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Provincial Administration of Mondul Kiri
Provincial Committee for Land Management
and Urban Planning

**Mondul Kiri Provincial Spatial Plan
Technical report**

Prepared by the Provincial Committee for Land Management and Urban Planning

March 2021

With support from



Mondul Kiri Provincial Spatial Plan
Technical report

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List of abbreviations

3S	Srepok, Sesan and Se Kong rivers
CDB	Commune Database
CF	Community Forestry
CFi	Community Fisheries
CLT	Collective Land Title
CLV	Cambodia, Laos Viet Nam
CPA	Community Protected Area
CWG	Core Working Group for Land Management and Urban Planning (Mondul Kiri province)
D-S-E	Deciduous-Semi-Evergreen and Evergreen
DBST	Double Bituminous Treatment Surface
ELC	Economic Land Concession
FA	Forestry Administration
FAO	Food and Agricultural Organization
FDH	Former District Hospital
FiA	Fisheries Administration
FWUC	Farmer Water User Group
GIS	Geographic Information System
GMS	Greater Mekong Sub-region
InVEST	Integrated Valuation of Ecosystem Services and Tradeoffs
JICA	Japanese International Cooperation Agency
LCC	Land Cover Change
LTDG	Long-term Development Goals
LULC	Land Use Land Cover
MAFF	Ministry of Agriculture, Forestry and Fisheries
MCD	Macadam
MDK	Mondul Kiri
MoE	Ministry of Environment
MoH	Ministry of Health
MoEYS	Ministry of Education, Youth and Sport
MoLMUPC	Ministry of Land Management, Urban Planning and Construction
MoPWT	Ministry of Public Work and Transport
MoT	Ministry of Tourism
MoWRM	Ministry of Water Resources and Meteorology
NIS	National Institute of Statistics
NR	National Road

NRM	Net Migration Rate
NSDP	National Strategic Development Plan
NTFP	Non Timber Forest Product
ODC	Open Development Cambodia
PA	Protected Area
PDA	Provincial Department of Agriculture
PCLMUP	Provincial Committee for Land Management and Urban Planning
PDLMUPCC	Provincial Department of Land management, Urban Planning, Construction and Cadaster
PDoCFA	Provincial Department of Cultures and Fine Arts
PDoE	Provincial Department of Environment
PDoISTI	Provincial Department of Industry, Science, Technology and Innovation
PDoLVT	Provincial Department of Labor and Vocational Training
PDoME	Provincial Department of Mines and Energy
PDoP	Provincial Department of Planning
PDoPWT	Provincial Department of Public Works and Transport
PDoRD	Provincial Department of Rural Development
PDoT	Provincial Department of Tourism
PSP	Provincial Spatial Plan
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RGC	Royal Government of Cambodia
RS4	Rectangular Strategy (phase 4)
SLC	Social Land Concession
SCP	Sustainable Consumption and Production
SO	Strategic Objectives
US	United States
WCS	Wildlife Conservation Society
WWF	World Wide Fund for Nature

List of terms and their uses in the Mondul Kiri provincial spatial plan

Agro-ecology: Agro-ecology is the application of ecological sciences to the study, design and management of agriculture (Altieri, 1995). Its core elements are integrated land-use systems that maintain species diversity, agro-biodiversity, the improvement of ecological processes and delivery of ecosystem service, the strengthening of local communities and recognition of the role and value of indigenous and local knowledge (IPCC, 2019).

Biodiversity is the variety and variability of all forms of life. It refers to variation at the genetic, species, and ecosystem level.

Biodiversity corridors are areas that connect several already delineated protected areas, which are off-limits to economic land concessions. The government has declared almost 1.5 million hectares as biodiversity corridors in a bid to enhance the sustainability of the ecology system and reduce the impact of climate change

Chamcar is Khmer term used in this report to refer to all non-paddy land usually located in upland areas

Climate Change occurs when changes in Earth's climate system result in new weather patterns that remain in place for an extended period. This length of time can be as short as a few decades to as long as millions of years.

Collaborative management is a key concept of the Cambodian Environmental Code used to describe how national government, communes and community groups can come together to effectively manage natural resources. It refers to principles such as citizen's access to information and effective remedies and effective and full participation of all relevant stakeholders in environmental decisions that may concern them. In the Mondul Kiri PSP, collaborative management is used in the context of PA management, even though the concept can also be applied to other forms of natural resources co-management such as community forestry or community fisheries.

Co-management refers to the sharing of responsibilities and power between the State and a community of resource users. Co-management is usually institutionalized through an agreement between the State and a local community. It often implies the coordination of multiple local interests and multiple government agencies. In the Mondul Kiri PSP, co-management is used in the context of natural resources management such as Community Forestry (CF) (co-management of forest resources outside Protected Areas), Community Fisheries (CFI) or Community Protected Areas (CPA).

Demographic growth rate is the increase in the number of individuals in a population. In this report, it is measured as a percentage using the formula $r = \frac{\ln(P_t) - \ln(P_0)}{t}$, where P_0 is the population at the base year, P_t is the population at year 't' and 't' is the time interval in years. Ln is the natural logarithm.

Dynamic: Refer to a movement of transformation, an evolution of a system across time

Ecosystem Services are the benefits that humans receive from the natural environment and from healthy ecosystems, such as for example, agroecosystems, forest ecosystems, grassland ecosystems and aquatic ecosystems. These services include such things like natural pollination of crops, clean air, extreme weather mitigation, human mental and physical well-being. Collectively, these benefits are becoming known as 'ecosystem services'.

Ecotourism is a form of tourism involving visiting fragile, pristine, and relatively undisturbed natural areas, intended as a low-impact and often small scale alternative to standard commercial mass tourism.

Forest cover, according to the Cambodian Forestry Administration (FA), includes several types of forest such as deciduous, semi-evergreen and evergreen (D-S-E) forest. It also includes other types of forests such as regrowth, stunted forests, mangrove forests, inundated forests, forest plantations, and

bamboo. According to FA, rubber is also classified as a forest cover. The classification proposed in the Mondul Kiri PSP, various types of forests are differentiated, namely: i) D-S-E forest, ii) other forests (forest plantation and bamboo) and iii) rubber forest.

Land use involves the management and modification of natural environment or wilderness into built environment such as settlements and semi-natural habitats such as arable fields, pastures, and managed wood lots.

Land cover is the physical material at the surface of the earth. Land covers include grass, asphalt, trees, bare ground, water, etc.

Land use system is a territorial division used in spatial planning to simplify and synthesize the information about land use management of a large area. It is basically a portion of a given territory – usually hundreds of square kilometers - where the dynamics of land cover, the existing land use and land use management regimes are relatively uniform. Land use systems are key features of the spatial structure of a province and are useful to analyze land use in relation to the polycentric structure of urban centers, the economic development poles, and the transport network of a large area like a Cambodian province.

Land tenure is a set of formal and informal institutions, i.e. rules invented by societies to define how property rights to land are to be allocated within societies. They define how access is granted to use, control, and transfer land, as well as associated responsibilities and restraints.

Planning team: consists of all the members of the Core Working Group, together with WWF staff and the members of the consultant team supporting them

Population density is the number of individuals in a particular geographic area, for example, number per square meter, per hectare, or square kilometer. In the Mondul Kiri PSP, we use people per square kilometer

Protected areas are designated by law in Cambodia for nature conservation and are under the management of the Ministry of Environment.

Spatial planning refers to the methods and approaches used by the public and private sector to influence the distribution of people and activities in spaces of various scales. Spatial planning can be defined as the coordination of practices and policies affecting the spatial organization

Watershed is a drainage basin in any area of land where precipitation collects and drains off into a common outlet, such as into a river, bay or other bodies of water

1 Introduction

1.1 Background and Rationale

1.1.1 Provincial Spatial Planning

According to the National Policy on Spatial Planning of the Kingdom of Cambodia (RGC, 2011), a provincial spatial plan belongs to the multi-level hierarchical planning system that includes national, sub-national and local plans. It is conceived as a spatial development framework based on a vision and provides strategic directions for the development of the province for a 20-year time span. The Provincial Spatial Plan aims to substantiate national level and spatially-relevant policies, plans, programs and strategies and to guide lower-level spatial planning (vertical integration). It also aims to maximize synergies and address trade-offs between provincial sectors (horizontal integration). As such, it informs the formulation of the provincial 5-year development plan and the corresponding investment plan.

The Provincial Spatial Plan aims to determine the future spatial structure of the province and assigns specific functions to different areas of the province. The spatial structure articulates four key elements: the main land-use systems, the transport and connectivity networks, the polycentric structure of urban centers, and the economic development poles. The provincial spatial plan charts the future course of action of these four key elements with a horizon of 20 years.

1.1.2 Objective of the Provincial Spatial Plan of Mondul Kiri province

Given the predominance of natural resources within the province, the Mondul Kiri provincial spatial plan seeks to influence decisions and build a collective ownership around a balanced development between sustainable natural resources management, economic development and equitable access to public services. It does this by providing effective development principles and tools for informed decision making and spatial development processes to promote balanced territorial development.

1.2 Planning Authorities

The Sub-Decree No.77 on the Establishment of Committees for Land Management and Urban Planning (RGC, 2012) describes the mandate and responsibilities of each different government-based institutions involved in the planning process (Figure 1).

1.2.1 National Committee for Land Management and Urban Planning (NCLMUPC)

The National Committee for Land Management and Urban Planning, currently composed of 26 ministries and institutions, has an overall role of advisor and technical backstopping during the planning process. The NCLMUP reviews the technical report produced by the provincial administration, and concludes with a summarized spatial plan statement based upon a government guidance. Then NCLMUPP finally submits the statement, enclosed with the technical report, to the Royal Government of Cambodia for adoption of the spatial plan.

1.2.2 Provincial Committee for Land Management and Urban Planning (PCLMUP)

The Provincial Committee for Land Management and Urban Planning was established on 14 May 2016 (PAM, 2016a). It is chaired by H.E provincial governor and consists of 30 members from different provincial departments (Annex 1). The committee's role is to initiate the planning process, review the technical content of the plan and lead the consultation with all ministries and other stakeholders in order to prepare the final technical report. Subsequently, the provincial administration, following the given planning procedure, must seek an approval from the provincial council before sending it to the National Committee for Land Management and Urban Planning for further action.

1.2.3 Secretariat of the PCLMUP

A secretariat was established on May 24, 2016 (PAM, 2016b) to support the committee in preparing and updating the plan. It consists of 28 members from different provincial departments (Annex 2).

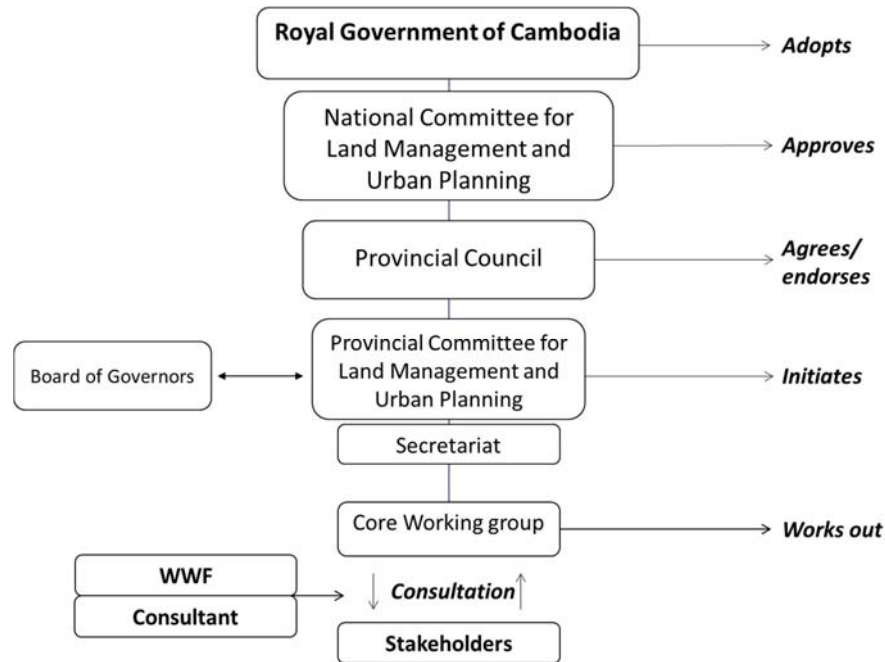


Figure 1: Institutions involved in the provincial spatial planning process

1.2.4 Core Working Group

The Core Working Group (CWG) is designated to do data collection, analysis, mapping, and to organize relevant consultation workshops. It is an interdisciplinary team whose members are from different provincial departments. The members of the CWG are also in charge of reporting and facilitating the spatial planning activities to their department. A Core Working Group with eight members was created on 29 November 2016 (PAM 2016c), soon after the creation of the PCLMUP and its secretariat. Subsequently, new members were added and a new Core Working Group was created on 25.01.2019 (PAM, 2019) with 14 people (Annex 3)

1.2.5 Supporters

Throughout the spatial planning process, the provincial administration of Mondul Kiri has received the support of several organizations and individuals listed in Annex 4.

The spatial planning initiative started in 2013 with EU support. Between 2014 and 2016, a comprehensive ecosystem services study funded by EU and USAID was commissioned by WWF to a team of researchers from the Royal University of Phnom Penh with backstopping from Stanford University. The results of this survey have served as direct inputs into the spatial planning process of Mondul Kiri province.

In July 2016, shortly before the creation of the Provincial Committee for Land Management and Urban Planning and its secretariat, spatial planning processes were initiated under WWF technical assistance with funding from the EU. During this inception phase, the first geospatial and tabular database was created. The EU support stopped in 2017 but USAID took over in January 2018. In

October 2018 the first consultancy team was hired to work out the planning process with the Core Working Group. In late 2019, a team of consultants was recruited to work closely with the newly formed Core Working Group to pursue and finalize the process.

1.3 Planning procedure and participation

1.3.1 Planning Methodology

The spatial planning of Mondul Kiri province took place according to the procedure laid out in the provincial spatial planning handbook (MLMUPC 2016). It consists of the following 6 steps (Figure 2):

Step 1: Preparation and public launch

Before the actual planning process starts, it was important to identify and reach out to the different stakeholders. A public kick-off workshop was organized to create a shared understanding of the spatial planning process amongst them. Once the role and responsibilities of all parties involved were clear, the provincial administration created the appropriate committees and bodies for steering and implementing the process.

Step 2: Situation Analysis

The current status of the province is to be considered as a basis for planning. The analysis of the existing situation starts with the collection and verification of secondary data. When needed, the planning team acquired primary data. All geospatial and tabular data were gathered in a unified provincial spatial database. The analysis started with the identification of the existing spatial structure and patterns of development in the province. The planning team then conducted a systematic review of the strengths and weaknesses of all spatially relevant sectors as well as a discussion of related needs, potentials, opportunities, options, and threats in order to provide a basis for the future plan.

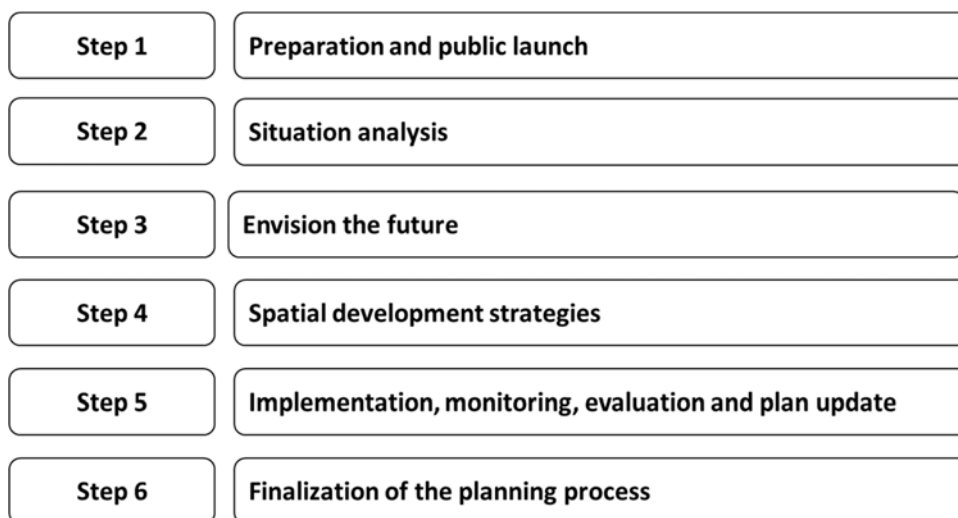


Figure 2: Sequence of steps followed during the planning step

Step 3: Envision the Future

After the diagnosis phase, the spatial planning process enters a process of prognosis. The team created relevant scenarios related to land use changes and their impacts on ecosystem services, to demographics, and to climate change. The situation analyses and scenarios then serve to formulate an overarching vision that will guide the development of the province in the next 20 years. Each pillar

of the vision is then further specified into long term development goals and objectives. At the end of step 3, the planning team presented the situation analysis, vision, and long-term development goals to the PCLMUP for discussion and endorsement.

