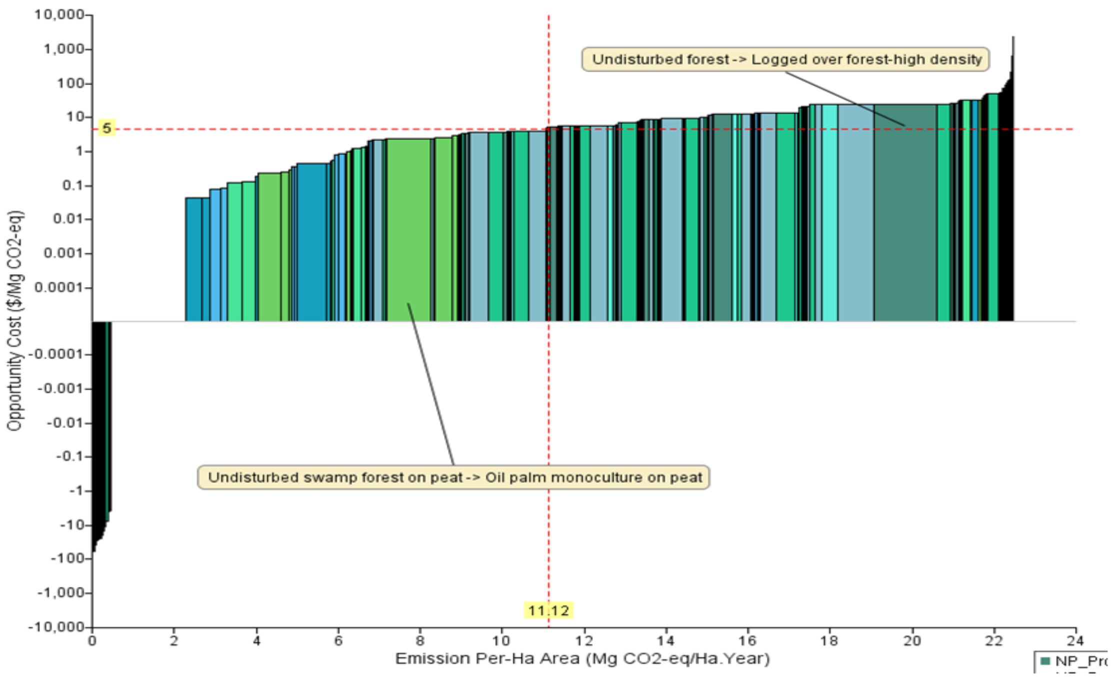


Figure 50. Opportunity cost curve of Jambi

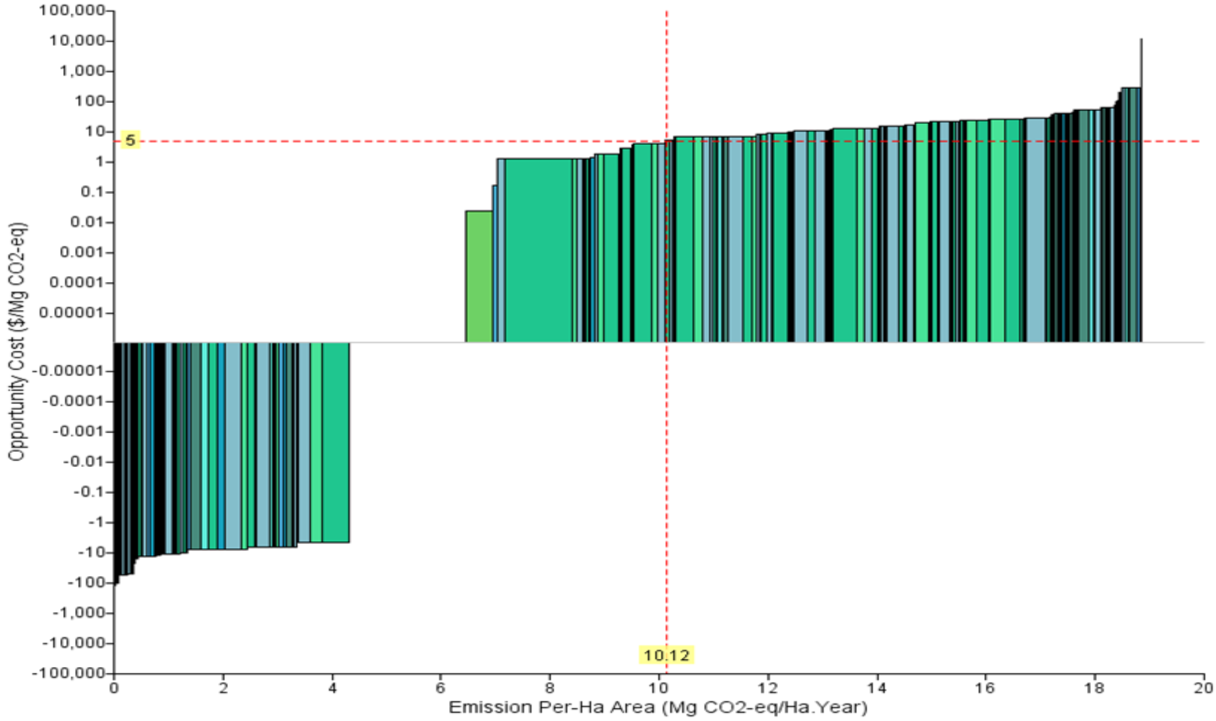


Figure 51. Opportunity cost curve of South Kalimantan

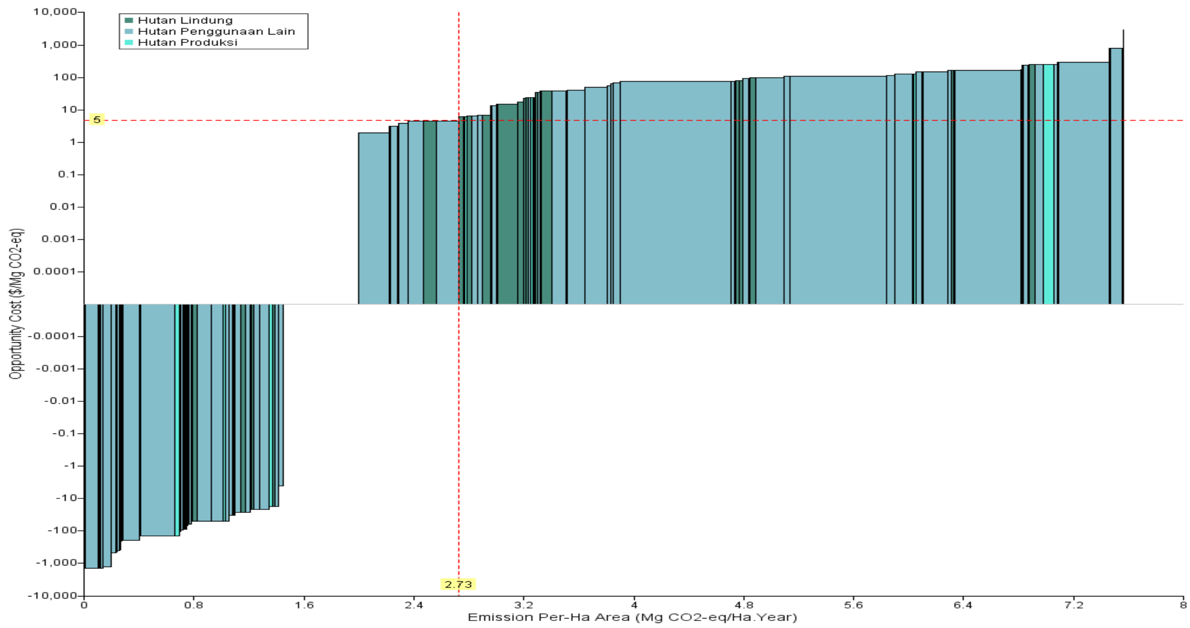


Figure 52. Opportunity cost curve of Pasuruan

2.1.5.1.4. Land-use planning assessment for low-emission development strategy (LUWES)

Indonesia has committed to reduce 26% of its greenhouse gas emission unilaterally, and an additional 15% through international support, by 2020 while maintaining 7% economic growth. In 2010, Indonesia signed a letter of intent with the Government of Norway for a two-year suspension on all new concessions for conversion of peatland and natural forest.

At the national level, the appropriate mitigation actions for agriculture, forestry and other land-use sectors are being formulated into a REDD+ mechanism where emission reductions are planned through conserving and enhancing carbon stocks while moving toward a better forest management system.

However, at the local level, there is still much confusion over how to implement the mechanism and whether it will affect local development plans that are already underway. In the five study areas, we designed and conducted a framework called Land-Use Planning Assessment for Low-Emission Development Strategy (LUWES). LUWES is a negotiation framework that aims to facilitate discussions by local stakeholders about planning for development that can minimise greenhouse gas emissions while still retaining economic growth. Figure 53 shows the overall framework of LUWES.

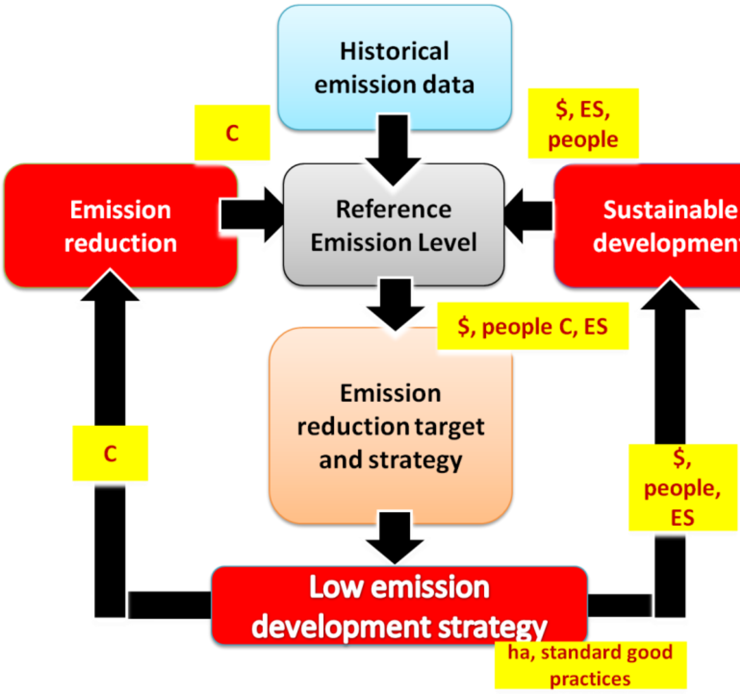


Figure 53. Overall framework of Land-Use Planning Assessment for Low-Emission Development Strategy (LUWES)

Legend: ES = environmental services; C = carbon; ha = hectares

LUWES has been conducted through workshops and capacity building. The workshops were attended by relevant government officials, NGO staff and academics in the five study areas. At the time of writing, the process has been completed at five sites (Jambi, Gorontalo, Papua, South Kalimantan and Pasuruan). LUWES is implemented through six steps.

1. An inventory is created of all planned land-based activity in the selected area
2. Stakeholders discuss priority sectors for development activities
3. Stakeholders discuss the allocation of all land-based activities by integrating development planning, spatial planning and analysis of priorities
4. The consequences of development activity on emission levels and economic growth are assessed
5. Low-emission development scenarios are created that reconcile emissions reduction targets and economic development goals
6. Stakeholders discuss possible policies that can support low-emission development scenarios.

Figure 54. Implementation of Land-Use Planning Assessment for Low-Emission Development Strategy (LUWES) in Jambi, Gorontalo and Papua provinces

Through the first two steps of LUWES, stakeholders were able to discuss and assess the challenges, development priorities and their potential to develop a land-based development strategy that could increase economic growth in their area. At each workshop, data on land-based development plans were collected and analysed jointly.

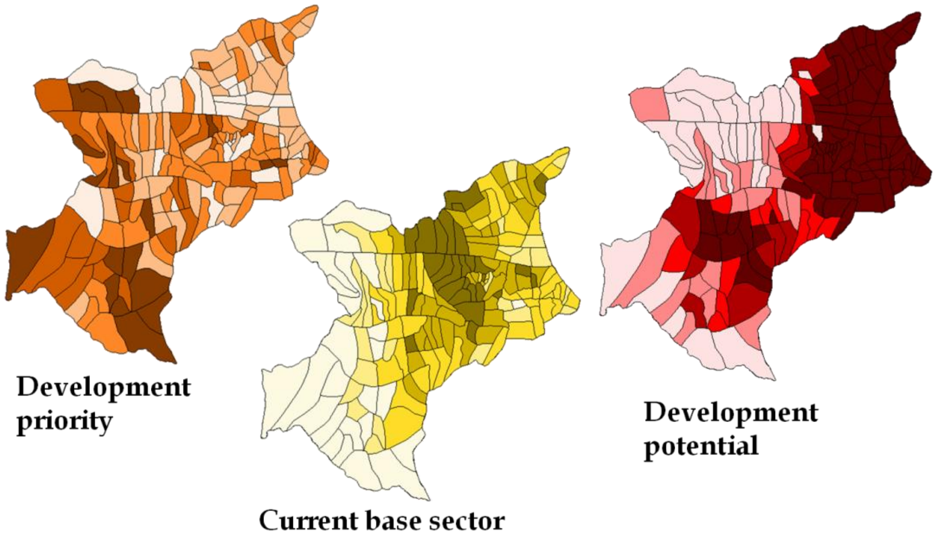


Figure 55. Result of land-based activity inventory and priority analysis in Merangin district, Jambi provinces

In the fourth step of LUWES, the participants were asked to determine the land allocation for each land-based activity that was planned in their area (Figure 55). The data compilation was used during the workshop to calculate future emissions. A compilation of local spatial plans is now available for the whole site.

2.1.5.1.4.1. Gorontalo

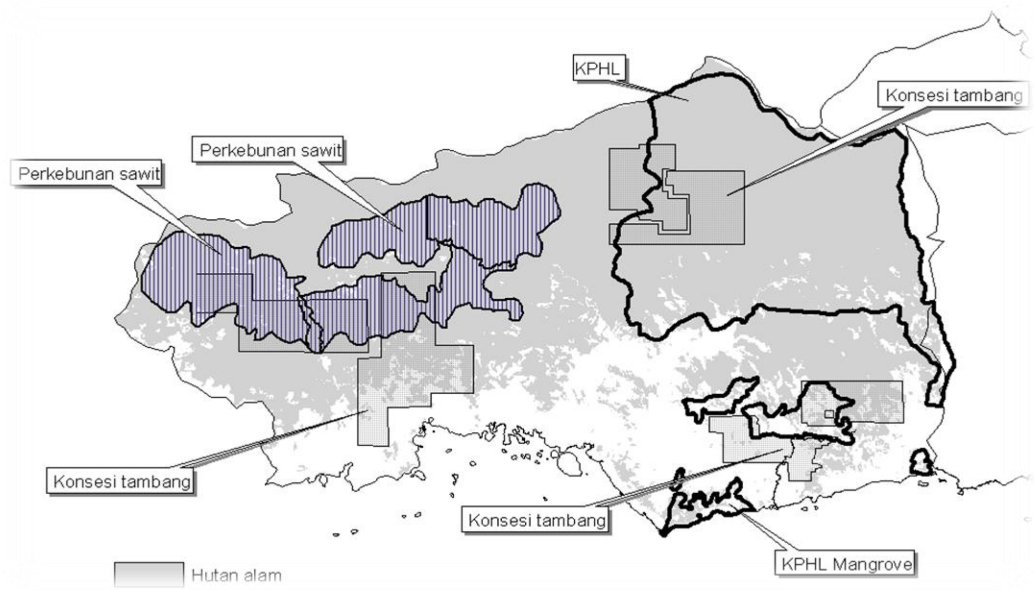


Figure 56. Example of land allocation for land-based development in Pohuwato district, Gorontalo province

Using the data collected through the initial steps of LUWES (Figure 54), stakeholders were trained to develop emission-reduction scenarios that concurred with their development plans. These scenarios can be used as a basis for local negotiations on any REDD+ mechanism.

