Partnership for the Tropical Forest Margins

Policybrief 35

Land-use planning for low-emission development strategies (LUWES)

Land-based, climate-change mitigation actions that are pro-poor and oriented towards 'green' development need spatially explicit land-use planning processes that are inclusive, informed and integrative. Bringing multi-stakeholder, land-use planning processes to life, beyond rhetoric, needs a breakthrough in political willingness, multi-stakeholder buy-in and technical capacities that allows negotiation platforms to operate. The LUWES approach is gaining followers and adopters.

Key findings

1. Land-based mitigation actions require land-use planning processes within the overall landscape approach that are transparent, credible and accountable and which lead to land-use plans that are pro-poor and oriented towards 'green' development.
2. In an iterative process with local government agencies, six steps of the LUWES approach were developed, along with public domain software for analyzing opportunity costs, known as Abacus SP.
3. Current patterns and trends in the landscape reflect diversity of existing land uses and users, with or without formal land allocations, with various tenure regimes and pluralities of social settings, local and regional economic strategies and biophysical characteristics.
4. Quantitative and spatially explicit trade-off analysis is a key element to develop and consider potential scenarios for reducing emissions with least cost and consequences to development and livelihoods.
5. The LUWES method was selected for use in all provinces of Indonesia as part of planning for appropriate emission reduction actions.

Implications

- The planning process should involve all major stakeholders, be guided by valid and updated data and models, and consider development and conservation simultaneously within the socio-economic environmental context.
- The many stakeholders involved in negotiating land-use plans now have a set of principles, steps, and tools that allow joint exploration of scenarios of mitigation and development.
- Existing plans have only a weak link with reality on the ground; reconciliation of plans with actual conditions that link to land managers is a basis for developing planning units that address the consequences and potential of zone-specific mitigation activities.
- Profitability and carbon stocks of land-use systems on a lifecycle basis are the first proxy but need to be expanded to labour adequacy and absorption, multipliers in the regional economy, livelihoods and food security as indicators.
- The method is sufficiently intuitive and flexible to allow entry-level use with minimal training but also caters for more advanced next steps.

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1. Land-use planning for low-emission development strategies that is inclusive, integrated and integrative

Land and forest-based activities that generate economic benefits and produce food often cause carbon loss from the landscape. If it is not properly planned, halting these activities to reduce emissions by conserving carbon stock can potentially have a negative impact on economic growth and food security. A landscape approach, rather than a project-based one, suits land-based, climate-change mitigation planning and implementation because of the interconnection of drivers and consequences of land use and land-use changes throughout landscapes. At the local level, land-use planning is pivotal at the interface between local, national and global agendas. This leads to a need for a negotiation process in land-use planning that is inclusive, integrated and informed (Dewi et al 2011, van Noordwijk et al 2013).

Figure 1 illustrates the links between development with land-based, climate-change mitigations captured in the local land-use planning cycle. A 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. 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. While historical emissions (in CO_2 equivalent net loss of carbon stock) are estimated from past land uses and land-use changes, the projected emissions from the land-use plan, with the development plan integrated, is one way to set the Reference Emission Level (REL) using a forward-looking scenario.

When planning for lower emissions development, an analysis is required of the portfolio of land-use changes that drive the projected emissions, their projected emission shares and the opportunity cost of the reduction. Strategies and targets for emissions reduction can be developed and simulated for 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 opportunity costs for those people and the means of implementing the actions, 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 a climate-change mitigation action is measured relative to the reduction of future CO_2-eq emissions from the REL informed by transparent and acceptable methods and data. Depending on the modalities and strategies, the costs of reducing emissions (comprised of transaction, opportunity and implementation costs) can either come from the national level, multilateral funds or the private sector, as in carbon markets.

The interconnected processes of inclusive 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 stakeholders to discuss, negotiate and decide on action plans.

2. LUWES in six steps

LUWES focuses on the local decision-making process. It offers a method for producing 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. Length of time necessary to implement each step was approximated from the experiences in conducting LUWES in several districts in Indonesia (Johana et al 2011, Ekadinata et al 2011) (Box 1). Emission estimation through carbon-stock differences from land use and land-use changes within steps 2 and 4 can be conducted through Rapid Carbon Stock Appraisal (RaCSA) (Hairiah et al 2011), which has been widely adopted. Step 3 is setting baseline scenarios and REL at sub-national level that are fair and efficient by using the forest transition stages as a basis, which suits large and heterogeneous countries, such as Indonesia. In 2012, this was submitted by the World Agroforestry Centre to the Subsidiary Body on Scientific, Technical and Technological Advice of the Convention on Biological Diversity (Dewi et al 2012). This brief further discusses steps 1 and 4. All the technical steps are accommodated by a public domain software, Abacus SP, which is simple, easy-to use and transparent (Harja et al 2012). The software is available in three languages: English, Spanish and Vietnamese.

