


# LUWES

Land Use planning for LoW Emission Development Strategy

Sonya Dewi, Andre Ekadinata, Gamma Galudra, Putra Agung, and Feri Johana

# L U W E S

## Land Use planning for loW Emission development Strategy (LUWES)

### Selected Cases from Indonesia

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# Preface

Opportunities for reducing greenhouse gas emissions exist across all sectors of the economy and across a wide geographic area, but emissions from forest and peatland conversion dominate the field, as well as the public debate. With the advent of REDD+, the introduction of an Indonesian action plan for emissions reduction under the remit of the Nationally Appropriate Mitigation Action (NAMA), and the potential for increased financial flows into carbon-rich landscapes, the question of how to relate national commitment to local context and effective implementation is more important than ever. Rather than focusing on short-term emissions reduction strategies, the debate has shifted towards new 'clean development' strategies that focus on maintaining high carbon stocks with low carbon flows, while still achieving development goals.

Land Use Planning for Low Emission Development Strategy (LUWES) is a platform for developing a multiple stakeholder decision-making process to establish land use plans for sustainable development, which can reduce greenhouse gas emissions from land-based activity while simultaneously maintaining economic growth. It can simulate emissions reduction scenarios within specific zones of a landscape, or across an entire landscape, in order to produce ex ante emissions reduction and opportunity cost forecasts. It also recognizes the impact of land use allocation policies and distribution on tenure and livelihood. LUWES can accommodate the integration process between multiple modalities of land-based emission reductions (such as REDD+; Locally Appropriate Mitigation Action (LAMA); and the voluntary carbon market) at the planning stage across a common landscape.

LUWES offers a set of principles, steps, and tools (including a Java-based software: Abacus SP) to help multiple stakeholders negotiate the development of land use plans. In LUWES, tools such as RaTA (Rapid Land Tenure Assessment), RaCSA (Rapid Carbon Stock Appraisal), and RESFA (REDD/REALU Site Feasibility Appraisal) are included in the multiple stakeholder decision-making process. This booklet draws on examples from sites in Indonesia where LUWES has been applied. LUWES is designed as a generic tool for rural land use planning in tropical countries. We hope that LUWES can contribute to the achievement of sustainable landscapes that support local development while also helping to mitigate climate change.

January 2012
LUWES team

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# Land Use planning for loW Emission development Strategy

## Background

REDD+, as part of climate change mitigation action in the Agriculture, Forestry and Other Land Use (AFOLU) sector, has been high on the agenda of many forest-rich developing countries. Some countries, like Indonesia, have made specific emissions reduction commitments. As the mechanism takes shape, implementation at the subnational level needs to be equipped with appropriate planning tools. The 2010 UN Climate Change Conference (COP16) in Cancun specified 5 key activities under REDD+ (FCCC/CP/2010/7/Add.1/C/Par.70): (i) reducing emissions from deforestation; (ii) reducing emissions from forest degradation; (iii) conserving forest carbon stock; (iv) implementing sustainable forest management; (v) enhancing forest carbon stock and, in the context of countries with extensive peat areas, avoiding and reducing emissions from peat land. It is well understood that mitigating climate change through AFOLU, by REDD+ implementation, and by other modalities such as subnational implementation of land-based NAMA, will impose some trade-off between financial and economic benefits and environmental ones, in this case climate change mitigation.

Achieving conservation and development goals simultaneously, requires inclusive, integrated and informed land use planning. Inclusivity involves the participation of multiple stakeholders during the entire cycle of the planning process, far beyond the consultation process in the final stages of planning. Integrating land use planning with development planning across sectors will provide the benefit of a systemic view of risk and opportunities while reaching the optimum economy of scale, and conservation-development trade-offs and goals. The use of relevant, up-to-date and accurate data and information, along with scientifically supported knowledge is imperative for assessing the past, present and future constraints and potentialities in sustainable rural development at the forest margins.

In the case of climate change mitigation through AFOLU at the subnational (local) level, the analysis of trade-offs and policy and development scenarios that take into account ex ante emissions levels and financial and economic benefit/loss for both land managers and the wider society is imperative. LUWES is a platform for multiple stakeholder decision-making and land use planning for sustainable development that can reduce greenhouse gas emissions from land-based activity while simultaneously maintaining economic growth. It also recognizes the impact of land use allocation policies and distribution on tenure and livelihood.

LUWES offers a set of principles, steps, and tools (including a Java-based software: Abacus SP) to help multiple stakeholders negotiate the development of land use plans. Projected scenarios can take the form of land use restrictions, plantation development targets, land swaps, improved forest management, or any other land use policies and strategies, either within a particular zone or the entire landscape, at a particular period of time in the future. Business as usual scenarios and projected emissions, such as the Reference Emission Level (REL), can also be simulated to compare the ex ante performances of various scenario options.

The examples and case studies in this booklet draw directly on our on-going collaborations with several districts and provinces in Indonesia, but the principles, steps, software and lessons learnt are directly relevant, usable, and adaptable for rural areas elsewhere in the tropics.

## Land use planning and development planning

Development activity in rural areas should embrace 4 development principles: equity; economic growth; efficiency; and sustainability. While, in the past, development activities were largely concerned with increasing economic growth, nowadays the development paradigm has shifted towards: 1) balanced objectives across the three principles; 2) success indicators that are focused on regional and local approaches rather than a macro-level approach; 3) promotion of community participation in the planning, implementation and monitoring/evaluation of the whole development process.

One of the challenges in designing sustainable development models is the integration of development planning and land use planning. Development plans seldom consider land allocation, suitability, and carrying capacity. Similarly, spatial/land use plans are often developed without due consideration of development needs and constraints. Ideally, development plans should consider gaps between rural-urban areas, structural gaps and spatial disparities. They should aim for equitable development between the rural poor and urban settlers, and should be able to mobilize domestic potential and resources. Land use plans should act as tools for distributing resources in order to achieve development that is equitable, balanced and fair. A good land use plan should also optimize land resource use to achieve efficiency and productivity.

Lack of integration between development and land use planning leads to inconsistencies and an overarching sectoral approach. In such cases, the aggregation principle (economy of scale) is not taken into account, causing inefficiency in the creation of enabling factors and policies. Lack of continuity generates programmes with short life cycles, which bring a higher risk of environmental degradation and demote sustainability. Lack of coordination between land use plans at different administrative levels leads to problems with permit issuances, overlaps between allocations, difficulties with law enforcement, conflicts between different stakeholders, and marginalization of local/indigenous people (Dewi *et al*. 2009).

## Politics economy of forest governance and land use planning

The key challenges for low emissions development planning are lack of integration across sectors and emissions sources; the way local economies are nested in the national economy; and demographic transitions, including migration into forest margins and away from degraded lands. Local and national economies tend to prioritize development that leads to deforestation and degradation. Geist and Lambin (2002) and Kanninen *et al*. (2007) state that the proximate and underlying causes of deforestation and degradation mainly derive from economic development. Here, we argue that the causes of deforestation and degradation are the result of a political economy that gives priority to economic development, while powerful interest groups also benefit financially from resource depletion.

A study by Galudra *et al*. (2010) shows that the legal basis of contested claims over Central Kalimantan peatland referred to rights and historical injustice, and to the use of contradictory and inconsistent laws and multi-sector policies. The dynamics of land use policies and its discourses create uncertainty about property rights in this area, resulting in confusion over carbon rights. Land tenure conflicts are mainly due to land use policies and allocation that favour powerful interest groups involved in forest conversion and allocation.


**Figure 1.** Allocation of land allocated to powerful interested groups can lead to violent conflicts (Photo by Putra Agung)

Where there is a lack of transparency and accountability during land use planning processes these powerful interest groups to take advantage of forest conversion and allocation. When land use allocation or forestry policies are unable to provide guidance or control in managing natural resources (and there is a lack of enforcement), a situation arises where certain actors or networks become dominant as the 'hidden controller' of forest resource distribution. This web of interests or networks often modifies or revises the defined status and function of forest areas, thus altering the right to utilize and access land and forest resources, and adding further negative impacts to the process of land use planning at the local level (Agung 2011).

## Trade-off analysis between mitigating climate change from AFOLU and economic gain

The main objective of climate change mitigation efforts is to reduce greenhouse gas emissions produced through human activity. In the AFOLU sector, climate change mitigation efforts can lead to a direct conflict with economic benefits and food security. Land and forest-based activities that generate economic benefits and produce food often cause carbon loss from the landscape. Halting these activities to reduce emissions by conserving carbon stock in the landscape can potentially have a negative impact on economic growth and food security, if it is not properly planned. Figure 2 shows that, at the plot level, most land use systems that harbour high carbon stock are low in Net Present Value (NPV), and those with high NPV have low carbon stock. There are, however, land use systems with both low NPV and low carbon stock. Opportunity cost analyses of land use systems are aggregated at the landscape level to be used as an indicator of economic gain or loss per unit of emissions resulting from land use change. This approach has been used retrospectively in various tropical countries as part of REDD+ readiness (White and Minang 2011).