Although most of the scenarios were made on a trial basis and might require further enhancement to be used for practical purposes, ALLREDDI has helped local stakeholders develop their capacity to create effective and efficient emission-reduction scenarios without halting their economic growth. Figures 57, 58, 59, 60, 61, 62 and 63 show several examples of stakeholders' scenarios in Jambi, Gorontalo, Papua, South Kalimantan and Pasuruan.

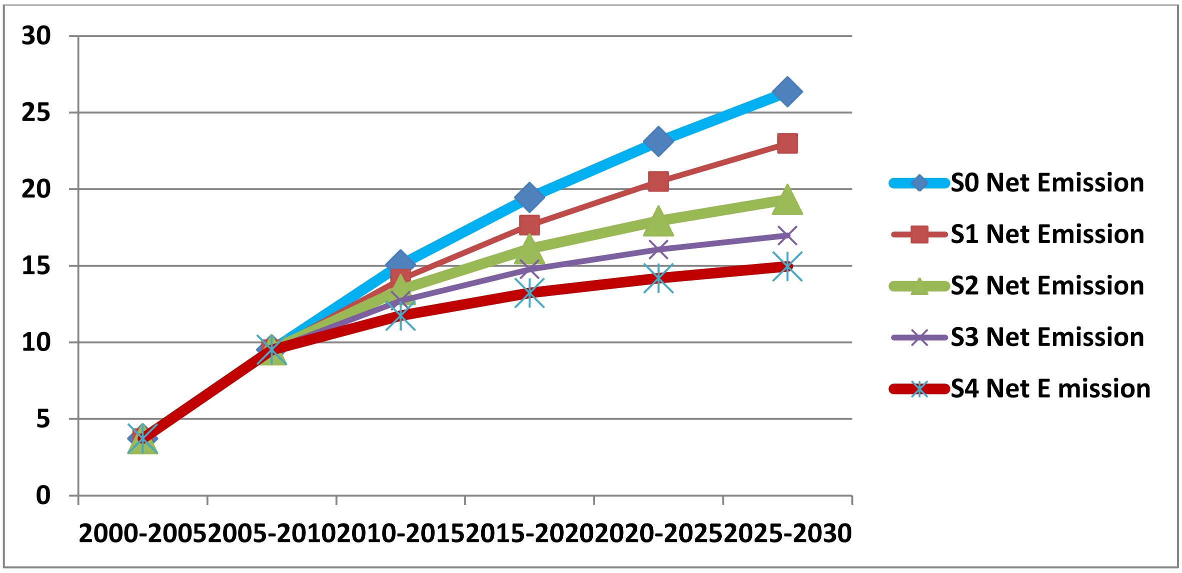


Figure 57. Land-Use Planning Assessment for Low-Emission Development Strategy (LUWES): Comparison of net emissions by scenario, Jambi province

Note: S0=emission under business as usual strategy; S1=Emission reducing conversion under protected ares; S2=emission by reducing conversion on protected and convertible areas; S3=emission by avoiding conversion of all forest; S4=emission by intensification of land use system

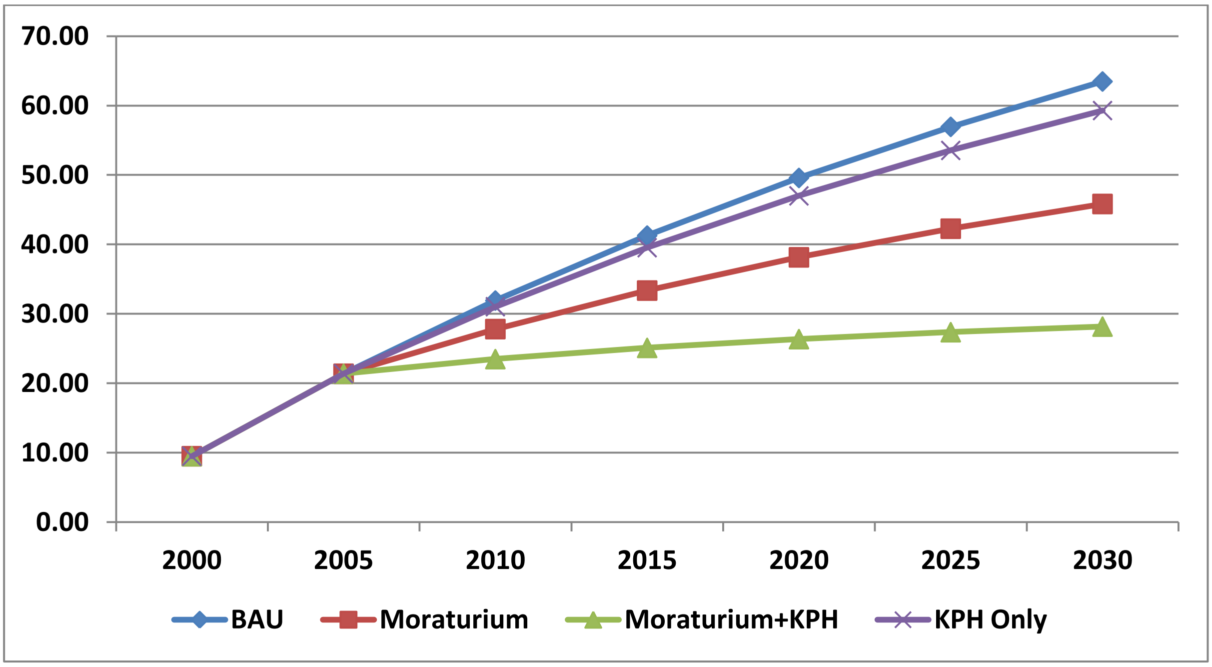


Figure 58. Land-Use Planning Assessment for Low-Emission Development Strategy (LUWES): Comparison of net emissions by scenario, Gorontalo province

Note: BAU = 'business as usual'; Moraturium = No new forest conversion for two years; Moraturium + KPH = Moraturium option plus Kesatuan Pengelolaan Hutan (Forest Supervisory Unit), that is, protection of existing forest remnants; KPH only = Protection of existing forest remnants only.

2.1.5.1.4.2. Papua

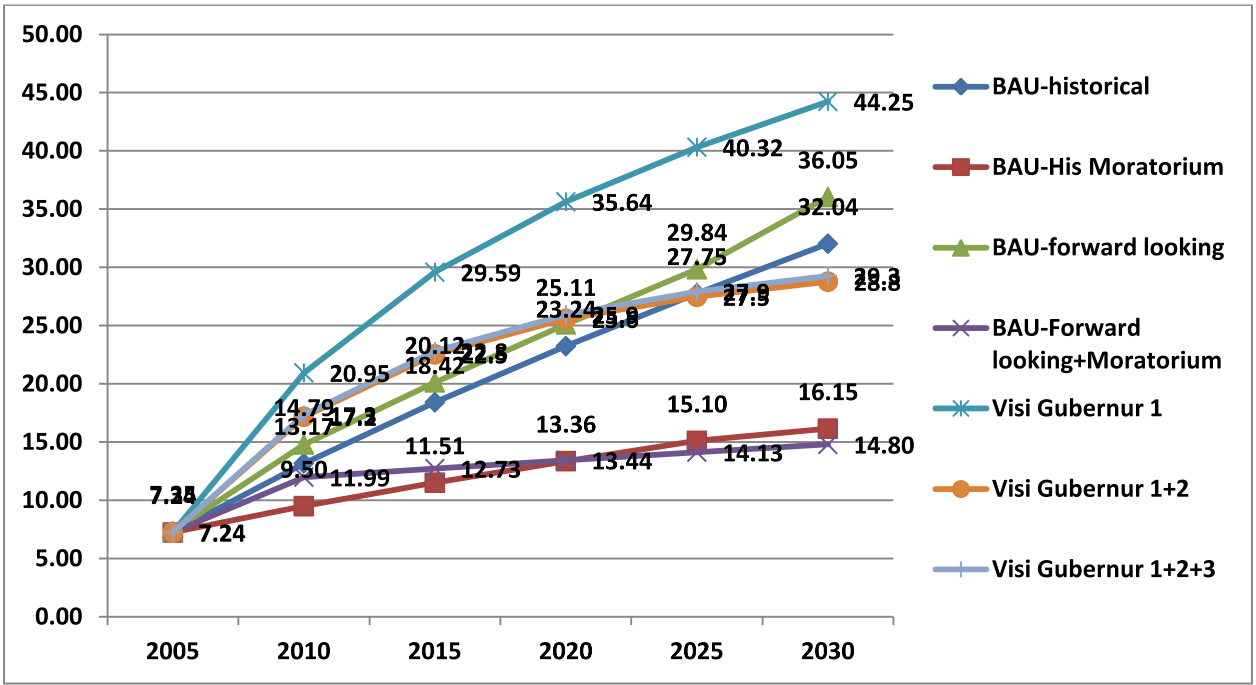


Figure 59. Land-Use Planning Assessment for Low-Emission Development Strategy (LUWES): Comparison of net emissions by scenario, Papua province

Note: BAU = Business as usual; BAU-historical = Business as usual reference emission level based on linear projection of historical emissions in a landscape; BAU-His Moratorium = Business as usual based on linear projection of historical emissions in a landscape plus no new forest conversion for two years; BAU-Forward looking = Business as usual reference emission level based on local development planning associated with land-use conversion; BAU-Forward looking + Moratorium = Business as usual reference emission level based on local development planning associated with land-use conversion plus no new forest conversion for two years; Visi Gubernur 1 = Conserving 50% forest cover in the areas that are designated as "Convertible Forest" (Hutan Produksi Konversi/HPK); Visi Gubernur 1 + 2 = Visi Gubernur 1 plus no oil palm conversion in high conservation value forest; Visi Gubernur 1 + 2 + 3 = Visi Gubernur 1+2 plus increased efficiency of land use for plantations, especially oil palm.

2.1.5.1.4.3. Jambi

LUWES implementation in Jambi was conducted in two districts: Tanjung Jabung Barat and Merangin. The drivers of green house gas emission are different in this area. Tanjung Jabung Barat emission came from expansion of timber plantation and oil palm expansion, while emission from Merangin came from the encroachment of natural forest within protected area. Figure 58 and 59 showed the example of land allocation map and reference emission level in Tanjung Jabung Barat and Merangin

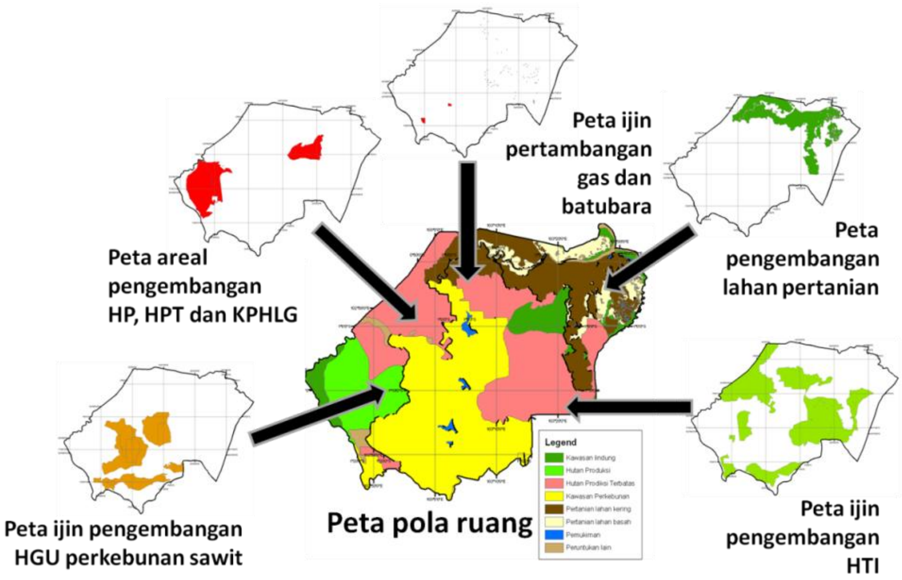


Figure 60. Land allocation for land-based development in Tanjung Jabung Barat

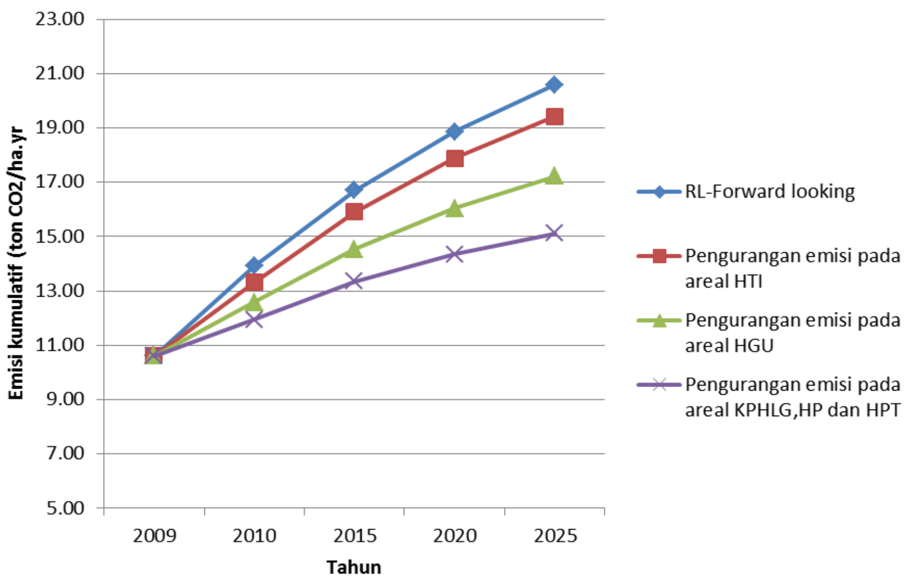


Figure 61. LUWES: comparison of net emissions by scenario, Jambi province

Note: RL=emission by business as usual scenarios; Emission by reducing conversion under timber plantation areas; Emission by reducing conversion on HGU areas; Emission by reducing conversion on KPHLG, HP and HPT areas.

2.1.5.1.4.4. South Kalimantan

Emission in South Kalimantan province came from the expansion of oil palm and coal mining activity. The result of stakeholder discussion using LUWES framework is presented in figure 62.

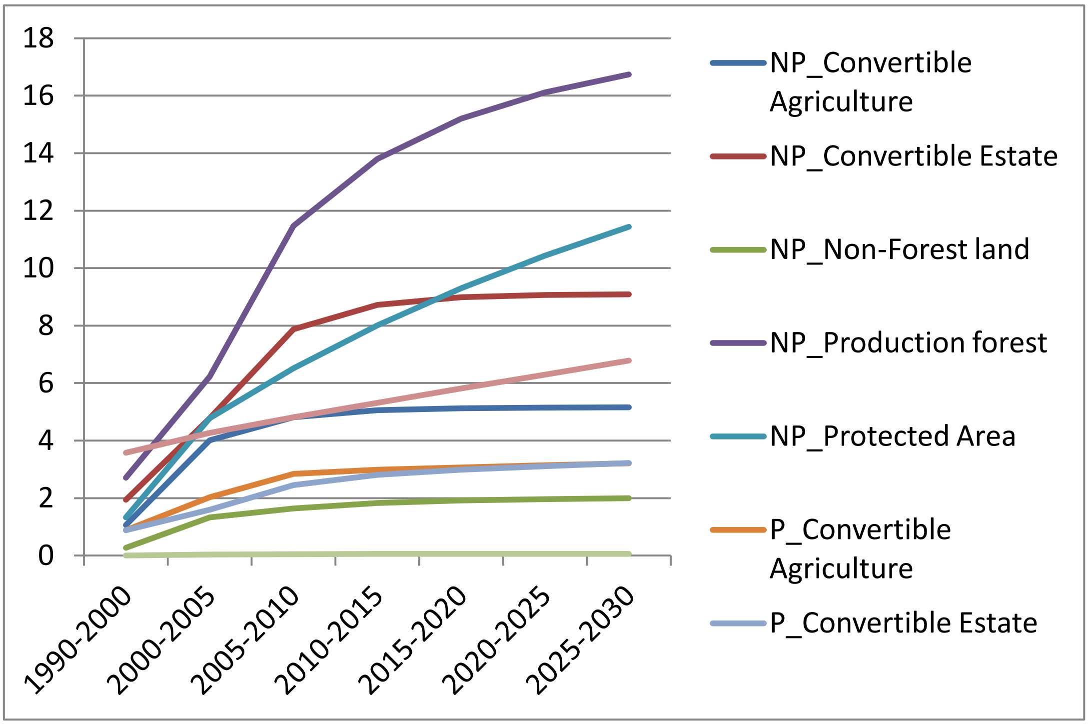


Figure 62. LUWES: comparison of net emissions by scenario, South Kalimantan province

Note: NP_convertible=reducing emission on convertible areas ; NP_Convertible_Estate=reducing emission on convertible and estate area; NP_Non-forest land=reducing emission on non forest land ; NP_Production forest=reducing emission on production forest; NP_protected areas=reducing emission on protected areas ; P_convertible=reducing peat emission on convertible land :P_convertible estate=reducing peat emission on convertible and estate

2.1.5.1.4.5. Pasuruan

Pasuruan is the only pilot area that projecting a negative amount of emission in the future due to expansion of timber plantation in low carbon area. The reference emission level of Pasuruan is showed in figure 63.