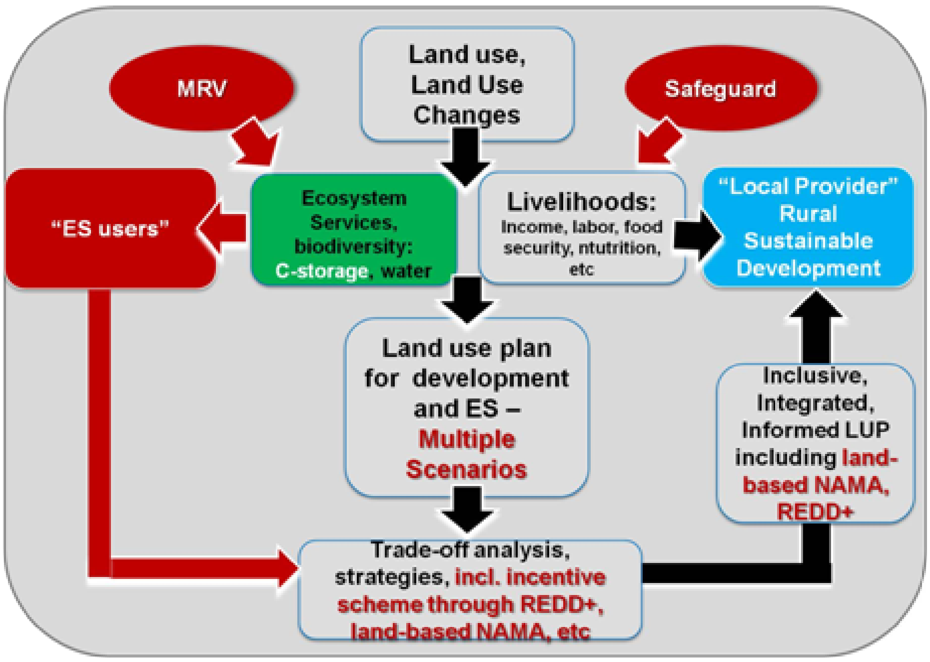


Figure 1. A land-use planning process that incorporates development plans and their consequences for ecosystem services, while internalizing the externalities (for acronym definitions, see van Noordwijk et al 2013)

3. Reconciliation of multiple views of land management into planning units

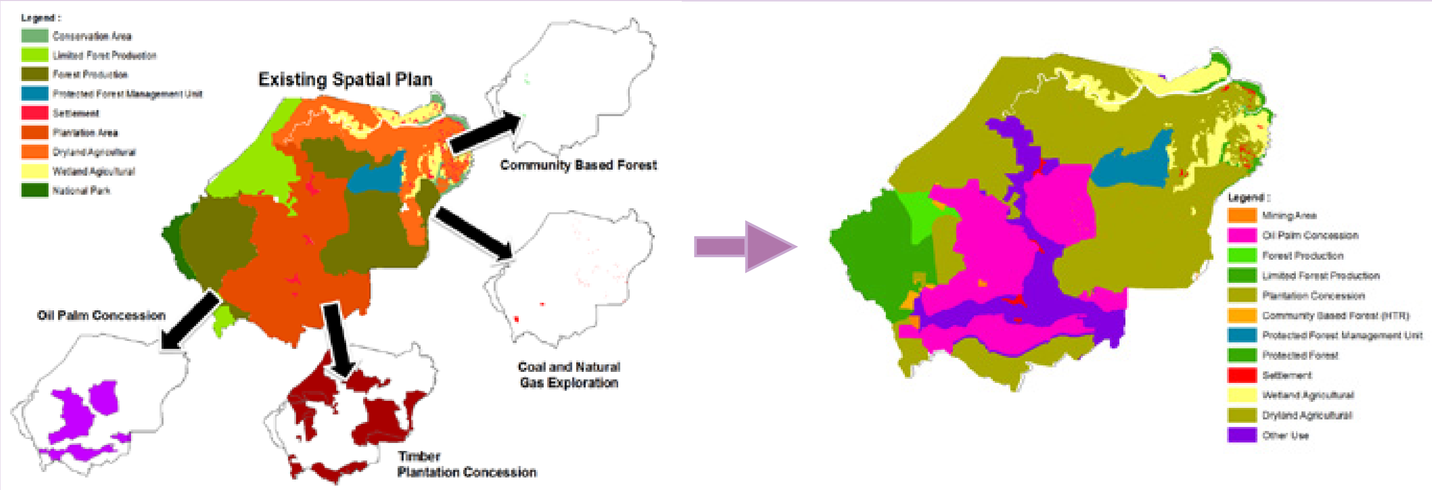
Heterogeneity within a landscape reflects existing land uses and users under formal land allocation, tenure regimes, pluralities of social setting, local and regional economic strategies and varying biophysical characteristics. It is necessary to compile existing spatial plans from various government agencies at local and national levels, and local development strategy and plans (including existing concessions). Overlap of permits may occur as a result of lack of transparency and poor coordination of issuance processes. Stakeholders' discussions with various government agencies that issue these permits should clarify such overlaps and highlight conflicts of interest. Land-use allocation often induces tenure conflict. The Rapid Land Tenure Assessment tool (Galudra et al 2010) identifies overlapping claims of tenure and the resulting conflicts. Local rights are often neglected. The legal basis of contested claims refers to rights and historical injustice and to the use of contradictory and inconsistent laws and multi-sector policies (Galudra et al 2010). The dynamics of land-use policies often create uncertainty about property rights, resulting in confusion over carbon rights. Land tenure conflicts are mainly due to land-use policies and allocation that favor powerful interest groups involved in forest conversion and allocation. This web of interests often modifies the status of forest areas, altering the right to use land and forest resources, which ultimately weakens and undermines the process of land-use planning at the local level (Agung 2011).