Step 4: Spatial development strategies

Spatial development strategies specifically chart how to reach the overarching vision, long term development goals, and objectives. For the sake of coherence and consistency, one objective is formulated as one overall strategy. Each overall strategy consists of an articulated set of sub-strategies that include a set of activities to be implemented. To identify and develop relevant strategies, the planning team organized a series of consultation workshops at the district level with participation from district administration representatives, district technical offices, all communes, community-based and civil society organizations, totalling 229 people. This information was then organized in a so-called strategy matrix and was further analysed to identify possible synergies and trade-offs to be addressed. These strategies are essentially multi-sector, so the planning team had to seek alignment with the existing sector strategies and plans.

Step 5: Implementation, monitoring, evaluation and plan update

Once the strategies were developed, the planning team facilitated a process to prioritize activities and projects to be implemented to realize the provincial spatial plan. This includes identifying contributions, clear roles and responsibilities for all stakeholders. In doing so, the team identified linkages between the spatial plan and existing provincial development, investment and sector plans. This forms the basis to develop monitoring and evaluation tools and updating mechanisms.

Step 6: Finalization of the planning process

To finalize the planning process, the team conducted a final consultation workshop gathering 109 people from the national to local levels. The discussion provided the planning team with an opportunity to improve and develop the technical report. Upon completion of the technical report, the provincial council gathered to endorse the report and then send it with all supporting documents to the national committee for land management and urban planning to review and approve; and then submit the reviewed technical report enclosed with the brief summary of plan statement to the Royal Government to adopt the plan and put into effect.

1.3.2 Stakeholders' participation and capacity building

Information, consultation and active involvement of stakeholders are the corner stones in any spatial planning process. Participation allows for the identification of the key planning issues, the optimization of planning results through broad interdisciplinary consultation and to build on the understanding and ownership of stakeholders.

The Core Working Group in close cooperation with the WWF-Cambodia's staffs and external consultants carried out various participation meetings and workshops at different levels in order to yield the result of the spatial plan of Mondul Kiri province.

Along the planning process, the Core Working Group attended several training on issues relevant to the provincial spatial planning. Training on Ecosystem services (concepts, indicators, InVEST tool) were conducted and facilitated by external trainers, whereas Geographic Information System (GIS) was delivered directly by the consultant team. In addition to these specific capacity development measures, on-the-job training activities were conducted by the consultant team during monthly meetings. All of these activities are listed in Annex 5.

1.4 Organization of the report

The technical report of the Mondul Kiri provincial spatial plan is organized according to the different steps that structured the planning process. It consists of 5 chapters. After this introduction, (Chapter 1), Chapter 2 analyses the current situation of the provincial territory. Issues and potentials are first

analyzed by sectors and are then synthesized along with the four main elements of the spatial structure of the province: land-use systems with an emphasis on forest resources and ecosystem services, road network and connectivity, economic development poles, and polycentric structure of urban center. Chapter 3 presents the scenarios developed by the planning team concerning land use, ecosystem services, demographic dynamics, and climate change. On that basis, the vision, long-term development goals, and objectives are presented. In Chapter 4, the objectives are taken one step further and developed into spatially explicit strategies. Chapter 5 presents the activities prioritized by the provincial stakeholders to implement these strategies, the mechanism to develop specific projects and to monitor and evaluate their implementation.

2 Situation analysis

2.1 History

The borderland region consisting of Northeast Cambodia and the Highlands in Vietnam has long been exclusively populated by indigenous peoples. In Mondul Kiri, the indigenous peoples are mainly the Bunong, an Austro-Asiatic population from the Mon-Khmer linguistic branch. The Bunong, also called Phnong, is still the largest group of indigenous people living in Mondul Kiri and represent 44 percent of the total population in the province (see section 'Demography and population' for more details). They have been established in this region for at least 2000 years (White, 1996) and remained relatively isolated for centuries. Even if the region was relatively free from immigration, it was often raided to recruit forced labor. Bunong are animists and their agrarian system is based on swidden agriculture that places forest ecosystems at its core (Condominas, 2003).

During the French protectorate of Cambodia (1863-1953), the territory was divided between Cambodia and Vietnam (Guérin, 2003) but remained little explored. It was only around 1930 that the French administration decided to subjugate the population they deemed wild.

After the departure of French settlers, some Khmers settled to control the area but their presence was not a source of conflict between indigenous peoples living from swidden or shifting cultivation agriculture and the Khmer settlers. Mondul Kiri province was carved out of Kratie province on 30 December 1961 according to the royal decree 46. At the origin, it consisted of 3 districts: Kaoh Nheaek, Chba and Ou Reang; and the provincial center was at YU 515-716. Then later in 1962, Saen Monourom became the municipality of the province.

During the Vietnam War in the late 1960s, Mondul Kiri was home to three bases of the National Liberation Front of South Vietnam which resulted in numerous incursions and bombings by US forces. Around 1970 the area fell under Khmer rouge domination. Subsequently, the entire population was forcibly removed to Kaoh Nheaek district to provide labor for rice growing.

2.2 Administrative boundaries

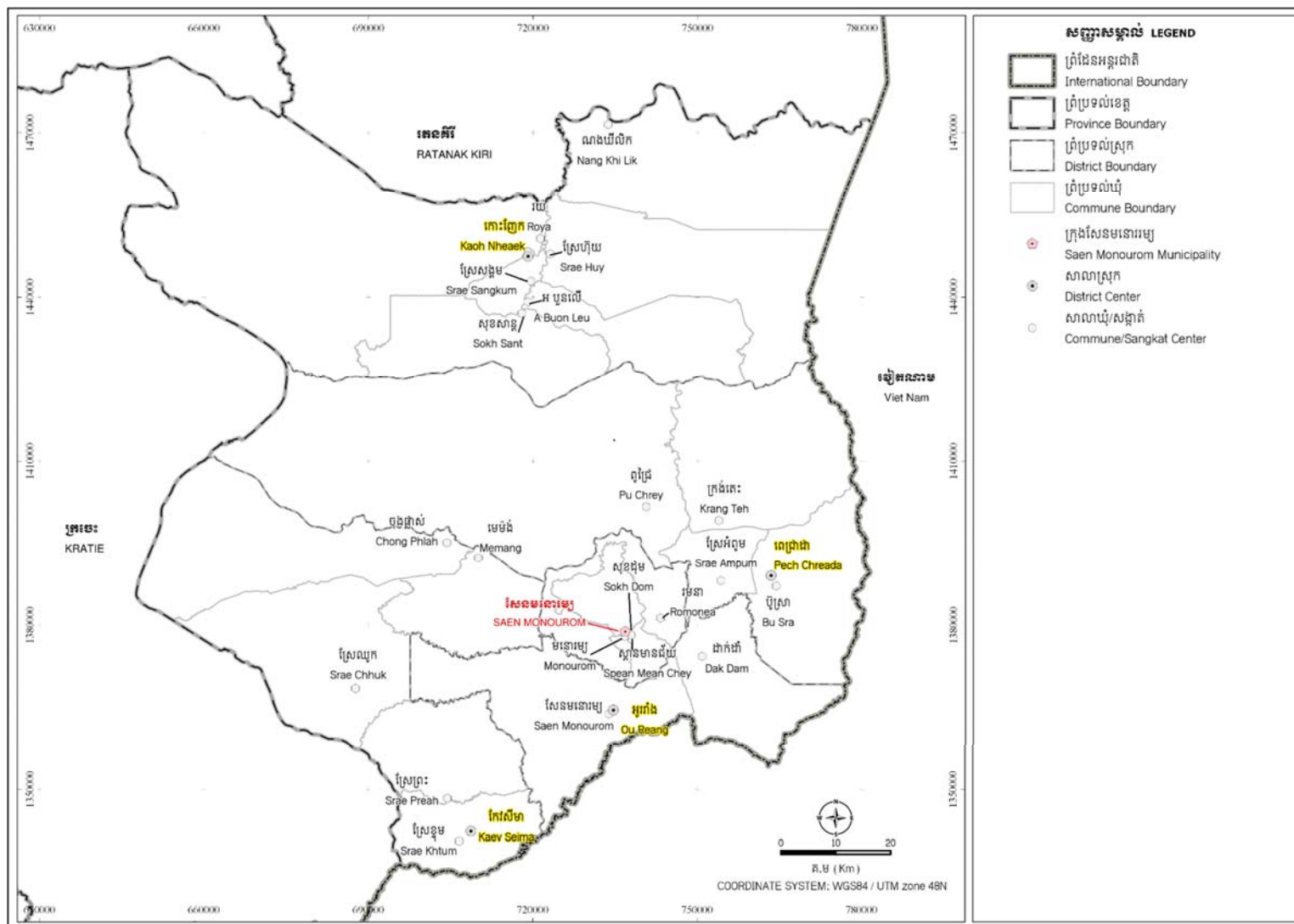
Mondul Kiri Province is located on the Northeastern border of Cambodia. It borders Kratie province to the West, Stung Treng and Ratanak Kiri province at the North and Dak Lak, Dak Nong and Binh Phuoc Provinces of the Socialist Republic of Vietnam in the South (Map 1). Mondul Kiri province is 365 km away from Phnom Penh along National Road 8 through Kandal, Prey Veng, Kampong Cham, and Kratie provinces.

With a total area of 14,288 square kilometers (1,428,800 ha)¹ and a total population of 90,949 people (PDoP 2020), the province has the lowest population density in the country (of 6.3 people/km²). Another important particularity is that Mondul Kiri is home to a large ethnic minority population, accounting for 47% of the total population (PDoP 2020).

The province of Mondul Kiri comprises one municipality (Krong Saen Monourom) and four districts divided respectively into 4 sangkats² and 17 communes and further into 14 and 78 villages.

¹ This is the area of the province as approved by the Ministry of Interior. However, the spatial database designed for the Mondulkiri Provincial Spatial Plan uses to a slightly different area, i.e. 13,715 km²

² Sangkat is Khmer language, officially and administratively used to designate as a commune in municipality and khan (Khan is also used to designate district or municipality, but in the Capital (of Phnom Penh))



Map 1. Administrative boundaries in Mondul Kiri province

Data sources: Administrative boundaries: PDLMUPCC, 2019

Table 1. Administrative divisions of Mondul Kiri province

District code	Name of district	Area (ha)	Percentage	Number of Communes/sangkat	Number of Villages	Total population in 2019
1101	Kaev Seima	291,328	20 %	5	27	26,248
1102	Kaoh Nheaek	561,790	39 %	6	26	22,718
1103	Ou Reang	121,055	9 %	2	7	6,476
1104	Pech Chreada	400,716	28 %	4	18	21,255
1105	Krong Saen Monourom	53,912	4 %	4	14	14,252
Mondul Kiri province		1,428,800	100.00%	21	92	90,949

Sources: Official source from Mol, https://en.wikipedia.org/wiki/Provinces_of_Cambodia

With a long international border with Viet Nam and proximity with Laos, Mondul Kiri Province is a strategic area in the Cambodia-Lao PDR-Vietnam (CLV) development triangle that is seen as an “integrated, sustainable and prosperous development between Cambodia, Laos and Vietnam”³.

2.3 Bio-physical environment

2.3.1 Topography and geology

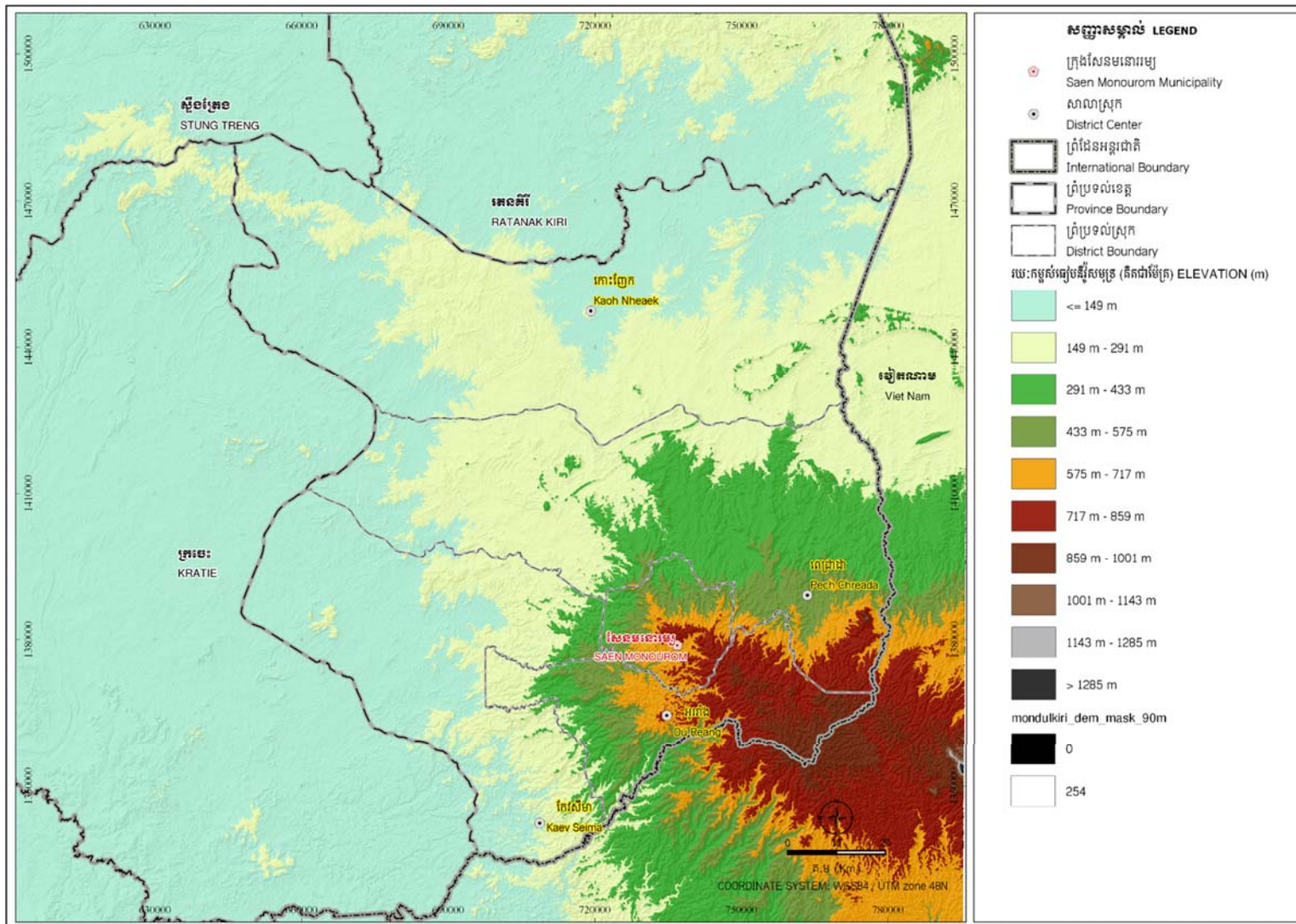
According to data of the U.S. Geological Survey⁴ the elevation of Mondul Kiri province varies from 40 m and 1,030 m above sea level. The highest altitudes are found in the Southeastern part of the province, in Pech Chreada district near the Vietnamese border (Map 2).