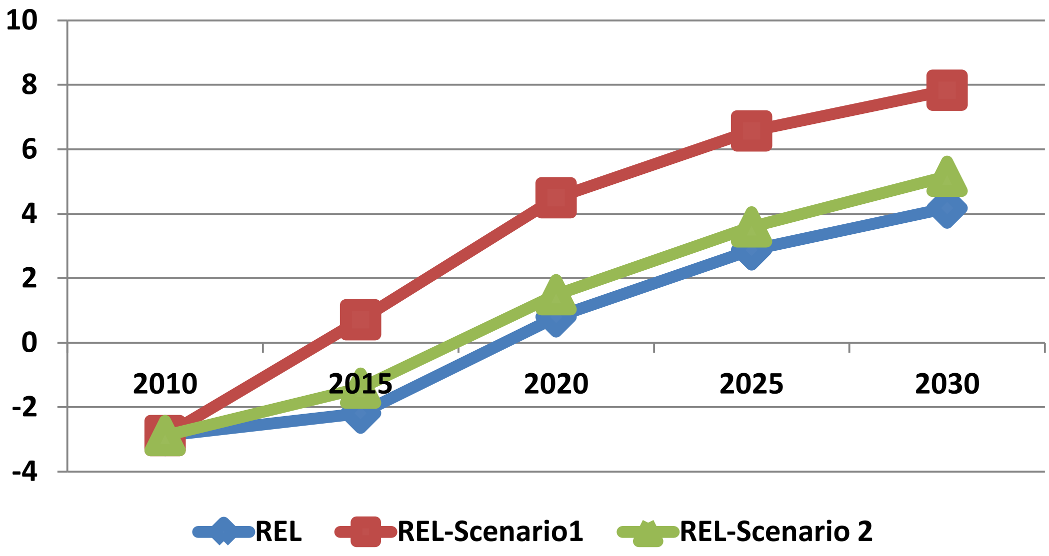


Figure 63. LUWES: comparison of net emissions by scenario, Pasuruan district

Note: Scenario 1=reducing emission by avoiding conversion of remaining forest; Scenario 2=reducing emission by avoiding conversion of remaining forest and planting timber plantation on non forest land

2.1.5.1.5. Facilitating negotiations among stakeholders linked to the legal and illegal drivers of change to determine a reward mechanism

2.1.5.1.5.1. Forest tenure insecurity In Tanjung Jabung Barat, Jambi: how new tenure arrangements were used for land grabs and claims

Buying land through their relationships with local people has been one of the ways that migrants gain access and control over state forest land, even though many do not receive a formal land title.

Land sales through several local tenure arrangements have become the legal basis for migrants to make strong claims that the land could not simply be seized. There are four reasons why local tenure arrangements had been changed to accommodate migrants' interests.

First, village officials have the power to determine land allocation, especially the ability to issue documents legitimizing possession by migrants. However, the village administration is not really run by an organizational apparatus but solely by the village headmen, leading to power polarization with all political power held solely by the headmen. Our research shows how local officials, as the "official arbiters on land matters", interpret the law according to their own interests and understanding.

Second, local people want to gain access to knowledge about, and capital for, cultivating oil palm. Shared land tenancy is an example of how a tenure arrangement was introduced as a way of providing a win-win solution for both local people and migrants.

Third, the fear of confiscation of land by other interest groups, especially when the land is state forest, often drives local people to sell to migrants. As the intensity of private agricultural production increases, land sales also increase. This also helps local people strengthen their customary claims together with the migrants.

The fourth reason that drives land transfer is the desire to extend customary claims and territories over state forest land. Using such claims, an area can be regarded as customary land, but this also requires changes to land tenure arrangements. In forest peatland, some migrants also have the technology and knowledge to clear and drain the forest, which the local people lack.

2.1.5.1.5.2. Design a reward mechanism aligned with ongoing international negotiations; REDD scheme for each pilot area is formulated

2.1.5.1.5.2.1 Rewards mechanisms at each site

The objective in developing REDD mechanisms at the five sites was to reconcile existing local development plans with the preservation of various types of environmental services. To do so, mechanisms must be realistic, voluntary and conditional economic incentive schemes based on the free and prior informed consent of the provider.

To achieve this, we conducted training and public consultation sessions at all project sites. We built local capacity to measure, report and verify carbon stocks and emissions, to prepare a local low-emission development strategy and to plan, develop, implement and evaluate locally appropriate mitigation actions.

Based on spatial plans at the provincial (Penyusunan Rencana Tata Ruang Wilayah or RTRWP) and district/city (Rencana Tata Ruang Wilayah Kabupaten/Kota or RTWK) levels and public consultation sessions with key stakeholders in Papua, Gorontalo, Jambi and South Kalimantan, we identified and analysed land allocations in long-term development planning and encouraged local partners to choose appropriate local strategies to reduce the emissions from forest deforestation and degradation.

2.1.5.1.5.2.1.1. Papua

The cooperative arrangement between the World Agroforestry Centre and the Task Force for Papuan Low-Carbon Development (PLCD) has been under the umbrella of the Badan Pengelola Sumber Daya Alam dan Lingkungan Hidup (Agency for the Management of Natural Resources and Environmental Security or BPSDLH) since September 2010. Under the arrangement, the Centre will support the PLCD task force in the implementation of its programs, that is, to map carbon stocks and train staff from BPSDLH in carbon assessment, to conduct workshops on reference emission levels and to inform communities involved with reforestation programs in the Wamena and Enarotali districts. In addition, we were also technically supporting the task force’s secretariat and providing funds for its daily operations.

We have still not been able to work with the communities in Wamena and Enarotali, owing to a lack of supporting funds from the government’s budget. The funds for these programs will be used for training staff from BPSDLH.

It was mentioned during the visit of the EU mission in March that the task force wished to continue this cooperative arrangement.

Based on training and discussions with several stakeholders in Jayapura (Table 14) about low-emission development strategies that we conducted from 8 to 10 March, we noted that competition between agricultural and non-agricultural activities had increased and appropriate spatial planning was needed to optimize development sustainability.

Table 14. Participants at reference emission level workshop, Papua province

No.	Institution	Participants
1.	BPSDLH Provinsi Papua	Dr. Franklin Situmeang
		Indah Dwi Setyowati,ST
		Melkisedek Wamea,SH
		Nurul Matin, ST
		John H. Mampioper, SP, M.Eng
		Yaconias Maintindom, SP, M.Si
		Hendrik J.P. Kamawa, S, Si, MMT
		Yuliana A. Mansawan
2.	Dinas Kehutanan dan Konservasi	Estiko Tri Wiradyo, SH. M.Si
		Ade John Moesiri, S.Hut
		Silly Benjamin Hukom
		Frans Ormuseray, S.Hut
3.	Bappeda Provinsi Papua	Tinus Gulua Karoba SE,MM
		Anna Fience Ayomi
4.	WWF Region Sahul	Piter Roki Aloysius

Papua, through Law 21/2001, has special authority to develop the province based on its own needs. One outcome of this special autonomy is the planned establishment of the Merauke Integrated Food and Energy Estate (MIFEE) in the southern part of Papua. The MIFEE was officially declared in February 2010.

To minimise land conflicts associated with the MIFEE and to support economic development, reconciled spatial planning is a must. This will help the Papuan government to achieve: the alignment of its objectives; the connectedness of stakeholders; balanced and harmonious development of economic, social, cultural, defence and security areas; an understanding of the carrying capacity of the environment; and inter-regional infrastructure. One of the goals of Papua's long-term spatial plans is to develop and implement an REDD scheme in order to harness the economic value of the environment. Such a scheme is planned to be implemented in protected areas in Asmat, Jayapura, Keerom, Mappi, Baiknumfor and others districts.

Another program similar in the scale of its ambition and potential environmental impact to MIFEE is the development of a trans-Papua road system, which will provide greater access to forests. Timber communities are one group which is a part of the culture of Papua and has the potential for development if there is available land.

Land-use changes in Papua can be divided into several types, such as primary forest into estates, infrastructure development, mining, transmigration, logging concessions, timber plantations, timber communities and agriculture. The process of land-use change in Papua involves government, the private sector and the public in terms of policy, investment and beneficiaries. The drivers of most land-use changes are multifaceted, influenced by economics, regional development, government programs, investment and political interests. But the driver of the dominant land-use change is economics. In 2010, the oil palm plantation sector was highlighted as the main future actor in land-use changes in Papua. The REDD mechanism is one of the alternative economic incentives proposed for Papua but if REDD is not able to provide significant benefits, then Papua will switch to plantations.

Total emissions for the period 1990-2000 were 1.4 gigatonne CO2 equivalent and the emission rate was 0.14 gigatonne CO2 equivalent. For the period 2000-2005, total emissions from land-use changes in Papua were 1.0 gigatonne CO2 equivalent and the emission rate was 0.2 gigatonne CO2 equivalent (Figure 64).

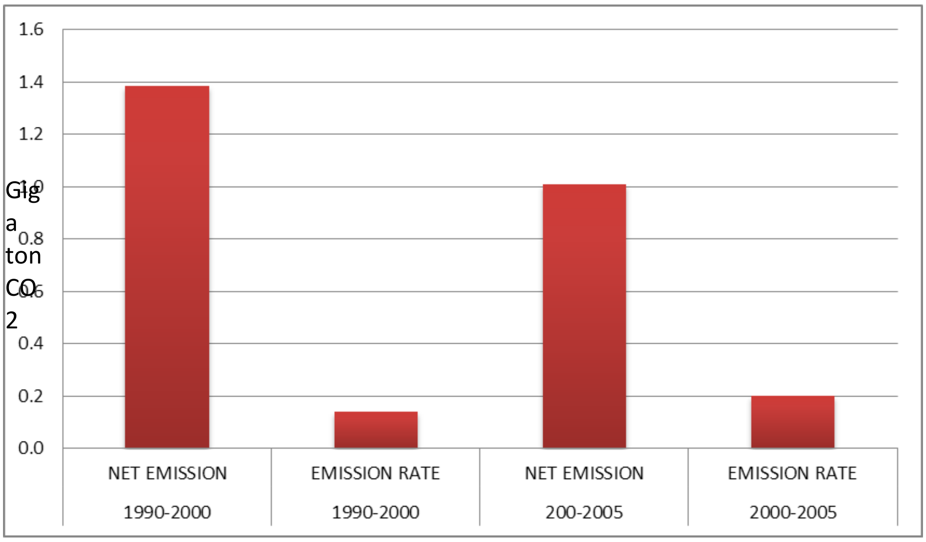


Figure 64. Emissions in 1990, 2000 and 2005, Papua province

2.1.5.1.5.2.1.2. Gorontalo

In Gorontalo Province, our development of a REDD mechanism are focusing on working with the Kesatuan Pengelolaan Hutan Lindung (Protected Forest Management Unit or KPHL) located in Pohuwato district (Figure 65).

A forest management unit (Kesatuan Pengelolaan Hutan or KPH) controls areas based on government regulation 6/2007. According to the Minister of Forestry Decree SK.65/Menhut-II/2010 dated 28 January 2010, Gorontalo Province is divided into seven areas of KPH control, covering 581 500 ha. KPH Unit 3 covers an area of 116 275 ha in Pohuwato. We selected the unit for our work based on the total area classified as falling under the Protected Forest Management Unit (KPHL).

Figure 65. Explanation of KPH Pohuwato boundary with stakeholders

Based on the draft regional regulations (Perda) regarding the organization and administration of the forest management unit in Pohuwato, the KPHL has several functions.

- Management, including planning, utilization, rehabilitation, reclamation, protection and conservation of forests
- Implement national, provincial and district forestry policy
- Monitor and assess forest management activities in its territory
- Create investment opportunities that are consistent with the objectives of forest management.

Mentoring activities and institutional strengthening of KPHL were begun in January 2011 by the State University of Gorontalo and BPKH 16 (Regional Forestry Office Unit 16), our main partners in the area. There were several objectives of the institutional strengthening of KPHL.

1. Identify and assess the capacity of government agencies in the district of Pohuwato to carry out their duties and responsibilities
2. Identify and assess the competence of government institutions in driving the implementation of KPHL activities in the district
3. Identify institutional policies and laws that guide the government in implementing KPHL (Figure 64)
4. Identify links between institutions in the district with institutions at the provincial level, as well as the Technical Services Unit, to assist with standardisation, especially in forestry management

5. Through the KPHL work, we are delivering scientific information and the actual implementation of KPHL model institutions in the district that can be used as a reference in the preparation of a strategic development plan (Figure 66).

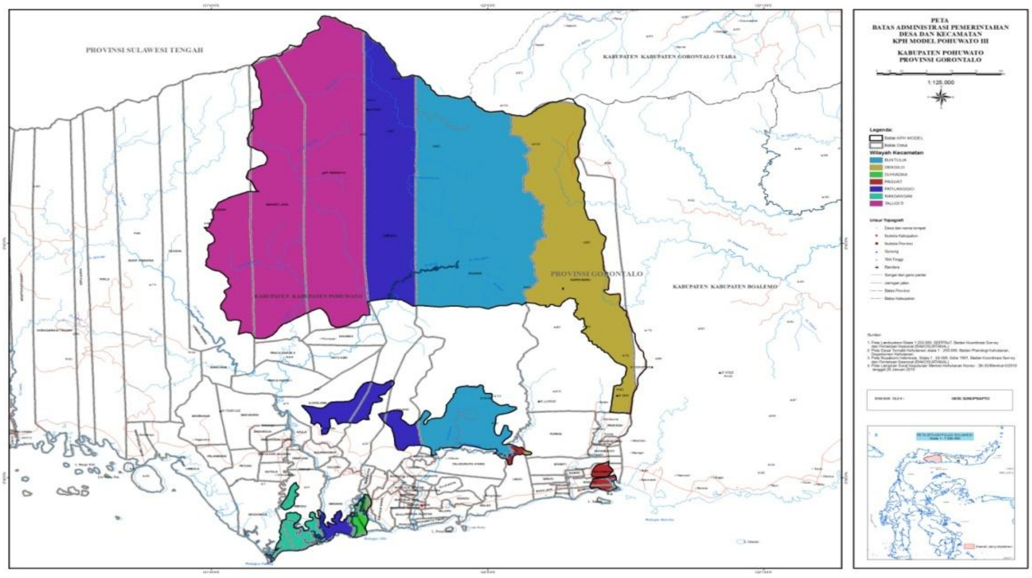


Figure 66. Location of KPH in Pohuwato

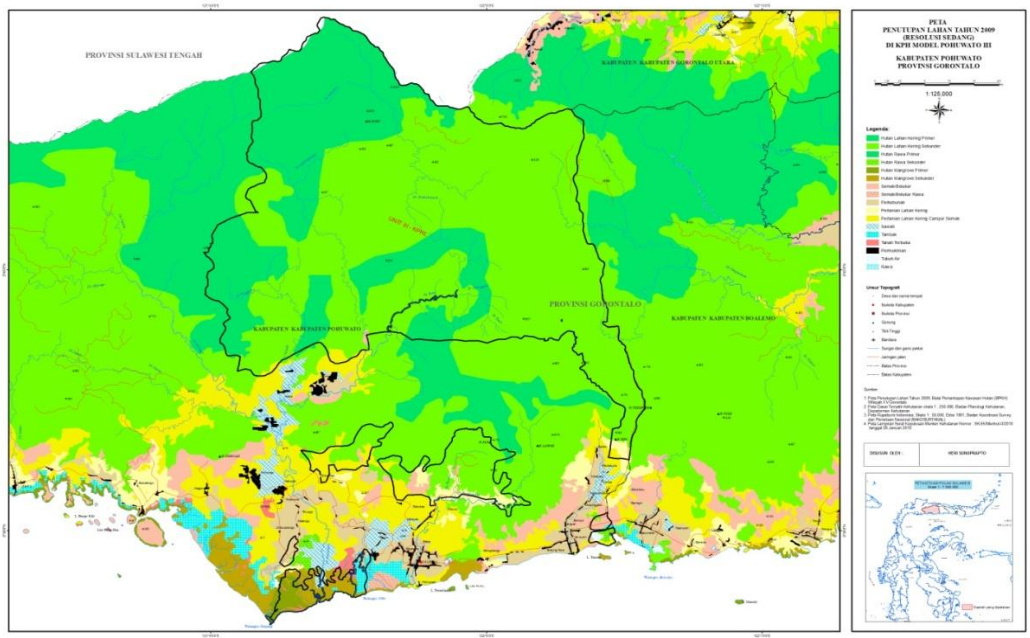


Figure 67. KPH Pohuwato land cover, 2009

2.1.5.1.5.2.1.3. South Kalimantan

The REDD mechanism in South Kalimantan is focusing on empowering the indigenous community in the Amandit watershed (Figure 68) to reduce emissions from land-use changes.

