



ADB

GREATER MEKONG  
SUBREGION  
CORE ENVIRONMENT  
PROGRAM

# Applying CluMondo to Support a Strategic Environmental Assessment of Viet Nam's 5-year Land Use Plan (2010-2020) Revision

Activity Summary

June 2016

## Background

Viet Nam has an elaborate land use planning system where Land Use Plans (LUP) are developed every 10 years and undergo revisions every 5 years. [1] The mandated authority is the General Department of Land Administration (GDLA) under the Ministry of Natural Resource and Environment (MONRE), which is currently undertaking the 5-year revision of the LUP 2010-2020.

Viet Nam also has a well-established Strategic Environmental Assessment (SEA) policy and significant SEA implementation practice across different sectors. The government has made SEA mandatory for most national and provincial plans and mandated the respective sector ministries with the responsibility to implement SEA. [2] In the case of land use planning, the mandate lies with the Institute of Strategy and Policy on Natural Resources and Environment (ISPONRE) of MONRE.

While the mandated authorities generally have a good understanding of the SEA process, they still face capacity gaps with the analytical tools needed to fulfil the SEA requirement of transparent and evidence-based assessment and evaluation. Consequently, in April 2015, ISPONRE requested the Greater Mekong Subregion Core Environment Program (CEP) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) to support the SEA of the 5-year revision of the Viet Nam LUP 2010-2020. ISPONRE requested CEP to provide analytical capacity and inputs for spatially-explicit land use change modeling to improve impact evaluation and recommendations. This activity brief summarizes the activity, its implementation, and its outcomes.

## Goal and Objectives

The goal of the activity was to enhance the Government of Viet Nam's understanding of the benefits of land demand allocation modeling for LUP, and for the government to commit its integration into present and future strategic planning processes.

## The model

The tool proposed to support this SEA was the CLUMondo model, which is a frequently used land use change model that has a 20-year history of scientific research and application. [3]

The model consists of four components driving the allocation procedure:

- (i) **Land use requirements:** Translate different development priorities into corresponding land demand scenarios,
- (ii) **Location characteristics:** Describe the suitability of a location for a certain land use and using it as a means to prioritize land allocation,
- (iii) **Conversion settings:** Define the model behaviors with regard to allowing or disallowing certain conversion sequences, as well as considering neighborhood context, and
- (iv) **Spatial policies and restrictions:** Capture all areas where conversion is fully or partially restricted.

From these four inputs, the model produces maps showing potential future land use distribution, with one map for each land demand scenario (i.e. land use requirements). Variable inputs generate outputs that represent different scenarios; Comparing these outputs is significant to the SEA process. Outputs serve as the basis for a spatially-explicit impact assessment, particularly when put into context with the location of societal assets that are sensitive to land use changes (e.g. hydropower and urban areas that are dependent on intact upstream forest for water regulation and flood protection purposes).

## Implementation

### Inception

Following a formal request from ISPONRE in April 2015 to support the upcoming SEA of the LUP 2016-2020 5-year revision with technical-analytical inputs, CEP held a 1-day inception meeting on 8 May 2015 at the ISPONRE offices in Hanoi, Viet Nam. Staff from the MONRE General Department of Land Administration and ISPONRE (SEA team) introduced the LUP 5-year revision and the corresponding SEA, and identified issues and challenges with regard to available data and analysis. CEP introduced analytical tools applied in previous SEAs in the region, with a focus on the CLUMondo model.

Participants' questions on the utility, applicability, robustness, and value-added of this model in the context of SEA and the LUP were addressed and ISPONRE and CEP then agreed upon CEP inputs and alignment with the SEA schedule.

## **Data Collection and Processing**

From May to July 2015 the CEP team collected relevant spatial and non-spatial data to configure the CLUMondo model, including:

- (i) A baseline land use dataset (MONRE, 2010) tallying with the national land categorization used in the LUP.
- (ii) Additional spatial data needed to configure the restriction and suitability components of the CLUMondo model, including Special Use Forests (SUFs), protected areas, soil, population distribution, road networks, terrain (slope, elevation), and production centers such as Special Border Economic Zones (SBEZs).
- (iii) Two land demand scenarios: the original scenario 2011-2020 and the revised 5-year scenario 2016-2020 as formulated by the LUP team.

All data underwent several processing steps, including projection to UTM WGS84 Zone 48N (all), georectification (soil layer only), distance calculations (road network, SBEZs), rasterization to 1km (all), and conversion to ASCII format.

Knowledge components of the model (e.g. conversion matrix) were configured by the CEP team based on expert knowledge and best practices from previous regional SEA applications of the model.

## **Model Runs and Outputs**

In late July 2015 the CLUMondo model was configured and run with the above data. The SEA team configured a second model and provided a revised version of the 2016-2020 land demand scenario in October 2015.

The model produced three land use maps for the year 2020: (i) the original demand scenario 2011-2020 (July 2015), (ii) the first version of the revised 5-year demand scenario 2016-2020 (August 2015), and (iii) the second version of the revised 5-year demand scenario 2016-2020 (October 2015).

Based on these model outputs, the 2010 land use base layer, and several administrative and basin boundary datasets, the CEP team generated statistical summaries as a base for the impact assessment, including:

- (i) Three land use change maps for each of the scenarios, categorized into restoration or degradation, depending on whether land was converted into a more productive or less productive system.
- (ii) Statistical summary of land use change maps by administrative units (provinces).
- (iii) Statistical summary of land use change maps by vulnerable areas and assets (e.g. river basins, SUFs and other protected areas, and key biodiversity areas).