LUWES does not aim to solve land tenure per se but rather to clarify planning units that allow specific policy interventions to be applied and feasible action plans to be implemented. Reconciliation of plans with existing conditions that link to land managers provides a basis for developing planning units that address consequences and potentialities of zone-specific mitigation activities. This zonation is conducted on

Box 1. Steps, Data, activities, approximate time requirement and outputs of each step in LUWES

Steps in LUWES	Data requirement	Activities	Approximate time length	Output
1. Zonation into planning units	Layers of biophysical characteristics, land designation, cultural-socio-economic conditions, land-use plans, permits, development plan, land management, tenure regimes, potential interventions	• Data compilation • Identification and consolidation of conflict over tenure with local governments and local people	1 to 2 months	Map of planning unit
2. Estimation of past emissions	• Land-use/cover changes • C-stock of each land-use system	• Data compilation • Plot level measurement • Allometric modelling • Expanding the scale	Depends on the landscape size, existing secondary data and uncertainty to be reached (1 day if all of the data is in place)	• Past emissions at the landscape level • Past emission share of each planning unit • Past emission share of each driver and trajectories
3. Baseline scenario development and estimation of REL	Depending on methods in projecting land-use/cover changes	• Projection of land-use/cover changes • Discussions of options of baseline scenarios • Estimation of future emissions	Depends on the level of sophistication of land-use/cover change modelling (2 weeks if all of the data is in place)	• REL up to a particular year at the landscape level • Projection of emission share of each planning unit
4. Emission reduction scenarios and estimation of projected emission	Scenario for each of the planning units	• Identification of scenarios, what, where, how much • Projected land-use/cover changes • Estimation of emissions of each scenario • Iterations	Depends on how comprehensive and deep (1-2 weeks of intensive discussions with multiple stakeholders)	• Ex-ante emissions • Potential total emissions reduction • Potential share of emissions reduction from each planning unit
5. Trade-off analysis to select best scenarios	• Opportunity cost of each scenario • NPV of land-use systems	• Estimation of trade-offs between opportunity costs and emission reductions • Stakeholder discussions and negotiations	Depends on the complexities on the ground (can be in a series of iterations between steps 4-6) (1-2 weeks of intensive discussions)	• Agreed scenario of future land use/land-use changes for low-emissions development • Opportunity costs • Potential emission reductions and shares
6. Formulation of action plans	• Existing policies and regulations that support or hinder the plans • Existing schemes or mechanisms can be used to provide the needs, cover implementation costs, transaction costs, opportunity cost (REDD+, carbon market, RAD GRK etc)	• Policy analysis • Identification of the cost bearers • Identification of policies, supports, institutions, enabling conditions necessary • Stakeholder discussions and negotiations • Agreed action plan to be discussed and adopted as a local government decree for action plan for reducing emissions	Depends on the complexities and political processes at the local level	Land-use and local action plans for reducing emissions from the land-based sector are enacted and implemented

Box 2. Reconciliation of land-use plans and allocations and existing land uses and management



the basis of stakeholder discussions on the layers of land-use plans and allocation maps. A table that specifies the area, stakeholders and decision-making authorities should be created as a companion to the map. Box 2 provides an example of planning unit development for a district in Indonesia.