The land cover of the watershed consists of dryland forests, timber plantations, swamp forest, open land, settlements, mining, cropland, dry crop land, swamps, wet rice fields, shrubland and rivers

(Table 12). In the Amandit sub-watershed (Loksado sub-district), a mountainous area of Meratus, there are customary rights to extract wood, especially in managing shifting cultivation. Other land uses are (a) home garden; (b) mixed fruit garden with useful plants such as cinnamon (Cinnamomum buhrmanii), candle nut (Aleurites moluccana) and palm sugar (Arenga pinnata); (c) rubber agroforest; and (d) smallholder oil palm.

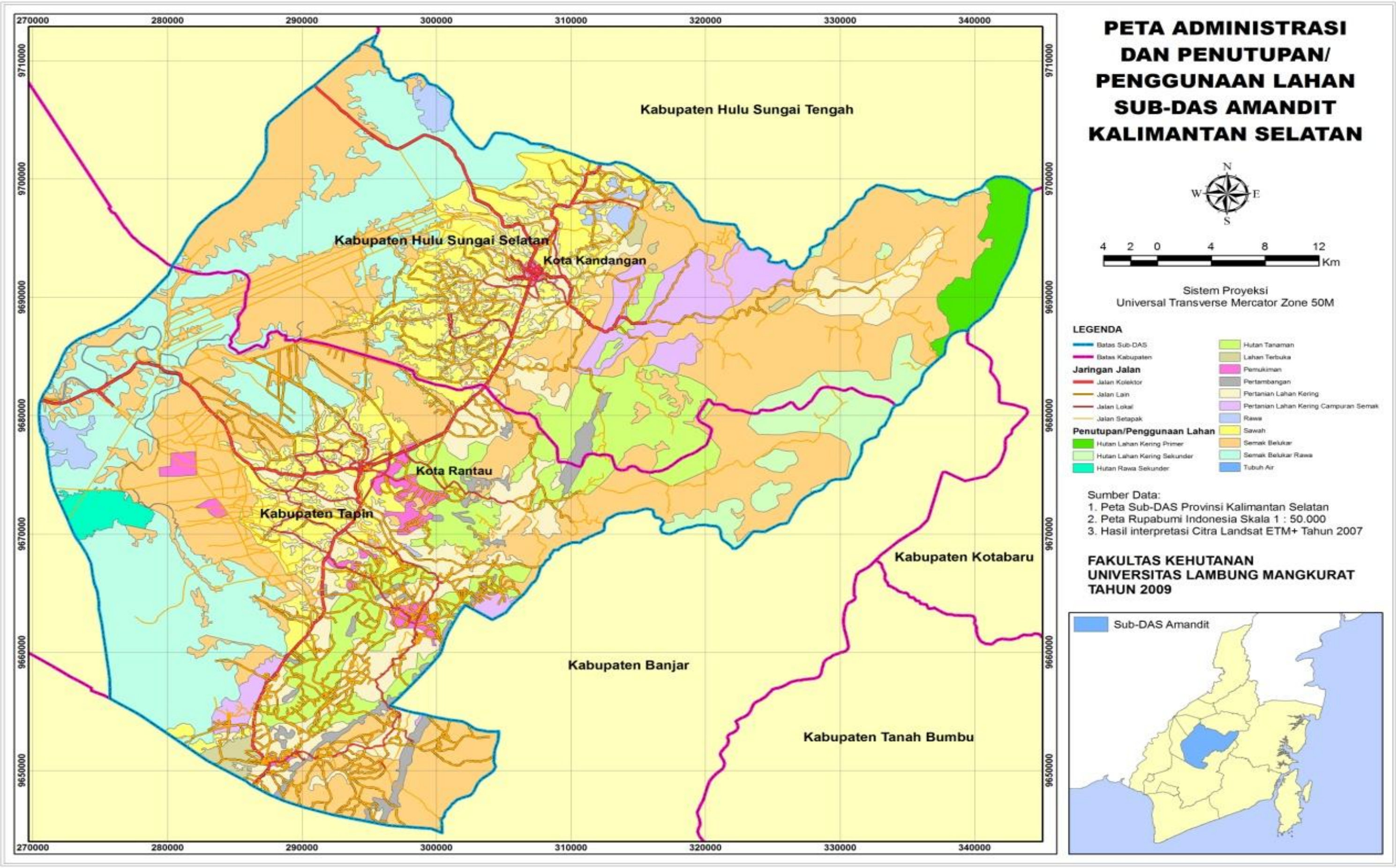


Figure 68. Amandit watershed land-cover map

Table 15. Land-cover areas of Amandit watershed

Land cover	Area (hectare)
Dryland secondary forest	8337.70
Dryland primary forest	4109.93
Secondary swamp forest	1891.35
Timber forest	21034.67
Open land	1299.35
Settlement	3821.60

Mining	3662.98
Dryland agriculture	34324.83
Mixed dryland agriculture	8959.71
Swamp	2760.84
Wet rice field	23647.31
Shrubland	90139.90
Swamp shrubland	46053.89
Water bodies	426.01
TOTAL	250470.06

The Dayak Meratus communities (Figure 69) employ shifting cultivation with six stages of activity: cutting, burning, planting, grazing and harvesting. These activities cannot be separated from the Kaharingan or traditional rituals performed by the local community. Dayak Meratus communities have customary laws for cultivation that cause pamali (bad consequences) if violated. Land ownership and management is based on trust. Ownership varies depending on the function of the land use. The land uses are described below.

1. Common katuan: land held for generations that can be used upon mutual agreement for a variety of purposes for the local community, but not for individual use
2. Sacred ground: not to be disturbed. Only certain people and balai (village council) leaders can enter the area for the ceremony of Puja Kayu. The area is far from human settlements and the forest types are heterogenic
3. Huma/Tugalan: this land can be owned by the clan authority (bubuhan balai) by converting katuan into slash-and-burn (ladang) fields. The size of land depends on the abilities and needs of the community members and is arranged through an agreement between the balai and its sub-sections
4. Gardens and farm land: often well established with different types of cash crops such as rubber and hazelnut. This land is specifically for plantations and can be owned by members of the community who cleared the land
5. Settlements: sites determined together, usually in a region where there are temporary dwellings and a good river flow. The temporary dwellings are usually simple lodges built at a farming site

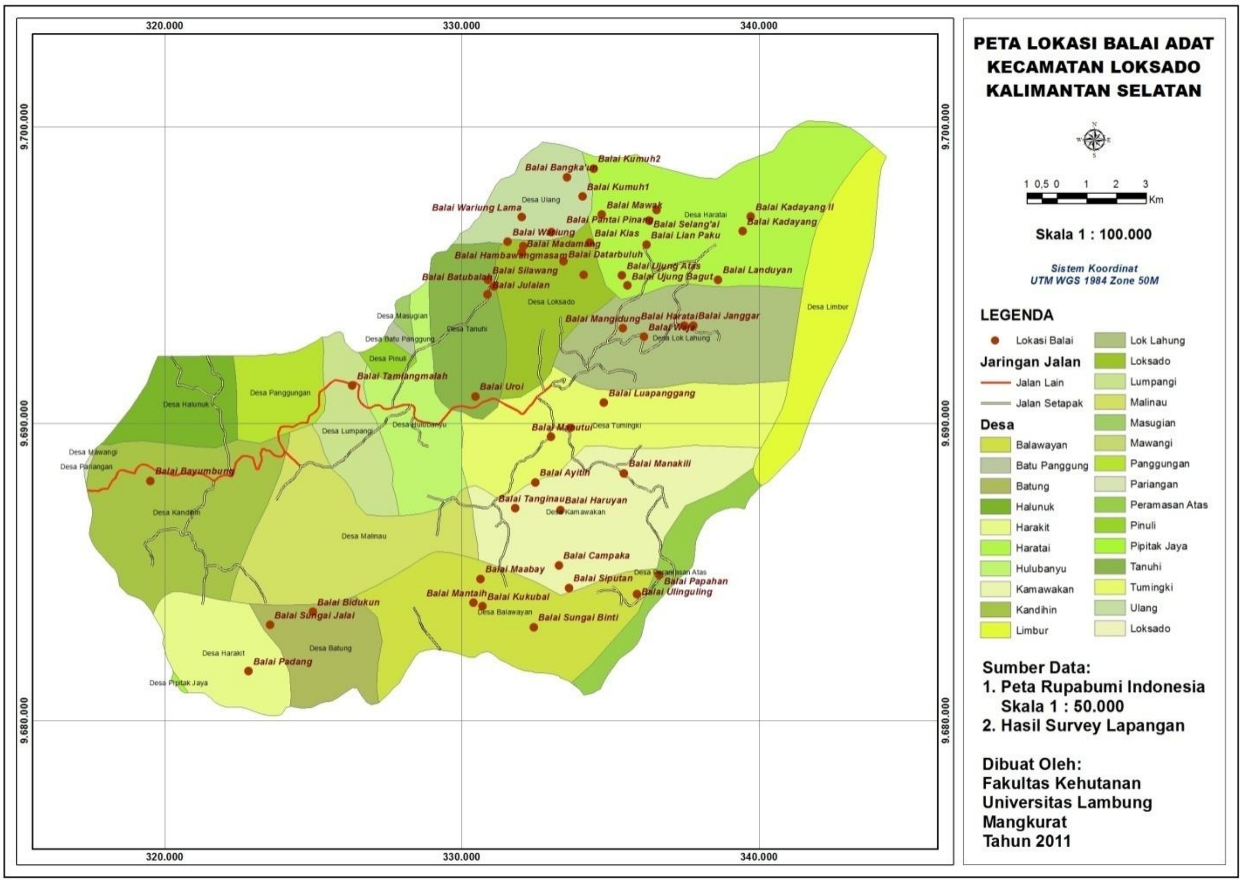


Figure 69. Location of Balai Adat (traditional councils) in Amandit watershed

2.1.5.1.5.2.1.4. Jambi

We are developing a REDD mechanism in Tanjung Jabung Barat district in collaboration with the KPHL Sei Bram Itam. The total area of the district is around 5000 km2, with almost 40% of that being peatland (in the east towards the coast). About 48%, or 240 000 ha, is classified as “forest area”. About 71% of this “forest area” is classified as production forest, 6.65% is protected peat forest and 3.66% is national park. The proportion of “non-forest area” in this district is very high, dominated by coconut agroforestry, rubber agroforestry, rubber monoculture and, most recently, oil palm.

The population was 266 952 in 2009, with a density of about 51 people/km2. Inward migration occurred from the 1940s to the 1950s, mainly Bugis and Banjar ethnic groups from Sulawesi and Kalimantan, respectively. In the 1980s and 1990s, another wave of migration brought people to the area via the Government’s transmigration program. Transmigration provided labour for large-scale oil palm plantations.

The total forested area in Tanjung Jabung Barat is shown in Table 16.

Table 16. Forested area in Tanjung Jabung Barat district

No.	Function	Area (ha)
1	Natural reserve	85
2	Bukit Tiga Puluh National Park	9900
3	Protected Peatland Forest	16 056
4	Limited Production Forest	41 995
5	Production Forest	178 605
	TOTAL	246 601

Source: Tanjung Jabung Barat Forestry Office, 2009

The potential mechanism for reducing emissions in Tanjung Jabung Barat is through the KPH. The KPH itself is believed to be the solution to the lack of forest governance in Indonesia. KPH's presence is expected to address fundamental problems in forest management that have developed over the years, by managing at the site level rather than the mostly distant administrative work that used to be the major role of central government in managing forested areas.

Three KPH areas were launched in Tanjung Jabung Barat district by Minister of Forestry decrees SK.787/Menhut-II/2009 and SK.77/Menhut-II/2010 (Figure 70). Two of the KPH areas cover production forests while the other covers protected peat forest.

The Tanjung Jabung Barat District Forest Agency faced the twin problems of conversion of forest to oil palm plantations and community claims to land within the KPH area. For example, in KPH 17 (Kesatuan Pengelolaan Hutan Lahan Gambut/KPHLG = Forest Management Unit on Peat Land), totalling around 16 000 ha, 4000 ha had already been occupied by communities and converted to oil palm plantations. The KPH asked the community to help restore the original function of the area as protected peat forest by planting jelutung (*Dyera costulata*) on the borders of their oil palm plantations.

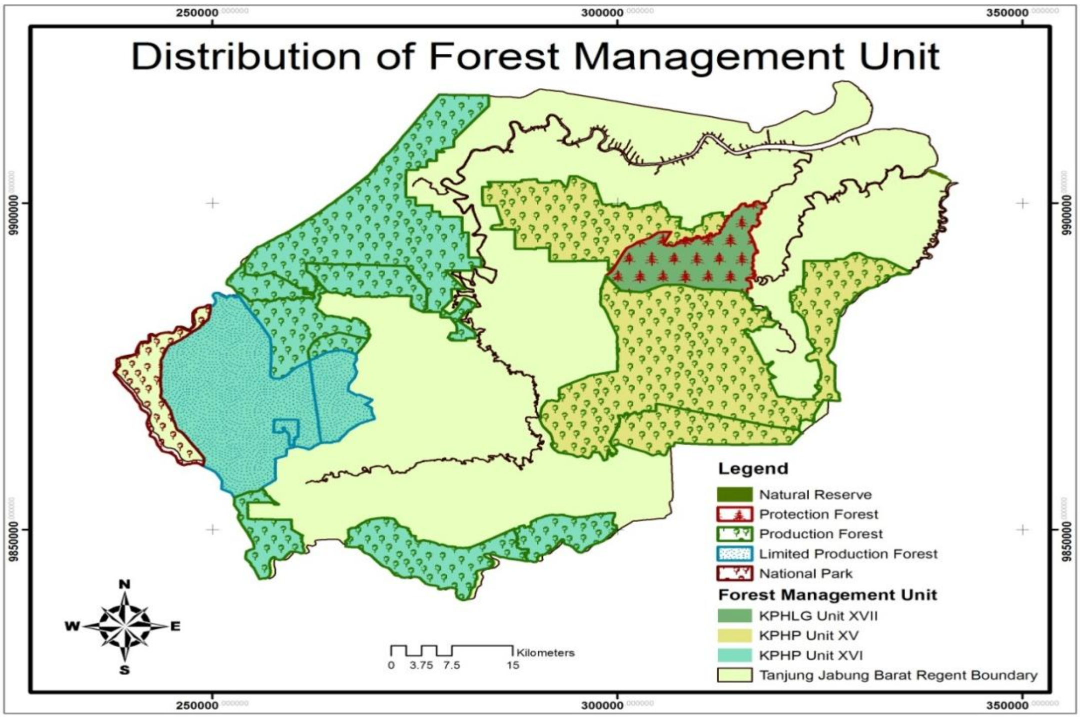


Figure 70. Distribution of forest management units in Tanjung Jabung Barat district

Further, almost 80% of the KPH area has already been allocated to timber plantation concessions, especially in the two KPH areas that cover production forests (Kesatuan Pengelolaan Hutan Produksi = Forest Management Unit for Production Forest Purposes). PT Wira Karya Sakti owns timber plantation concessions for about 141 594 ha of production forest in Tanjung Jabung Barat district.

