3.2 Empowering local stakeholders for planning, Indonesia

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Landscape approaches towards sustainability of ecosystem services

Beginning in the mid-2000s the ecosystem service (ES) framework developed by the Millennium Ecosystem Assessment — and a performance-based incentive mechanism for climate-change mitigation through REDD+ — gained immediate and widespread acceptance. Payment for Environmental Services (PES) or, more generally, Rewards for Ecosystem Services (RES) is becoming increasingly popular in Asia (van Noordwijk and Leimona 2010). They complement rule-based initiatives (for example, land tenure systems and land-use planning) and economic instruments (for example, taxes and subsidies) in achieving conservation and development objectives.

Most PES and RES programmes, however, lack robust monitoring and evaluation systems; performance is not assessed and their effectiveness remains largely unknown. In terms of encouraging governments to reduce emissions from land uses, policy instruments in trade such as uninterrupted export of commodities can be as effective as or more effective than PES (van Noordwijk et al. 2013).

EFFECTIVE LAND-USE PLANNING CAN SUPPORT MULTIPLE ENVIRONMENTAL SERVICES.

The main concepts of the landscape approach have been evolving from those of Integrated Natural Resource Management (INRM) since the mid-1990s (Sayer and Campbell 2001), with the promise of managing trade-offs between development and conservation where ecosystem services are at stake. In contrast to a sectoral approach that addresses issues of forest loss in isolation from other issues in the landscape, a landscape approach treats landscapes holistically, allows for inter-dependent issues and finds ways to address policy factors. Landscape approaches should adopt four best practices:

- embrace the principles of INRM to maintain or restore ecosystems and deliver services and benefits through conservation, development and land-use planning processes;

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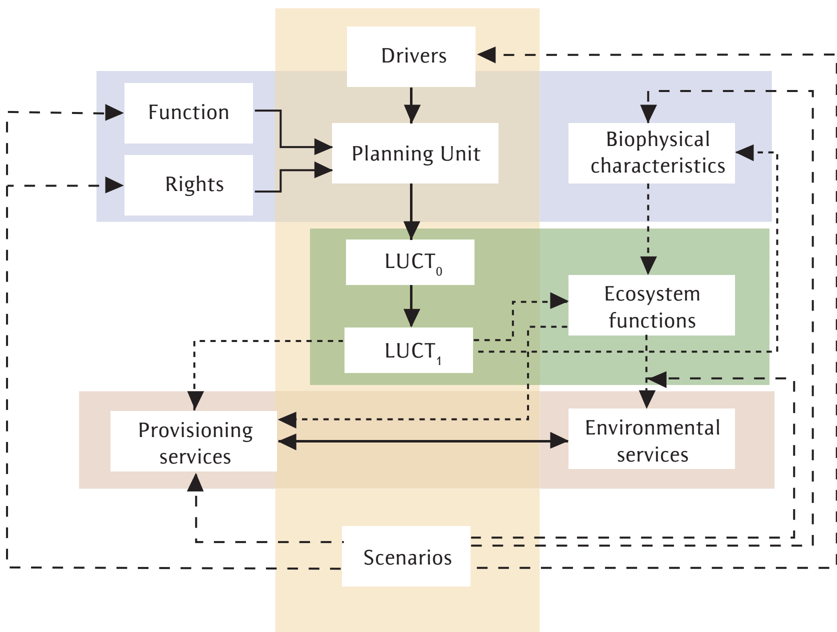
- adopt multiple instruments, using both incentives and disincentives;
- respect local rights and apply social safeguards (see article 5.6); and
- carry out performance-based monitoring to evaluate the effectiveness of the instruments.

There is a lack of technical capacity on the part of local planners in tropical landscapes. A new tool, Land-Use Planning for Multiple Environmental Services (LUMENS; Figure 1), is based on the Land-Use Planning for Low Emissions Development Strategies (LUWES) tool (Dewi et al. 2011), but encompasses issues other than carbon. LUMENS can be used to achieve three goals:

- enable local planners to diagnose historical land-use changes and their impact on ecosystem functions;
- simulate baseline scenarios to encourage interventions with positive consequences and avoid those with negative consequences; and
- analyze the trade-offs between economic benefits and ecosystem functions in various scenarios.