4. Trade-off analysis between land-use profitability and land-based emissions

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). Regional economies, livelihoods and food security beyond land-use profitability as indicators of benefits from land uses and land-use changes are crucial but the gaps between data requirements and availabilities have not allowed any applications at the local level yet.

For an entire landscape, based on past land-use and land-cover changes, a retrospective abatement cost curve can be developed from the analysis of carbon-stock differences and economic benefit through land-use profitability, measured by NPV of land-use systems. Figure 3 (left) shows an example of a retrospective abatement cost curve for a landscape, 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

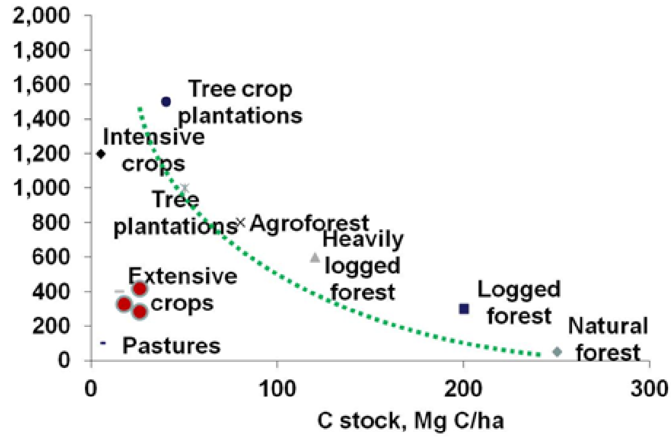


Figure 2. Trade-off between carbon stock and economic profitability (White and Minang 2011)

the 3.8 t CO_2-eq emitted per hectare annually only a small part of the total emissions was associated with negative financial gain, more than half with zero financial gain, and about a third with substantial financial gain (> 5 $/t CO_2-eq). Abacus SP was used for the analysis (Harja et al 2012).

The curve and the analysis can guide planners to identify potential scenarios for low-emissions development strategies in two steps.

1) Identification of types of land uses and land-use changes that associate with Low-Low, Low-High, High-Low, High-High emission-economic benefit (Figure 3, left) and those that associate with Low-Low, Low-High, High-Low, High-High removal-economic benefit (Figure 3, right)

2) Prioritization of emission reduction and carbon-stock enhancement in suitable planning units through reducing High emission-Low economic benefit land uses and land-use changes that have been contributing a lot in the past and will potentially be dominant sources of emission in the future (Figure 4) and promoting High removal-High economic benefit land uses and land-use changes that are biophysically and socio-culturally suitable for the area. Box 3 shows some suggested mitigation scenarios based on the analysis.

	ΔNVP <<	Δ NPV >>
Δ CO_2-eq > 0	Low emission, less profitable land uses and land-use changes	Low emission, highly profitable land uses and land-use changes
Δ CO_2-eq >> 0	High emission, less profitable land uses and land-use changes	High emission, highly profitable land uses and land-use changes

	ΔNVP <<	Δ NPV >>
Δ CO_2-eq << 0	High removal, less/not profitable land uses and land-use changes	High removal, highly profitable land uses and land-use changes
Δ CO_2-eq < 0	Low removal, less/not profitable land uses and land-use changes	Low removal, highly profitable land uses and land-use changes

Figure 3. Characterization of land uses and land-use changes based on emissions, removals and economic benefit