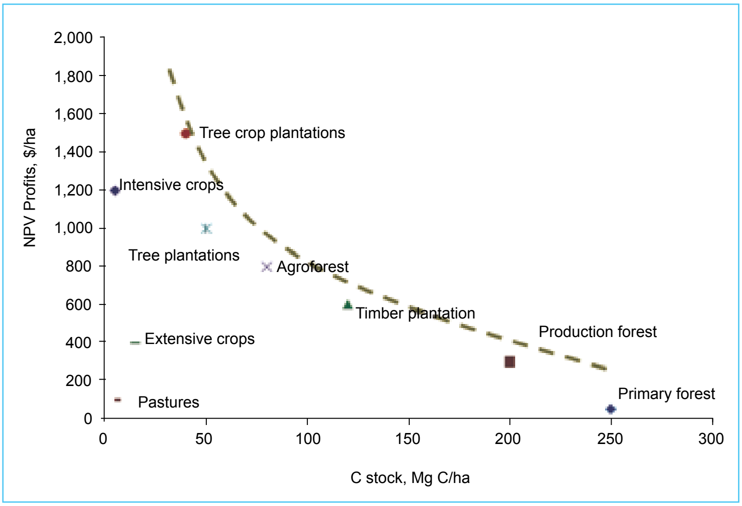


**Figure 2.** Trade-off between carbon stock and economic profitability (White and Minang 2011)

## LUWES framework

At the national level, common but differentiated responsibility for climate change mitigation has been agreed among parties within the United Nations Framework Convention on Climate Change (UNFCCC). Furthermore, the implementation of climate change mitigation at the local level should recognize the specificities of local needs and circumstances. As local level land use planning is pivotal in interfacing between the local agenda (sustainable development) and the global agenda (in this case, AFOLU sector climate change mitigation), there is a huge need for a tool that can support a negotiation process that promotes inclusive, integrated and informed land use planning. Figure 3 (below) illustrates the interlinkages between development and land use planning with land-based climate change mitigations action at the local level. This LUWES framework takes a landscape approach, rather than a project-based one.

A sustainable development plan at the local level, especially in rural areas where the land-based sector is a primary source of revenue, income and livelihoods, is a reflection of past land uses and land use changes, as well as existing needs and constraints. This plan, without prejudice against early mitigation action or intervention in climate change, can be taken as the baseline scenario or business as usual (BAU) scenario. A development plan should detail the number of people involved and economic growth; it should be linked to land use planning that details the respective size of areas and the location of specific planned activities. The projected emissions (in $CO_2$-eq) using the baseline scenario on current land use/cover is the Reference Emission Level (REL, used for gross emissions) and the Reference Level (RL, used for net emissions). For areas in the forest margins where REDD+ is more applicable and profitable, REL is usually more important as sequestration is generally low.

When planning for lower emissions development, an analysis of the portfolio of land use changes that drive the projected emissions, their projected emission shares and the opportunity cost of the reduction is required. Strategies and targets for emissions reduction can be developed and simulated to ascertain ex ante emissions. These strategies are formulated to note the size of affected areas, location, and standard practices, all of which can eventually be used to estimate how many people will be affected, the costs of compensation for those people and the means of implementing that compensation, the effects on tenure, and what environmental services can be delivered. An action plan and revised development and land use plans can then be established.

From the global perspective, with its emissions reduction agenda, the performance or success of climate change mitigation action is measured relative to the reduction of future $CO_2$-eq emissions from the REL, using a transparent and acceptable method. Depending on the modalities and strategies, the costs of reducing emissions (comprised of transaction costs, opportunity costs and implementation costs) can either come from the national level, multilateral funds or the private sector, as in carbon markets.

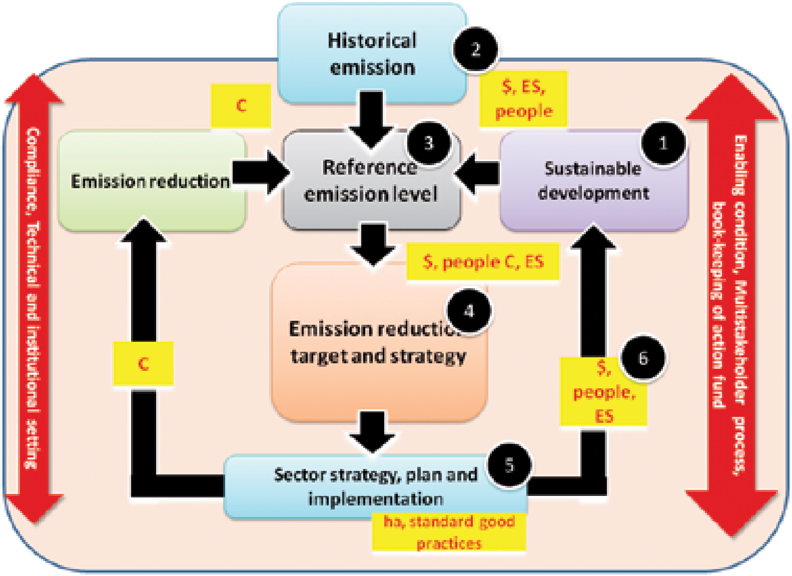


**Figure 3.** Stepwise description of the LUWES framework

The interconnected processes of stakeholders' decision making at global, national and local levels with varying, and sometimes conflicting, agendas are complicated. It would be difficult but instrumental to produce a systematic assessment tool that allows multiple stakeholder to discuss, negotiate and decide on action plans. LUWES focuses on the local-level decision making process. It offers a method to produce an integrated form of land use planning that connects development planning and land allocation in sustainable ways. LUWES uses ex ante trade-off analysis to help establish a land use plan for low emissions development at the landscape level; this would be an economic system that minimizes greenhouse gas emissions while still generating appropriate economic benefits. Appendix 1 provides a list of the data and information required for developing a local action plan based on LUWES.

## LUWES in 6 steps

LUWES has adopted a rational-participatory approach to integrating development and land use planning. Rational planning is a systematic and comprehensive planning approach that utilizes data and information throughout 5 related steps: 1) identifying problems; 2) determining goals and objectives; 3) identifying of opportunities and obstacles; 4) designing alternatives in order to achieve goals; and

5) creating options and implementation. The participatory approach is relies on the inclusion of all stakeholders in determining goals and types of development activity to be implemented. LUWES combined these 2 approaches through a series of training sessions, stakeholder discussions and public consultations in order to produce a land use planning for low emission development strategy. LUWES can be used in district or provincial landscapes, and across the land-based sectors.

LUWES is implemented through 6 key steps:

1. Compilation of existing land-based development plans and spatial plans into a single system, identification of zones relevant to the strategies and policies of the land use plan, and intervention with regard to land use changes, economic gain, carbon stock and potential emissions;
2. Development of baseline scenarios and estimation of projected REL and RL. Baseline scenarios can be based on a linear projection of historical land use changes, the modelling of drivers of land use changes, forward looking plans through the adoption of an existing plan, and the projection of emissions from the baseline scenarios as the basis of setting the REL/RL. However, REL/RL will eventually have to be negotiated at a broader level;
3. Calculation of opportunity cost as the trade-off of financial gain and emissions from land use changes based on the baseline scenarios. Trade-off analysis should ideally include employment and economic gain;
4. Development of scenarios to reduce emissions, simulation of these scenarios to estimate the ex post emission reduction, estimation of the opportunity cost of the emission reduction, and selection of the most efficient scenarios;
5. Identification of cost bearers from the selected emission reduction scenario and analysis of synergy between this and the subsector, and development prioritization across the landscape at the smallest administrative level based on gaps and inequality. This involves direct stakeholder negotiation and will result in revised scenarios. Most of step 4 will need to be repeated;
6. Identification of the need for policy intervention to support local strategic and action plans for emissions reduction in order to implement the agreed scenarios.

Before LUWES can be successfully used in the planning process, it is crucial to meet certain preconditions: 1) recognizing the need for land use plans that integrate spatial and development plans, the need for low emission development plans, and the need for inclusive and informed planning processes; 2) identifying the stakeholders; and 3) building trust among and between stakeholders and facilitators.