Figure 1. LUMENS: process and components



Note: LUCT = Land Use Change Trajectory

Land-use change in Merangin District, Jambi Province

Merangin is one of Jambi's 11 districts. Its 7,680 km^2 make up 15% of the province and were home to just over 336,000 people in 2010. The district's population density of 45 per km^2 is lower than that of Jambi and Indonesia.

The upper watershed of Merangin is located in Kerinci Seblat National Park, the largest in Sumatra, which forms a substantial forest remnant in the Barisan Range. It is home to a rich array of endemic species. About 71% of Merangin is delineated as forest land. The rest is non-forest land, owned privately or managed by communities or estate companies.

In 2011, the World Agroforestry Centre established a working group in Merangin that included various stakeholders in land-use planning: the District Planning and Development Agency, Forestry Office, researchers and NGOs. The group developed land-use plans that took into account carbon storage, biodiversity and watershed functions. They also delineated Planning Units (PUs) that combined land allocations, permits issued by local and national governments, land suitability and land-use plans.

Forests, including those in the national park, had degraded due to encroachment. During the 1990s and early 2000s, many logged-over forests were converted to rubber and oil-palm plantations. Forest conversion was still taking place in 2005, but changes were more rapid within non-forest areas. Annual emissions attributable to land-use changes in Merangin slowed from 11.6 tCO2e/ha during 1990–2000 to 9.05 tCO2e/ha annually in recent years. The integration of biologically diverse, undisturbed forest with the rest of the landscape has also declined, showing higher fragmentation and higher intensity of land uses between undisturbed forest patches. Edge contrasts between land patches are barriers to ecological processes such as seed dispersal and animal movement, causing forests to become isolated islands, rather than integrated patches, within the landscape (Dewi et al. 2013).

Several scenarios of land uses and changes, based on historical dynamics, illustrate LUMENS:

- Business as usual (BAU): historical changes in each PU are retained, assuming a stationary process and drivers between the periods 2005–10 and 2010–15;
- Expansive agricultural development (Expand): increased conversion of forests to oil-palm and acacia plantations and agroforests;
- Green development (Green): all undisturbed and most logged-over forests are retained and degraded areas in protected forests are rehabilitated. Oil-palm, acacia and rubber plantations and agroforests are established only on shrubland, grassland and cleared land.

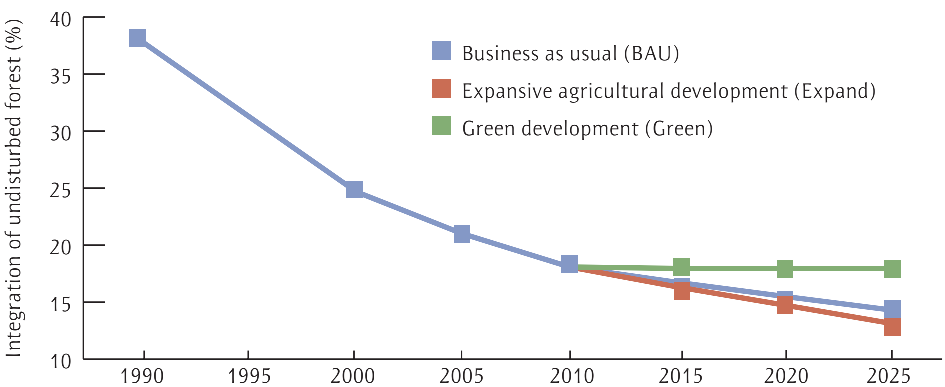
Spatially explicit projections of each scenario were created up to 2025 to estimate future economic benefits and ESs. The scenarios were evaluated in terms of profitability, expressed as the net present value per ha of a land-use system. It is a proxy for economic benefits or provisioning ESs provided by land-use change. BAU showed an annual average 3.1% growth and Expand a 6.9% growth in profitability; Green showed a 0.2% decline.

The annual rate of job growth from agriculture and forestry under BAU was 1.99% on average; those of Expand and Green were 2.41% and 0.42%, respectively. The average annual population growth of Jambi during 2000–10 was 2.88%; well above labour growth rate in the most expansive scenario. To address this, post-harvest processing in the agricultural and forestry sectors would need to be enhanced. For example, oil-palm processors could be established, rather than transporting fruit out of the district. Given the scarcity of land suitable for agriculture, and the amount of land allocated for forests, employment in other sectors would need to be created, along with more devolution of forest management. RES, REDD+ and other compensation schemes are also options.