Despite central government efforts to protect and rehabilitate the remaining state forest, legality and legitimacy issues still remain as areas of conflict. The central government has strengthened forest legality through finalising the forest gazettal process, but it is still being challenged by local governments and communities.

2.1.5.1.5.2.1.5. Pasuruan

In East Java, in the Pasuruan district, the forest's primary purpose for local people is to provide clean water for daily use. About 60% of people in the area depend on the Arjuna mountain forest.

Pasuruan district has an area of 147 401 ha, of which almost 75% is forest and crop land. Forest cover in Pasuruan consists of forest reserve, wildlife reserve, conservation forest, protected forest, production forest and community forest.

The trend in the size of forest areas from year to year shows a decline but the quality of forests from 2000 to 2005 showed a significant increase in carbon stock. Based on our analysis of satellite imagery, the area and quality of community forest in Pasuruan has increased. Many communities have changed their land use to community forest.

The purpose of developing an REDD mechanism in Pasuruan was to establish multi-stakeholder collaboration for improving the quality of forests through the rehabilitation and enrichment planting of protected forests, conservation forests and community forests.

As a forest mosaic type, Pasuruan district is categorised as “Forest Mosaic 2”. In the forest transition, this means that the tree cover from estates, forest plantations and agroforestry is greater than the natural forest cover; income opportunities from non-land-based sectors increase; land tenure is clear; and markets for export commodities are accessible.

In collaboration with Yayasan Satu Daun (a local NGO) and Bappeda (Badan Perencanaan Pembangunan Daerah = the Regional Planning and Development Agency), we formulated a mechanism to increase carbon stocks through a partnership with the private sector.

The potential for involving the private sector through corporate social responsibility programs in Pasuruan is promising because there are around 1300 companies located in the area. Emissions reduction and watershed protection are relevant for them. Thus, collaboration between the private sector, government and communities, facilitated by NGOs, is likely to prove an effective strategy.

The pilot project has three targets.

1. Establishment of a cooperative arrangement with at least two private companies, local government and communities
2. Rehabilitation of degraded land by planting 150 000 trees in forest areas (Gunung Arjuna, Bromo Tengger and Semeru)
3. Establish at least four community groups for the promotion of Hutan Rakyat (community forest).

Activities and achievements to date include the following.

1. Meetings held with PT Coca-Cola Amatil Indonesia, PT Tirta Investama, Aqua, Bappeda, agriculture and forestry offices and communities
2. Established two nurseries managed by farmers
3. Completed tree planting on degraded land with locally appropriate species
4. Developed micro-economic schemes for community forestry

2.2 What your assessment of the result of the Action? Include observations on the extent to which foreseen specific objective and overall objectives were met and whether the Action has had any unforeseen positive or negative results. (please quantify where possible; refer to Logframe Indicators) Action plan for Year 3

Table17. Assessment of the Action

	Intervention Logic	Objectively verifiable indicators of achievement	Sources and means of verification	Assessment
Overall objectives	*What are the overall broader objectives to which the Action will contribute?*	*What are the key indicators related to the overall objectives?*	*What are the sources of information for these indicators?*	
	Indonesia uses carbon accounting system for land-use-based greenhouse gas emissions for implementing international economic 'REDD' incentives for emission reduction in its decision making at the local and national levels.	Increased 'readiness' for Indonesia to participate in the international negotiations on realistic, voluntary and conditional economic incentives for emission reduction, and of the various sub-national entities within Indonesia to actively participate, based on free and prior informed consent by 2013 (expected within a year from end of project).	Policy and decision making at the national and local levels refer to produced database and information International communities accept the credibility of the data and information National baselines are negotiated based on the data and information produced Number of agreed and implemented REDD schemes Project report (progress, annual and final technical reports), government and donor reports, public consultation	• National strategy for REDD+ acknowledges the database and the results of this project. The database has been requested by many institutions. We have strong involvement in the writing process of the national strategy for REDD+ • Several collaborations were sought from the international community to use the data and information for further analysis, e.g. Utrecht University-SarVision, Be-REDD-I (Belgium REDD Initiative), Paneco, RSPO WGGHG (Working Group on GHG, which includes as partners CI and Tropenbos, among others) • The data has been used in the national policy. A national baseline was set using other data before the database was produced. This baseline, according to a high official of the Ministry of Forestry, was set based on political rather than technical criteria • Technical report 2009 has been circulated to partners and a national workshop was conducted last year as public consultation

	What specific objective is the Action intended to achieve to contribute to the overall objectives?	*Which indicators clearly show that the objective of the Action has been achieved?*	*What are the sources of information that exist or can be collected? What are the methods required to get this information?*	
Specific objective	Functioning national carbon accounting system that complies with Tier 3 of the IPCC guidelines for AFOLU (Agriculture, Forestry and Other Land uses), complementing and maximising existing efforts developed and ready to use	Availability of national AFOLU carbon-stock database (aboveground for national level and belowground for selected areas) is submitted to National Carbon Accounting System coordinator by end 2011.	Published manual for accounting system, project reports, peer-reviewed journal publications.	The database has been restructured and developed on a MYSQL database server. New modules of the Species and Wood Density database were created for carbon-stock computation. The data were cleaned based on consistency checks and the possibility of typographical errors. The database is available online at local networks and will be made available for public use upon approval from Ditjen Planologi, Ministry of Forestry, which holds the ownership of the data.
		Guidelines for field data collection, analysis, reporting and monitoring are developed to govern system information between regional and central forest offices by 2011.	Field, reporting and monitoring guide is agreed, adopted and implemented by FPA and RFO and other Indonesian institutions.	Rapid Carbon Stock Appraisal (RACSA) has been widely adopted and implemented by different Indonesian institutions, including, FORDA, LATIN, GTZ Merang REDD project, Ford Foundation, RFO in Gorontalo, TNC Berau. The RACSA manual has been published both in English and Bahasa Indonesia.

	National and sub-national capacity in carbon accounting and monitoring developed and strengthened	A minimum of 100 people from various relevant institutions (both Government of Indonesia and NGOs) trained in carbon accounting and monitoring system. Data gaps in accomplishing Tier 3 IPCC reporting are identified and necessary corrective measures taken by end 2010. Training and education curricula on carbon accounting and monitoring are developed by 2010.	Training report, project progress reports. Datasets, project reports. Curricula for carbon-related training, training manuals.	177 people, from government agencies, NGOs and local universities, have been trained in the carbon accounting and monitoring system. Training report for each site has been produced Regional Forestry Office in Gorontalo has measured carbon stock at KPHP model and has already shared GPS points to support our dataset. Manual of carbon training was published in 201.
	Examples of functioning REDD mechanisms set up in pilot sites in Indonesia for REDD	REDD schemes are designed through multi-stakeholder negotiations in each pilot area by 2011 REDD schemes are approved by the designated national authorities by 2010	Operational negotiation platforms, meeting reports, project documents, Government instruction and reports, project documents, monitoring reports, government officials	We facilitated local government in institutionalizing the use of the tools in developing land use spatial planning that led to lower emissions as a part of pilot activities. The project has facilitated local governments at the pilot sites to use the tools for designing land use planning scenarios through the formation of District ALLREDDI teams.
Expected results	*The results are the outputs envisaged to achieve the specific objective. What are the expected results? (enumerate them)*	*What are the indicators to measure whether and to what extent the Action achieves the expected results?*	*What are the sources of information for these indicators?*	

Credible estimates of the dynamics of carbon stocks at the national level over the past 20 years that complies with Tier 3 reporting guidelines of the IPCC are available for use	A comprehensive database on carbon stocks at the national level ready by the end of the project. Methodology and uncertainty assessment are established by year 2 of the project	Project reports, technical papers, journal articles, the number of citations and uses of the database	Under close cooperation with the Indonesian Forest Planning Agency (FPA), some progress has been made towards the establishment of national carbon accounting system: - Aboveground carbon stock database of Indonesia has been prepared based on National Forest Inventory (NFI) data and is currently in the finishing stages. ALLREDDI has put some added value to the data by upscaling the forest inventory parameters into carbon-stock density for each forest type in Indonesia. - Nationwide land-cover change analyses for Indonesia in 1990, 2000 and 2005 have been completed. The outputs have been submitted to the Forest Planning Agency and also have been used by the Presidential Unit for Development Monitoring (UKP4) in December 2010. In addition, we also added the data of 2010 to our analysis, providing better updated data and analysis. - Preliminary results on Indonesia's aboveground historical emissions are available based on the carbon-stock database and land-cover change analysis results. - Four briefs on national carbon-stock dynamics have been produced as a first step towards peer-reviewed journal publications. These briefs have been translated into Bahasa Indonesia.

An accounting and monitoring system that relates local level Action to national emission data towards international agreements	A nested system among levels with clear operational guidelines by the end of year 2 of the project Minimum 50 government officials and 10 NGO-associated people trained on carbon-stock plot-level measurement and data analysis by 2010	Jointly published guidelines and manual for carbon monitoring and its application for sustainable land-use management RFO and the central office of FPA seamlessly produce and update the database	• The foundation of the REDD mechanism has been developed and has been incorporated in the exercises with different stakeholders on low carbon emission development strategy through simulation using SPASI (Spatially explicit Planning and Assessment tool for land use Sustainability and Integration) tool. • 177 representatives from government agencies, NGOs and local universities have been trained on carbon stock measurement at the plot level
REDD mechanisms for five pilot areas developed, including baselines nested within national policy, providing efficient and fair payment distribution, including necessary capacity enhancement	Minimum of three agreed REDD schemes among local multiple-stakeholders are in line with the national policy and baseline by 2011	A series of meetings among stakeholders and meeting report	We have been empowering local stakeholders on REDD technical capacity at the five sites and supporting forestry services, agricultural services, universities and non government agencies through a series of meetings and training workshops. The stakeholders dialogues in five sites have resulted in the assessment of drivers of land use change and in the identification of a local strategy to reduce emissions. The formal REDD mechanism is yet to be developed. However, other types of mechanisms for reducing emissions have been initiated and are soon to be implemented. At one of the sites, Pasuruan, the CSR (Corporate Social Responsibility) mechanism is being exercised. The private companies are willing to support communities to establish “Hutan Rakyat” (community forest)) with facilitation by a local NGO. Other types of mechanisms at other sites will be developed in year 3 (2011).

	Technical and institutional capacity at local and national levels	Training evaluation report, Government directives	• 184 trainees participated in capacity building workshops, which include exercises on an emission reduction strategy
Operational guidelines for REDD approved by the designated national authorities in Indonesia	REDD schemes in pilot areas are further formulated and documented into operational guidelines and at least three submitted to designated national authorities	Government report, notes, directives, project report, process documentation	Through the LUWES approach, we facilitated the local stakeholders to use their knowledge, technical capacity and data resources gained from work program (WP) 1 and WP 2 for assessing drivers of deforestation and forest degradation and setting a baseline as the basis for evaluating their performance in implementing programs toward low carbon development including the development of a negotiation platform with multi-stakeholders in setting the baseline and emission reduction scenarios as well as the distribution of benefits. It is expected that lessons gained from the ALLREDDI project can provide inputs for governments on the process of developing a negotiated baseline and also mitigation scenarios with multi stakeholders. Most of the activities under the work programs whose implementation depended on the progress made at the national level, could not meet the target. Under WP 3, it was expected that the design of the REDD scheme at the pilots sites would be approved by the designated national authority (DNA) for REDD. These targets could not be met, as, until now, the DNA for REDD has not been established.

2.3 What has been the outcome on both the final beneficiaries &/or target group (if different) and the situation in the target country or target region which the Action addressed?

A web-based application platform for the database of the National Forest Inventory has been developed and is ready for publication. However, as mentioned above, it needs approval from the data custodian to make it public. The analyses have been written and disseminated as policy briefs to various audiences, including during the national workshop. This is a basic set of data that the national government needs to produce the third report on greenhouse gas emissions to the UNFCCC. The technical capacity at the national level have been strengthened, especially in producing land-use and land-cover maps from satellite imageries with legend categories that suit land-based emissions estimation. At the local level, regional forestry offices, NGOs and academics have benefitted from the training and also follow-up discussions amongst the alumni. Our partners within the Action have been requested to train other groups of people within the country, based on the manuals that were developed within the Action. The manuals have been widely distributed and have become a standard guidebook across Indonesia.

Once the progress of REDD+ and land-based NAMA are advanced enough for full implementation, the technical capacity and data are available and ready for moving quickly to monitoring and reporting, as long as institutional issues are resolved. Towards planning for mitigation actions, the enhanced capacity for land-use planning at the local level at the Action's sites will enable stakeholders to take up opportunities once there are available. The booklet and brief on the LUWES tool and experiences from two districts in Jambi province, which are among the sites of this Action, have been distributed widely. The software developed for exploring trade-offs between land-based emissions reduction and economic opportunities has been made available publicly and has been used widely beyond Indonesia.

2.4 Please list all publications (no. of copies) produced during the Action on whatever format, amongst other containing new approaches, innovative ways of communicating. (please enclose a copy of each item, except if you have already done in the past).