The region forms a plateau (Chhlong Plateau), which is the western extension of the South-Annamese mountains located in the central highlands region of Vietnam. It consists of a basaltic dome of volcanic origin or peneplain laterite deposits that has been heavily eroded to form a landscape of steep hills and valleys. This bedrock is relatively young as it dates from the Cenozoic era (quaternary period). For this Southwestern plateau, the altitude gradually declines towards the Mekong River (to the West) and Kaoh Nheaek district and further to Ratanak Kiri province (to the North). In this lower elevation region, the main bedrocks are sandstone and red sandstone from a more distant past (Mesozoic era, Triassic sandstone and Jurassic red sandstone). In this region, there are incursions of more recent basaltic or flood plain deposits (Map 3).

Due to relatively recent tectonic and volcanic activities, Mondul Kiri Province is endowed with mineral deposits, mainly gold and bauxite. Gold deposits are found in association with Triassic sandstone in Pech Chreada, Keav Seima, Kaoh Nheaek districts, while bauxite deposits (with 25-35% aluminum content) are found in Ou Reang district (Map 3). A light green magnesium-rich gem stone called “Period” is found in the valleys.

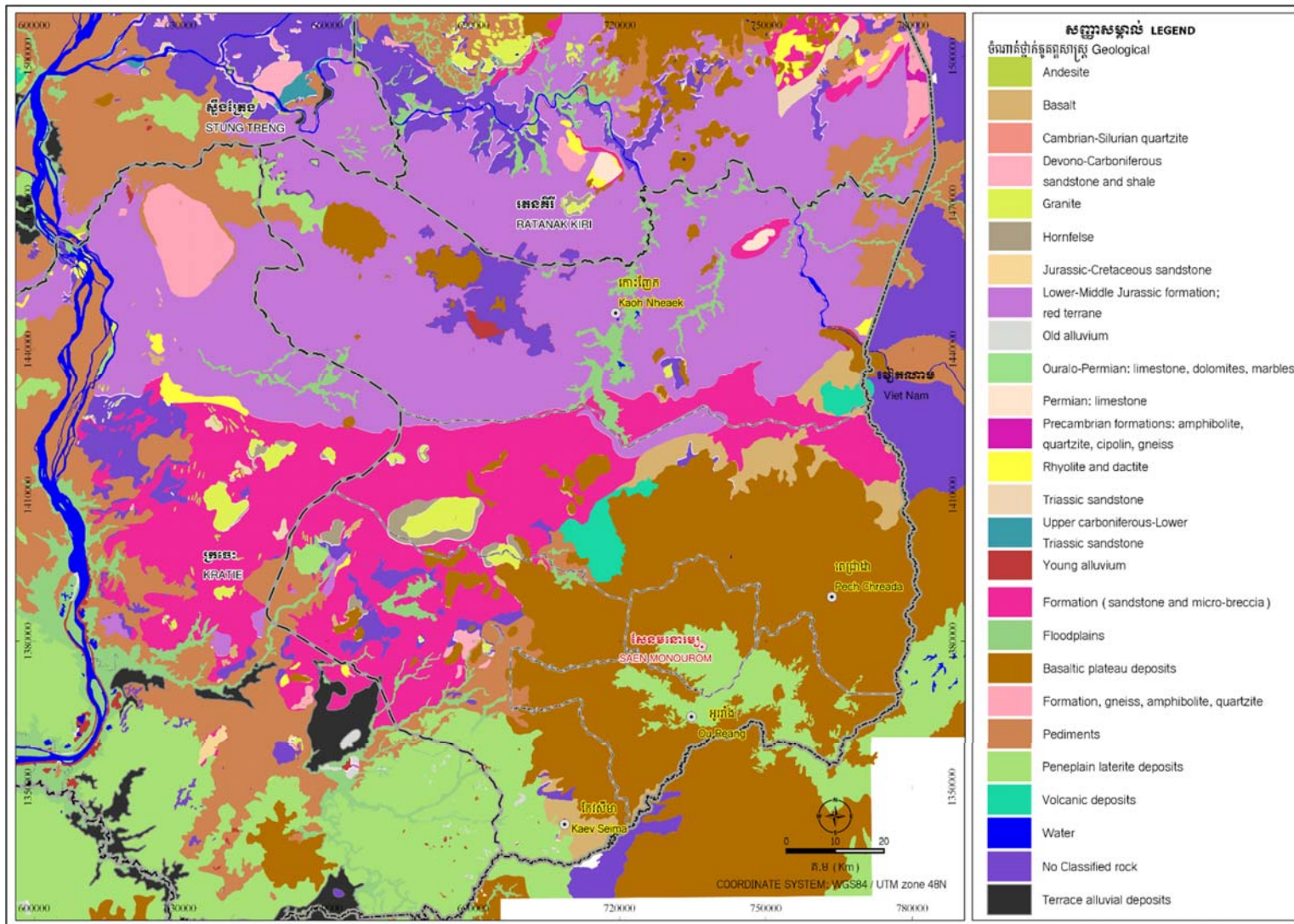
³ <https://theaseanpost.com/article/what-clv-development-triangle-area>. See section on regional connectivity and road network for more details.

⁴ <https://earthexplorer.usgs.gov/>



Map 2. Topography of Mondul Kiri province

Data sources: Administrative boundaries: PDLMUPCC, 2019 - Elevation: USGS, 2014



2.3.2 Climate

There is a single meteorological station in Mondul Kiri located in Saen Monourom⁵. Even if it does not provide a complete picture of the climate across the province, it helps understand its main characteristics. The ombro-thermic diagram below (Figure 3) shows the average monthly temperature and precipitation for the period 2015-2018.

The climate of Mondul Kiri has two distinct seasons: a dry season from December to April and a rainy season for the rest of the year. Over the period 2015-2018, the average annual total precipitation was 2001 mm with important inter-annual variations (a minimum of 1648 mm in 2015 and a maximum of 2266 mm in 2017). Temperatures are relatively low as compared to the rest of the country and their distribution throughout the year presents less variation than in the central area of the country. Over the period 2015-2018, the annual average temperature was 27.2° C (average minimum temperature of 16.2° C in January and the average maximum temperature of 37.0° C in April).

The yellow areas depicted in Figure 3 represent the dry period, which is usually limited to three-four months, a feature the province shares with other tropical climate regions. During this period, the risk that drought affects the availability to water and the development of vegetation is more pronounced.

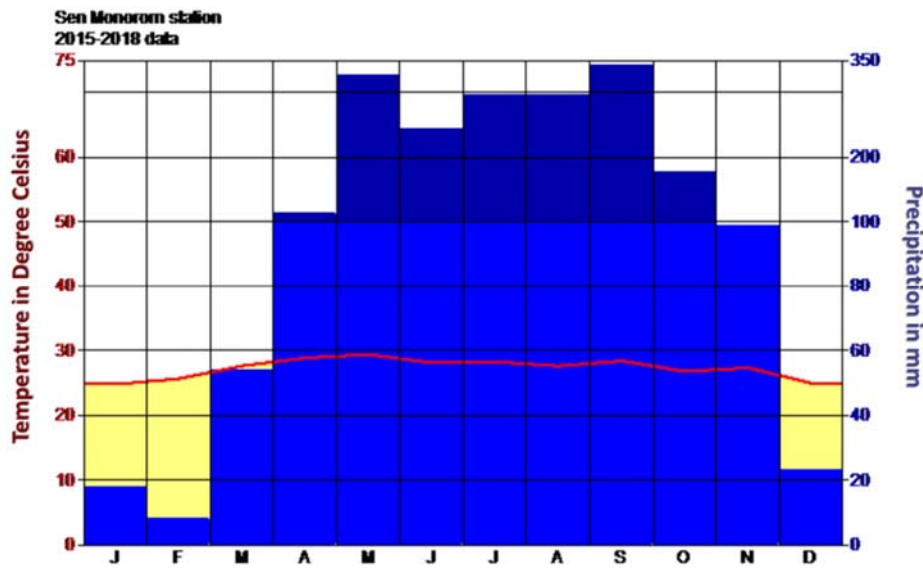


Figure 3. Ombro-thermic diagram, Saen Monourom station 2015-2018

Note: The left Y-axis gives the monthly average temperatures in degrees Celsius while the right-Y axis gives the monthly precipitation in millimeters⁶

Data sources: Provincial Department of Water Resources and Meteorology, 2019. Figure computed by the authors.

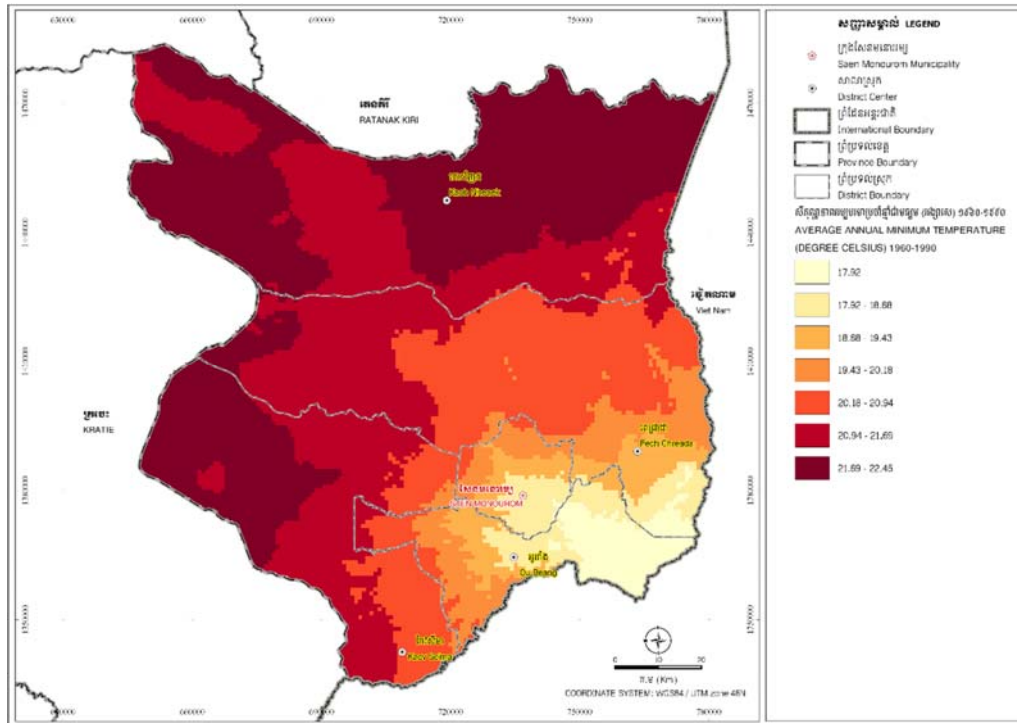
In order to obtain a larger spatial spread of temperature and precipitation across the province, we used WorldClim's data (Hijmans et al., 2005)⁷. Map 4 and Map 5 present the average minimum and maximum temperature covering the period 1960-1990 in the province. Temperatures are well correlated with the elevation (the higher the altitude, the lower the temperature). The average maximum temperature varies from 25.24 (in the Southeast) to 30.95 (in the Northwest) whereas

⁵ Of note, WWF set up a meteo station at Thmier Outpost in February 2020.

⁶ when precipitation values in mm are less than two times the value of temperatures in °C

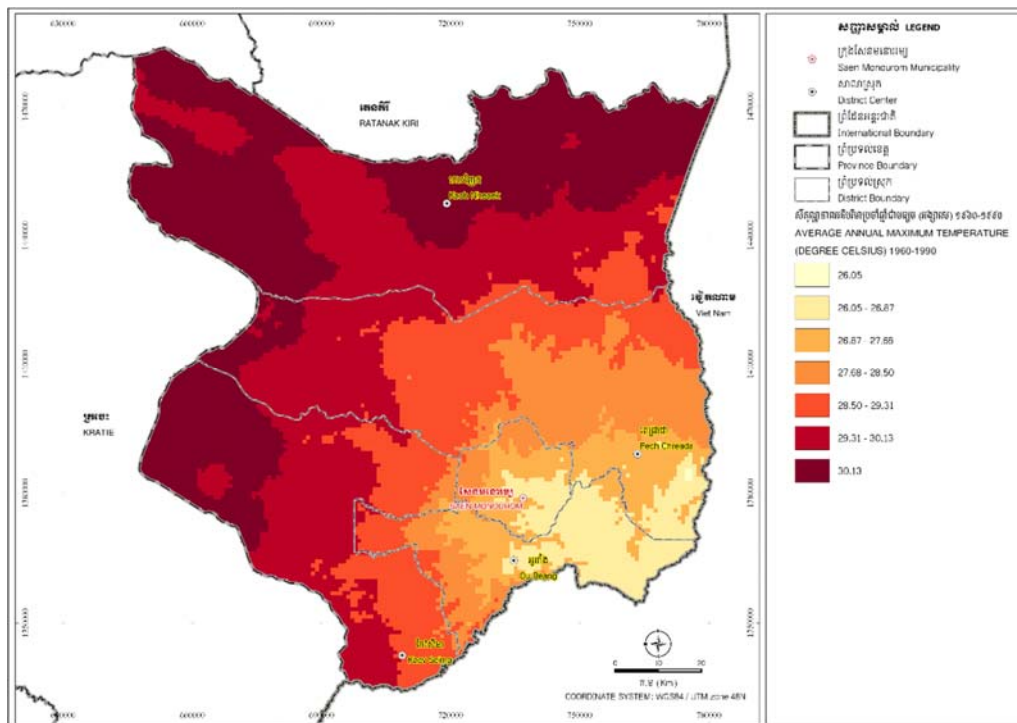
⁷ <https://www.worldclim.org/version1>

average minimum temperature varies from 17.18 (Southeastern plateau) to 23.96 (in the Northwest) with regions of higher elevation receiving more rainfall than others (Map 6).



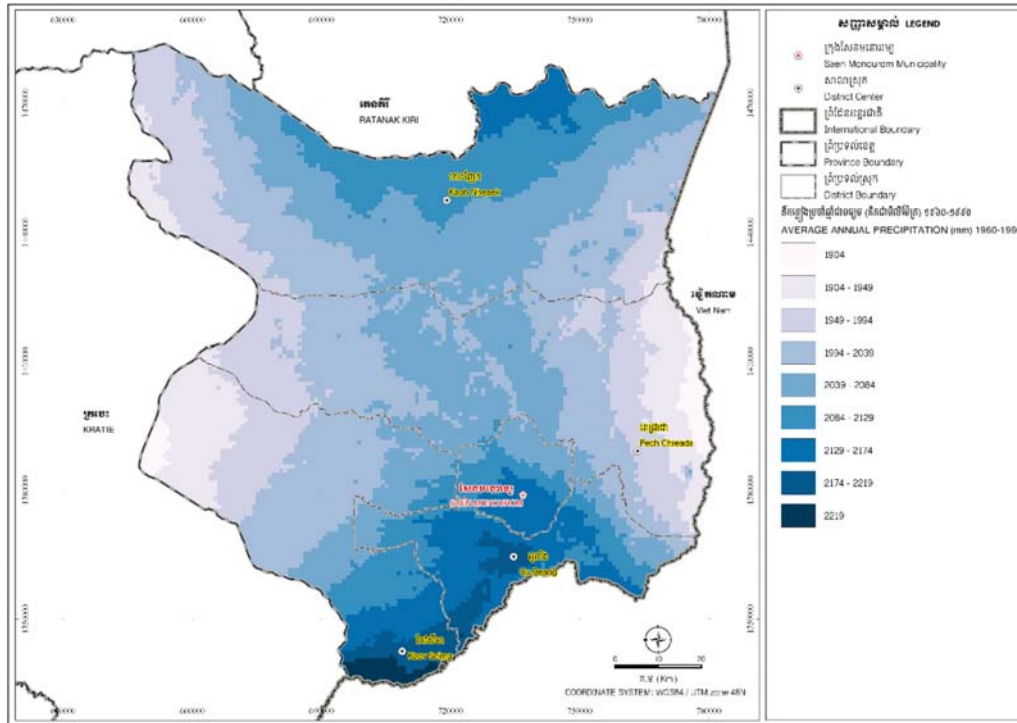
Map 4. Average annual minimum temperature in Mondul Kiri province over the period 1960-1990

Data sources: Administrative boundaries: PDLMUPCC, 2019 – Temperature: WorldClim, 2017



Map 5. Average annual maximum temperature in Mondul Kiri province over the period 1960-1990

Data sources: Administrative boundaries: PDLMUPCC, 2019 – Temperature: WorldClim, 2017



Map 6. Average annual precipitation in Mondul Kiri over the period 1960-1990

Data sources: Administrative boundaries: PDLMUPCC, 2019 – Precipitation: WorldClim, 2017

2.3.3 Water and watershed

The main rivers running through Mondul Kiri are tributaries of the Mekong River. Their catchment areas are thus oriented East-West and extend into Kratie and Stung Treng provinces (Map 7).

