INNOVATIONS IN LAND USE PLANNING IN THE GREATER MEKONG SUBREGION

▲ Mangrove forests protect coastlines from storm damage, provide habitats that sustain biodiversity, and regulate water quality.

Land is essential to human well-being. How a country values, manages, uses, and protects its land resources, and the ecosystem services these provide, will have a huge impact on that country's economy, environment, and society. This is especially true in the Greater Mekong Subregion (GMS), where agriculture and forestry remain important pillars of the national economies, and where subsistence farming is the main source of support for millions of the poorest people living there.

As the GMS countries build and diversify their economies, and as their populations grow, competition for land becomes more intense. Land is in demand for the ever-expanding agriculture sector, and for growing urban centers and industries; it is also needed for regulating the water supply, conserving biodiversity, and more. Increasing demand combined with uncertain land tenure, weak regulatory enforcement, incomplete land valuation, and inadequate planning, has led to unsustainable land use in many parts of the subregion. As well as widespread environmental degradation, unsustainable land use fuels conflicts and undermines long-term socioeconomic opportunities for rural communities—and for the nations as a whole.

Since 2006, the GMS Core Environment Program (CEP) has contributed to better land governance in the subregion through its focus on holistic land valuation and integrated land use planning. The CEP support included village participatory land use planning in biodiversity corridors, developing land use change modeling tools, and analyzing the geographical suitability of a pipeline of GMS investments totaling more than $50 billion.

Drawing on a decade of CEP experience, this brief provides an overview of land use planning challenges and opportunities in the subregion. It then introduces two tools—the CLUMondo land allocation model and Spatial Multicriteria Assessment—both of which have the potential to greatly improve the environmental and social sustainability of land use planning and management in the GMS.

KEY MESSAGES

(i) Sound and systematic land valuation, and land use planning and management systems, are essential if the GMS countries are to tackle the increasing challenges resulting from land competition and overuse.

(ii) To succeed, these planning and management systems must utilize transparent, inclusive, and quantitative spatial planning tools.

(iii) The use of spatial planning tools should be maximized especially at the strategic planning levels, to leverage the benefits of early (and more cost-effective) mitigation options.

(iv) The GMS countries need to invest more in spatial data infrastructure and capacity development in order to enable their transition from nonspatial to spatial planning systems.


▲ River valleys are often desirable farming areas due to their productive soils, proximity to water, and flat topography.

▲ Hydropower dams provide a source of renewable energy, but their construction and operation can have a negative impact on other land uses, such as agriculture and human settlements.

THE CHALLENGE OF EVOLVING LAND USE DEMAND

Although the GMS economies are diversifying, agriculture still employs one-third of Thailand's workforce and nearly 80% of the workforce in the Lao People's Democratic Republic (Lao PDR).[1] Small-scale agriculture directly supports the livelihoods of around 200 million people in the subregion. Primary commodities—raw and unprocessed materials, such as timber—still account for nearly a quarter of total exports from the GMS countries, including more than 70% of exports from Myanmar.[2] Economic diversification does not mean a decoupling from the land, but instead it changes how the land is used. For example, tourism is a major growth sector, with millions of visitors arriving every year to enjoy the subregion's natural features, such as forests, mountains, and rivers.

Although land resources will remain vital to the GMS countries' socioeconomic development in the foreseeable future, their potential contribution is under threat. Overuse and unsuitable use of land resources are widespread. Land degradation is a major concern in the subregion, affecting 10%–40% of total land area.[3] Forest clearing and agricultural intensification are among the practices that contribute to the loss of ecosystem services such as climate and water regulation and erosion control. Declining agricultural yields, desertification, and soil erosion can result, and may impact food security and income generation, especially for rural communities. The damage often occurs far beyond the locales where the problems originate, sometimes in areas where land is being sustainably managed. For instance, mining or manufacturing operations near a river can cause water pollution that impacts agricultural or tourism activities a long way downstream.

New and emerging economic activities are increasing and intensifying competition for land both *between* and *within* sectors. Tourism businesses, manufacturers, and renewable energy developers might be looking at the same plot of land in which to expand their operations, but how they would use that land is often inherently incompatible. Similarly, a fertile area may be sought by both organic and industrial agricultural companies, but despite being in the same sector, their respective land use practices would have very different long-term impacts on the natural resources and ecosystem services, as well as on the population's well-being.