## Step 1: Compilation of existing development and spatial plans and identification of zones

These first steps in LUWES aim to understand the existing spatial plan and local development strategy and plans, focused on lands in particular and natural resources in general. This stage uses inventories and compilations of land-based development plans and spatial plans from various government agencies at local and national levels. Interviews with government officials and focus group discussions with multiple stakeholders are also conducted. A list of the data and information that are used during this stage is shown in Appendix 1. Figure 4 shows an example of an integration of spatial and development plans.

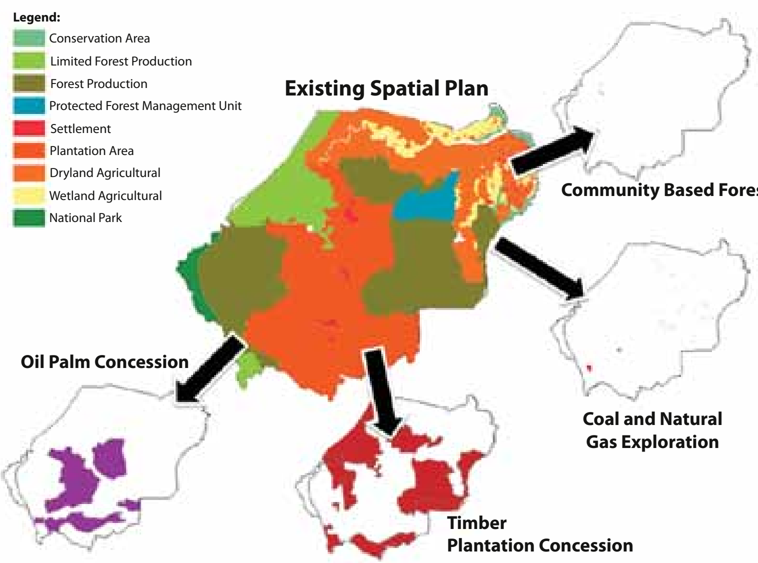


**Figure 4.** Integration of spatial and other development plans

Further, compilations of the existing concessions, land use plans and management units indicate the LUWES planning units (those zones that allow specific policy interventions to be applied and action plans to be implemented). Figure 5 shows the zonation of the areas based on LUWES planning units that integrate the spatial plan at the national level, land use plans (including concessionaires and local land use plans), and management units specific to the localities. This zonation is conducted on the basis of stakeholder discussions on the available maps. A table, specifying the area, stakeholders and decision making authorities, is developed as a companion to the map. Table 1 is an example of this, developed for a district in Indonesia. Overlap of permits may occur as a result of lack of transparency during land use planning. Stakeholders' discussions with different government agencies that issue these permits should be closely followed to clarify such overlaps and to highlight conflicts of interest.

On the other hand, the impact of this kind of land use allocation is somehow connected with land tenure conflict. Therefore, ICRAF developed a tool, called RaTA (Rapid Land Tenure Assessment), that identifies overlapping claims of tenure and the resultant kinds of conflict (see Appendix 2 for more detail on RaTA). Local rights are often neglected in the development of land use policies, and it is imperative that these rights are recognized throughout the land use allocation process.

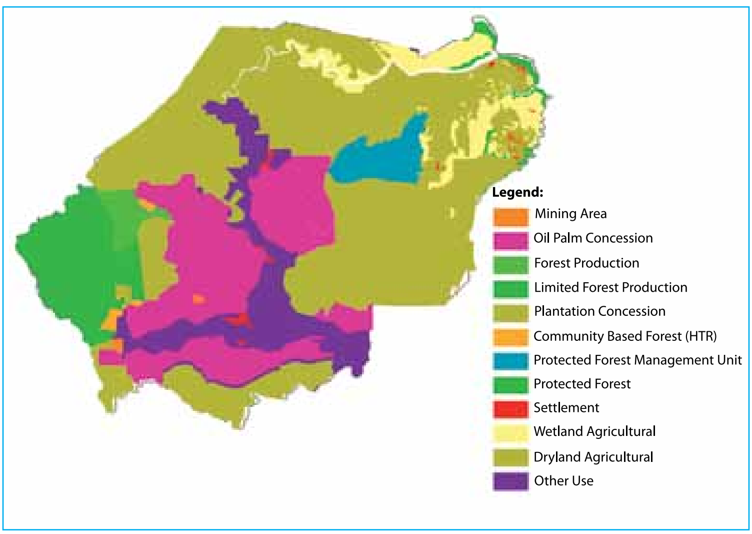


**Figure 5**. Zones identified as LUWES planning units based on existing development and land use plans, and specific areas targeted for future policy interventions and actions for reducing emissions.

**Table 1.** Identifying stakeholders and decision making authorities in each zone

| No | Zone | Area (ha) | Stakeholders | Decision Making Authority |
|---|---|---|---|---|
| 1 | Mining area | 1248 | Energy and Mineral Resources Ministry, Energy and Mineral Resources District Agency, Company | Energy and Mineral Resources Ministry, Energy and Mineral Resources District Agency |
| 2 | Protected forest | 7558 | Ministry of Forestry, Forestry Province and District Body, Forest Management Unit, Community | Ministry of Forestry, Forestry Province and District Agency, Forest Management Unit |
| 3 | Limited production forest | 34 058 | Ministry of Forestry, Forestry Province and District Agency, Forest Management Unit, Community | Ministry of Forestry , Forestry Province and District Agency, Forest Management Unit |
| 4 | Plantation concession (HTI) | 15 6306 | Ministry of Forestry, Forestry Province and District Agency, Forest Management Unit, Community, Company | Forestry Ministry, Forestry Province and District Agency, Forest Management Unit, Company |
| 5 | Conservation area | 10 969 | Ministry of Forestry, Forestry Province and District Body, Forest Management Unit, Community, Company | Ministry of Forestry |
| 6 | Protected forest management unit | 10 016 | Ministry of Forestry, Forestry Province and District Body, Protected Forest Management Unit | Ministry of Forestry |
| 7 | Oil palm concession | 90 655 | Ministry of Agriculture, Forestry and Estate Province and District Body, Community | Forestry and Estate Province and District Agency, Company |
| | Settlement | 2103 | Planning District Agency, General Works Agency | Planning District Agency, General Works Agency |
| | Wetland agriculture | 23 127 | Agricultural District Agency, Community | District Agricultural Agency |
| | Dryland agriculture | 73 403 | Estate District Agency, Agricultural District Agency, Community | Estate District Agency, Agricultural District Agency, Community |
| | Other use | 44 865 | District Government | District Government |
| | Community-based forest (HTR) | 1882 | Forestry District Agency, Village Authority, Community | Ministry of Forestry |

## Step 2: Development of baseline scenarios and estimation of REL/RL

The objective of the second step of LUWES is to produce scenarios of land use/cover changes assuming there are no interventions (baseline scenarios), and to estimate the emissions projected for the baseline scenarios. These baseline scenarios can be developed using 3 options:

- Linear projection of historical land use/cover changes
- Driver modelling of land use/cover changes, including simulation of changes in drivers
- Forward-looking scenario based on an existing plan

A hybrid model of the 3 options is also possible. In a linear projection of historical land use/cover changes, a constant rate of land use/cover changes is assumed. For each zone, the rate of transition between land use/cover types in the past is calculated and applied in future scenarios. If an area moves from one zone to another, due to changes in spatial plans, new permits or policies, the future scenario uses a rate for the new zone, calculated from past data for that area. There is a huge selection of spatially explicit driver modelling software available in the commercial and public domains, from agent-based systems to full empirical modelling. The uncertainties of the resulting projections or predictions from models are often so high that many people question the value of modelling. However, the same doubts apply to linear projection, since there is no assurance that the future will resemble the past. But the selection of appropriate drivers helps to ensure good modelling exercises, which are not only useful for forecasting but also deepen our understanding of the process by allowing us to see the ex post through simulations and such. This is mostly the case with proximate drivers of existing infrastructure, biophysical characteristics, agents and the like.

The existing plans that are largely developed to achieve specific target and objectives based on identified constrains, and primarily developed by the government, both at local and national level, at the interaction with large and medium scale investors and local land use decision makers based on some consultancies with local stakeholders. These scenarios will vary considerably depending on local contexts, particularly population density and the stage of forest transition, that are associated with the 5 forms of capital important to rural livelihoods: physical, natural, financial, human and social (Bebbington 1999). Analysis of and recommendations about how these variations across a country can be accommodated can help to develop a fair and efficient mechanism to mitigate climate change. They are particularly helpful in setting baseline scenarios and REL/RL to suit Indonesia's circumstances (Dewi *et al*. 2009), but the principles should apply more generally.