2.4.1.Books:

1. *Hairiah K, Ekadinata A, Sari RR and Rahayu S.* 2011. **Pengukuran cadangan karbon dari tingkat lahan ke bentang lahan. Edisi ke 2.** Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 90 p. → 1500 copies
2. *Hairiah K, Dewi S, Agus F, Velarde SJ, Ekadinata A, Rahayu S and van Noordwijk M.* 2011.**Measuring Carbon Stocks Across Land Use Systems: A Manual.** Bogor, Indonesia.World Agroforestry Centre - ICRAF, SEA Regional Office. 154 p. → 1000 copies

3. *Agus F, Hairiah K and Mulyani A.* 2011. **Pengukuran Cadangan Karbon Tanah Gambut. Petunjuk Praktis.** Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 58 p. (English version is in press) → 1000 copies

4. *Dewi S, Ekadinata A, Galudra G, Agung P and Johana F.* 2011. **LUWES: Land use planning for Low Emission Development Strategy.** . Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 47 p. → 1000 copies

5. *Harja D, Dewi S, van Noordwijk M, Ekadinata A, Rahmanulloh A .* 2011. REDD Abacus SP. User Manual and Software. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. → 1000 copies

2.4.2. Briefs:

1. *Ekadinata A, Widayati A, Dewi S, Rahman S and van Noordwijk M.* 2011. **Indonesia's land-use and land-cover changes and their trajectories (1990, 2000 and 2005).** ALLREDDI Brief 01. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 6 p. (Bahasa Indonesia version in press) → 1000 copies
2. *Dewi S, Suyanto S and van Noordwijk M.* 2011. **Institutionalising emissions reduction as part of sustainable development planning at national and sub-national levels in Indonesia.** ALLREDDI Brief 04. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 6 p. (Bahasa Indonesia version in press) → 1000 copies
3. *Harja D, Dewi S, Heryawan F and van Noordwijk M.* 2011. **Forest carbon-stock estimates based on National Forest Inventory data.** ALLREDDI Brief 02. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 6 p. (Bahasa Indonesia version in press) → 1000 copies
4. *Ekadinata A and Dewi S.* 2011. **Estimating losses in aboveground carbon stock from land-use and land-cover changes in Indonesia (1990, 2000, 2005).** ALLREDDI Brief 03.Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 6 p. (Bahasa Indonesia version in press) → 1000 copies
5. *Johana F, Agung P, Galudra G, Ekadinata A, Fadila D, Bahri S and Erwinsyah.* 2011.**Merencanakan pembangunan rendah emisi di Kabupaten Merangin Provinsi Jambi.**Brief No 17. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 6 p. → 1000 copies
6. *Ekadinata A, Agung P, Johana F, Galudra G, Palloge A, Usman G and Aini N.* 2011.**Merencanakan pembangunan rendah emisi di Kabupaten Tanjung Jabung Barat Provinsi Jambi.** Brief No. 18. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 6 p. → 1000 copies
7. *Ekadinata A, van Noordwijk M, Dewi S and Minang PA.* 2010. **Reducing emissions from deforestation, inside and outside the 'forest'.** ASB Policy Brief 16. Nairobi, Kenya. ASB Partnership for the Tropical Forest Margins. 4 p. → 1000 copies
8. *Suyanto S and van Noordwijk M.* 2010. **Fair and efficient? How stakeholders view investments to avoid deforestation in Indonesia.** . Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. → 1000 copies
9. *Johana F, Agung P, Galudra G, Ekadinata A, Fadila D, Bahri S and Erwinsyah.* 2011. **Planning for Low Emission Development in Merangin Regency, Jambi Province**. Brief No. 19. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 6 p. → 1000 copies

10. *Ekadinata A, Agung P, Johana F, Galudra G, Palloge A, Usman G, Aini N.* 2011. **Planning for Low Emission Development in Tanjung Jabung Barat Regency, Jambi Province**. Brief No. 20. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. 6 p. → 1000 copies

2.4.3. In Press:

1. Manual of Carbon Measurement in Peat (English Version) → 1000 copies
2. Four ALREDDI Briefs (Bahasa Indonesia Version) → 1000 copies each

2.4.4. DISSEMINATION/DISTRIBUTIONS for ALLREDDI plublications and other ICRAF publications

ICRAF publications are widely disseminated to some different channels. They are through:

- ICRAF Southeast Asia mailing list: Beside the project mailing list, we are also disseminate through the Regional Office mailing list that consist of donor institutions, governments, NGOs, partners, universities, host country, media, etc.
- Print versions of ALLREDDI publications have also been disseminated to donor institutions, national and local government institutions, NGOs, project partners, and universities.
- Websites*:* We also upload the softcopy (PDF) to the ICRAF Southeast Asia website, which allows freel downloads. ICRAF also contributes to the REDD-I (REDD Indonesia) website – which is a collaboration between CIFOR-ICRAF-Ministry of Forestry. This is one of the media points for interaction, knowledge sharing and socializing information about REDD+, forest and climate change in Indonesia.
- ICRAF publications corner in libraries*:* Since March 2006, ICRAF Information unit maintains a publication corner at FORDA R.I. Ardi Koesoema library, with a dedicated area and frequently updates of the collection. To date, 259 print publications have been placed in the library. This is one of the most important information channels between ICRAF and FORDA, promoting continuous collaboration and easy access for PORDA staff and other library visitors to ICRAF publications. In February 2011, ICRAF placed the publication and installed a computer in the Library of Ministry of Forestry in Jakarta: Pusat Dokumentasi Info Taman Hutan. ICRAF also lodges three copies of all its publications with the National Library of Indonesia.

2.5. Please list all contracts (works, supplies, services) above 5000 € awarded for the implementation of the action since the last interim report if any or during the reporting period, giving for each contract the amount, the award procedure followed and the name of the contractor.

Procedure of award: Collaborators have selected through direct appointed by ICRAF based on their capacity and capability. The fund basically is tapping up of their existing activities that link to emission reduction. For example Low Carbon Emission Development Working Group is already established in Papua; Satu Daun foundation has implemented corporate social responsibility program in Pasuruan, the Action has extended (broader) to the issue of emission reduction.

Table 18 . List of collaborators

ID	Collaborator	Project Title	Period	Amount
U3905	Univ Lambung Mangkurat - Abdi Fitria S. Hut. MP	Estimation of carbon stored in various land use systems in the watershed of Amandit, South Kalimantan	1 September 2010 - 30 September 2011	Rp 100,000,000 eq. EUR 8400
U7804	Gorontalo State University - Mr. Amir Khalid	Study of working group institution of unit forest management in Pohuwato district, Gorontalo	1 September 2010 - 1 September 2011	Rp 100,000,000 eq. EUR 8400
N7201	BPDSLH Papua - Ir. Noak Kapisa MSc	Supporting Low Carbon Emission Development Working Group in Papua	1 Sept 2010 - 30 Sept 2011	Rp 100,000,000 eq. EUR 8400
N7101	DKKT Tj Jabung Barat - Dri Handoyo	Development of management unit of peat forest preservation of Bram Itam river, Jambi	1 Sept 2010 - 30 Sept 2011	Rp 100,000,000 eq. EUR 8400
N7001	Yayasan Satu Daun - Heri Agus Setiawan - Director Executive	Quality improvement of forest resources through forest partnership in Pasuruan, East Java	1 September 2010 - 30 September 2011	Rp 100,000,000 eq. EUR 8400

2.6. Describe if the Action will continue after the support from the European Community has ended. Are there any follow up activities envisaged? What will ensure the sustainability of the action?

ICRAF as the leading partner of this Action has been actively engaged in discussions about land-based NAMA with Bappenas. Bappenas has decided that the LUWES tool will be adopted for land-use planning for land-based emissions reductions as part of NAMA at the provincial and district levels. It is planned that in May we will conduct training sessions for provincial governments for the whole country. We also plan to broaden the scope of LUWES, in the next generation of the tool, from targeting emission reductions only to also considering biodiversity and watershed functions.

From the experience we had in producing national land-cover maps of Indonesia from Landsat imageries (1990, 2000, 2005, 2010), we concluded that object-based image interpretation is excellent for mimicking the strength of visual interpretation and in guaranteeing the consistency and speed of the process such that it resembles automatic interpretation. ICRAF is part of the working group for developing methods and approaches for mapping Indonesia, as part of the one-map system led by the National Mapping and Surveying Agency. Some further collaborative research with accompanying recommendations is currently being developed.

At the local level, within a subset of sites where the Action took place, we continue the engagement in land-use planning activities, supported by other donors. Linking this activity with land-based NAMA, which is supported from the national budget, is strategic in promoting the sustainability of the activities. We are exploring with the REDD+ task force ways to integrate the planning process at the local level between REDD+ and land-based NAMA. If this is fruitful, then the impact of the Action will be magnified and sustained.

The wide distribution of manuals and briefs, and also the broad network of partners, will allow the methods, tools, information, capacity and lessons learnt to be carried further beyond the Action sites and even beyond the Action scope. Requests, publications and discussions with regards to the outcome of the Action are continuously high, which indicates the high uptake of the outcome.

The training participants reported that all training activities in this project were on new topics and were very interesting, as the training was relevant to global as well as national problems. Our activity under the ALREDDI Project in the second year was very limited because of undelivered budget from the EU. However, the UB team was still engaged in various training programs related to the impact of "Land Use Changes on Carbon and Water Balance at Landscape Level" inside and outside Java (Table 19). The training sessions were hosted by various organizations such as the Forestry Research and Development Agency (LITBANGHUT), NGO's, and LIPI (Indonesian Institutes of Sciences) with financial support from various donors. The participants were mainly from communities living near forest edges, forest rangers and managers of estate forest etc. However, the most challenging aspect for trainers was having participants with various levels of education that ranged from primary school to university (Bachelor and Master degree level). Therefore, choosing training mechanisms and tools had to be done carefully taking into account the target groups and target outputs.

Table 19. Training activity beyond WP2 activity that impacted on ALREDDI

No	Title of training	Organizer	Location and Time
1	Tropical forest conservation for reducing emissions from deforestation and (forest) degradation and enhancing carbon stock in Merubetiri National park. Community involvement in MRV carbon stock in Merubetiri National Park	FORDA (Forestry Department Agency)	Jember, 29-31 October 2010
2	Tropical forest conservation for reducing emissions from deforestation and (forest) degradation and enhancing carbon stock in Merubetiri National park. Community involvement in MRV carbon stock in Merubetiri National Park	FORDA	Banyuwangi, 1-3 November 2010
3	Involvement of stakeholders in MRV of carbon stock changes in the forest community	Indonesian Communication Forum on Community Forestry (FKKM)-NGO	Merubetiri National Park, Jember (east Java), 26-28 November 2010
4	Seminar and training: Landscape management as a base strategy on maintaining watershed hydrology and carbon stock. Improvement of knowledge and skill of researchers	Indonesian Institutes of Sciences, LIPI	Botanical Garden, Purwodadi, 12-13 January 2011
5	Training the Trainer: Improvement of understanding and skills of stakeholders on reducing carbon emissions and its measurement in community forest	WATALA (NGO)	Sumberjaya, West Lampung, 18-20 February 2011

6	Tropical forest conservation for reducing emissions from deforestation and (forest) degradation and enhancing carbon stock in Merubetiri National park: Inventory of land resources	FORDA	Jember, 26-28 Juli 2011
7	Tropical forest conservation for reducing emissions from deforestation and (forest) degradation and enhancing carbon stock in Merubetiri National park: Inventory of land resources	FORDA	Banyuwangi, 27-29 October 2011

2.7. Has the Action promoted gender equality, disabilities...? If yes, please explain.

The Action has promoted gender equality through trainings and workshops. The direct involvement between man and women on the trainings and workshop during the project implementation were 248 for man and 128 for women.

2.8 How and by whom have the activities been monitored/evaluated? Please summarise the result of the feedback received, including from the beneficiaries

The third external evaluation was conducted on 2 December 2011 by the national evaluator (Prof. Rizaldi Boer from IPB). The evaluator visited Jambi province and held interviews and discussion sessions with the local stakeholders there. The process of external evaluation in Jambi was effective as the evaluator had good discussions with the stakeholders, especially from the provincial planning agency.

2.8.1 General Findings

In general, the ALLREDDI project has met most of its objectives, particularly in developing the capacity of local stakeholders in using tools developed in the project for setting the baseline or reference level, for measuring carbon stocks at the field level and estimating emissions from change in land use. A number of beneficiaries received the trainings beyond the target. Alumni of ToT from this project are often invited by other regions to be trainers.

The understanding of local governments on REDD issues has significantly increased. REDD has been seen as a program that should be adopted by local government to ensure the sustainable use of land and forest resources to support economic and environmental development. Staff from the Development and Planning Agency in the two districts being interviewed stated that the tools developed by the project helped them in designing land-use plans for low emission development strategies. This is in line with the current government policy that all local governments are requested to integrate environmentally strategic issues (e.g. low carbon development) into their spatial plan.

The Forest Planning Agency also recognized that the ALLREDDI project has contributed to the process of developing a land use and carbon accounting (LUCA) system at the national level and can provide support for the development of INCAS (Indonesian National Carbon Accounting System, supported by AusAID).

Most of the activities under the work programs in which implementation depended on progress made at the national level, could not meet their targets. Under work program 3, it was expected that the design of the REDD scheme in the pilot sites would be approved by the designated national authority (DNA) for REDD. This target could not be met, as up until now, the DNA for REDD has not been established. In Forest Minister Regulation Number 30/2009 on the Procedure for REDD Implementation such an institution is mentioned as the REDD Commission. With the issuance of the new presidential regulation on the REDD Task Force, the mandate for the establishment of such an institution has been transferred to the REDD Task Force. However, in the absence of such an institution, the Minister of Forestry has established the Climate Change Working Group under Decree Number 13/Menhut-II/2009. One of the tasks of the Working Group is to facilitate initiatives from various stakeholders to mitigate climate change in the area of forestry including a clean development mechanism (CDM) and a reduction in emissions from deforestation and forest degradation (REDD).

2.8.2 Specific Findings

2.8.2.1. Development of national carbon accounting and monitoring systems that are in compliance with Tier 3 IPCC Guidelines

Most of the targeted outputs under this work program have been achieved. The ALLREDDI project has produced consistent land-use/cover maps for 1990, 2000, 2005 and 2010 including carbon databases for the five pilot areas (Kalsel, Jambi, Gorontalo , Papua provinces, and Pasuruan district). Carbon-stock data from the National Forest Inventory (NFI) at the FPA have also been compiled and put in the worldwide web database. However, this database is still not available to the public as it is under the authority of the FPA. Up until now, the FPA has not made a decision regarding the accessibility of the database to the public.

The FPA recognized the contribution of the ALLREDDI project in assisting them in developing consistent land-use maps and a carbon-stock database. With the contribution from this project, the FPA has revised and improved the estimation of historical emissions from deforestation and forest degradation. Nevertheless, the FPA and local governments expected that consistent land-use maps should be developed on an annual basis including the improvement of the C-stock database for various land-use types and non-CO2 emission factors for different soil types and climate regimes. The availability of this system will assist them in the development of a GHG inventory for agriculture, forestry and other land uses, following the IPCC Guideline as mandated by Presidential Regulation Number 71/2011.

The tool called ABACUS, developed in this project, uses a carbon-stock change approach to estimate the emissions from agriculture, forests and land-use changes. This approach is simple and quick. The emissions from a particular land use are calculated based on the change of time-average carbon-stock in the land as a result of the change in the land-use category. The tool is not able to estimate the rate of GHG emissions from soil for a particular land use due to the change in management. In addition, the tool for assessing the uncertainty of carbon stock estimates for different land cover types has not been developed yet.

The concept of the process for institutional arrangements for reporting data related to the implementation of REDD+ from the local to the national level was discussed but it has not been developed yet. Similarly, the concept of a nested approach has also been discussed within the project team but it has not been adopted and implemented. The understanding of local stakeholders on the nested concept has also not been developed yet.

2.8.2.2. Development of technical capacities at (sub)national level to contribute to national carbon accounting and monitoring system

The achievement of this work program to some extent has already exceeded the target, particularly in training activities. The number of people trained on the use of the land-use carbon accounting tool for estimating emissions and methods for measuring carbon stock has exceeded the target. A number of trainee alumni of the ToT from this project have been invited by other regions (nonpilot districts) to be trainers. A number of manuals for measuring carbon stock and a curriculum for the education centres of forest department have also been produced and are accessible from the web (http://www.worldagroforestry.org/sea/). Nevertheless, project activities to develop a manual and conduct training for uncertainty assessment have not been done.

To fill the data gaps, the project has also measured the carbon stock from various land uses at the pilot sites. It was planned that the measurement of carbon stock after training would be conducted by the local partners who had received training. Due to the unavailability of funds, the measurement was done by the ICRAF staff and the involvement of local project partners (local government and RFA) was still limited.

2.8.2.3. Development of REDD mechanisms in 5 pilot areas in western, central and eastern Indonesia

ALLREDDI has been quite successful in facilitating local governments in institutionalizing the use of the tools to develop land-use spatial plans that lead to lower emissions as part of pilot activities. The project has facilitated local governments at the pilot sites to use the tools for designing land-use planning scenarios through the formation of district ALLREDDI teams. Based on interviews with the ALLREDDI teams from the two districts (Tanjung Jabung Barat and Merangin Districts), the ALLREDDI team felt confident in using the developed tools for integrating the REDD+ strategies into spatial plans (RTRW). However, they considered that to some extent, they still needed support and facilitation from the project. The team also stated that institutional arrangements for conducting, monitoring and reporting data from the implementation of REDD+ to the national level has not been developed yet. It was stressed that it was very important the system being developed should be attached to the existing institutional system. The system for QA/QC (Quality Assurance/Quality Control) should be prioritised in the next activities.

Nevertheless, the members of the ALLREDDI teams from the two districts are all from Development and Planning Agencies. In performing their tasks, the teams did consolidate and coordinate with other related district agencies (Satuan Perangkat Daerah or SPDs) particularly BPN (National Land Agency), the District Agriculture Office, the District Forestry Office and the District Mining Office.