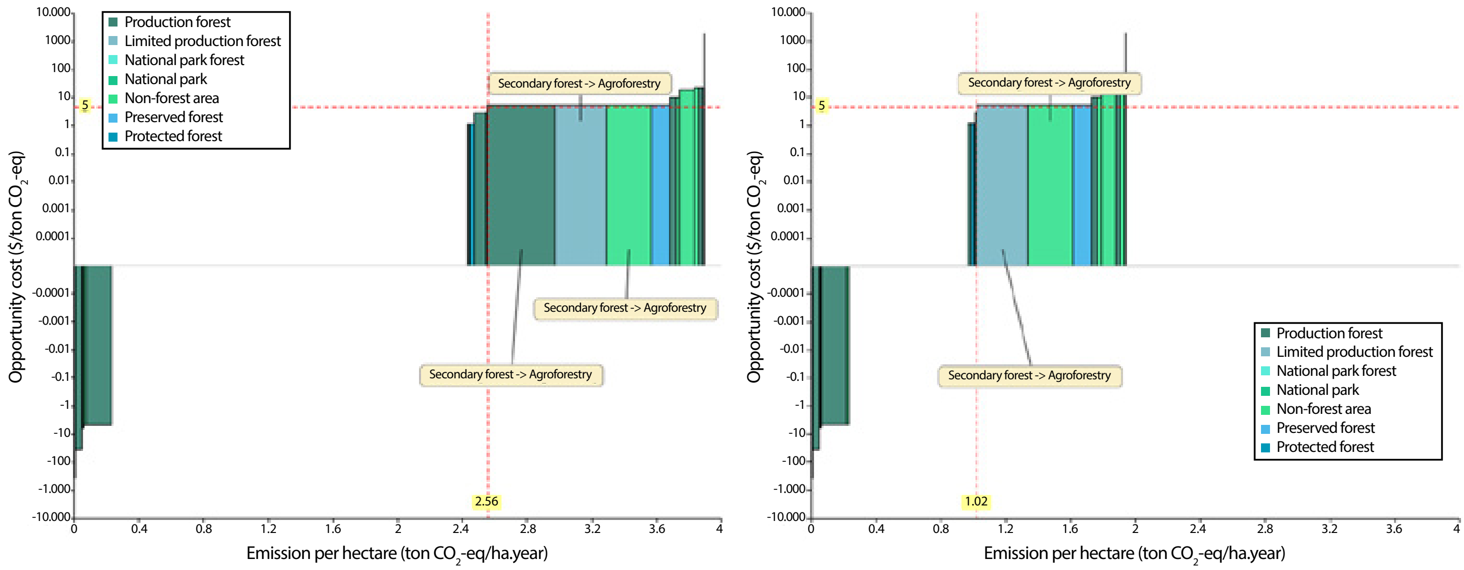


Figure 4. Abatement cost curve of baseline scenario (left) and mitigation scenario through avoiding land-use change that is high in emission and low in economic benefits (right)

Box 3. Potential mitigation scenarios based on opportunity cost analysis

Opportunity costs	Land uses, land-use changes and planning units	Intervention	Expected output
(Δ NPV/Δ CO_2-eq)< 0 $	Existing, all zones	Avoid by policy and development programs	No emissions associated with negative economic benefit
0< (Δ NPV/Δ CO_2-eq)< 5$	Existing, all zones	Avoid by compensation and/or livelihoods alternatives in non-forest zones, law enforcement in forest zone	Lower emissions, maintain income generations
(Δ NPV/Δ CO_2-eq) > 5$	Options for lower C-stock of original land uses within convertible forest zone, e.g., oil palm established from shrub rather than from forest	Proper land allocation and land swap	Development is achieved with lower emissions
Δ NPV/Δ CO_2-eq)> 5$	Options for best practices to lower emissions within production forest zone, e.g., reduced impact logging	Adopt technology	Development is achieved with lower emissions
Δ NPV <<, Δ CO_2-eq >0	Existing, within non-forest zone	Increase profit by improving productivity per unit area, market chains, enabling conditions	Economic growth with low emissions
Δ NPV <<, Δ CO_2-eq >> 0	Especially on peatland, all zones	Rehabilitation, drainage regulation, fire prevention and control	Emission reduced significantly, without much loss in economic benefit
Δ CO_2-eq < 0	Existing in forest zone and non-forest zone without any management	Rehabilitation, restoration	Enhanced C-stock in forest zone or non-managed area
Δ CO_2-eq < 0	Existing in managed zone	Agroforestry with high profitability through increased productivity and market chains	Enhanced C-stock with increased income generation

Outlook

Partial steps of LUWES have been applied in most provinces in Indonesia in developing their land-based local action plan for reducing greenhouse gas emissions as a sub-national operationalization toward an unsupported National Action Plan for Reducing Emissions in Indonesia. The national program has been enacted since 2011 through a presidential decree. The technical steps are relatively easy to be absorbed and applied by local planners through a series of training sessions and workshops. The data, at Tier 2 to Tier 3 levels, are available and being effectively used in the planning processes. As implementation of mitigation actions will mostly take place at the district level it is important for the planning processes to be conducted at that level. At the moment there are no policies of the Government of Indonesia that direct district-level mitigation planning, even though several institutions champion the process in some pilot districts under the coordination of the National Planning and Development Board in collaboration with district planning boards.

At the project level, training sessions and workshops about LUWES have been conducted in Cameroon, Viet Nam and Peru. The concepts and tools are relatively simple for local and national practitioners and academics to grasp. Political willingness to adopt has been expressed but since the national umbrella program doesn't yet exist adoption is limited. Data availability is also scarce and limits application of LUWES. While it has reached proof of concept stage, LUWES has not gone broader in application as it has in Indonesia.

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