All the GMS countries are working to improve their land governance, and they recognize that achieving many of the Sustainable Development Goals will depend on it. This is happening in many ways. For example, Myanmar is implementing major land reforms, Cambodia is expanding its protected area network, and Viet Nam has recently mobilized 500,000 rural people as paid custodians of important forest watersheds under its Payments for Forest Environmental Services scheme. However, integrated spatial planning tools for land use decision-making are still not widely used in the GMS. This is especially apparent at the strategic planning level, wherein these tools could help identify ways to avoid or minimize the potential negative impacts of sector plans, policies, and programs. Actually, these tools can later prevent the need for costly remedial actions and compensation.

Understanding the evolving and often incompatible land use demands, from increasingly numerous and diverse stakeholders, is in itself a complex task. Balancing their demands against the need for environmental sustainability and socioeconomic development makes the task much more challenging. Yet doing so transparently, equitably, and effectively, is a critical responsibility for land planning and management authorities in the GMS. As the widespread land degradation and loss of ecosystem services indicate, it is a challenge yet to be successfully addressed.

1 The World Bank. Employment in Agriculture. https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=MM-KH-LA-TH (accessed 7 December 2018).

2 GMS Information Portal. Share of Primary Commodities in Total Exports. http://portal.gms-eoc.org/charts/all/share-of-primary-commodities-in-total-exports?gid=40&gideoc=40&regoreoc=1 (accessed 11 December 2018).

3 ADB. 2013. *Food Security in Asia and the Pacific*. Manila. https://www.adb.org/sites/default/files/publication/30349/food-security-asia-pacific.pdf.