From interviews, it was revealed that the developed baselines produced by the District ALLREDDI teams have not been negotiated yet with broader stakeholders. The decision to adopt the approach for defining a baseline and REDD+ was made only by the teams; there has not yet been any consultation/negotiation with other stakeholders. The teams considered that a further socialization and negotiation process on the baselines is required. The teams also felt that the formation of a multi stakeholder forum may be required in the two districts as a medium to facilitate negotiation and consultation toward low carbon development including a payment and distribution mechanism, and there was also a need to develop the operational negotiation platform.

2.8.2.4. Conclusion

In general, the ALLREDDI project has met most of its objectives. Some of the programs had exceeded their targets, particularly the number of people being trained on the use of the tools. However, some of the programs had only partly met their targets, and a few had not met any of their targets.

A summary of the achievements of the project is presented in Figure 71.

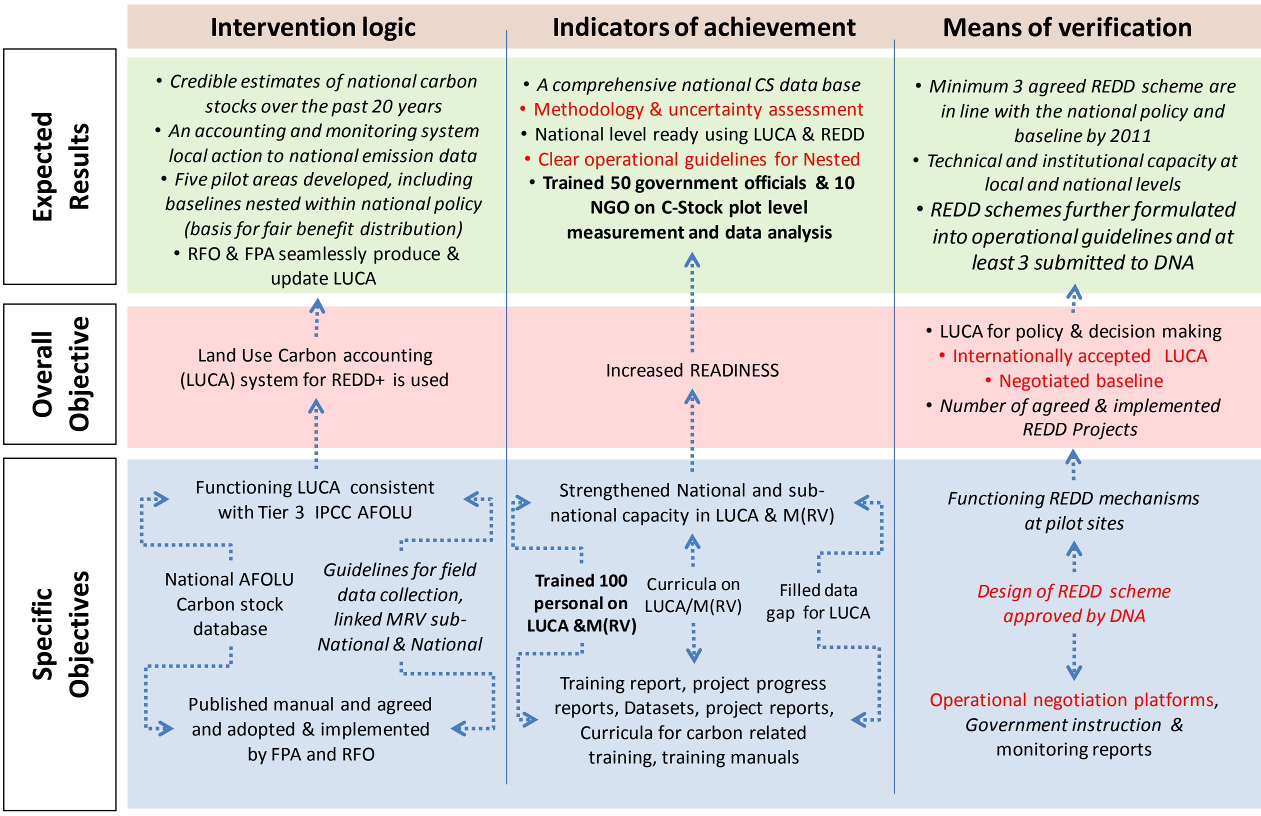


Figure 71. ALLREDDI project achievements according using a logical framework approach (Note: Objectives or results in black mean the target was met, black and bold means exceeded the target, black and italic means partially met the target and red means did not meet the target)

2.9. What has your organization/partner earned from the Action and how has this learning been utilised and disseminated?

In general, we learned that the technical capacities and awareness at national and local levels in measuring and monitoring carbon stock do indeed need strengthening. The training in rapid assessment and also in mapping have been proven to be effective. For the objective of supporting Indonesia to be ready for REDD+ implementation at the national level, especially with regards to data and analysis, we learned that strengthening the technical capacity for data production, management and analysis that is in-line with the IPCC guideline was fruitful despite the challenge presented by the over-commitment of our partner, the Ministry of Forestry.

We found institutional issues internal to the Ministry to be most challenging, that is, placing the data and results into the public domain remains difficult. Having the data accessible by the public is necessary for encouraging data exchanges and quality control, to promote the iterative process of enhancing data quality, to endorse the uses of the data and to stimulate further actions within Government bodies. The Action tremendously increased the availability of necessary data for REDD+ and other mitigation actions at the national level, however, it is not yet matched with an increase in data accessibility.

Land-use planning at the local level (province and district) that brings land-based emissions and economic trade-offs onto the negotiation tables are key to planning emission reductions. The technical capacity, tools and data had been seriously lacking to do this. A set of principles, steps and software were packaged within the LUWES tool. This tool integrated the different modalities of emission reduction actions. Training and workshops conducted at the local level showed that local government needs such tools and has some basic technical capacity that can be sharpened to create a land-use planning process that is integrative, inclusive and informed.

The political process at the country level and the negotiation process at the international level have not brought REDD+ to the stage we anticipated when the Action was proposed. However, we learned that integrating REDD+ with the land-based sector's NAMA should be the way to go, especially for the monitoring and land-use planning process, which are two of the foci of the Action. Our engagement with the discussions at the national level about REDD+ and NAMA have enabled us to disseminate our lessons learnt from the Action. Also our close collaboration with the local government and the REDD+ working groups at the local level, if they exist, have been fruitful especially in terms of influencing the land-use planning processes.

3. Partners and other co-operation

3.1. How do you assess the relationship between the formal partners of this Action (i.e. those partners which have signed a partnership statement)? Please specify for each partner organization.

The Directorate General of Forest Planning continued its commitment in the third period of this Action through data provision (Landsat imagery) and by co-hosting two training courses at two sites (Papua and Gorontalo). However, owing to the high staff turnover in Ditjen Planologi, several activities that were their responsibility experienced a slow down during the completion phase; therefore, some adjustments need to be applied.

The Brawijaya University (UB) team has been very responsive and highly committed to finalise the guidelines and manuals for carbon measurement in the third year of the project. With excellent resource staff, they have performed the technical and administrative aspects very well and have completed their tasks. Through the third year of this Action, the UB team has conducted several carbon measurement training sessions with various organizations.

The contribution of the Indonesian Center for Agricultural Land Resources Research and Development (ICALLRD) to this Action in the first semester of the third year was to finalise carbon measurement of peatlands in Jambi province and they have continued in Papua for the second semester. ICALRRD also developed the manual for carbon measurement on peatland to the first draft stage.

3.2. How would you assess the relationship between your organization and State authorities in the Action countries? How has this relationship affected the Action?

The most relevant State authority for technical issues on REDD is the most important partner we have in this Action, that is, Ditjen Planologi. Ditjen Planologi is the key organization responsible for Indonesia’s carbon accounting and monitoring and they have been relying on the outputs of this Action to determine baseline emissions at the national level. The national baseline can be established faster by compiling, cleaning and processing the existing data rather than by having to start data collection from scratch.

The National Forest Inventory of Indonesia is a rich source of key data. Ditjen Planologi is the custodian of the data which has been shared with us for joint analysis. Ditjen Planologi also invited us to various meetings with different institutions to discuss carbon and biomass issues.

3.3. Where applicable, describe your relationship with any other organizations involved in implementing the Action.

Associate(s) (if any)

- Yayasan Satu Daun in Pasuruan district have undertake improving forest quality through forestry partnerships with private companies
- Gorontalo State University, Gorontalo, will undertake an institutional review of the KPH working group and KPH model in Gorontalo
- Lambung Mangkurat University, South Kalimantan, will undertake carbon measurement on various land-use systems in the Amandit watershed
- Dinas Kehutanan Tanjung Jabung Barat, Jambi, will establish a KPH model in the Sei Bram Itam protected forest
- The Papua low-carbon working group will undertake development of a low-carbon emission strategy for Papua

3.4. Where applicable, outline any links you have developed with other Actions.

The World Agroforestry Centre has conducted a study on the carbon footprint of biofuel produced from oil palm. This work is very relevant to ALLREDDI as REDD in Indonesia will cover oil palm as one of the strategies. We worked together with the Indonesian Palm Oil Commission to address issues proposed by the EU Directives.

Land-cover maps which have been generated from ALLREDDI (1990, 2000 and 2005) were used for INCAS, which produced the "Forest–Non-Forest" classification in INCAS. The "Forest–Non-Forest" classification will be produced by Ditjen Planologi and Lembaga Penerbangan dan Antariksa Nasional (National Institute of Aeronautics and Space or LAPAN, supported by AusAID, in the near future. The work on accounting for historical emissions in the ALLREDDI project (based on 1990, 2000 and 2005) will be used in INCAS to account for annual emissions.

Data (land cover and carbon) and other results of the project have been acknowledged at the level of Indonesia's national strategy for REDD+ and have also been requested by many institutions.

Different collaborative works by the World Agroforestry Centre with various international organizations addressing climate-change mitigation efforts and low-emission development pathways have benefitted from different products and methods produced by ALLREDDI. The utilisation of the data in the projects can be categorized into:

- Site-level REDD feasibility appraisals (REALU project under the CGIAR-ASB partnership)
- Landscape carbon-stock and aboveground emissions in Sumatran orangutan (Pongo Abelii) habitats as biodiversity conservation hotspots (collaboration with PanEco)
- Joint analyses and data cross-validation (involvement in the RSPO Working Group on greenhouse gas emissions, collaborating with SarVision-Utrecht University)
- Joint analyses for carbon flux methods and REDD sustainability framework (in collaboration with Belgium organizations under the Be-REDD-I project).

4. Visibility

4.1. How is the visibility of the EU contribution being ensured in the Action?

During our communications and presentations on ALLREDDI and ALLREDDI-related issues that are made internally and externally, EU support is explicitly acknowledged. For printed material, banners and slides, the EU logo and disclaimer text are posted whenever appropriate. In the first semester of the project we acknowledged EU support associated with

- Training materials and banners at five sites and at national workshop
- ALLREDDI briefs 1-4 (English versions) that were disseminated and ALLREDDI briefs 5-8 (Bahasa Indonesia versions) that are in press
- Land Use Planning for low emission briefs in Tanjung Jabung Barat and Merangin (English and Bahasa Indonesia version)
- RaCSA Manual, second edition

- REDD Abacus Manual
- LUWES Manual

For different collaborations which made use of ALLREDDI data, as mentioned above, acknowledgement of ALLREDDI as an EU-funded project has been made in publications and presentations produced by the partners.

4.2. The European Commission may wish to publicize the results of Actions. Do you have any objection to this report being published on Europe Aid Co-operation Office website? If so, please state your objections here.

We do not have any objections whatsoever.

Name of the contact person for the Action: Dr Ujjwal Pradhan

Signature:

Ujjwal Pradhan, Ph.D.
Regional Coordinator
ICRAF Southeast Asia Regional Office

Appendix:

MONITORING REPORT

IMPLEMENTATION OF ACCOUNTABILITY OF LOCAL LEVEL INITIATIVE TO REDUCE EMISSION FROM DEFORESTATION AND DEGRADATION IN INDONESIA (ALLREDDI) PROJECT

Prepared by Rizaldi Boer

World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

BOGOR

JANUARY 2012

1. INTRODUCTION

Accountability and Local Level Initiative to Reduce Emission from Deforestation and Degradation in Indonesia (ALLREDDI) is one of related REDD projects implemented in Indonesia supported by the European Commission (EU). The project was implemented by World Agroforestry Centre (ICRAF) in partnership with the Directorate General of Forest Planning, Ministry of Forestry (Ditjen Planologi), Brawijaya University (UB) and Indonesian Centre for Agricultural Land Resources Research and Development (ICALLRD) in the period between 2009 and 2011. It was designed to contribute to three main areas related to Monitoring, Reporting and Verifying (MRV) system of REDD program, namely:

1. Development of national carbon accounting and monitoring system that are in compliance with Tier 3 IPCC Guideline
2. Development of technical capacities at (sub)national level to contribute to national carbon accounting and monitoring system
3. Design of REDD mechanism in 5 pilot area in western central and eastern Indonesia through: (a) reference emission level setting (b) payment and distribution mechanism

To ensure that projects remain on course to reach their objectives and gain timely feedback from project implementation for the improvement of subsequent project design, it is necessary to invite independent evaluator to monitor the implementation of the project. This report provides findings from independent mission conducted by evaluator on the implementation of the ALLREDDI project. It is expected that this can be of use for the project implementer to maintain and where possible improve the quality of projects in external co-operation.

2. ABOUT THE PROJECTS

As mentioned above, the ALLREDDI program focused on the main areas. The first is focused on the inventory and compilation of carbon stock data and forest maps, development of tools for land use assessment, carbon accounting and monitoring system, and development of guidelines on the use of the tools including method for integrating carbon accounting and monitoring system of local with national using nested approach (Called work program 1 or WP1). The second is focused on the data gap filling (between existing data and data required to fulfill Tier 3 IPCC reporting guidelines) and development of capacity of national and local stakeholders on the use of the tools from WP1 through trainings and piloting curricula for the education centers of the forest department and universities to ensure long-term sustainability (called work program 2 or WP2). Third is focused on development of REDD mechanisms in 5 pilot areas in western, central and eastern Indonesia (called work program 3 or WP3). In these pilots, the local stakeholders are facilitated to use their knowledge, technical capacity and data resources gained from WP1 and WP2 for assessing drivers of deforestation and forest degradation and setting baseline as basis for evaluating their performance in implementing programs toward low carbon development including development of negotiation platform with multi-stakeholder in setting the baseline and emission reduction scenarios as well as distribution of benefits. It is expected that lesson learnt gained from the

ALLREDDI project can provide inputs for the governments on the process of developing negotiated baseline and mitigation scenarios with multi stakeholder. Implementation of REDD program following this process is expected to gain international recognition. The interrelation between the work programs is presented in Figure 1.