The most significant water body is the Srepok River, which is part of the 3S hydrographic system (Srepok, Sesan and Se Kong rivers). It originates in the central highland region of Vietnam and crosses the province through Kaoh Nheaek district. In Cambodia, its catchment covers the Southern part of Ratanak Kiri province. Like most rivers with perennial water, Srepok River's water level fluctuates widely between the rainy and dry seasons as depicted in Figure 4. Many other water bodies in the province are intermittent and dry in the dry season. There are also evidences that upstream dams on the Mekong and its tributaries have an impact on water fluctuation (Eyler and Weatherby, 2020).

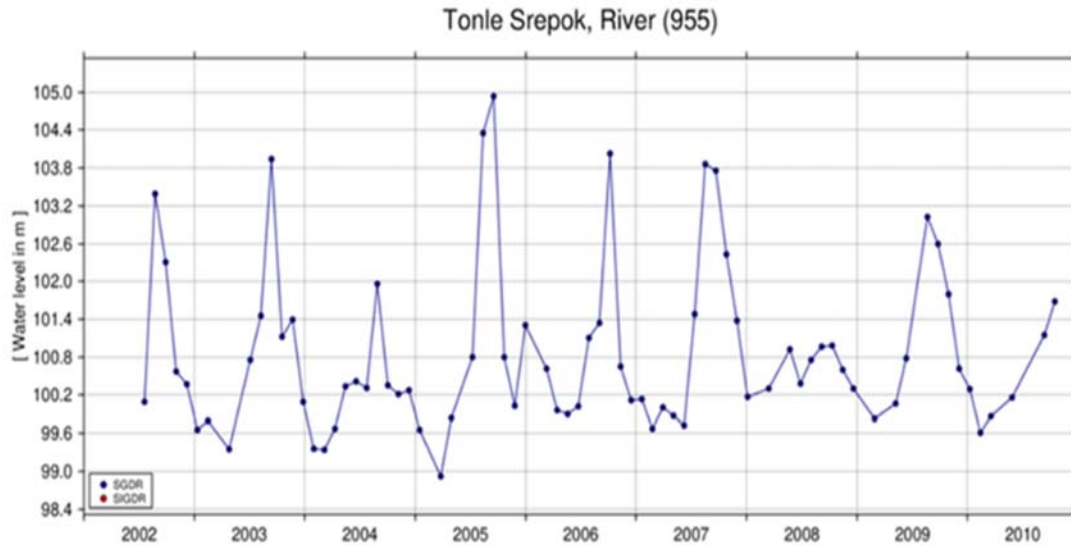


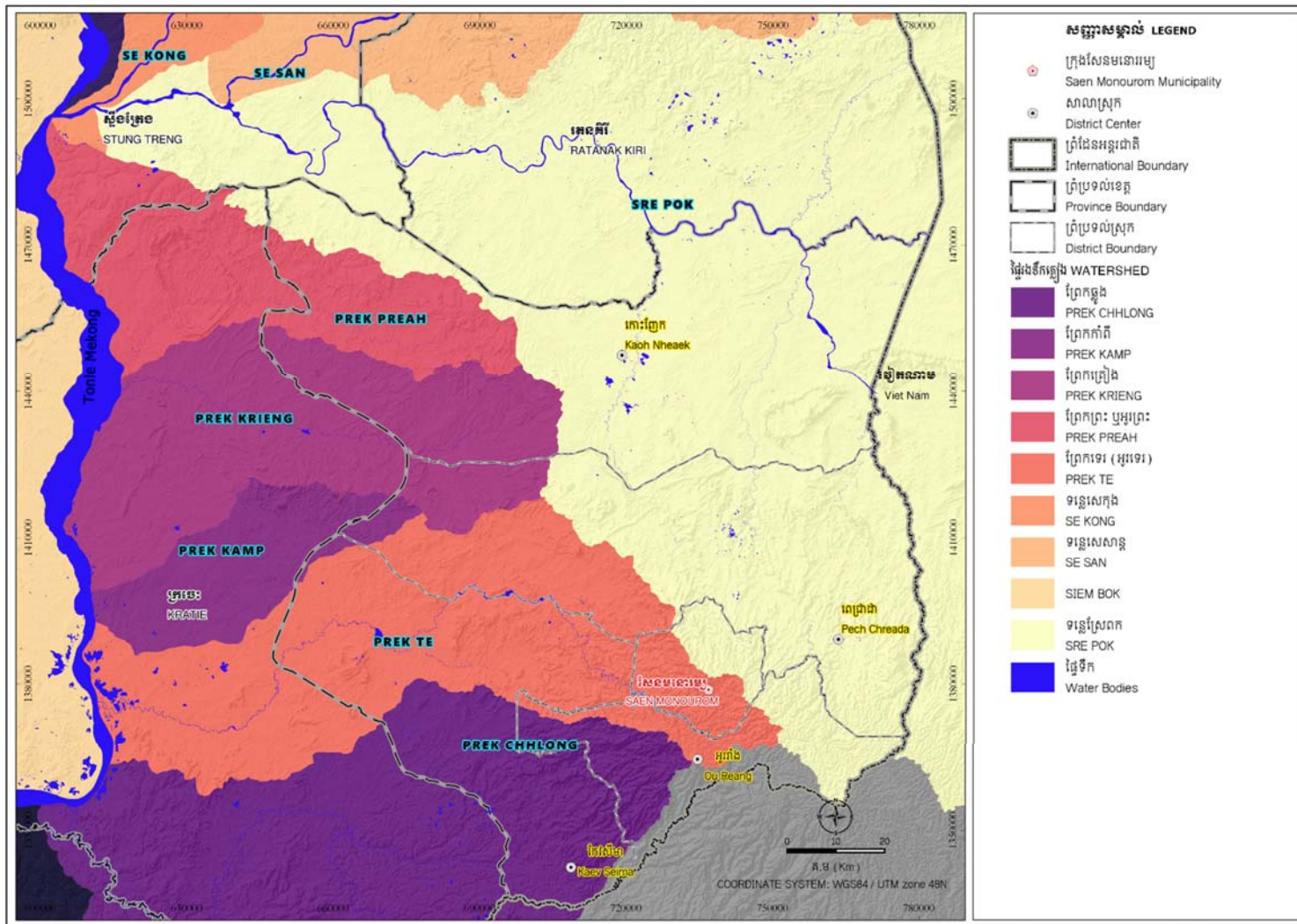
Figure 4. Monthly variations of the water level of Srepok River, from 2002 to 2010

Source: Schwatke et al. 2015

The Ou Chba river is an important tributary of the Srepok river flowing South-North through Kaoh Nheak district. It is an important water body that sustains agriculture in the Northern part of the province. It feeds important lakes allowing for supplemental irrigation in the rainy season and, to a lesser extent, during the dry season.

The other rivers that irrigate Mondul Kiri province and their respective catchment areas are (from South to North, see Map 7):

- Prek Chhlong: a river that originates in Kaev Seima district but mainly flows through Kratie province before reaching the Mekong at its Northern elbow
- Prek Te: a river that shapes the boundary between Saen Monourom municipality and Ou Reang district, before flowing into Kaev Seima district, and then Kratie
- Prek Krieng and Prek Preah are two rivers in Kaoh Nheak. Prek Krieng flows towards Kratie whereas Prek Preah catchment covers both Kratie and Stung Treng provinces.



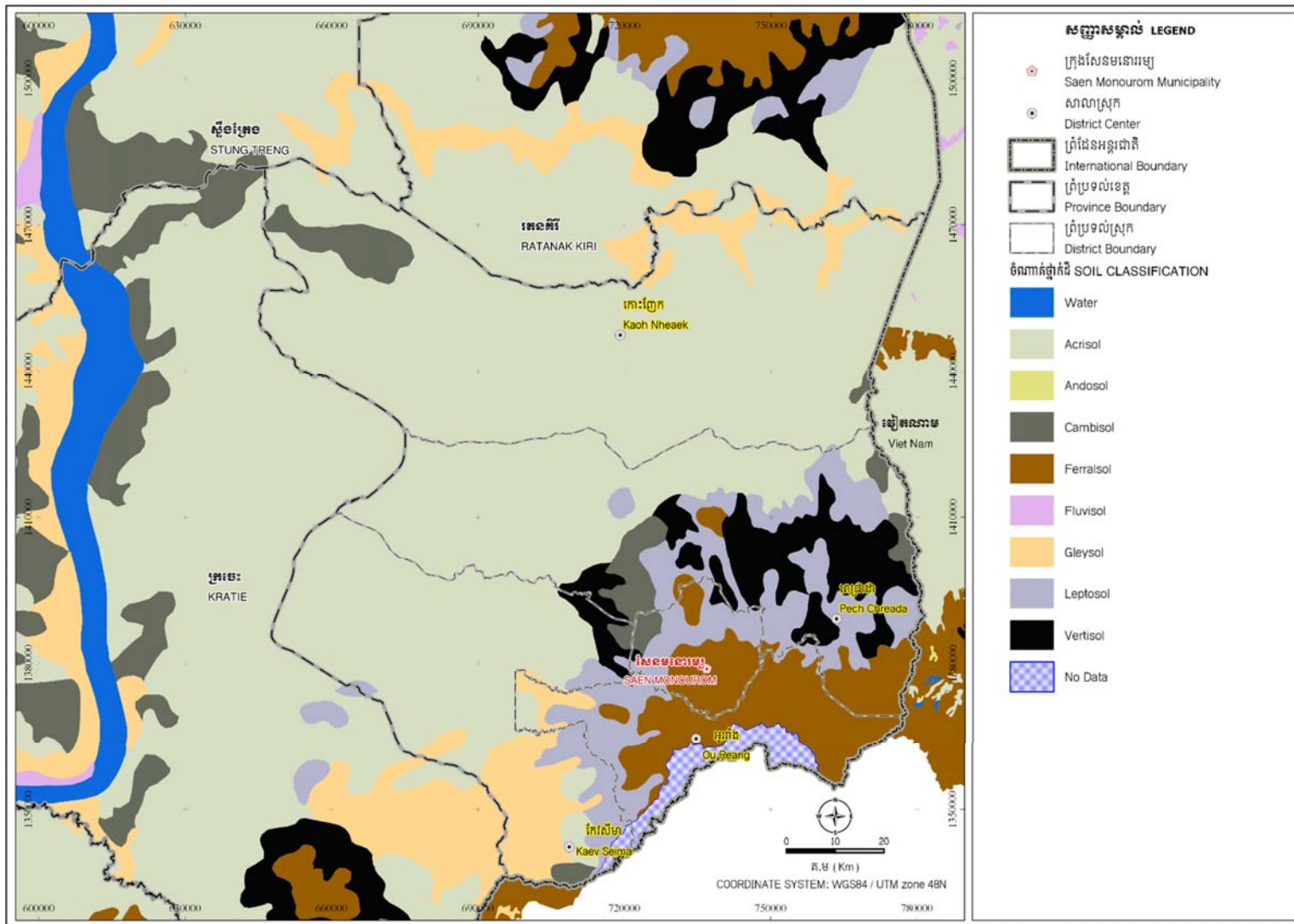
2.3.4 Soils and suitability for agriculture

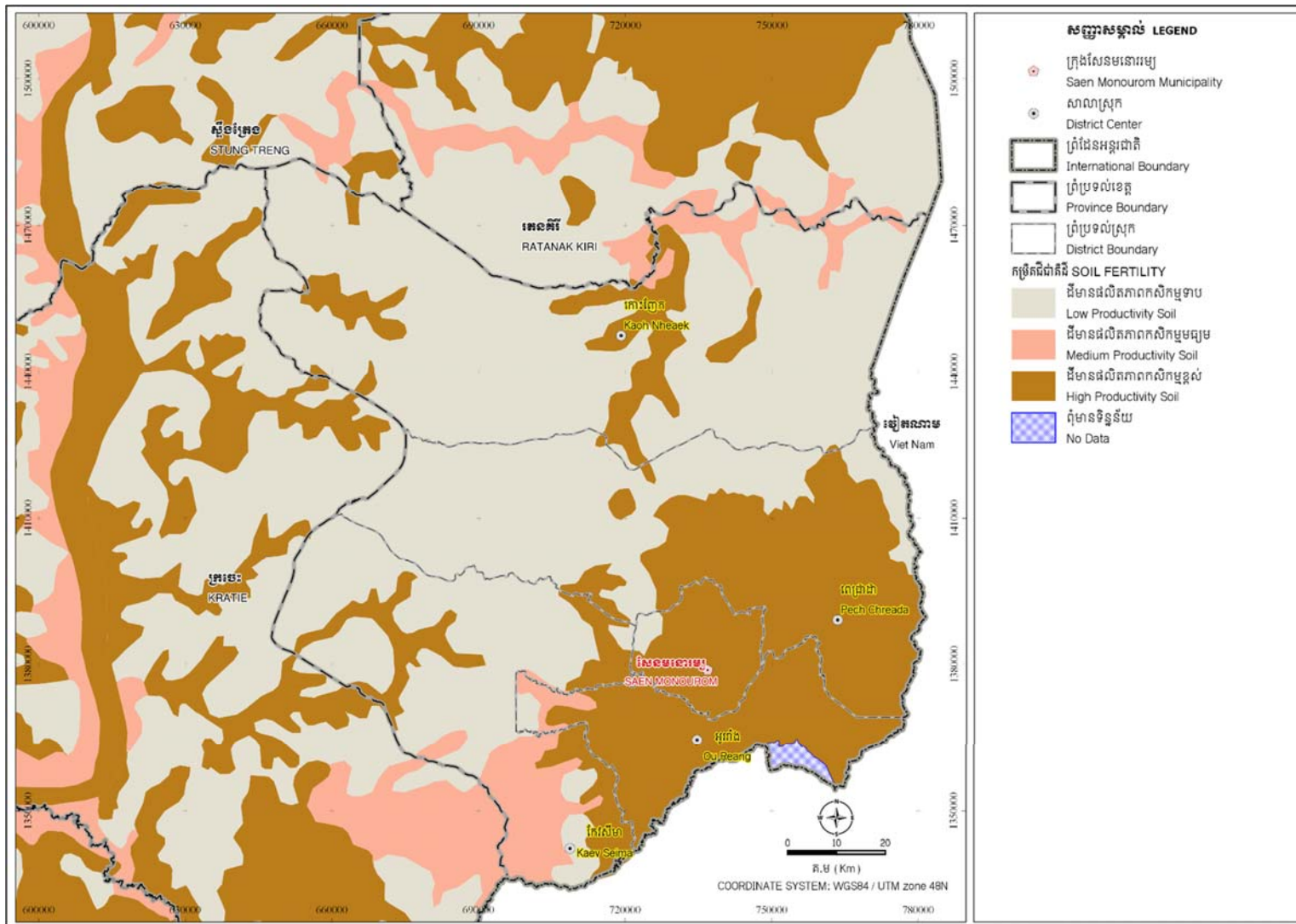
The soil characteristics and their suitability for agriculture depend on criteria such as the geology, topography, climate, and water resources.