The CLUMondo summary report, provided to the SEA team in November 2015 (in Vietnamese), described in detail the results.

## Consultations with the SEA Team

To enable the SEA team to efficiently engage with the LUP writing team at all stages of the LUP revision, the CEP team conducted on-site meetings and support missions that closely aligned with the SEA process. Key meetings held include:

- (i) **May 2015 (on-site):** Inception meetings to formalize CEP analytical support and consultations with SEA team on LUP scenarios and baseline data sources (part of the SEA *screening and scoping phases*).
- (ii) **August 2015 (on-site):** Presented and discussed results of the baseline mapping and scenario with the SEA team (part of the SEA *baseline assessment and scenario development phases*).
- (iii) **October 2015 (report):** Presented, summarized and discussed the first run of CLUMondo model results with SEA team (part of the SEA *impact assessment and evaluation of options and alternatives phases*). The SEA team provided the CEP experts with a revised alternative scenario in response to the feedback provided during the August meeting.
- (iv) **November 2015 (on-site, report):** Presented the second run of CLUMondo model results to SEA team, amended the October report with the results of the revised alternative scenario, enhanced impact assessment, and inputs from the SEA *recommendations phase*.
- (v) **November 2015 (on-site):** Supported SEA team in the SEA appraisal meeting and the SEA was approved by MONRE.

## Outcomes

The CLUMondo application successfully closed a gap in the analytical requirements of the SEA team. Consequently, the SEA team embedded CLUMondo results and recommendations into the final SEA report as follows:

**Section 2.3 - Introduction of SEA legal bases and methodologies for implementing SEA.** In this section, the SEA team introduced the CLUMondo model as one of six methods (the others being: GIS overlay analysis, trend analysis and extrapolation, expert opinion, impact matrix, and ecosystem-based adaptation) that were applied in this SEA (pp. 16-17). The section summarized the approach behind the model, how the model was configured (scenarios, spatial data used, etc.) and which outputs it produced. It then referred for the interpretation of the outputs to chapter 3 (impact assessment and evaluation) and chapter 5 (recommendations for LUP revision).

**Section 3.6.1.2 - Impact Assessment.** In this section, the SEA team summarized the anticipated impact of land use change on land resources and soil environment. On pages 112 through 131, the CLUMondo statistical summaries identified the following risks and potential impacts:

- (i) The provinces of Binh Thuan, Cao Bang, Ha Tinh, Hoa Binh, Khanh Hoa, Nghe An, and Phu Yen face could see a conversion of protection to

production forest (~30%) which will have implications for water regime regulation and soil protection in the Da, Red and the Vu Gia-Thu Bon river basins.

- (ii) The provinces of Binh, Hue, Can Tho, Ha Tinh, Long An, Nam Dinh, Thai Binh, Thanh Hoa, and Quang Tien Giang may see conversion from intensive agriculture to urban area, infrastructure, and industrial land. This potentially risks irreversibly altering the soil quality (from soil and water pollution), agricultural productivity and ultimately food security of the large and densely settled Red River Basin and Mekong Delta.
- (iii) The Mekong Delta also could see conversion from agriculture to aquaculture, which would risk further intensifying the already existing problem of soil salinization.
- (iv) The Protected Areas (national parks and nature reserves) of Chu Mom Ray (Kon Tum), Song Thanh (Quang Nam), Vu Quang (Ha Tinh), and Yokdon (Dak Lak) face an increased risk of deforestation due to nearby road investments (e.g. planned border road) and establishment of Special Border Economic Zones (Bo Y, Cau Treo, Nam Giang, and Dak Rue SBEZs).

**Section 5.1.1 - SEA recommendations for LUP revision.** In this section (pp. 187-191), the SEA team included several recommendations from the CLUMondo impact assessment report:

- (i) To maintain food security, avoid conversion of agriculture land into industrial zones in the Red River Delta.
- (ii) To maintain security and protect coast lines from erosion (e.g. from climate change) and degradation (soil salinization), avoid conversion of agriculture land (rice paddy) and mangrove forest into aquaculture land in the Mekong River Delta.
- (iii) To maintain food security, the proposed coastal highway through Nam Dinh, Thai Binh, Thanh Hoa, Thua Thien Hue should be aligned with the existing road network (no conversion of agriculture land).
- (iv) To maintain the forest ecosystem, prioritize unused land or low value agriculture land for the establishment of Special Border Economic Zones, especially in the central highlands.
- (v) To maintain forest ecosystem, avoid alignment of new road developments through Chu Prong, Phong Nha Ke Bang, Pu Mat, Pu Hoat, Song Thanh, Vu Quang, and Yok Don, National Parks (north central coast and central highlands).
- (vi) To maintain coastal and climate change protection functions, avoid conversion of protection forest to production forest in the coastal provinces of Ha Tinh, Nghe An, Quang Binh, Quang Tri, Hue).
- (vii) To improve ecosystem services and soil protection functions, increase conversion of unused land into production forest in the mountainous provinces of northern and central coastal Viet Nam, in particular Cao

Bang, Hoa Binh, Hue, Lao Cai, Lang Son, Quang Ninh, Quang Tri, Quang Binh and Quang Nam. [4]

The SEA appraisal meeting comprised experts from MONRE, the Ministry of Planning and Investment, the Ministry of Industry and Trade, the Ministry of Transport, and the University of Mining and Geology. During the meeting, the SEA team were complimented for its innovative use of spatial decision support tools, in particular the CLUMondo model.

At the time of this report, the LUP team are revising the LUP based on the SEA and other inputs received. Therefore, final assessment of the value and influence of the CLUMondo application is yet to be fully determined.

## References

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