Projecting emissions based on baseline scenarios is the next step. Regardless of the options in setting baseline scenarios, calculating the historical emission is important for understanding the driving factors of carbon emissions from the AFOLU sector and developing a REL. LUWES uses Rapid Carbon Stock Appraisal (RaCSA) to estimate historical emissions from a particular area. RaCSA is adopted from one of the the IPCC's approaches, the stock-difference method, which measures stocks at two different times and assumes a steady rate of either emissions or removals for a landscape-level carbon dynamics estimation. RaCSA requires 2 types of data: 1) area of changes and trajectories of land use systems; and 2) time-averaged carbon stock for each land use system. Data about areas where changes of land use system have taken place is produced through land use change analysis based on the interpretation of satellite imaging, while time-averaged carbon stock data is normally obtained from measurements in the field (see Appendix 3 for more details about RaCSA).

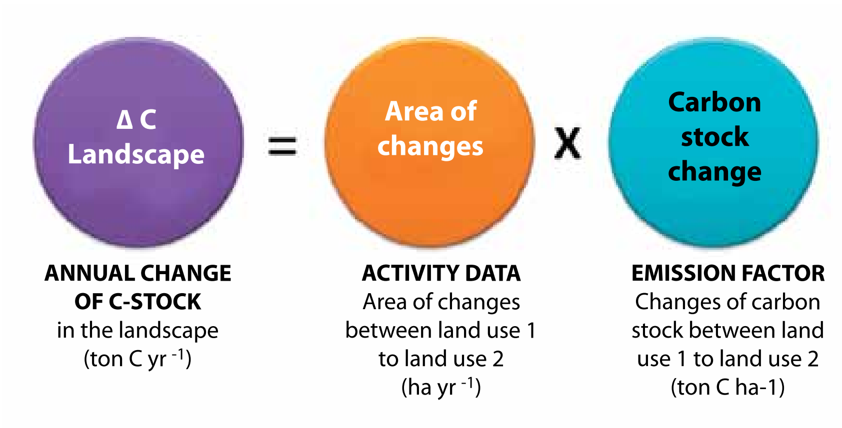


**Figure 6**. Stock difference approach in calculating historical emissions

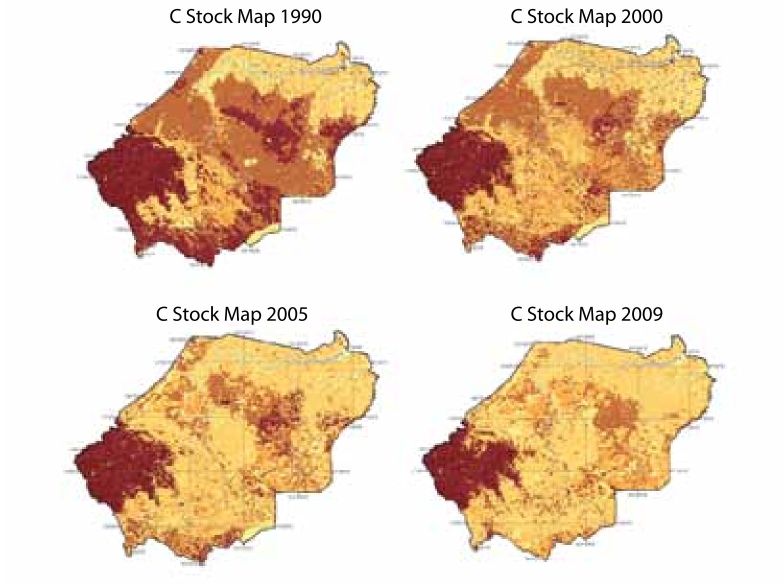


**Figure 7**. Example of landscape level carbon stock dynamics analysis using RaCSA

Applying the same emission factors of each pair of land use/cover types to the projected activity data from the baseline scenarios, projected future emissions can be estimated. This estimation is used to set the REL (when we consider only the gross emissions), or RL (when we consider the net emissions, as when sequestration is taken into account as negative emissions). However, the determination of REL/RL, despite the technical steps outlined here, is ultimately a political decision, most likely driven by regulations on REL/RL settings and negotiations between subnational, national and international entities. In the following stages, all REL/RL options can be used to compare emissions reduction scenarios with projected emissions reduction.

Using an example from the province of Papua, the REL options based on projected emissions of baseline scenarios, based on the inventory of existing plans and historical land use changes are:

- REL1: Projected emissions are based on historical emissions (BAU scenario); in the example, the projection was made using historical patterns and rates of land use/cover changes specific to institutional land allocation in the province 2000-2005 (it is preferable to use the most recent available land use/cover map).

- REL2: Future emissions are projected based on land use plans (forward-looking scenario); in this example, the plans are taken from indicative maps of the Hutan Tanaman Rakyat (peoples' plantations), integrated development of new areas for food and energy, and plans of forest conversion into oil palm plantations.

- REL3: Emissions levels projected on the basis of the commitment made by the Governor (2009) that at least 50% of convertible forest is to be conserved.

Figures 8 shows the REL options based on the 3 baseline scenarios. In this particular province, where forest cover is high, population density is low and forest transition is in the early stages, historical land use changes have produced lower emissions and a lower linear projection than the existing plans. In different parts of the country, where the forest transition stage is more advanced and the remaining forest cover is more limited and is located mainly within conservation zones, the forward-looking emissions from the existing plans are lower than the historical projection. Regulation and negotiations on the REL setting should acknowledge the variations in past and future trajectories as well as the varied stages and circumstances affecting the level.

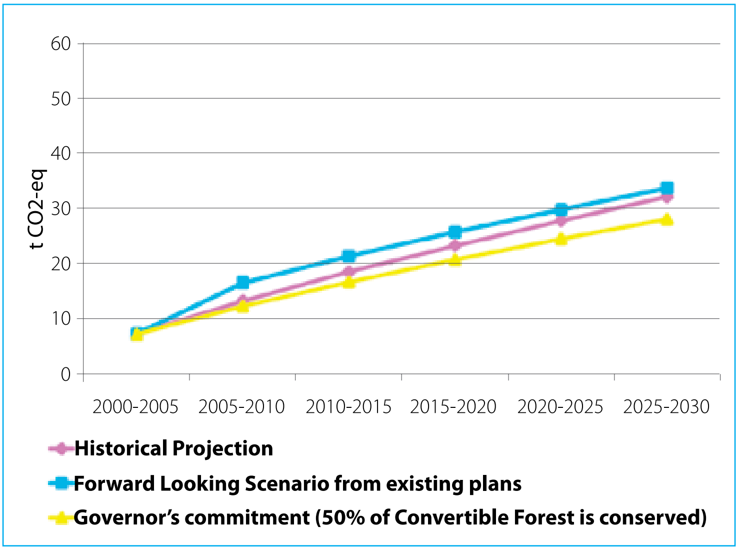


**Figure 8**. Projections of different reference emissions levels, based on historical projection, existing plans, and gubernatorial commitment to conserve convertible forest

## Step 3: Opportunity cost of emissions from land use changes

The third step of LUWES aims to understand the trade-off between emissions from land use change and the economic profitability generated from it. The method for estimating the opportunity cost of REDD+ used in this study follows the World Bank Institute's manual and the REDD Abacus SP software developed by the World Agroforestry Centre. The main result of this step is an abatement cost curve for the landscape. This abatement cost curve shows the quantity of emissions from land use change that can potentially be reduced at a given incentive level (see Appendix 4 for more details about REDD Abacus SP).