As depicted in Map 8, the soils on the Southeastern plateau are *ferralsols* (9 percent of provincial area). Ferralsols are red and yellow weathered soils whose colours result from an accumulation of metal oxides, particularly iron and aluminum. They are named after their high content in iron. Ferralsols are not particularly rich chemically but their profile is well developed due to intensive and deep weathering thus well suited for agriculture (Driessens and Dudal, 1991). Agriculture on these soils includes a large variety of annual and perennial crops with deep rooting systems (Map 9).

In association with steep relief, there are *Leptosols* (11 percent of provincial area). Leptosols are a very shallow soil over hard rock or a deeper soil that is extremely gravelly and/or stony. They are not suitable soil for agriculture (Driessens and Dudal, 1991). In more hydromorphic conditions (i.e. Southwestern part of the province), there are *Gleysols* (6 percent of provincial area). Gleysols are wetland soils that, unless drained, is saturated with groundwater for long enough periods to develop a characteristic gleyic colour pattern. If properly drained, they are moderately suitable for agriculture (Driessens and Dudal, 1991)

Acrisols cover 64 percent of the provincial area (Map 8). Acrisols have a clay-rich subsoil and is associated with humid, tropical climates, such as those found in Cambodia, and often supports forested areas. They are developed on sandstone bedrocks, are highly weathered soils and relatively poor. The suitability of *Acrisols* for agriculture is rather low. But when *gleyic* conditions are met (waterlogging in lower elevation areas), they are well suited for agriculture (Driessens and Dudal, 1991) (Map 9).





Map 9. Soil suitability for agriculture in Mondul Kiri province

Data sources: Administrative boundaries: PDLMUPCC, 2019 – Soil fertility: FA, DANIDA and DED, 2003

2.4 Land use and land use management

This section presents the changes in land cover in Mondul Kiri province between 1999 and 2019. This analysis will help situate current land use issues in a wider context. We then present the detailed 2019 land use and the various land tenure regimes designed and mobilized to manage it.

2.4.1 Land cover changes

We developed a simplified land cover classification to allow for the comparison of 1999 land cover (JICA, 2003) with the current 2019 land cover. As both land cover information did not use the same categories, we generalized land cover classification for 1999 and 2019 to obtain similar categories in order to compare them. The details of this classification are presented in Annex 6. Map 10 presents land covers in 1999 and 2019 and Figure 5 presents the distribution of land cover categories in both years. Table 2 quantifies land cover for 1999 and 2019 (horizontal readings for 1999 land cover and vertical readings for 2019). The table also provides the area of particular change in land cover between both dates.

Between 1999 and 2019, a large area of land cover has changed in Mondul Kiri (303,464 ha, representing 21 percent of the total area of the province). This situation is characteristic of a highly dynamic land cover, typically found in other regions of Southeast Asia.

Four main types of land cover changes can be identified (accounting for 93 percent of total land cover change in Mondul Kiri between 1999 and 2019)

- **Deforestation for agriculture** (orange in Table 2). These changes consist of the conversion of Deciduous, Semi-Evergreen and Evergreen (D-S-E) forest, degraded forest or other forest types to crops (rice, chamcar, and mosaic forest/crop). A total area of 187,773 ha of forest has undergone this transformation, representing 62 percent of all land cover changes (13.1 percent of the provincial area) (computed by authors). The expansion of agriculture is the main driver of deforestation in Mondul Kiri province. It occurs either through implementation of large scale agro-industrial operations conducted through economic land concession (mainly rubber plantations), through smallholder farmers involved in subsistence farming or through agricultural entrepreneurs involved in middle-scale operations (20-50 ha). As indicated by Map 10, the hotspots of these transformations are located in:
 1. Northeast, Kaoh Nheaek district
 2. Southwest, Kaev Seima district
 3. Around main settlement area in Kaoh Nheaek district
 4. Southeast, Pech Chreada district

- **Forest degradation** (blue in Table 2) is the transformation of deciduous, semi-evergreen and evergreen forest into degraded forest. It concerns a total area of 41,638 ha, representing 3.4% of forest (D-S-E) cover (computed by authors). Spatially, the areas where this transformation occurred are more diffuse and less visible on satellite data as in the case of the agricultural expansion. In general, forest degradation is more difficult to identify and measure with remote sensing data and these results might under-representate the process. Yet, three main hotspots can be identified:
 - A. Southern plateau, around Saen Monourom town
 - B. West, Kaev Seima district
 - C. Around main settlement area in Kaoh Nheaek district

Forest degradation is driven by timber logging but the degraded forest is a transition land cover as it is usually further transformed into an agricultural area. For this reason, it is likely that forest degradation identified here signals the conversion of degraded forests into agriculture in the future.

- **Forest regrowth/densification** (green in Table 2) consists of the conversion from the degraded forest and other forest types to deciduous, semi-evergreen and or evergreen forest. It concerns 51,413 ha or 17 percent of all land cover change area (3.5 percent of the total area of the province). It has occurred mainly in the central part of the province (i and ii), mainly in areas that are designated as protected areas. To some extent, it represents the relative success of forest protection efforts in certain areas.

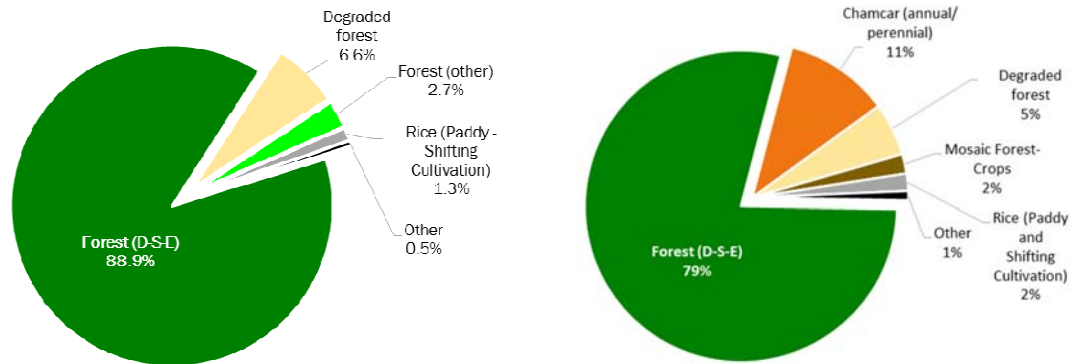


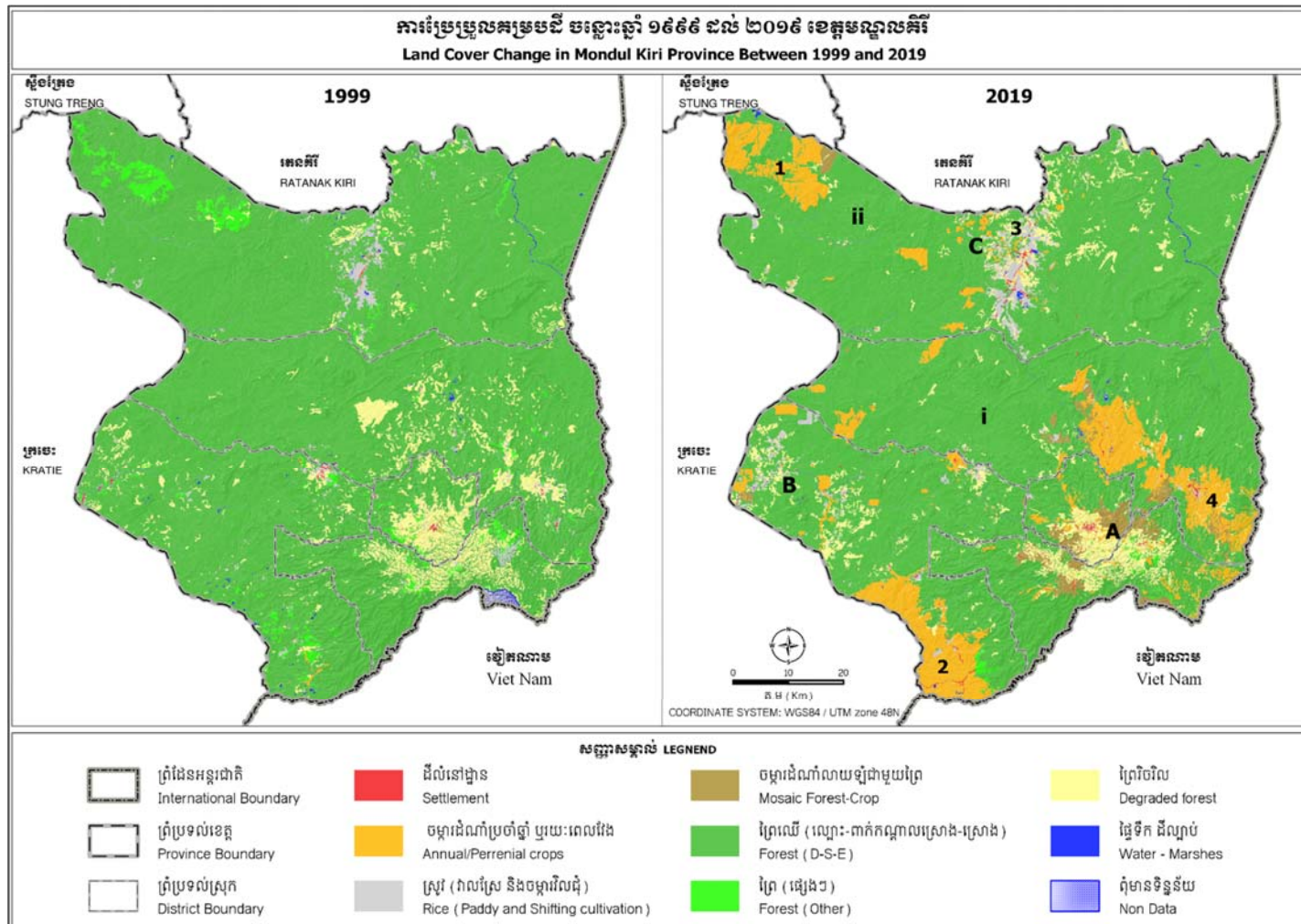
Figure 5. Distribution of land cover categories in 1999 (left) and 2019 (right) in Mondul Kiri province

Table 2. Land cover change analysis in Mondul Kiri province between 1999 and 2019 (hectares)

		Land Cover in 2019								Not identified	Total land cover 1999
		Settlement	Chamcar (annual/perennial)	Rice (Paddy and Shifting Cultivation)	Mosaic Forest-Crops	Forest (D-S-E)	Forest (Other)	Degraded forest	Water-Marshes		
Land cover in 1999	Settlement	484 (0%)	108 (0%)	313 (0%)	74 (0%)	77 (0%)	1 (0%)	273 (0%)	19 (0%)	1,350 (0.1%)	
	Chamcar (annual/perennial)	319 (0%)	341 (0%)	48 (0%)	151 (0%)	16 (0%)	82 (0%)	101 (0%)	3 (0%)	1,061 (0.1%)	
	Rice (Paddy - Shifting cultivation)	582 (0%)	2,398 (0.2%)	8,837 (0.6%)	812 (0.1%)	1,586 (0.1%)	228 (0%)	2,992 (0%)	254 (0%)	17,688 (1.3%)	
	Mosaic Forest-Crops	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
	Forest (D-S-E)	1,859 (0.1%)	116,530 (8.5%)	11,586 (0.8%)	15,669 (1.1%)	1,024,403 (74.9%)	1,932 (0.1%)	41,638 (3%)	1,929 (0.1%)	1,215,546 (88.9%)	
	Forest (other)	111 (0.0%)	13,743 (1.0%)	380 (0.0%)	3,003 (0.2%)	17,680 (1.3%)	53 (0.0%)	2,163 (0.2%)	111 (0.0%)	37,243 (2.7%)	
	Degraded forest	861 (0.1%)	15,414 (1.1%)	3,403 (0.2%)	8,045 (0.6%)	33,733 (2.5%)	1,137 (0.1%)	27,531 (2.0%)	192 (0.0%)	90,315 (6.6%)	
Water - Marshes	12 (0.0%)	515 (0.0%)	99 (0.0%)	15 (0.0%)	691 (0.0%)	0 (0.0%)	291	2,941	4,563		
Not identified										61,033	61,033
Totals land cover 2019		4,229 (0.3%)	149,050 (10.9%)	24,666 (1.8%)	27,769 (2.0%)	1,078,185 (78.8%)	3,432 (0.3%)	74,988 (5.5%)	5,448 (0.4%)	61,033	1,428,800

Land Cover Change type: Orange= Deforestation for agriculture, Blue=Forest degradation and Green=Forest regrowth (tree densification)

Note: The Land Cover Change analysis was conducted through a topological intersection of the 1999 and 2019 land covers. The area covered by the analysis is limited to the area of dataset available for 1999, which is smaller than the 2019 area. The reason for this discrepancy is that the administrative boundaries of the country have changed between 1999 and 2019. As we can't address this problem, we added a category 'not identified'. The percentages displayed in table are relative to the total land area that has been identified in the land cover classification (1,367,767 ha)



Map 10. Land cover change (LCC) in Mondul Kiri province between 1999 and 2019

Note: The annotations (1, 2, ... A, B, ... and i, ii) refer to land cover changes hotspots described in the text are relative to the total land area that has been identified in the land cover classification (1,367,767 ha).

Data sources: Administrative boundaries: PDLMUPCC, 2019 – Land Cover 1999: JICA, 2003 – Land cover 2019: CWG, 2020

2.4.2 Current land use

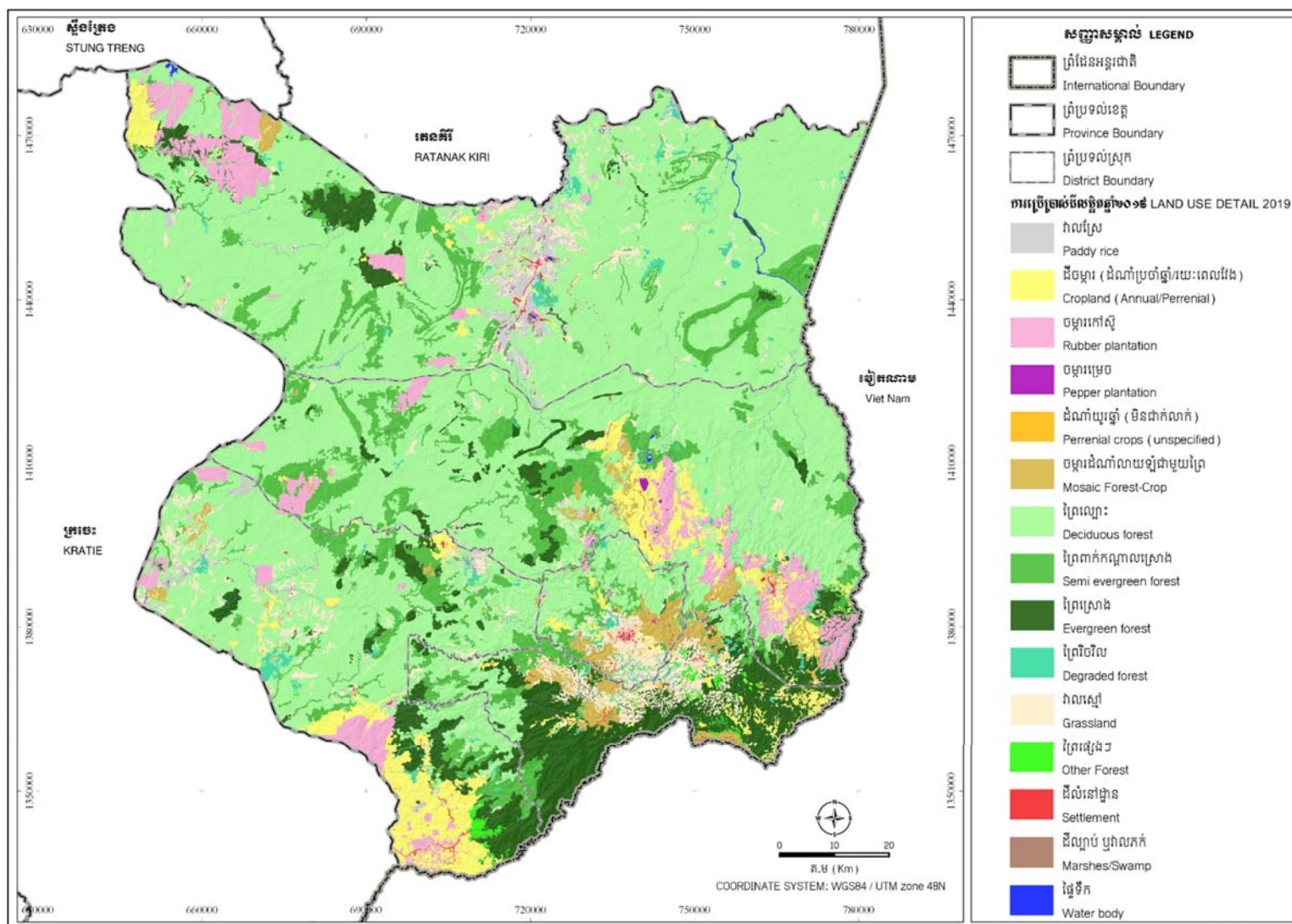
The identification of detailed 2019 land use categories (Map 11) is based on the interpretation of remote sensing imagery (Sentinel 2, Multispectral resolution is 10m) captured on Feb 2019 with least cloud cover (scene: T48PYV, T48PYU, T48PXV, and T48PXU). We used a first draft classification conducted for WWF with a series of random ground truth points to check the accuracy of the 2019 land use classification. When necessary, we used a higher accuracy Google Earth dataset to fine tune the interpretation. The various land use categories pertaining to agriculture represent 9.8 percent of the total area in Mondul Kiri province (Table 3). Agriculture consists mainly of pepper plantations and unspecified annual or perennial crop plantation. Paddy rice is cultivated in Kaoh Nheak district (North). Of note, a mosaic of forest and cultivated patches represents 2.2 percent of the total area. It is not possible to single out specific crop types, but shifting cultivation is included in this category (cultivated plot and fallow/secondary forest).