Opportunity costs (the economic benefit generated from land-use changes that result in CO_2 emissions) are relatively high. For the BAU, only 7.6% of emissions from land-use changes were associated with economic benefits of less than US$ 5. The Expand scenario increased emissions by 6%, while Green reduced 23% of emissions of BAU. Considering the difference in profitability between the BAU and Green scenarios, the opportunity cost of implementing the Green scenario amounted to US$ 26.1 per tCO2e, which is high at today's carbon prices. This means that relying on full compensation from external sources would be neither feasible nor sustainable. Co-investment by both internal and external sources would be necessary to maintain ecosystem services.

In addition to carbon, biodiversity and watershed functions are also important to local stakeholders. Figures 2 and 3 show that landscape-level biodiversity declines sharply and carbon emissions continue to rise under the BAU and Expand scenarios, but remain stable under Green.

Figure 2. Changes in landscape-level biodiversity, 1990–2025

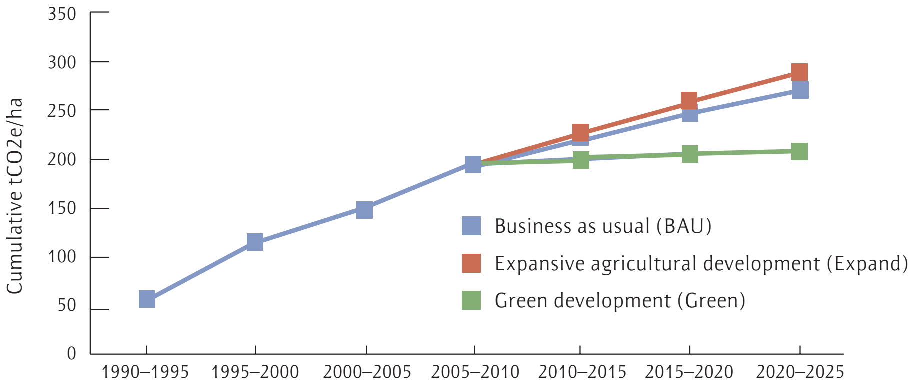


Lessons learned from practical application of the model

The working-group process revealed that a dedicated session is needed in which members explore the basic concepts of LUMENS. Games, examples and illustrations using cases relevant to local issues were effective.

A major problem was the lack of availability and accessibility of data. Often, data are scattered across many offices in different formats and of varying sources and quality. Including members of the group from various government and non-governmental offices would make it easier to compile data. Database management is a crucially important part of the process.

Figure 3. Cumulative land-based emissions, 1990–2025



Leadership of the District Planning and Development Agency is also crucial. Individual leaders can usually be identified during the first round of training sessions, group discussions and key informant interviews. However, the high staff turnover rate within government offices can be a challenge. If possible, it is better to have at least two leaders from each office. LUMENS is simple enough to be managed independently by trained local planners.

Impacts on decision-making

The working group process resulted in a technical document that will inform the district's development plan, emissions reduction plan, annual budget and monitoring and evaluation plan. The latter has become feasible since the scenarios created under LUMENS allow specific measures to be targeted to specific problems. The district was invited to submit a proposal for a REDD+ pilot funded through the Forest Carbon Partnership Facility. Recognition by the national and provincial governments is encouraging replication. Recently, all 11 districts in Jambi gathered to undergo the same process as Merangin. The working group members became trainers of this larger group and also presented at a national forum.

The landscape approach applied in Merangin has integrated the planning process for the entire land-based sector, addressing each planning unit in conjunction with the others. Drivers of changes to forests can be influenced through policy in other (non-forest) parts of the landscape. The development objectives of the district, together with conservation and other programme objectives, can now be achieved by planning for the entire landscape. Each PU is associated with specific land managers and locations within the landscape. Each intervention — and the details of its social, environmental and economic impacts — is known and the impacts are linked to the section of government that is responsible for them.

Previously, in the annual budget process led by the District Planning and Development Agency, it was often difficult for the Forestry Office to receive funding for its programmes. Its targets were often unclear and the locations were not sufficiently specific; this meant that monitoring and evaluation could not be effectively designed. Using the landscape approach, these programmes can now be mainstreamed.