Figure 9 shows an example of a retrospective abatement cost curve for a province in Indonesia, based on analysis of past land use changes, past emissions and past financial gain per unit area of changed land uses, which is then converted into past financial gain per unit of emissions (opportunity cost of emitting). The x-axis is the cumulative annual emissions per hectare and the y-axis is the opportunity cost associated with each slot of emissions in the landscape. The curve shows that of all the 7.2 t CO2-eq emitted per hectare area annually, only a very small part was associated with low financial gain. REDD Abacus SP can also show what quantity of

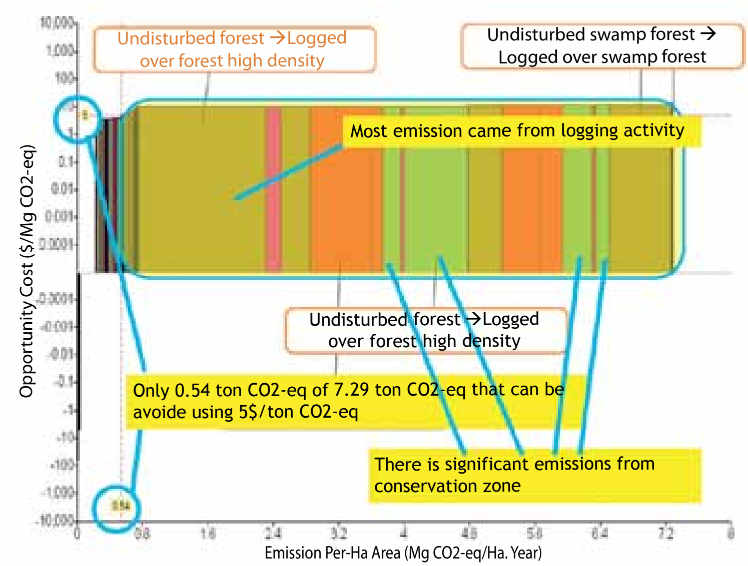


**Figure 9.** Example of abatement cost curve

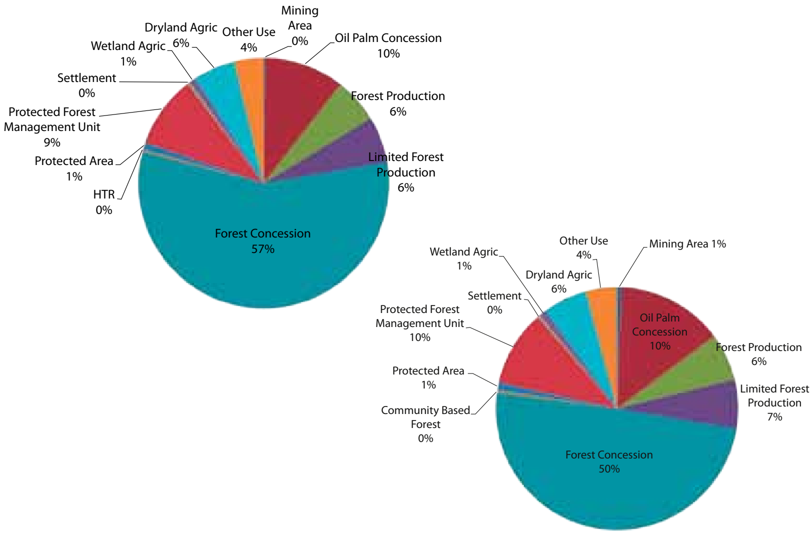


**Figure 10.** Emission shares in the past (left) and in the forecast scenario (right)

emissions comes from a particular subsector of AFOLU (from logging, for example) and also how much derives from a particular zone (from conservation areas, for example).

Similarly, the baseline scenarios can be simulated in REDD Abacus SP to estimate future emissions (REL/RL) and also to generate an abatement cost curve. Emission shares from each zone and each subsectors in AFOLU can then be estimated (Figure 10), which is instrumental to the analysis of how and where to reduce emissions. Total emission reductions and opportunity loss can also serve as the basis for selecting scenarios for emissions reduction.

## Step 4: Scenario analysis to reduce emissions

The emission reduction scenario is developed through stakeholder discussion, based on emission shares in the past and future, trade-off analysis at the land use level, and aggregated at the zone level in the form of the abatement cost curve, all taking the development target and plan into consideration. Zone-specific scenarios can be developed and simulations can be run in Abacus SP by specifying the projected future size of the areas to be converted or maintained within each zone, or by modifying the rates of transition of each pair of land use types. According to the zonation scheme developed in Step 1, multi-stakeholders need to take into account the dominant agents/actors/beneficiaries, the activities, regulations and the decision makers specific to each zone when developing scenarios. Depending on the geographical scope of the LUWES application, the zonation can be very detailed and specific for a district level land use plan, or quite general for provincial level land use planning. For example, the following scenarios might be suitable for a province level land use plan:

- S1: Halt primary and secondary forest conversion in all areas
- S2: Halt primary and secondary forest conversion in protected areas
- S3: Halt primary forest conversion in protected areas
- S4: Increase land utilization efficiency though cultivation on low carbon land

Table 2 shows an example of a district level scenario development, specific to each type of zone. It was developed with reference to Table 1.

**Table 2.** Example of emissions reduction scenarios

| Zone | Emission Reduction Scenarios |
|---|---|
| Plantation concession (HTI) | 1. Avoid primary forest conversion to acacia<br>2. Preserve smallholders plantation<br>3. Speed up acacia planting in shrub area |
| Oil palm concession | Avoid primary forest and logged-over forest high density conversion to oil palm |
| Protected forest management unit | 1. Preserve existing forest cover<br>2. Plant *dyera* |
| Forest production | 1. Preserve primary forest<br>2. Plant rubber in non-forest areas |
| Limited forest production | 1. Preserve primary forest<br>2. Plant rubber in non-forest areas |

We have presented simplified and more general zonal case studies in order to illustrate the type of trade-off analysis to be used when comparing scenarios. Figure 12 shows the expected emissions from each of the 4 scenarios listed above for the provincial level case study, and the opportunity loss in reducing those emissions. This example was built using actual data from Papua. It shows that emissions can be reduced with a low opportunity loss, demonstrating the feasibility of further developing LUWES.

### Step 5: Stakeholder negotiation in selecting the optimum low emission development plan

An identification of the risks and costs associated with each scenario in each locality must be conducted in order to pinpoint which groups could be at risk and will bear the costs of the selected emissions reduction scenario. Spatially explicit priority scaling, based upon livelihood indicators, primary and potential commodities, enabling conditions, and local potential, is required in order to establish the possible livelihood options (needs, poverty and risk) beyond the basic financial measure. This involves stakeholder negotiation and will result in revised scenarios. Repetition of Step 4 is likely to be necessary.

Using spatial analysis, the information gathered through stakeholder discussion is synthesized into a set of priority scales for development activities. The prioritisation is useful for linking

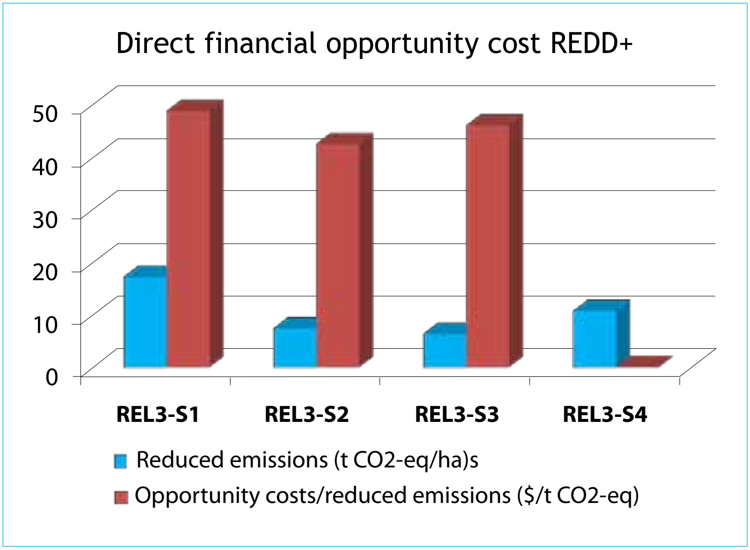


**Figure 11.** Example of emission reduction scenario simulation and its opportunity cost

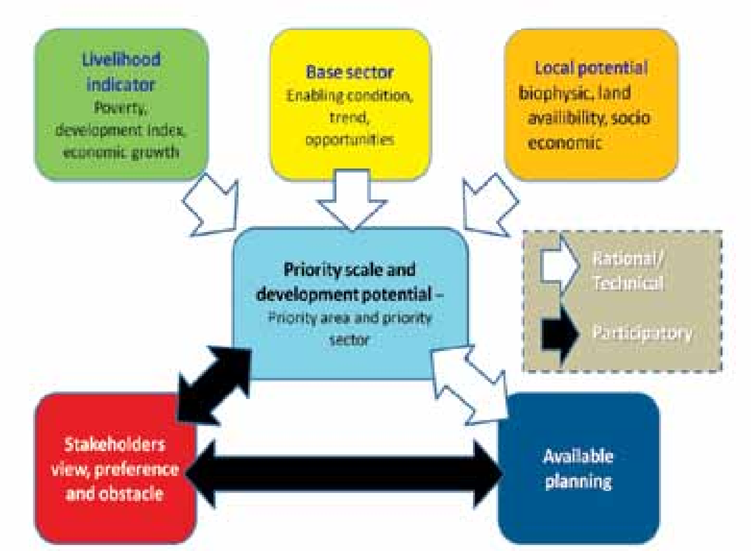


**Figure 12.** Framework to analyze the priority scale of development activities

development planning with potential emissions reduction and its effect on livelihoods in the area.