When rubber is factored in as a forest type, the total forest cover in 2019 is equivalent to 89.8 percent of the total provincial area (Table 3). Deciduous, semi-evergreen and evergreen forest represents the largest share in this category (78.8 percent of the total provincial area). Rubber plantations make up to 5 percent while degraded forests, combined with grassland, represent 5.5 percent of the total area. Degraded forests are probably a pool of land resources that will be tapped in the future for agricultural development.

Table 3. Area of detailed 2019 land use categories, Mondul Kiri province

Main land Use category	Detailed Land Use type (2019)	Ha	%	
Agriculture	Paddy rice	22,776	1.7%	9.8%
	Cropland (undifferentiated annual or perennial)	79,679	5.8%	
	Pepper plantation	848	0.1%	
	Perennial crop (unspecified)	264	0.0%	
	Mosaic Forest-Crop (including shifting cultivation)	31,265	2.3%	
Forestry	Deciduous forest	806,546	58.8%	89.8%
	Semi-evergreen forest	152,431	11.1%	
	Evergreen forest	119,842	8.7%	
	Degraded forest	15,232	1.1%	
	Grassland	59,757	4.4%	
	Rubber plantation	68,325	5.0%	
	Other forest types	4,154	0.3%	
	Forest plantation	1,844	0.1%	
	Bamboo forest	1,838	0.1%	
	Cemetery forest	292	0.0%	
Spirit forest	180	0.0%		
Other	Settlement	4,323	0.3%	0.7%
	Water body	4,894	0.4%	
	Marsh or Swamp	580	0.0%	
Not identified		57,886		
Total province		1,428,800		

Note: as per the rule of forestry administration, rubber plantation are included here as part of the forest cover. However, the ecology of a rubber plantation is very different from the ecology of a natural forest, be it deciduous or evergreen.



Map 11. Detailed 2019 Land Use in Mondul Kiri province

Data sources: Administrative boundaries: PDLMUPCC, 2019 – Land use 2019: CWG, 2020

2.4.3 Forestry

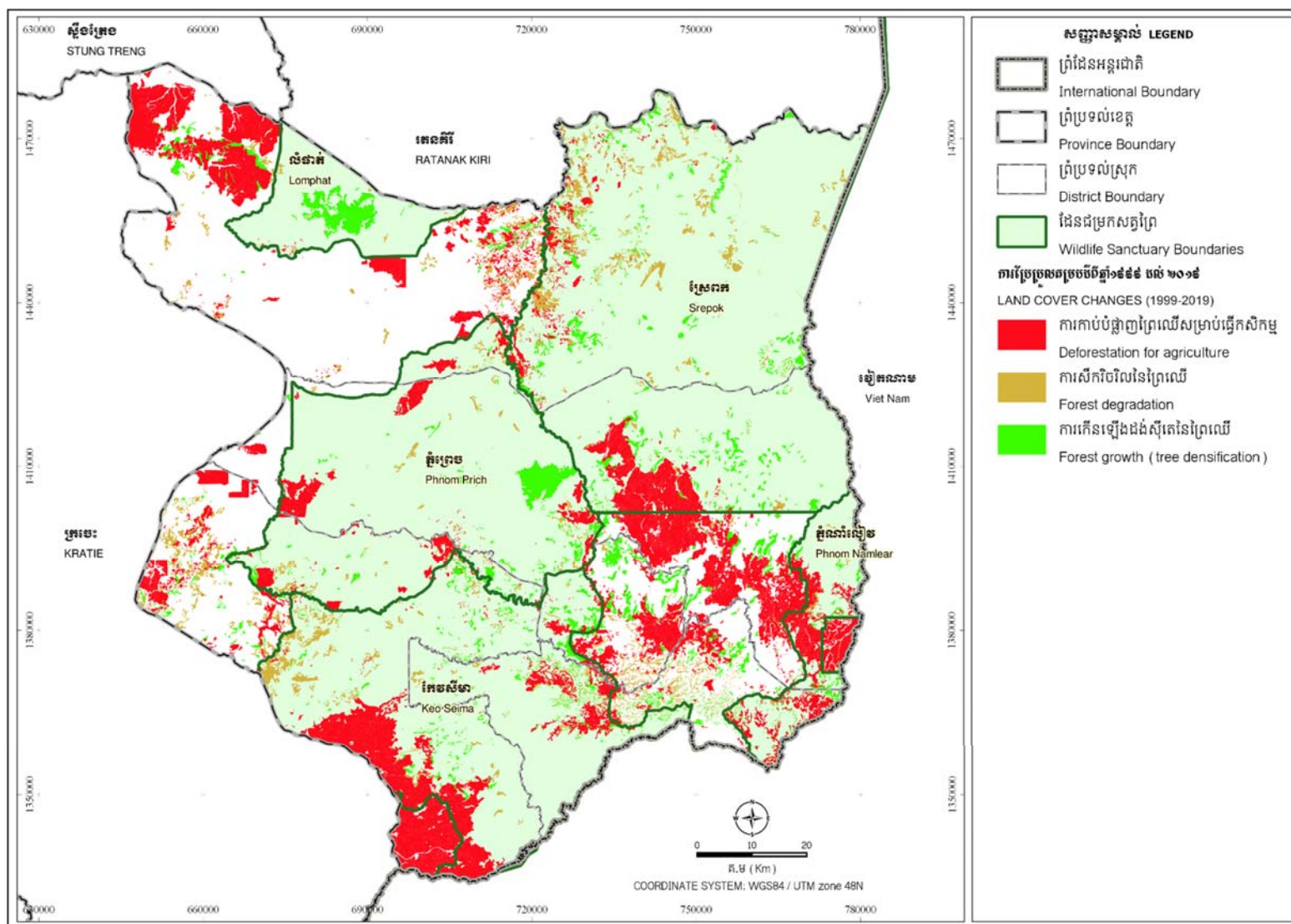
2.4.3.1 Protected areas management

In 1993, a royal decree on Protected Areas was issued to promote nature conservation. It empowered the then called Secretariat of Environment (precursor of Ministry of Environment) to lead, manage and develop a Protected Area system to preserve Cambodia's land, forest, wildlife, wetlands and coastal zones (Royal Government of Cambodia, 1993). Twenty-four areas were included in the decree covering a total area of 3.2 million ha. (Royal Government of Cambodia 1993). This decree distinguished four different types of protected natural areas: national parks, wildlife reserves, protected scenic view areas, and multi-purpose areas. In Mondul Kiri province, three wildlife sanctuary areas came into existence following this royal decree (Phnom Prich, Phnom Namlear and Lumphat). Wildlife sanctuaries are natural areas preserved in their natural state to protect wildlife, vegetation and ecology. Unlike national parks, they do not primarily play a role as tourism destination for the general public. Additionally, two protected forests managed by the Forestry Administration of the Ministry of Agriculture, Forestry, and Fisheries (MAFF) were declared in 2002, namely Srepok and Kaev Seima. Their management was transferred to MoE in 2016, as a result of sub-decree 69 (RGC, 2016).

Table 4. Protected areas and biodiversity corridors managed by Ministry of Environment in Mondul Kiri province

Name	Created in	Created by	Total area (ha)	Province(s)	Area in MDK (ha)	Percentage of MDK area	
Protected areas (Wildlife Sanctuary)	Phnom Prich	1993	Royal decree	222,500	MDK	222,500	15.6%
	Phnom Namlear	1993	Royal Decree	47,500	MDK	47,500	3.3%
	Lumphat	1993	Royal Decree	250,000	MDK-RAT	49,210	3.4%
	Srepok	2016	Sub-Decree 69	372,971	MDK	372,971	26.1%
	Kaev Seima	2016	Sub-Decree 69	292,690	MDK-KRA	233,654	16.3%
Biodiversity Corridor	Northeast	2017	Sub-decree 07	757,661	MDK-RAT-STT-KRA	177,856	12.4%
Total					1,103,691	77.25%	

Note: MDK=Mondul Kiri, RAT=Ratanak Kiri, KRA=Kratie and STT-Stung Treng



Currently there are five Protected Areas managed by the Ministry of Environment (Table 4, Map 12 and Map 13), covering a total area of 925,835 ha (64.8 percent of the provincial territory). In 2017, new biodiversity conservation corridors were added to the system of Protected Areas (Royal Government of Cambodia, 2017). In Mondul Kiri, the Northeast corridor is divided into three sections covering 177,856 ha (Map 13). So altogether, the total area under Protected Area management equals 1,103,691 ha (77percent of Mondul Kiri total territory).

It is useful to examine the nature and extent of the land cover change inside protected areas between 1999 and 2019. This analysis helps shed light on the efficacy of nature protection efforts (Map 12). Out of the five protected areas of Mondul Kiri province, Phnom Namlear and Kaev Seima wildlife sanctuaries experienced the most extensive deforestation over the last 20 years (Map 12) to make space for rubber plantations (Map 11). The deforestation area originates in the Phnom Namlear extend into Srepok Wildlife Sanctuary (Map 12). Srepok has been relatively well preserved from deforestation. Yet, forest degradation, associated with timber logging has impacted its Northern part (Map 12), which suggests that deforestation continues to be highly relevant in Mondul Kiri. In Phnom Prich Wildlife Sanctuary, the nature conservation efforts seem spatially contrasted with gains and losses of important forest patches being observed (Map 12). Lumphat wildlife sanctuary is the most preserved area, at least in its section located inside Mondul Kiri province.

In 2008, the Law on Protected Areas (Royal Government of Cambodia 2008a) aimed to clarify the management of Cambodia's Protected Areas (PA). Among other things it proposed that each PA be structured into four spatial zones:

- **Core zones** are designated to protect biodiversity, natural resources, ecosystems and genetic resources of high value for scientific research and for sustaining the natural environment. Access to this area is prohibited, except for the officials of the Nature Conservation and Protection Administration and natural science researchers to protect and preserve natural resources, biodiversity, and the environment.
- **Conservation zones** are adjacent to the core zone and are also designed for nature conservation purposes. However, local communities and people living within and next to the PA can access it to collect NTFPs for subsistence purposes. Yet, this access is subject to strict supervision of the Nature Conservation and Protection Administration.
- **Sustainable Use zones** are of great economic value for national development, the development of the Protected Area itself and for the improvement of livelihoods of local communities including ethnic minorities. The Government may authorize the development and investment in this area upon request by the Ministry of Environment after consultation with relevant ministries, local authorities and local communities. In the past it was used for the development of agro-industrial plantations through the granting of Economic Land Concessions. It is also the zone for the construction of hydropower dams. In addition the 2008 law on Protected Areas foresees the possibility of releasing part of the land in the sustainable use zone to communities through Community Protected Area mechanisms (Ministry of Environment 2018). More details below.
- **Community zones** entail areas to be utilized for the socio-economic development of the local communities. It might contain residential land, rice fields and field gardens (chamkar), and should protect the rights of ethnic minorities. The release of land titles is possible for these areas but these should be authorized by the Ministry of Environment in conformity with the Land Law.

In Mondul Kiri, the MoE along with environmental protection organizations have conducted and approved the zoning of 3 protected areas (Phnom Prich, Srepok and Lumphat) (Table 5 and Map 13). There is proposed zoning for Kaev Seima protected area but it has not been approved yet and the information provided here is indicative only. As of 2020, there's no zoning for Phnom Namlear. Core zone and conservation together represent 66 percent of the total PA area, while the community zone represents only 9.2 percent (Table 5 and Map 13). This figure needs to be contrasted with the fact

that 16 percent of the population of Mondul Kiri province lived inside PA (Annex 7) and continue to grow.

Table 5. Zonation inside protected area, Mondul Kiri province

	Core Zone (ha)	Conservation zone (ha)	Sustainable-use zone (ha)	Community zone (ha)	Total (ha)
Lumphat	19,096	24,680	1,341	4,093	49,210
Phnom Prich	45,480	78,850	91,395	6,775	222,500
Srepok	187,631	75,631	65,717	43,992	372,971
Kaev Seima	64,384	84,392	58,733	26,146	233,654
Total	316,591	263,553	217,186	81,006	878,336
	36.0%	30.0%	24.7%	9.2%	100.0%

2.4.3.2 Forest resources co-management

Community Protected Areas (CPA) are co-management schemes designated for specific forest areas located inside the Sustainable Use Zone of Protected Areas. Co-management is institutionalized through an agreement between the community and the Ministry of Environment and provides the community with rights to manage and use forest resources based on an approved inventory or resources and management plan. The management right enjoyed by local communities is granted for 15 years. In Mondul Kiri province, there are 21 CPAs, covering 63,079 ha thus 6.7% of PA total surface (Map 13) (PDoE, 2019). See Annex 8 for details.

Forest land that is not inside a protected area and thus managed by the forestry administrator of MAFF, similar forms of co-management called Community Forestry (CF) are implemented. In Mondul Kiri, there are 8 CF schemes, covering a total area of 9,799 ha, involving 724 families. Four of them have an area agreement (Map 13) and three are in the process.

Two schemes located in the Northern part of Kaoh Nheaek district were established in 2011 as community fisheries, a form of natural resources co-management similar to community forestry. These CF is covering a total area of 1,529 ha, aim to protect and manage the access to water resources that are important sources of fish for the local population. The area of the community fisheries comprises the water body but also includes the surrounding area covered by forest (Map 13).

2.4.3.3 Forest management by indigenous peoples under a collective ownership

For the first time in history, the 2001 Land Law could grant communal land titles (Save Cambodia's Wildlife 2014). Communal land titling has been integrally linked and restricted to indigenous people (Baird 2013). Article 25 of the 2001 Land Law clearly specifies that indigenous communities can exercise collective ownership over land where they have established residence and where they carry out traditional agriculture. In 2009, sub-decree #83 was brought into effect to establish the legal foundation for the granting of collective titles to indigenous communities. The procedures include three steps: first, the designation of the community as 'indigenous' by the Ministry of Rural Development; second, the registration of the community as a legal entity by the Ministry of Interior; and third the actual issuance of the communal land titles by the Ministry of Land Management, Urban Planning and Construction (Royal Government of Cambodia 2009).