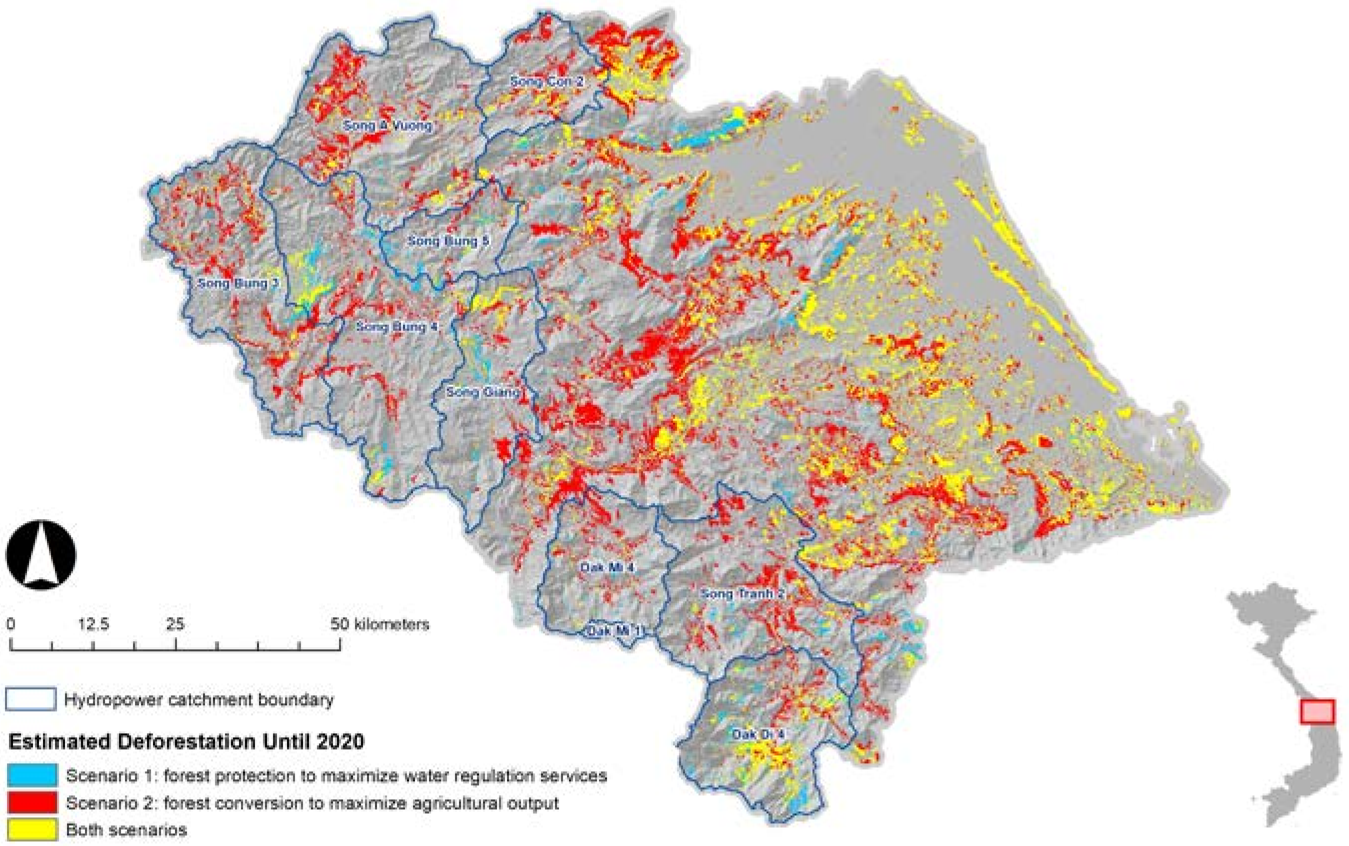
APPLYING LAND USE CHANGE MODELING TO IMPROVE LAND ALLOCATION DECISIONS

With almost every economic sector needing land, decision-makers must carefully consider how land is distributed, so they can ensure an environmentally sustainable balance. A land use change model can help achieve that balance by translating different land-demand scenarios into future land use maps. These can then serve as the basis for assessing how different land use change trajectories and intensities could affect the performance of sector assets in a particular geographic area. Costs can be estimated for the impacts of land use changes—e.g., productivity losses from soil degradation, health issues due to pollution, and hydropower energy shortages due to revisions in water regulations. Decision-makers can then either choose a more sustainable land-allocation scenario, or develop measures to avoid or reduce the risks well before the impacts occur.

One of the most widely utilized land use change models is the Conversion of Land Use and its Effects (CLUE) model. It works with four key inputs: two spatial and two nonspatial. The nonspatial inputs consist of land-demand scenarios (e.g., how much additional agricultural land will be needed over a given number of years) and rules for land conversions (e.g., forests can be converted into agricultural fields, but urban areas cannot be converted into forests). The spatial inputs consist of maps representing the drivers of land use changes (e.g., expanding road networks and growing human populations) and the spatial restrictions on land conversions (e.g., protected areas, land tenure). Based on this information, the CLUE model produces a future land use map for each land-demand scenario. An example of an application is shown in Figure 1.

Understanding scenarios for future land use is also important with other spatial models and planning tools. For instance, land use data is a key input for integrated water resource management and related spatial models. The incorporation of future land use maps can provide important insights into the potential impacts of land use changes on the availability and distribution of drinking water and irrigation, and on flood risks. Future land use maps are also a valuable input when using the Universal Soil Loss Equation model to estimate the risk of soil erosion and sedimentation. This information is important for agriculture planning (threats to soil quality) and for hydropower planners (reservoir maintenance costs).

Figure 1: Application of the CLUE Model—An Example from Quang Nam Province, Viet Nam



Disclaimer: The information contained in this map is not necessarily authoritative.
CLUE = Conversion of Land Use and its Effects.
Note: The map shows the potential consequences of a business-as-usual land-demand scenario (expansion of agricultural land) for the integrity of hydropower catchments, and provides a comparison with an alternative (land conservation) scenario.
Source: Author.

▲ Mining operations provide valuable resources, but they can damage land and generate pollution farther afield.

The CEP has used the CLUE model in several strategic environmental assessments (SEAs) to identify those development scenarios with the best balance among economic opportunities, environmental impacts, and mitigation costs. These included the SEAs of the Strategy and Action Plan for the Greater Mekong Subregion North-South Economic Corridor, the Quang Nam Land Use Plan, 2011–2020, and the 5-year revision of the Viet Nam Land Use Master Plan, 2016–2020.

The CLUE land-demand model was relevant and useful. However, it became evident from these pilots that the model had functional and usability constraints that prevented it from being more widely used by the GMS countries for land development and investment planning. Consequently, the CEP continued with a dual approach to operationalizing land use change modeling in the GMS. One aspect involved shifting capacity-building efforts to the country's academic institutions, which would then become long-term partners of the government both in model application and in the preparation of the next generation of government land use planners to use this modeling technology. The other aspect sought to improve the model software to make it more relevant to GMS planners; this was done by incorporating an ecosystem service demand module and a better user interface. The enhanced software, CLUMondo, has since been used in the Lao PDR (land-system change options), Cambodia (Integrated Water Resource Management of the Tonle Sap Basin), and Viet Nam (SEA of the 5-year revision of the Viet Nam National Land Use Master Plan, 2011–2020).

The CEP has also promoted CLUMondo widely at major GMS events, and provided free online access—along with user manuals in seven languages—via the GMS Information Portal: http://portal.gms-eoc.org.

FINDING THE BEST LAND FOR SECTOR INVESTMENTS

Spatial multicriteria assessment (SMCA) is an approach to investigating the suitability of land for a specific investment purposes based on a variety of attributes. While land use change modeling helps to identify the most sustainable mix of different land use options in a given locale, an SMCA drills down further, assessing land suitability for a specific investment. An SMCA also maps suitability values across a larger geographic area of interest (e.g., a country or a region), thereby providing more locations to consider when an investment is being evaluated.