After several options of emissions reduction scenarios have been determined, the various stakeholders need to negotiate which options are feasible for implementation and how this will be achieved. Step 5 displays a simulation of the process of stakeholder negotiation

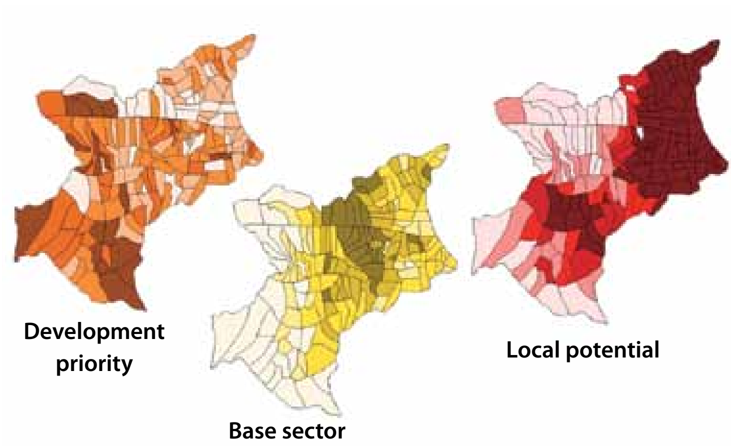


**Figure 13.** Example of priority scale for development activity in Merangin, Indonesia

and debate; it demonstrates how to reach an agreement on planning and implementation for emissions reduction scenarios.

Several methods, such as focus group discussions and local debating groups, are used in order to offer an ideal experience of how stakeholders might persuade and convince policy makers bout emissions reduction targets. The negotiation process will not only involve all the local government agencies that have interests in land-use change (such as regional planning and development agencies, forestry agencies, crop-estate agencies, land affairs offices, agriculture agencies, and mining agencies) but also other policy makers, such as the head of the district/provincial office, and the legislative office, which may have the final decision on local policies. The issues that should be discussed in detail include:

a. Why choose this option?
b. How large is the emissions reduction target for each type of land-use?
c. How will the plan be implemented?
d. What is the strength of this option compared with other alternatives?

After discussing each option, each group will debate and analyze their different perspectives on each option.

**Figure 14.** Discussion process at district level (Photo by Ratna Akeifnawati)

## Step 6: Policy intervention and local action planning for low emission development land use plans

The output of Step 5, presented as a list of zone-specific scenarios to reduce emissions, forms the basis of discussion and the analysis of which policies and interventions need to be put in place. Further plans to ensure the implementation of the identified policies and interventions should be proposed. This process can feed into the relevant local action plan concerning land-based emissions reduction strategy and the local action plan for REDD+.

### Policies for emissions reduction

The identification of relevant policies will help stakeholders to understand the most realistic means to achieve the emissions reduction target. It also helps determine which is the most feasible option, in relation to current government policies and other external priorities. First, stakeholders should identify which policies (such as local or national level regulations, statements from government officers, and policy documents) support the emissions reduction target. Then, those policies that hinder achievement of the target must be identified. Sometimes this is a confusing process as policies released at different levels of government can be contradictory. In such ambiguous cases, the stakeholders may need to establish new policies, either to fill gaps in the current policies, or to settle the overlap where existing policies appear to be contradictory. The outputs of Step 6 are twofold: 1) it explains the challenges and opportunities to and for the local community, during the process of determining the emissions reduction target; and 2) it helps stakeholders gain a better understanding of the various policy priorities that either support or hinder emissions reduction efforts.

Policy intervention is required to provide guidance and legislation to help stakeholders to achieve a rational target for emissions reduction. This can take the form of rules and regulations, strategic protocols and documents, or sustainable management practices and so on. These interventions should not only explain **what** and **why** emissions reduction should occur, but also address the related issues of **how**, **where** and **when**. They should, therefore, be easily adoptable by government bodies; they may also contain incentive and disincentive mechanisms to ensure compliance. Despite this, government bodies may still have other priorities that can interfere with policy interventions. Moreover, the negotiation process is time consuming, due not only to bureaucratic procedures, but also because the political struggles and power relationships between different interest groups (such as conflicts between executive and

**Table 3**. Policy debate for emissions reduction scenario options in Papua

| Emission scenario options | Supportive existing policy options | Unsupportive existing policy options | Strategies /policies needed | Follow-up plan |
|---|---|---|---|---|
| Conservation of 50% of total area designated to conversion forest | 1. Act Number 21 on Papua`s Special Autonomy regulations<br>2. Governor's Regulation number 13/2010 on Implementation of Sustainable Forest Management (SFM) and indigenous peoples<br>3. Governor's decree in 2008 on log export ban<br>4. Governor's political will to maintain 70% of total area of Papua Province as forest zone<br>5. Local government regulation on customary protected areas<br>6. National and local policy on Forest Management Unit (FMU)<br>7. Environmental Law number 32/2009. | 1. Disharmony of Forestry Law number 41/1999 with the Special Autonomy regulation regarding local government and forest management<br>2. Over-simplification of forestry and large-scale plantations' permits, especially before the issue of the Presidential Decree on Moratorium | 1. Policy synchronization between national, provincial and district government<br>2. Harmonization between provincial and district spatial planning<br>3. Clarity and confirmation of annual allowable cut (AAC) of forest concession by local government<br>4. Revision on Forestry Law number 41/1999<br>5. Inventory of existing forest and industrial plantation forest concessions<br>6. Full authority of forest management to the local government | 1. Inventory of existing forest and industrial plantation forest concessions<br>2. Acceleration of forest management unit design and institutional settings |

legislative bodies, and industrial lobbies and so on). can slow down the negotiation process. These potential pitfalls must be taken into account when deciding on the most feasible policy intervention.

## Policy intervention towards low emissions development pathways in West Tanjung Jabung and Merangin districts, Indonesia

In the districts of West Tanjung Jabung and Merangin, there are now greater opportunities to develop policies and interventions since the establishment of a 2009 environmental law that demands that spatial plans developed after this date must achieve a set environmental threshold. A clear emissions reduction target can be one criterion for this environmental threshold.

Another opportunity arises from the newly released national action plan on emissions reduction (RAN-GRK), based on Presidential Decree No 61/2011. This decree develops several strategies to achieve both development and emission reduction objectives at national level, formulated through a process of 'low-carbon (loss) development planning'. The national action plan not only describes ways of achieving low carbon emissions development, but also encourages action at the local level to do the same way through provincial/district land use planning. Since these two policies have been enforced, a new form of spatial planning has been developed, based on emissions reduction (Ekadinata *et al*. 2011; Johana *et al*. 2011).

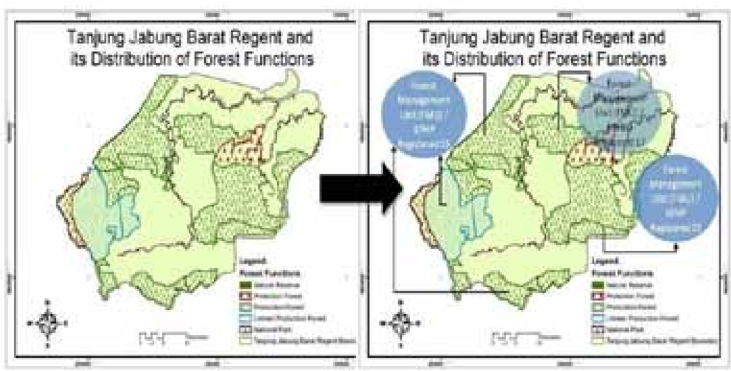


**Figure 15**. Policy intervention through Forest Management Unit Production (*Kesatuan Pemangkuan Hutan Produksi*)

The identification of implementation strategies that are more geared towards specific zones and activities can be translated into the implementation costs for a subnational action plan for reducing emissions from land based sectors. Table 4 shows an example of a milestone towards the type of subnational action plan that can be produced with LUWES.

It is possible to take this further and formulate a strategic emissions reduction document that contains the guidance and procedures necessary to achieve the emissions reduction target, and which can be signed by the head of district/province. The guidance can relate to management practices for all land-based activities that may directly and indirectly produce emissions, such as agriculture, forestry, crop-estates, mining and others.

Setting up a working group, consisting of government officials, academics, and representatives from the private sector and NGOs, is another alternative. Such groups are quite useful when a lack of common understanding on how to achieve the emissions reduction target in a particular area requires additional negotiations in order to reach a resolution.