The land to be transferred by the State under a communal land title is classified in the sub-decree into five categories: agricultural production land and residential land (transferred from State private land) and lands reserved for this kind of cultivation, burial areas and spirit forests (transferred from State public land) (Royal Government of Cambodia 2009).

In Mondul Kiri, seven Collective Land Titles have been granted (Map 13) (PDLMUPC. 2019a). Yet, there are another 7 that are in the process of being recognized or of land measurement. The area of cemetery and spiritual forests has been delineated for the seven CLT but also for other indigenous people's communities (Map 13). These cemetery and spirit forest patches cover a total area of 470 ha.

2.4.3.4 Reducing Emissions from Deforestation and Forest Degradation (REDD+)

Deforestation and forest degradation is still one of the major source of global carbon emissions despite the adoption of several policy incentives to reduce carbon emissions from deforestation and forest degradation (Ken et al., 2020). One of these incentive schemes is the so-called REDD+ which stands for "Reduce Emissions from Deforestation and forest Degradation", the "+" signifies the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.

Several REDD + projects are implemented Cambodia where forest cover is relatively undisturbed. In Mondul Kiri, REDD+ project has been implemented in Kaev Seima Wildlife Sanctuary with technical assistance of the Wildlife Conservation Society (WCS) with USAID funding (Map 13).

The program started in January 2010 with a 60-year loan covering approximately 167,000 hectares of protected dense forest and a 297,000 hectare buffer zone and will run until 2069. Carbon verification was first implemented in 2016 (<https://seimaredd.wcs.org/>). The three main benefits of this program are:

Climate benefits

- The project will reduce emissions of approximately 14 million tons of CO² over 10 years. Carbon calculations are based on forest types.

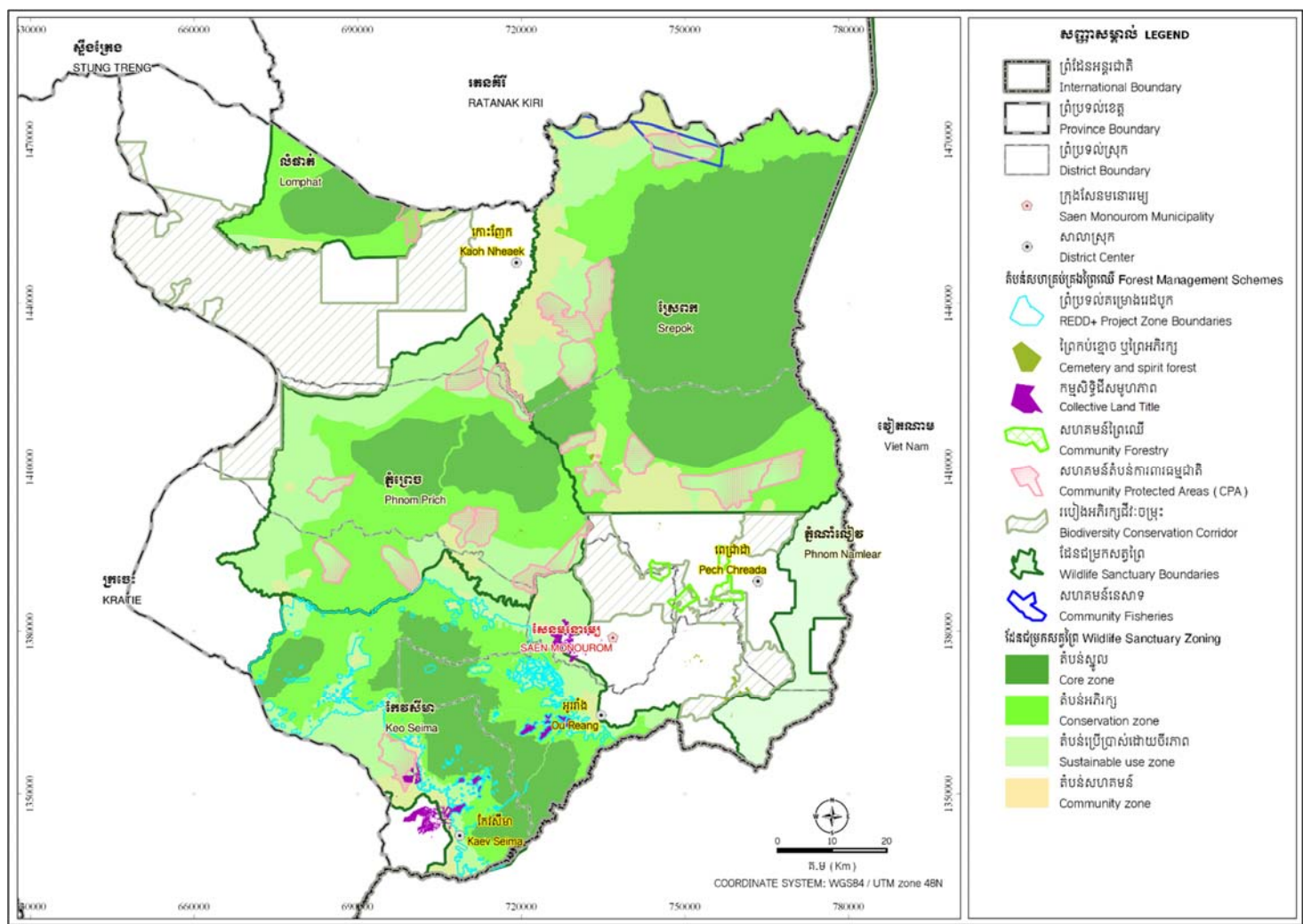
Community interests

- 20 villages with 2,500 families (12,500 people) benefiting from traditional forest use
- Supporting livelihood options through increased income and employment capacity

Biodiversity Benefits

- In the first 10 years, the project will reduce degradation of 30,000 hectares of lowland and mixed forest.
- Protect some rare wildlife, such as elephants, cows, rabbits and peacocks.

However, the land cover change analysis conducted above shows that the project is threatened by massive deforestation driven by the expansion of agriculture.



Map 13. Forest management schemes in Mondul Kiri province (PA zonation, bio-diversity corridor, co-management and collective land titles)

Data sources: Administrative boundaries: PDLMUPCC, 2019 - Wildlife Sanctuary and zoning of Srepok and Phnom Prich and Lumphat: PDoE, 2020 – Zoning of Kaev Seima Wildlife Sanctuary: WCS, 2021 – Biodiversity corridor: PDoE, 2019 - Community Fisheries: opendevlopmentcambodia.net – Collective Land Titles and Cemetery Forest: PDLMUPCC, 2019 – Community in Protected Area: PDoE, 2019 and Community Forestry: FA, 2019

2.4.4 Agriculture

2.4.4.1 Main crops and spatial distribution

As mentioned above, the agricultural area of Mondul Kiri province has considerably increased over the last 20 years. Agricultural land use by district reveals important differences as to the total size of agricultural landholding and the type of cropping systems practiced (Table 6).

Table 6. 2019 Agricultural land use by district in Mondul Kiri (ha.)

	Kaev Seima	Kaoh Nheaek	Ou Reang	Pech Chreada	Saen Monourom	Total
Cropland (annual or perennial)	34,316	8,939	6,858	26,029	3,470	79,612
	61%	17%	43%	40%	29%	40%
Mosaic Forest-Cropland	2,553	2,025	8,935	8,750	7,396	29,659
	5%	4%	56%	13%	63%	15%
Paddy rice	5,158	15,901	13	1,531	174	22,776
	9%	31%	0%	2%	1%	11%
Pepper plantation	59	0	136	492	162	848
	0%	0%	1%	1%	1%	0%
Perennial crop (unspecified)		16	98	11	139	264
	0%	0%	1%	0%	1%	0%
Rubber plantation	14,348	25,053	3	28,441	480	68,325
	25%	48%	0%	44%	4%	34%
Total Agriculture	56,434	51,933	16,042	65,255	11,820	201,484
	100%	100%	100%	100%	100%	100%

Source: 2019 Land Use Classification based on remote sensing technologies, analysis and computation by the authors

Note: Percentages provide the area distribution for main crops within each district. These figures are slightly different from data of provincial department of agriculture because the methodology used to compile them was different. The MDK spatial plan refers to the values of Table 6 because they are clearly geo-referenced.

The statistics of agricultural production provided by the provincial department of agriculture allows for a more detailed classification of the agricultural land use. As for annual crops, rice and cassava are by far the most important, representing 52 and 29 percent of the total cultivated area in annual crops respectively (Figure 6). Regarding perennial crops rubber comprises 78 percent of area cultivated. Cashew and pepper follow with 14 and 2 percent respectively (Figure 6). With the exception of rice and vegetables the annual and perennial crops cultivated in Mondul Kiri are so-called boom crops, which are crops that have benefited from attractive markets over the last two decades. This suggests that global markets and value-chains of these agricultural commodities are key drivers shaping the cropping systems of Mondul Kiri.

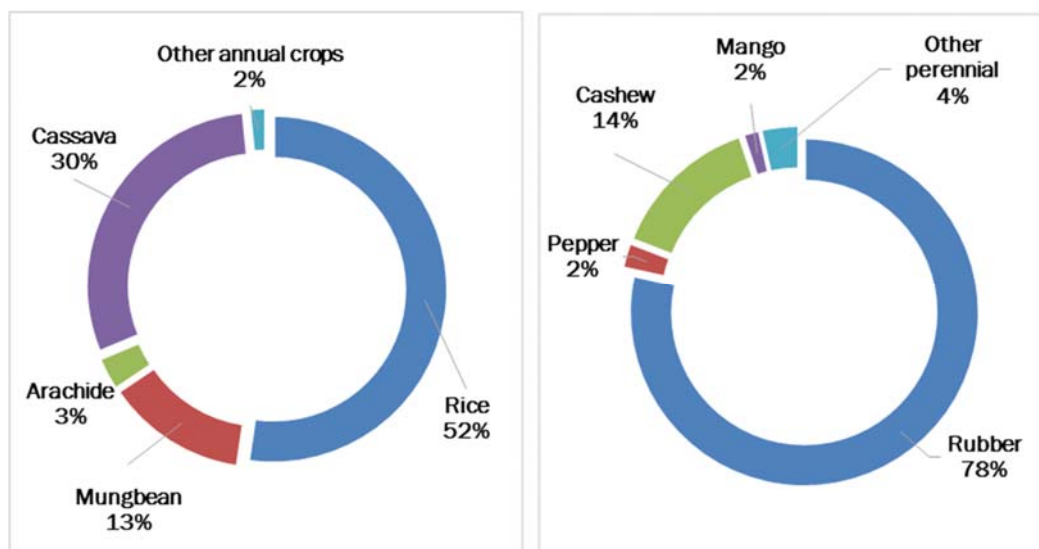


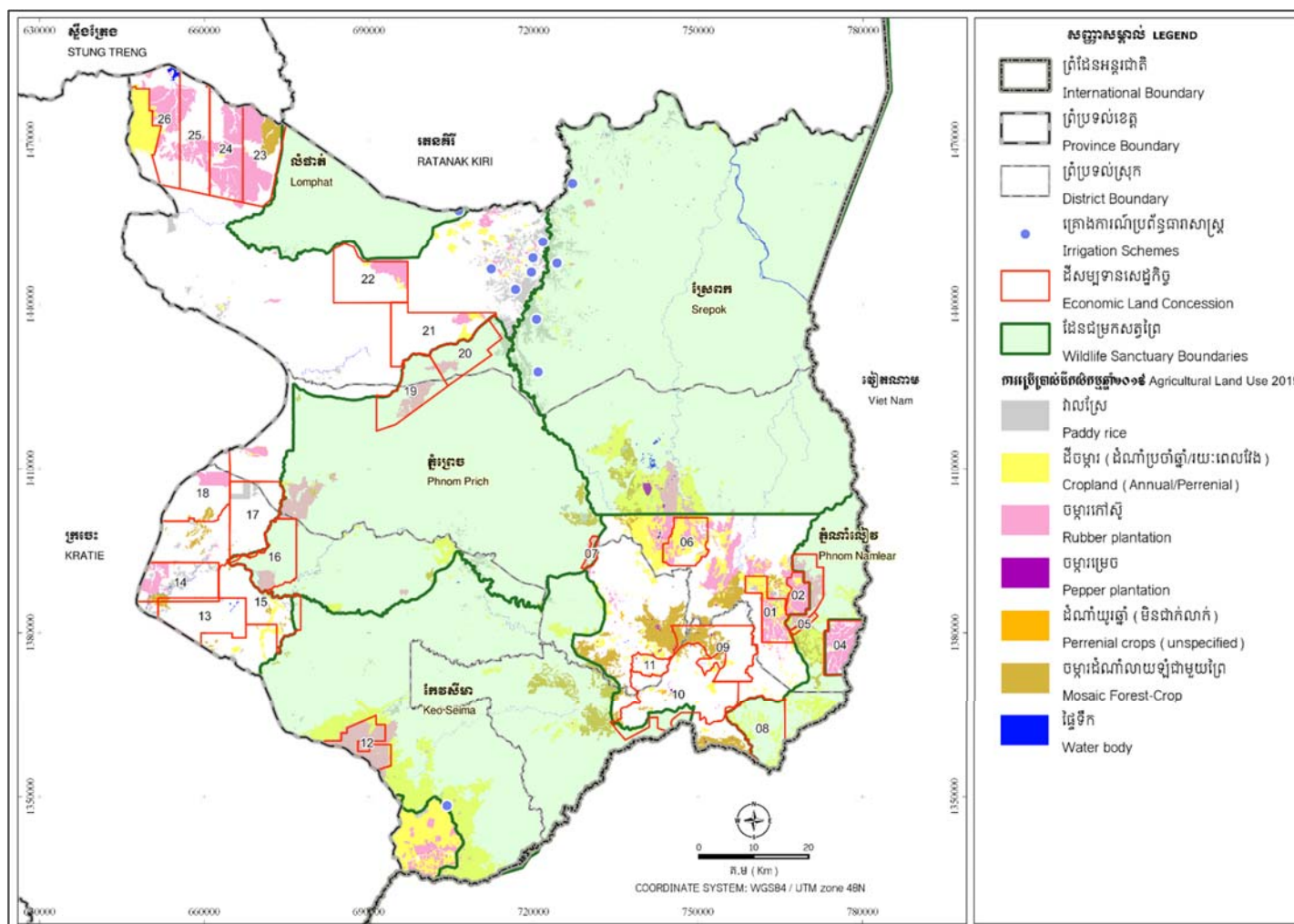
Figure 6. Distribution of cultivated area annual crops (left) and perennial crops (right) in Mondul Kiri province in 2019

Data source: PDA, 2020a

In terms of total cultivated area (annual and perennial crops), Kaev Seima, Pech Chreada, and Kaoh Nheak districts have the largest share (Table 6). In the first two districts, the main agricultural productions are rubber and other annual or perennial crops. In Pech Chreada, the bulk of the agricultural land is located in the Southeastern corner in a region that has undergone massive and recent deforestation. In Kaev Seima the two agricultural hotspots are in the Northeast and Southeast along the border with Kratie province. Here agrarian change is influenced by provincial land tenure and market dynamics.

Kaoh Nheak stands out as the cultivation of lowland paddy, which is widespread in a large area North and South of the district center (Map 14). Eleven irrigation infrastructures of small and medium scale help manage water for rice production that plays an important role to ensure the food security of the population. It mainly helps provide complement water for early rainy season rice production. The total area of the command perimeter that benefits from these irrigation schemes are 5,856 ha, of which 546 ha only receives water for dry season rice production. In terms of water management, four of these irrigation schemes are managed by a farmer water user community (FWUC).

In Ou Reang and Saen Monourom districts/municipality, the cropping system consists of a mosaic of forest and crop patches where crops are mainly cassava (Ou Reang) and vegetables (Sen Monourom).