Those PUs that are under the jurisdiction of the national government but interact with local drivers of change are also addressed in the landscape approach. For example, encroachment on the national park, which is under the Ministry of Forestry, needs to be addressed by joint management, as does permit issuance. In Merangin and other parts of Jambi, mining and forestry concessions — which are issued permits by the national government — often create tension. The working group was able to discuss policy options to reduce this tension, such as a partnership between local government and companies to support local people's involvement in co-managing concessions and/or protecting areas of high conservation value. Under such partnerships, the national government can assist through policies for land use (for example, land swaps) or economics (such as tax reduction). The related Village Forest programme of the Ministry of Forestry allows communities to manage their forests under national regulations. Village Forest has been identified as one PU; demonstrating performance against BAU will contribute to achieving national policies.

Over the next year and a half, the working group will expand its process to include hydrological functions, collecting data and conducting training. With regional economic data now available, trade-off analyses can be comprehensively carried out. This will be followed by three tasks:

- institutionalizing the process fully into medium- and long-term plans;
- harmonizing various funding mechanisms, such as national and local government budgets, REDD+, supported Nationally Appropriate Mitigation Actions, the private sector and carbon markets; and
- integrating with RES.

The future of LUMENS

An early version of the LUMENS software was used as part of the working group's training. It will continue to be refined to include a more efficient algorithm for modelling land-use change and developing a more user-friendly graphic interface. Adding indicators that are relevant to users' objectives in analyzing trade-offs; for example, food security, will be a priority. The World Agroforestry Centre and its partners have facilitated similar processes in 12 other districts of four provinces in Indonesia to broaden application and increase impact.

The centre has joined the Tropical Flagship Initiative, a joint programme of the International Institute for Applied System Analysis and the Indonesian National Committee for Applied Systems Analysis, to apply the Global Biosphere Management Model (GLOBIOM) in Jambi and East Kalimantan provinces. This is an economic model of land-use decision-making that has been applied widely in numerous other tropical countries. The model seeks to optimize land-use decisions in response to global and external demands for land-based products, based on local land capabilities, labour and local demand. LUMENS and GLOBIOM will be coupled and modified for the Indonesian context. This will allow global economic and policy scenarios to be simulated in local land-use decisions and the consequences for ecosystem services.

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References

Dewi, S., A. Ekadinata, G. Galudra, P. Agung and F. Johana. 2011. *LUWES: Land use planning for Low Emission Development Strategy.* Bogor, Indonesia: ICRAF, SEA Regional Office.

Dewi, S., M. van Noordwijk, A. Ekadinata and J-L. Pfund. 2013. "Protected areas within multi-functional landscapes: Squeezing out intermediate land use intensities in the tropics?" *Land Use Policy* 30: 38–56. doi: 10.1016/j.landusepol.2012.02.006.

Johana, F. and P. Agung. 2011. *Planning for low-emissions development in Merangin District, Jambi Province, Indonesia.* Brief No 19. Bogor, Indonesia: ICRAF, SEA Regional Office.

Sayer, J. and B. Campbell. 2001. "Research to integrate productivity enhancement, environmental protection, and human development." *Conservation Ecology* 5 (2): 32. www.consecol.org/vol5/iss2/art32.

Sayer, J., T. Sunderland, J. Ghazoul, J-L. Pfund, D. Sheil, E. Meijaard, M. Venter, A.K. Boedhihartono, M. Day, G. Garcia, C. van Oosten and L.E. Buck. 2013. "Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses." *Proceedings of the National Academy of Sciences* Vol. 110, No. 21, 8349–8356. doi: 10.1073/pnas.1210595110.

van Noordwijk, M. and B. Leimona. 2010. "Principles for fairness and efficiency in enhancing environmental services in Asia: payments, compensation, or co-investment?" *Ecology and Society* 15(4): 17. www.ecologyandsociety.org/vol15/iss4/art17.

van Noordwijk, M., F. Agus, S. Dewi and H. Purnomo. 2013. "Reducing emissions from land use in Indonesia: motivation, policy instruments and expected funding streams." *Mitigation and Adaptation Strategies for Global Change.* doi: 10.1007/s11027-013-9502-y.