**Figure 16.** Village forest (*hutan desa*): recognition of local forest management rights and requirements for qualifying for REDD funding (Photo by Asep Ayat)

**Table 4**. Subnational strategy for reducing emission from land based sectors

| Zone | | Scenarios | Share To Emission | Possible Condition (Problem) | Implementation Strategy |
|---|---|---|---|---|---|
| Forest concession (HTI) | 1. | Avoid primary forest conversion into acacia | 1.63 | Company concession | Suggest to concession holder to preserve primary forest and disseminate Spatial Plan of Plantation Concession (Kepmenhut No. 70/ KPTS-II/95) and initiate to HCVF |
| | | | | Raw material for company | Halt consumption of raw material from primary forest |
| | | | | Community threat to open forest area | Strengthen monitoring and control activity in primary forest |
| | 2. | Protect smallholders' plantations from conversion to acacia | 1.01 | Limitations of community's administration and documentation of land tenure | Implement MOU between government, company, and community on forest borders |
| | 3. | Plant acacia in shrub and grass area immediately | 1.16 | Limited company capacity to plant acacia quickly | Disseminate Act No. 7/1990 Section 12 |
| Oil palm concession (HGU) | 1. | Avoid primary forest and logged over forest high density conversion into oil palm | 3.36 | Company concession (under authority of company) | Suggest to oil palm concession holder to halt conversion of primary and logged over forest high density into oil palm as company's participation in government's emissions reduction programme |
| | | | | Need land to achieve company's production target | |
| Protected forest management unit (KPHLG) | 1. | Preserve remaining forest | 4.68 | Community need for land in the surrounding area | Disseminate forest management programme to community |
| | | | | Limited number of officers | Propose addition of officers to Ministry of Forestry |
| | 2. | Plant *Dyera* sp in the area | 4.84 | Limited understanding (technical and market) of *Dyera* sp | Provide technical assistance to community regarding *Dyera* sp |
| | | | | Limited budget to support *Dyera* sp planting material. | Involve the community in *Dyera* sp planting |
| | | | | | Explore the extent of market |

| | | | | | |
|---|---|---|---|---|---|
| Production Forest (HP) | 1. | Preserve primary forest | 5.08 | People's need for land | Campaign to community on forest management |
| | | | | Limited forestry guard officers | Propose addition of officers |
| | | | | Granting permits in the zone | Propose to Ministry of Forestry to halt other permits in the zone |
| | | | | | Facilitate establishment of forest management unit |
| | | | | | Law enforcement |
| | 2. | Plant rubber in non-forested area | | People active in non-rubber based land cultivation | Distribute rubber planting material |
| | | | | | Allocate land for village forest, and other community based forest |
| Limited Production Forest (HPT) | 1. | Preserve primary forest | 5.49 | People active on the land | Dissemination about limited forest production management to community |
| | | | | Limited number of officers | Propose addition of officers |
| | | | | Mining permits in the area | Propose that Ministry of Forestry halt other permits |
| | | | | | Facilitate establishment of forest production management unit |
| | | | | | Law enforcement |
| | 2. | Plant rubber in non-forested area | 5.48 | People active in non-rubber based land cultivation | Devote rubber planting material |
| | | | | | Dissemination about limited forest production management to community |

## General remarks and future development of LUWES

LUWES, as a platform that combines technical and participatory processes, facilitates the practice of well-informed stakeholder negotiation. The quality, accuracy and relevance of the data and information provided, along with the metadata (data about data), assumptions, and method of analysis, are the key inputs for the process. Low quality data as input results in inaccurate or misleading output. Incomplete data can bring to similarly flawed results. Due to the quantitative nature of scenario simulation in LUWES, the difficulties in measuring certain important factors pertinent to land use planning could lead to those factors being excluded from the analysis. Inputting a number of zones with specific policies and interventions is possible within Abacus SP, but the current version does not allow easy inputting of the data, nor is it simple to extract and compile multiple outputs from the simulation. In developing scenarios, LUWES relies heavily on the ground assessment information provided by the stakeholders. Therefore, LUWES should be accompanied by an appropriate ground assessment such as RESFA, a REDD site level feasibility appraisal (see Appendix 5 on RESFA).

RESFA helps to assess the feasibility of implementing a given scenario or policy. For example, converting an oil palm plantation in protected peatland forest into *Dyera* sp can increase carbon stock, but is probably not feasible as it could harm the livelihood of local communities. Another example is where 'idle land', mostly with low carbon stock, is allocated for crop-estate concessions. Although much 'idle land' is perceived as unoccupied and therefore ripe to be allocated to concessions as part of carbon emissions mitigation and sequestration, some of this land is being claimed by local people in land rights claims, thus leading to land tenure conflict.

Rather than setting a target to reduce emissions within existing constraints, as with optimization tools like Marxan (Watts *et al*. 2009), LUWES requires multiple stakeholders to formulate plausible scenarios and to make projections about future emissions based on these. LUWES' entry point is bottom level and gradually moves toward aggregation at the upper level. Adapting the format of results and process of modelling to make LUWES compatible with other spatially-explicit optimization tools (such as Marxan) will reduce the breadth of the blind search for possible scenarios. Currently LUWES only accommodates climate change mitigation action as a subset of environmental services in a broader sense. In future developments, multiple environmental services such as hydrological regulation, biodiversity maintenance and non-monetary indicators such as food security should also be catered for with the tool. LUWES will eventually evolve into LUMENS (Land Use Planning for Development with Multiple Environmental Services). More user-friendly and less error-prone inputting processes will be prioritized in the next generation of Abacus SP. Including the option of maps as inputs will significantly reduce the hassle of setting up a new landscape or scenario to be developed and simulated. Linking LUWES with a spatially explicit modelling tool such as Geomod (Harris *et al*. 2008) or Land Change Modeler within IDRISI (Clark Labs 2009) to simulate emissions reduction scenarios will also enrich LUWES' output. This is the direction of our future work.

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Harris NL, Petrova S, Stolle F, Brown S. 2008. Identifying optimal areas for REDD intervention: East Kalimantan, Indonesia as a case study. *Environmental Research Letters*3:035006-035017.

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# Appendices

## Appendix 1. List of data and information sources for LUWES

For the first stage of LUWES, the following data has been collected from government institutions and agencies:

| No. | Data | Remark | Agencies |
|---|---|---|---|
| 1 | *Rencana Pembangunan Jangka Panjang Daerah* (RPJPD) – Regional Long Term Development Planning and *Rencana Pembangunan Jangka Menengah Daerah* (RPJMD) - Regional Mid Term Development Planning | Provides an inventory of several development programmes related to land. For the purposes of LUWES only the relevant programmes that relate to land-use are used. | *Badan Perencanaan dan Pembangunan Daerah* (Bappeda) |
| 2 | *Rencana Tata Ruang Wilayah Daerah* (RTRW) – Regional Land-Use Planning | Shows the allocation of development activities that are currently in planning. It consists of utilization zones and non-utilization zones (*kawasan budidaya-non budidaya*) | *Badan Perencanaan dan Pembangunan Daerah* (Bappeda) |
| 3 | *Rencana Kerja Pemerintah Daerah* (RKPD) – Regional Government Work Plan | Provides data on an assessment of the consistency between development plans and the RKPD. It provides additional details on aspects of the RPJMD. | *Badan Perencanaan dan Pembangunan Daerah* (Bappeda) |
| 4 | *Daftar Prioritas Anggaran-Satuan Kerja Perangkat Daerah/ Anggaran Pendapatan Belanja Daerah* (DPA-SKPD/APBD) – Budget Priority List – Local Government Unit/ Regional Budget Plan | As with remark 3. | *Badan Perencanaan dan Pembangunan Daerah* (Bappeda) |

| | | | |
|---|---|---|---|
| 5 | Land use permits such as:<br>1. Forest concession and timber plantation map<br>2. Allocation map for community-based forest management such as People Plantation Forest (HTR), Village Forest etc<br>3. Map of converted and convertible forest areas<br>4. Crop-estate permits map<br>5. Mining concession map<br>6. Other maps related to land-based activities. | The land use permit data is used to identify land use activities that are going to be implemented in the region. The data collected should be spatially explicit so that we can distinguish land use planning in the future. | *Dinas Kehutanan, Dinas Perkebunan, Dinas Pertanian, Dinas Pertambangan* |
| 6 | Forest designation map/ Forest Land Use Consensus Plan – *Tata Guna Hutan Kesepakatan* (TGHK) | The document is being used to provide data on the status of specific areas that are located between TGHK zones and other developments. | *Dinas Kehutanan*, Ministry of Forestry |
| 7 | Land status and tenure map (*peta status dan penguasaan tanah*) | The map is being used to provide data on the status of land, mostly owned and controlled by local communities, either outside forest land or overlap with forest land | *Badan Pertanahan Nasional* (BPN) |

## Appendix 2. Overview of Rapid Land Tenure Assessment (RaTA)

Land tenure conflicts arise from the different perceptions and interpretations that people have regarding their rights to forested land and associated resources. These differing views are often cited as a root cause of communal or even separatist violent conflict. Although such conflicts are often defined in terms of underlying ethnic or religious tensions, it is commonly stated that disputes over land and natural resources are the main cause of these conflicts.