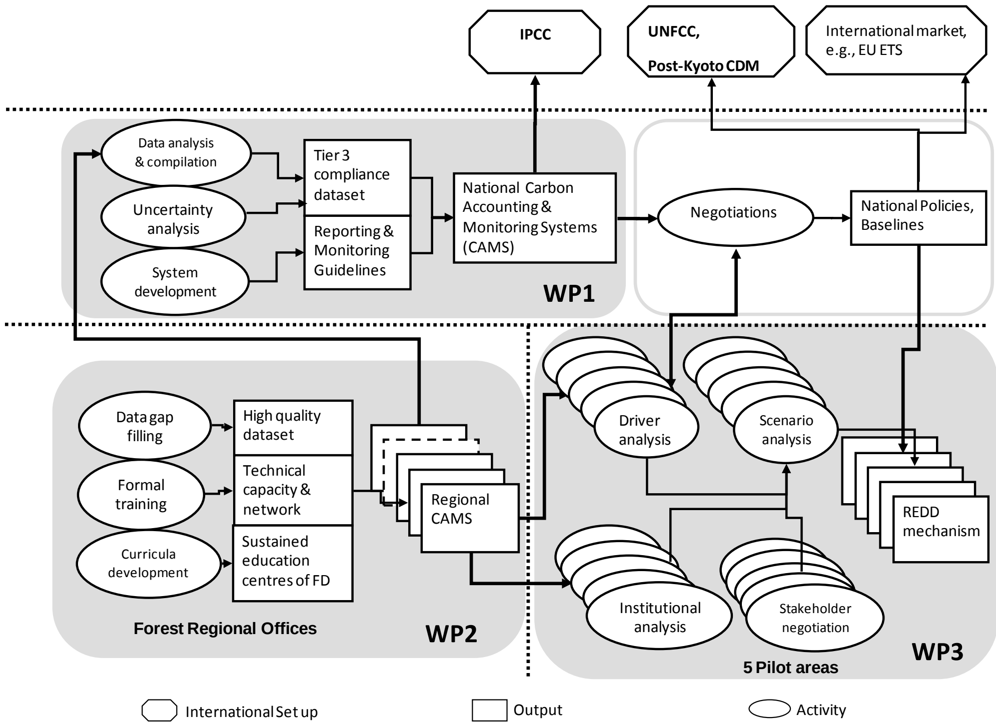


Figure 1. The three Work Programs under ALLREADDI Project

The main target beneficiaries of the project at national, regional and local level are Forest Planning Agency (FPA), Regional Forest Offices (RFA) and five local governments respectively including local communities.

3. METHODOLOGY

The evaluation of the project implementation was conducted through site visits and interview with a number of national and local stakeholders and review of project documents/reports. The evaluation was done based on a logical framework prepared for the project. Logic of intervention, indicators of achievements and means of verification used during the evaluation process is presented in Figure 2. The assessment was mainly based on interview to national and local project partners, i.e. from Forest Planning Agency (FPA), Development and Planning Agencies of two pilot sites (Tanjung Jabung Barat and Merangin Districts) and ICRAF project staffs.

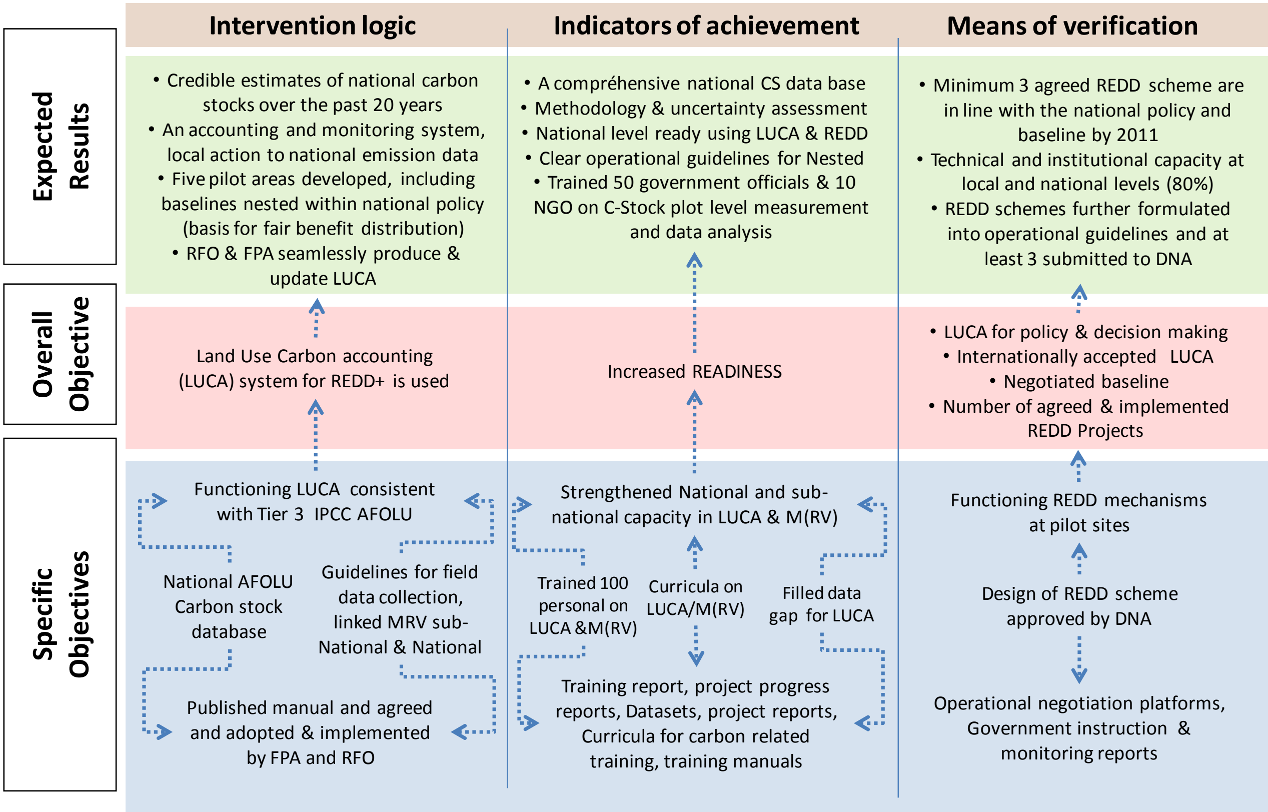


Figure 2. Summary of logical framework used for the project evaluation.

4. RESULT OF EVALUATION

4.1. General Findings

In general the ALLREDDI project has meet most of its objectives, particularly in developing capacity of local stakeholder in using tools developed in the project for setting the baseline or reference level, measuring carbon stock at field level and estimating emissions from the change of land uses. Number of beneficiaries received the trainings beyond the target. Alumni of ToT from this project are often invited by other regions to be trainers.

Understanding of local governments on REDD issues has significantly increased. REDD has been seen as programs that should be adopted by local government to ensure sustainable use of land and forest resources for supporting economic and environmental development. The staffs from Development and Planning Agency of the two districts being interviewed stated that the tools developed by the project help them in designing land use plan for low emission development strategy. This is very in line with the current government policy that all local governments are requested to integrate environmental strategic issue (e.g. low carbon development) into their spatial plan.

Forest Planning Agency also recognized that the ALLREDDI project has contributed to the process of developing land use and carbon accounting (LUCA) system at national level and can provide support for the development of INCAS (Indonesian National Carbon Accounting System supported by AusAID).

Most of the activities under the work programs in which their implementation depends on the progress made at the national level, could not meet the target. Under the work program 3, it was expected that the design of REDD scheme in the pilots sites is approved by the designated national authority (DNA) for REDD. These targets could not be meet as until now the DNA for REDD has not been established yet. In the Forest Minister Regulations Number 30/2009 on Procedure for REDD Implementation such institution is mentioned as REDD Commission. With the issuance of new presidential regulation on REDD Task Force, the mandate for the establishment of such institution is transfferred to the REDD Task Force. In the absence of such institution, however, the Minister of Forestry has established Climate Change Working Group under the Decree Number 13/Menhut-II/2009. One of the tasks of the Working Group is to facilitate initiative from various stakeholders to mitigate climate change in the area of forestry including clean development mechanism (CDM) and reduction emission from deforestation and forest degradation (REDD).

4.2. Specific Findings

4.2.1. Development of national carbon accounting and monitoring system that are in compliance with Tier 3 IPCC Guideline

Most of targeted outputs under this work program have been achieved. ALLREDDI project has produced consistent land use/cover maps for 1990, 2000, 2005 and 2010 including carbon database for the five pilot areas (K*alsel, Jambi, Gorontalo , Papua provinces, and Pasuruan district).* Carbon-stock data from National Forest Inventory (NFI) at the FPA has also been compiled and put in the web base database. However, this data is still not available for public as it is under authority of FPA. Up to know the FPA has not made decision regarding the accessibility of the data for the public.

The FPA recognized the contribution of the ALLREDDI project in assisting them in developing consistent land use map and carbon-stock database. With the contribution of this project the FPA has revised and improved the estimation of historical emission from deforestation and forest degradation. Nevertheless, the FPA and local governments expected that the consistent land use map should be developed on annual basis including the improvement of C-stock database for various land use types and non-CO_2 emission factors for different soil types and climate regime. The availability of this system will assist them in the developing GHG inventory for agriculture, forest and other land uses following the IPCC Guideline as mandated by Presidential Regulation Number 71/2011.

The tool developed in this project called ABACUS uses carbon-stock change approach in estimating the emission from agriculture, forest and land use changes. This approach is simple and quick. The emission from particular land is calculated based on the change of time-average carbon-stock in the land as a result of changing land use category. The tool is not able to estimate rate of GHGs emission from soil in particular land use due to change in management. In addition, the tool for assessing uncertainty of carbon stock estimates in different land cover types has not been developed yet.

Concept on the process institutional arrangement for reporting data related to the implementation of REDD+ from local to national has been discussed but it has not been developed yet. Similarly, the concept on nested approach has also been discussed within the project team but it has not being adopted and implemented. Understanding of local stakeholder on the nested concept has also not been developed yet.

4.2.2. Development of technical capacities at (sub)national level to contribute to national carbon accounting and monitoring system

The achievement of this work program to some extend has already beyond the target, particularly training activities. The number of people being trained on the land use carbon accounting tool for estimating emissions and method for measuring carbon stock has beyond the target. Number of trainee alumni of the ToT from this project has been invited by other regions (non pilot districts) to be trainers. A number of manuals for measuring carbon stock and curriculum for the education centres of forest department have also been produced and accessible from the web (http://www.worldagroforestry.org/sea/). Nevertheless, project activities to develop manual and conduct training for uncertainty assessment have not been done.

To fill the data gaps, the project has also measured the carbon stock from various land uses in the pilot sites. It was planned that the measurement of carbon stock after the training were expected to be conducted by the local partners who received training. Due to unavailability of fund, the measurement was done by the ICRAF staff and the involvement of local project partners (local government and RFA) was still limited.

4.2.3. Development of REDD mechanisms in 5 pilot areas in western, central and eastern Indonesia through

ALLREDDI is quite successful in facilitating the local government in institutionalizing the use of the tools in developing land use spatial plan that lead to lower emission as part of pilot activities. The project has facilitated the local governments in the pilot sites to use the tools for designing land us plan scenario through the formation of District ALLREDDI team. Based on interview with the ALLREDDI Team from the two districts ((Tanjung Jabung Barat and Merangin Districts), it was expressed that the ALLREDDI Team felt confidence in using the developed tools for integrating the REDD+ strategies into spatial plan (RTRW). However, they expressed that to some extends they still support and facilitation from the project. The team also stated that institutional arrangement for conducting monitoring and reporting data from the implementation of REDD+ to national has also not been developed yet. It was underlined that it is very important the system being developed should be attached to the existing institution system. System for QA/QC (Quality Assurance/Quality Control) should be prioritized in next activities.

Nevertheless, the members of the ALLREDDI Team from the two districts are all from Development and Planning Agencies. But in performing its task, the team did consolidation and coordination with other related district agencies (*Satuan Perangkat Daerah or SPDs*) particularly BPN (National Land Agency), District Agriculture Office, District Forestry Office and District Mining Office. From the interview, it was revealed that the developed baseline produced by the District ALLREDDI Team has not been negotiated yet with broader stakeholders. The decision in adopting the approach for defining baseline and REDD+ was made only by the team, there was no consultation/negotiation with other stakeholders being implemented yet. The team considered that further socialization and negotiation process on the baseline is required. The team also felt that the formation of multi stakeholder forum may also be required in the two districts as media to facilitate negotiation and consultation toward low carbon development including payment and distribution mechanism, and a need to develop the operational negotiation platform.

5. Conclusion

In general the ALLREDDI project has meet most of its objectives. Some of the programs were beyond the target, particularly the number of people being trained on the use of the tools. However, some of the program only partly met the target, and a few do not meet the target at all.
Summary of the achievement of the project is presented in Figure 3.

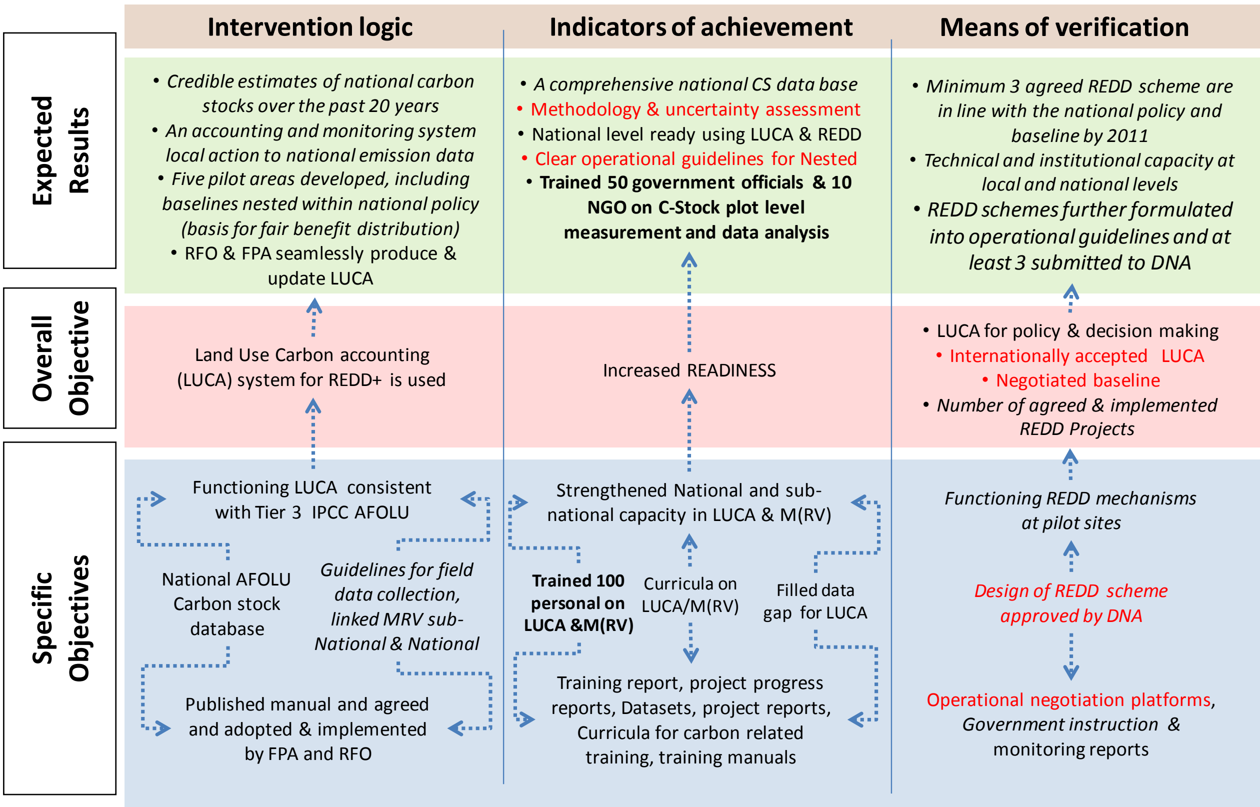


Figure 3. ALLREDDI project achievement according to the Logical Framework (Note: Objectives or results with black means met the target, black and bolds mean beyond the target, black and italic mean partially met the target and reds mean do not meet the target)

The Accountability and Local Level Initiatives to Reduce Emissions from Deforestation and Degradation in Indonesia (ALLREDDI) program is implemented by the World Agroforestry Centre (ICRAF) in partnership with the Directorate General of Forest Planning, Ministry of Forestry (Ditjen Planalogi), Brawijaya University (UB) and the Indonesian Centre for Agricultural Land Resources Research and Development (ICALRRD) through support from the European Commission (EU) under the Environment and Sustainable Management of Natural Resources, Including Energy program. The agreement was signed in December 2008 and ALLREDDI activities began in January 2009.

This project is designed to contribute to: the development of national carbon accounting and monitoring systems in Indonesia that are in compliance with the Tier 3 Intergovernmental Panel on Climate Change (IPCC) reporting guidelines; the development of technical capacities at sub-national and national levels; and the design of mechanism for Reducing Emissions from Deforestation and Degradation (REDD) in five pilot areas in western, central and eastern Indonesia.