Because an SMCA is a form of rational decision-making, the assessors (i.e., teams of experts and stakeholders) must systematically structure their problem and outline their information requirements. The basic steps of an SMCA are:

(i) Formulate the problem.

(ii) Disassemble the problem into its component attributes.

(iii) Associate each attribute with an appropriate proxy map.

(iv) Identify measurable parameters or rules for each attribute.

(v) Standardize these parameters or rules to create a common scale of measurement.

(vi) Weigh each attribute according to its relative contribution to solving the problem.

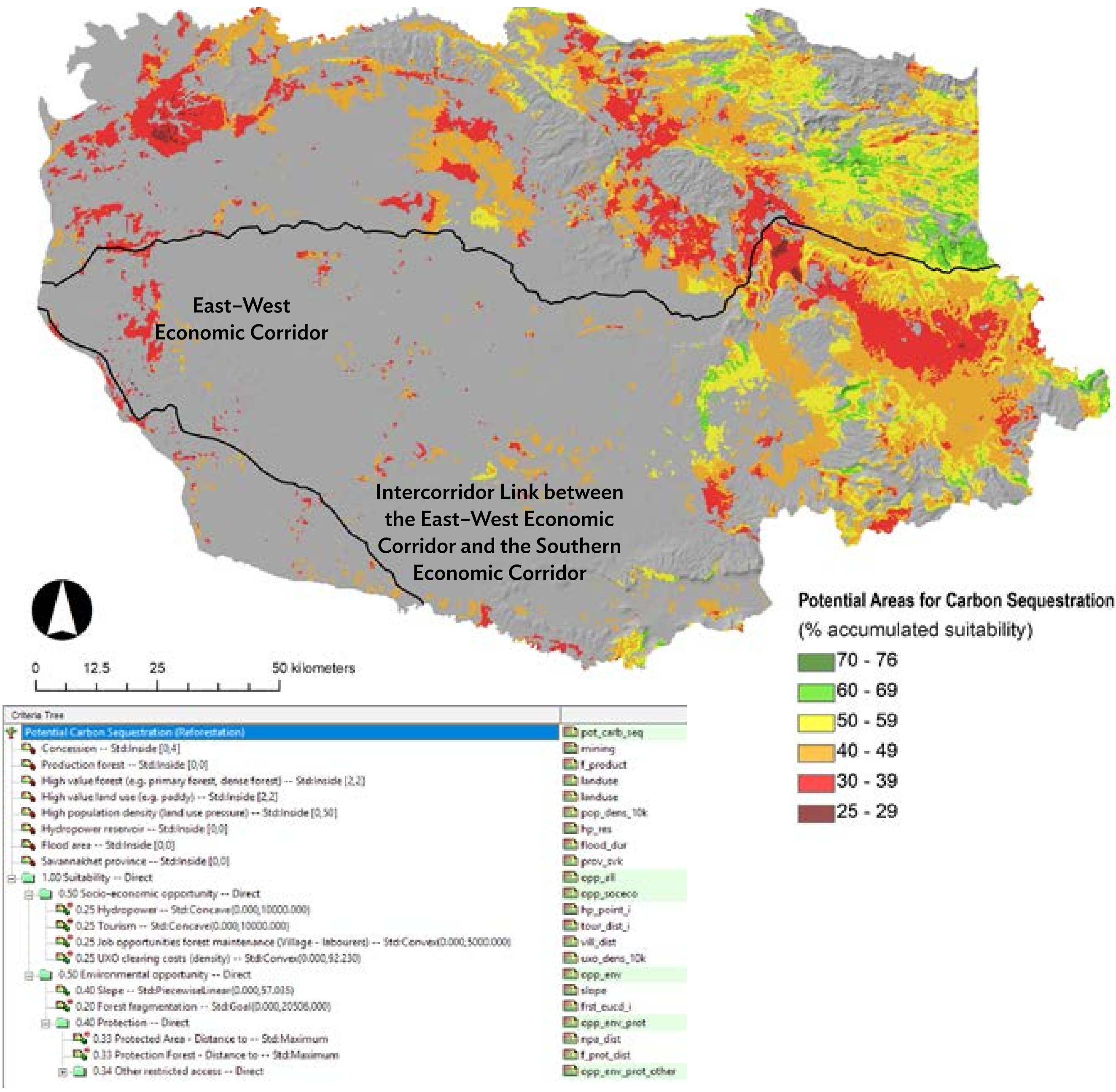
(vii) Aggregate all the inputs into a single output map (decision map) based on a criteria tree.