This RaTA is based on the Indonesian experience and the resulting knowledge. The main objectives are:

1. To provide a practical introduction to the relationship between land tenure and land claims, whether we are talking about how land claim issues function as causal or aggravating factors in conflict, or whether we are thinking about land claims that arise in post-conflict settings;

2. to contribute towards the improvement of land tenure policies through a better understanding of land tenure system dynamics and pluralism;

3. to familiarise practitioners with a range of interventions and to sensitise officers to the fact that confusing policies can inadvertently cause competing land claims to occur.

RaTA has been widely used by many research institutions and development agencies at several sites across Indonesia. Below are some selected publications related to RaTA:

1. Galudra G, Sirait MT, Pasya G, Fay CC, Suyanto S, van Noordwijk M, Pradhan UP. 2010. ***RaTA: A Rapid Land Tenure Assessment manual for identifying the nature of land tenure conflicts***. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. p80. http://www.worldagroforestry.org/sea/publication?do=view_pub_detail&pub_no=BK0143-10

2. Galudra G, van Noordwijk M, Suyanto S, Sardi I, Pradhan UP. 2010. ***Hot Spot of Emission and Confusion: Land Tenure Insecurity, Contested Policies and Competing Claims in the Central Kalimantan Ex-Mega Rice Project Area***. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. Working Paper no 98. p34. http://www.worldagroforestry.org/sea/publication?do=view_pub_detail&pub_no=WP0130-10

3. Mitra Samya. 2010. ***Assesment dan Analisa Tenurial untuk Mendukung Pembentukan dan Pengelolaan KPH Model Rinjani Barat, NTB***. Working Group Tenure-Departemen Kehutanan-Kemitraan. p56.
http://www.wg-tenure.org/file/Pelatihan-RATA/hasil_assessment_KPH_model_lombok.pdf

4. Kus Saritano (Mitra LH). 2010. ***Laporan Assesment dan Analisa Tenurial untuk Mendukung Pembentukan KPH Model di Kabupaten Kapuas Prop Kalimantan Tengah.*** Working Group Tenure-Depertemen Kehutanan-Kemitraan. p17.
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## Appendix 3. Overview of RaCSA (Rapid Carbon Stock Appraisal)

The RaCSA appraisal tool is designed to provide a basic level of locally relevant knowledge to assist in discussions between stakeholders. It introduces a scientifically sound methodological framework of accounting for carbon sinks, while focusing on activities that can improve local livelihoods and alleviate rural poverty.

The purpose of RaCSA is to provide a cost effective and time-limited (within 6 months) appraisal that:

- Provides reliable data on carbon stocks in a defined landscape, its historical changes and the impact of ongoing land use change on projected emissions, with or without specific interventions to increase or retain carbon stocks;
- identifies the primary issues in the local trade-off between management of carbon stocks, and livelihoods and opportunities to achieve more sustainable development pathways;
- enhances shared understanding between stakeholders as a step towards free, prior and informed consent (FPIC) in contracts to increase or retain carbon stocks.

RaCSA has been mostly used by research institutions and development agencies in several sites across Indonesia, but it has also been applied in other countries in the South East Asian region. Listed below are some selected publications relating to RaCSA:

1. Kurniawan S, Prayogo C, Widianto , Zulkarnain MT, Lestari ND, Aini FK, Hairiah K. 2010. ***Estimasi Karbon Tersimpan di Lahan-lahan Pertanian di DAS Konto, Jawa Timur. RaCSA (Rapid Carbon Stock Appraisal).*** Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. Working Paper no 120. p60.
   http://www.worldagroforestry.org/sea/publication?do=view_pub_detail&pub_no=WP0141-11

2. Do H. 2009. ***Applying RaCSA to estimate carbon stock in some land use systems in Tan Thai commune, Dai Tu district, Thai Nguyen province.*** Hanoi, Vietnam. World Agroforestry Centre (ICRAF) - Vietnam. p45.

3. van Noordwijk M. 2008. ***Rapid Carbon Stock Appraisal (RaCSA): a rapid but integrated way to assess landscape carbon stocks.*** Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office.
   http://www.worldagroforestry.org/sea/publication?do=view_pub_detail&pub_no=LE0102-08

## Appendix 4. Overview of REDD Abacus

**REDD Abacus SP** is the **ABA**tement **C**ost c**U**rve**S** generator based on the opportunity cost estimation analysis on **R**educing **E**mission from **D**eforestation and **D**egradation. REDD Abacus was developed to analyse the opportunity cost of land use changes in a landscape or area within a period of time and generate the abatement cost curve using:

1. A legend that represents land use change from the perspective of economic (land use) as well as carbon storage (land cover) perspectives, which allows land use change data to be compiled by a combination of land cover change detection and economic constraints (e.g. labour requirements in relation to human population density).
2. Typical carbon stock data for each unit on the legend
3. Net Present Value data for each land use type, typically using a private (= farm gate) and/or a social (= national economy) accounting stance.
4. A matrix of land use change values that are internally consistent and represent either historical change or a forward looking scenario. More information on REDD Abacus SP can be found on the following website: http://www.worldagroforestry.org/sea/node/403

## Appendix 5. Overview on RESFA (REDD/REALU Site-level Feasibility Appraisal)

Any design for reducing net emissions of CO2 and other greenhouse gases needs to balance between (A) dealing with the local representations of drivers of land cover change, by protecting high C stock density areas (effectiveness and, when expressed per unit investment, efficiency) and (B) promoting sustainable development pathways that provide livelihoods (welfare and wellbeing) at reduced net emission levels (fairness).

Several key questions in the assessment are:

- What is the current carbon stock of the system? What other environmental services does the system provide?
- What are the driving factors and threats that lead to reduction in carbon stock (and the corresponding increase in carbon emissions)?

- What is the dependency of the local people on the system?
- Are there any problems with tenure security and land claims?
- What are the possible scenarios and what is the potential carbon stock increase or decrease under these scenarios?
- What are the implications of these scenarios for livelihoods, institutions and equity? What are the opportunity costs, both financial and social? What about additionality, leakage and permanence issues?
- How can the benefits of REDD/REALU be shared or distributed equitably? Who will benefit and who will suffer?

REDD projects developed based on clear answers to these questions are likely to have a good chance of success.To date the tool has been widely used by many research institutions and development agencies in several sites across Indonesia. Here are some selected publications related to RESFA.

1. Tata MH, van Noordwijk M, Mulyoutami E, Rahayu S, Widayati A, Mulia R. 2010. ***Human livelihoods, ecosystem services and the habitat of the Sumatran orangutan: Rapid assessment in Batang Toru and Tripa.*** Project Report. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. p136
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2. Joshi L, Janudianto, van Noordwijk M,Pradhan UP. 2010. ***Investment in carbon stocks in the eastern buffer zone of Lamandau River Wildlife Reserve, Central Kalimantan province, Indonesia: a REDD+ feasibility study.*** Project Report. Bogor, Indonesia. World Agroforestry Centre - ICRAF, SEA Regional Office. p91
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   http://www.worldagroforestry.org/sea/publication?do=view_pub_detail&pub_no=LE0155-09

With the advent of REDD+, and the national action plan on emission reduction under the context of NAMA, as well as the potential for increased financial flows into rich carbon landscapes, the question of how to relate national commitment to the local context and implementation is more important than ever. Rather than focusing on short-term emission reduction strategies, the debate has shifted to a new form of 'clean development' strategies that focus on the combination of maintaining high carbon stocks, involving low carbon flows and yet achieving development goals.

LUWES is a platform for multiple stakeholder process to decide on a land use plan for sustainable development purposes that can reduce green house gas emission from land-based activity while at the same time maintaining economic growth. It also recognizes the impact of land use allocation policies and distributions to tenure and livelihood.

LUWES offers a set of principles, steps and tools (including a Java-based software, ABACUS SP) to help multi-stakeholders to negotiate the land use plans by entertaining scenarios that can be developed together. Tools such as RaTA (Rapid Land Tenure Assessment), RaCSA (Rapid Carbon Stock Appraisal) and RESFA (REDD/REALU Site Feasibility Appraisal) are being included during multiple stakeholder process. This booklet draws on examples from sites in Indonesia where LUWES has been applied. LUWES is designed as a generic tool for rural land use planning in tropical countries.



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