The decision map will display the geographic distribution of the ratio between costs and benefits, allowing decision-makers to identify the optimal locations for investment.

In the GMS, the Asian Development Bank and the CEP are major advocates of SMCAs as a means of mainstreaming environmental issues into investment planning at various levels. In 2007, an SMCA was used in the SEA of the North–South Economic Corridor Strategy and Action Plan. Since then, SMCAs have been used to evaluate different alignments for roads and railways along the North–South Economic Corridor, with the aim of balancing the environment and social protection with economic opportunity and the benefits of transport infrastructure. SMCAs have also been used to guide investments in agriculture, specifically to identify areas complying with major environmental and social safeguards for rubber plantations (southern Lao PDR) and cassava cultivation (Cambodia). In 2013, an SMCA was used to evaluate the environmental and social risks of investments under the GMS Regional Investment Framework, 2013–2022, and to help identify mitigation measures early in the project preparation process. An example of an SMCA application is shown in Figure 2.

SMCAs are also useful as an ex-post monitoring and decision-making support tool. For example, in 2013 the CEP supported an SMCA in Quang Nam Province, Viet Nam, that evaluated the efforts of communes to protect forest watersheds contributing to hydropower production. This evaluation made it possible to calculate the payments due to communes for the environmental protection services they provided.

Figure 2: Application of Spatial Multicriteria Assessment—An Example from Savannakhet Province, Lao People's Domestic Republic



Disclaimer: The information contained in this map is not necessarily authoritative.
Note: The inset shows a criteria tree used for the assessment of suitable areas for carbon sequestration.
Source: Author.

▲ Effective land management can help prevent costly natural disasters, such as urban floods.

INVESTMENTS NECESSARY TO ACHIEVE EFFECTIVE LAND USE PLANNING

CLUMondo and SMCA are two examples of tools that can enhance the analytical depth and rigor of strategic planning and investment design. They are particularly useful in identifying the options for avoiding or minimizing negative development impacts, thereby helping to leverage the full potential of the mitigation hierarchy.

Economic growth and sector diversification have ramped up the competition for land resources and related environmental services. Addressing the adverse impacts of this increased competition will require potent integrated planning and decision-support tools, given that nonspatial planning processes are no longer sufficient. To make the best use of their land resources, the GMS countries must make the transition to integrated spatial planning and sustainable land management systems, leveraging the possibilities that they provide for advancing sustainability and competitiveness.

To successfully manage this transition, the following steps should be prioritized:

(i) Enable and empower government authorities to efficiently and effectively drive the cross-sector dialogues and mediation processes required for sustainable land allocation and management.

(ii) Leverage the capacity of academe to build and maintain national centers of excellence in land use planning, with a strong focus on applied science and science-policy links. In return for government funding, these centers should be tasked with providing scientific and technical support for government planning and training the next generation of government land use planners.

(iii) Connect national centers of excellence to a regional network of excellence, with a view to promoting subregional cooperation and learning opportunities.

(iv) Develop and maintain nationally accepted, numerically specific databases on environmental, social, and economic sustainability criteria for different types of investments, which planners using spatial decision-support tools can readily draw on.

(v) Invest in national spatial data infrastructure to supply spatial decision-support tools with better-quality data, and to fill common spatial data gaps (e.g., the value of regulations and cultural ecosystem services, high-resolution information on human well-being).

(vi) Invest in developing, updating, and maintaining free and easy-to-use spatial planning software that meets developing country requirements.

(vii) Provide opportunities for stakeholders to use and regularly contribute to criteria databases, spatial data infrastructure, and analytical tools.

ABOUT THE ASIAN DEVELOPMENT BANK

ADB is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty. Established in 1966, it is owned by 67 members—48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

ABOUT THE CORE ENVIRONMENT PROGRAM

The Core Environment Program (CEP) supports the Greater Mekong Subregion (GMS) in delivering environmentally friendly economic growth. Anchored on the ADB-supported GMS Economic Cooperation Program, the CEP promotes regional cooperation to improve development planning, safeguards, biodiversity conservation, and resilience to climate change—all of which are underpinned by building capacity. The CEP is overseen by the environment ministries of the six GMS countries and implemented by the ADB-administered Environment Operations Center. Cofinancing is provided by ADB, the Global Environment Facility, the Government of Sweden, and the Nordic Development Fund.

▲ When agricultural expansion involves the clearing of natural forests, it often leads to the loss of biodiversity and other ecosystem services.

ADB

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