Map 14. Agricultural land use and Economic Land Concessions in Mondul Kiri province

Data sources: Administrative boundaries: PDLMUPCC, 2019 - Wildlife Sanctuary: PDoE, 2020 - 2019 Land use identification based on Sentinel imagery (February 2019): CWG, 2020 - Economic Land Concessions: PDA, 2020- Irrigation schemes: Ministry of Water Resources and Meteorology, 2017

Note: The list of ELC (identified with ID number) with name, area and main crops is given in Annex 9

2.4.4.2 Economic land concessions

Agricultural production is conducted under two main forms in Mondul Kiri province. It is primarily based on smallholder farmer production on their own land but also on Economic Land Concessions (ELC), which are large-scale land areas granted by the government to domestic or foreign companies through specific contracts for agricultural and agro-industrial production. ELC contracts cover areas of up to 10,000 hectares (Royal Government of Cambodia, 2005) and the maximum concession period has now been reduced from 99 to 50 years (Civil Code 2007, Article 247).

The Ministry of Agriculture, Forestry, and Fisheries (MAFF) chairs the Technical Secretariat on Economic Land Concessions and is the official body that manages data on ELCs. Most recent data computed and triangulated from various sources (Ingalls and Diepart, 2018) provides an aggregate figure of 25 ELCs in Mondul Kiri covering a total of 162,303 ha (PDA, 2020b). ELCs were previously allocated through two Ministries - the Ministry of Agriculture Forestry and Fisheries (MAFF) and the Ministry of Environment (MoE), but Sub-decree 34 (Royal Government of Cambodia, 2016a) and 69 (Royal Government of Cambodia, 2016b) abolished this dual responsibility and the management all ELCs has now been transferred from MoE to MAFF. Map 14 shows that 7 ELCs in Mondul Kiri are located inside areas delineated as protected covering 43970 ha or 4.7 percent of the total protected area of the province. Among the 25 ELCs in Mondul Kiri, the area of 14 companies has been registered as Private State Land (110,437 ha = 68 percent of total), another 9 is on process (48,166 ha = 30 percent of total) while 2 are not registered as Private State Land (3,700 ha = 2 percent) (PDA, 2020b)

These figures on Economic Land Concessions have been updated to incorporate the latest data following a review of ELCs and the land titling campaign under Order 01. Order 01 is a directive released by the government in 2012 with three measures aiming to strengthen and increase the effectiveness of the management of ELCs (RGC, 2012). Order 01 established a moratorium on the granting of new ELCs, a titling campaign (see below) as well as a full review of existing ELCs in an effort to discover which companies were in violation of the contract they signed with the government (Ingalls and Diepart, 2018). The review of ELC was also conducted because in many instances, the land that was granted to the companies was already cultivated or used by smallholder farmers and this overlap of land claims resulted in several land conflicts. Since the evaluation and registration of ELCs is not yet completed, it is likely that the total size of land under ELCs could eventually be reduced further.

Based on an updated inventory of ELC in Cambodia carried out by the Provincial Department of Agriculture (PDA, 2020b), ELC can be differentiated based on the type of crops intended. The main crop by far is rubber (79,865 ha, 50 percent of total ELC area). Another 64,665 ha (49 percent) is unidentified as per the document available to us, while another 11 percent (17,773 ha) of total ELC area is dedicated to pine plantation (see details in Annex 9).

Large-scale agricultural investments, mainly in the form of land concessions, have not fulfilled their promises and have created problems for communities, investors and government authorities (Ingalls and Diepart, 2018). The area under actual active cultivation is very small and the implementation has created a number of land conflicts between the State, farmers, and companies.

The moratorium on new ELC has been effective since the released of the Order 01 in 2012 and the current approach to promote investment in the agricultural sector rather focuses on out-growers models, linking a company with farmers through various forms of contracts. These models aim to link companies and smallholder to create a win-win situation whereby companies can provide technologies and access to markets and smallholder brings their land, labor, and knowledge in the partnership. However, these mutually beneficial partnerships remain the exception rather than the norm and more efforts are needed to develop them.

2.4.5 Mining

A number of mining licenses have been granted to national and international companies for the exploration and exploitation of gold and bauxite minerals (Map 15 and Table 7). The total area licensed is 213,531 ha. A proportion of this area is intended for exploitation (18.2 percent of total) but if the area granted for exploration turned into effective exploitation, the impact on surface and ground water quality, infrastructure development, agricultural land and the land rights of smallholder farmers and forestry would be important in the future.

Table 7. Mondul Kiri mining license statistics survey January, 2021

ID (see map 15)	Company Name	Type of	Area (ha)	Area (% of total)
1	Renaissance-O Khvav	Exploitation (gold)	1,150	0.5%
2	Rong Cheng Industrial Investment	Exploitation (gold)	1,957	0.9%
3	Alex Corporation	Exploitation (bauxite)	35,980	16.8%
4	Renaissance Ou Stong	Exploration (gold)	19,520	9.1%
5	Renaissance Praek Klong	Exploration (gold)	19,680	9.2%
6	Renaissance-O Khvav	Exploration (gold)	18,050	8.5%
7	Renaissance-O Chhoung	Exploration (gold)	18,201	8.5%
8	Antrong Metals Co., Ltd	Exploration (gold)	20,000	9.4%
9	Antrong Metals Co., Ltd	Exploration (gold)	20,000	9.4%
10	Riching Mining Development	Exploration (gold)	19,945	9.3%
11	Angkor Gold Corp (Cambodia)	Exploration (gold) (invalid)	18,888	8.8%
12	Kun Yuan International (Cambodia)	Exploration (gold)	20,144	9.4%
13	RSPMK Co, Ltd	Exploitation (sand extraction)	7.22	0.0%
14	Heng Chaily	Exploitation (stone)	8.2	0.0%
15	Hou Bao	Exploitation (sand extraction)	0.9321	0.0%
Total			213,531	100%

Source: Provincial Department of Mines and Energy 2018 (with update from 2021)

2.4.6 Smallholder farmers and land tenure security

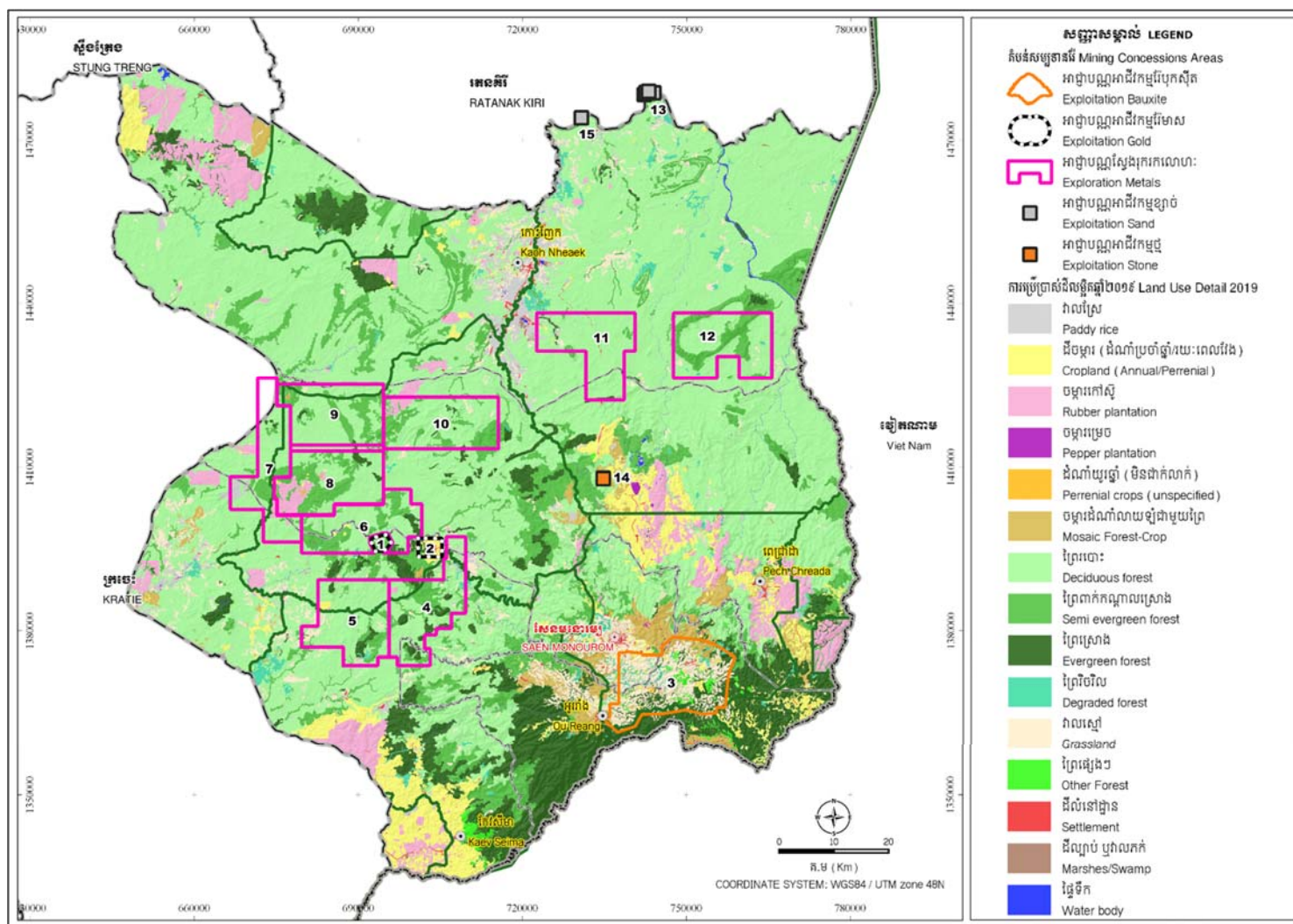
In addition to the above-mentioned co-management schemes and collective land titles, private land titles provide smallholders with land tenure security on their privately owned land.

The land titling campaign conducted by Order 01 has issued land titles between 2012 and 2013. On the other hand, the systematic land registration process is still being conducted. As of 2020, a total area of 45,914 ha has been titled, including 93 percent (42,996 ha) from the Order 01 land titling campaign, the remaining 7 percent (2,918 ha) has been titled through the systematic land registration program (PDLMUPC, 2019b). Map 16 shows that some very specific area has been titled, particularly the areas that have recently deforested (Kaev Seima and Pech Chreada) as well as the rice-based area in Kaoh Nheaek district. However, a large area remains untitled meaning that in these areas, smallholder farmers land right depends on local level recognition by village and commune authorities. Past experiences have revealed that land rights of smallholder farmers are particularly at risk in areas occupied by Economic Land Concession and areas where mining licenses were granted.

As in other parts of the country, the issue of agricultural landlessness or quasi-landlessness (agricultural household with agricultural land holdings less than 1 hectare) is tackled through social land concession schemes (SLC). SLCs imply a legal mechanism to transfer private State land for social purposes to the poor (landless or quasi landless) who lack land for residential and/or family farming purposes. This is further detailed in the procedure for granting and managing SCL schemes in a sub-decree (Royal Government of Cambodia 2003). Under the SLC program, possession rights (*phokeak*), are given to the land recipient for the first five years. If a Social Land Concession recipient remains on

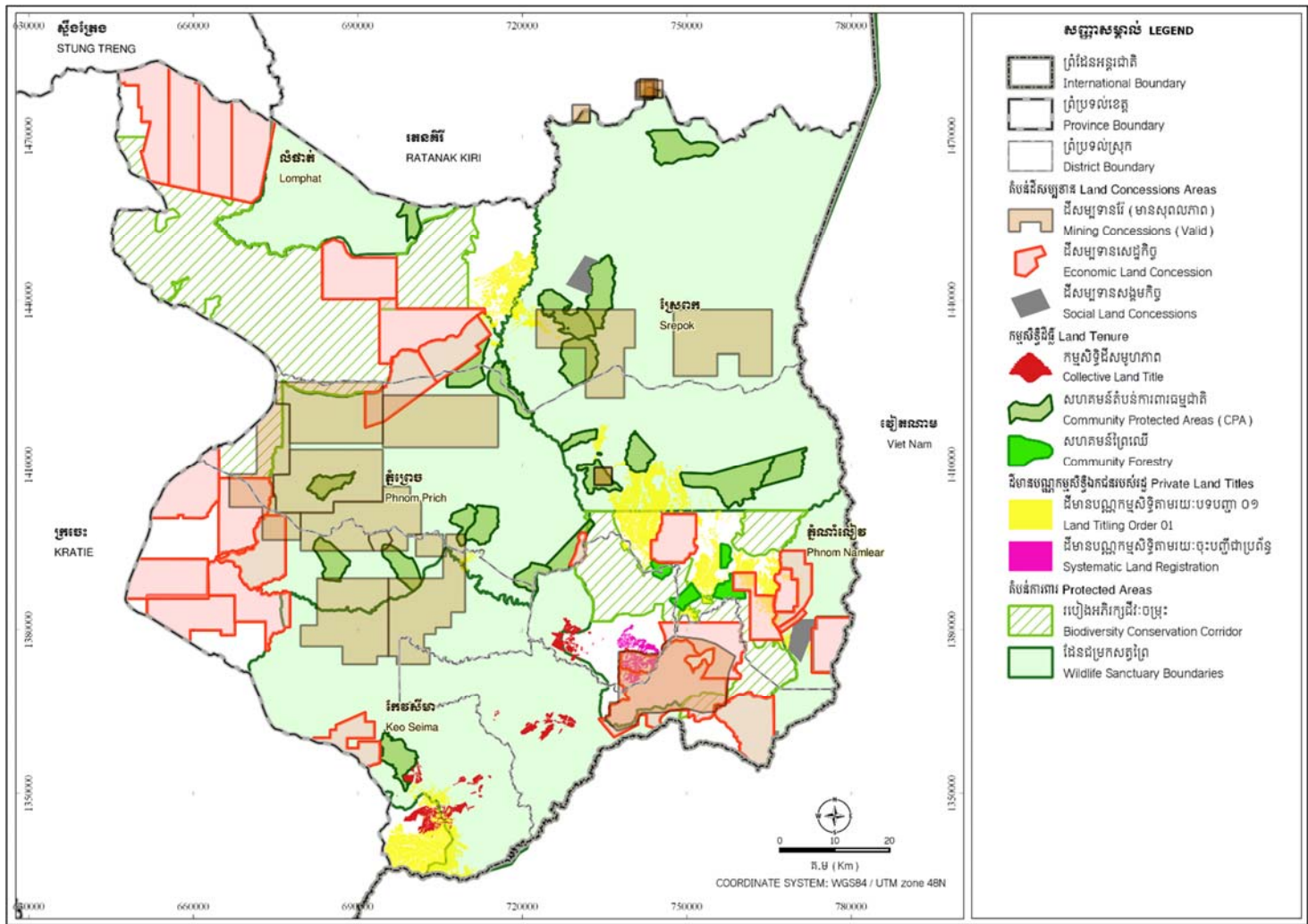
the land for five years and follows legal duties, he/she can apply to convert the concession rights to ownership.

In Mondul Kiri, according to the Ministry of Land Management, Urban Planning and Construction (MLMUPC), as of 2020, 5 SLC schemes with a total area 4,844 ha of land was registered for settlement, infrastructure, and agriculture. Yet this represents only 2 percent of the total area granted for Economic Land Concessions



Map 15. Mining licenses in Mondul Kiri province

Data sources: Administrative boundaries: PDLMUPCC, 2019 - Wildlife Sanctuary: PDoE, 2020 – 2019 Land use identification based on Sentinel imageries (February 2019): CWG, 2020 – Mining concessions: PDoME, 2019



Map 16. Land titling and land rights formalization in Mondul Kiri province

Data sources: Administrative boundaries: PDLMUPCC, 2019 - Wildlife sanctuary: PDoE, 2020 – Biodiversity corridor: PDoE, 2019 - Community fisheries: opendevlopmentcambodia.net – Communal Land Titles and Cemetery Forest: PDLMUPCC, 2019 – Community in Protected Area: PDoE, 2019 - Community Forestry: FA, 2019 - Economic Land Concessions: PDA, 2020b – Mining concessions: PDoME, 2019

2.5 Ecosystems services

Ecosystems produce valuable benefits to society and to the local economy. Ecosystem services are usually grouped into four broad categories (Millennium Ecosystem Assessment 2005):

- *Provisioning services* are the products obtained from ecosystems (food, medicines, fresh water, etc.)
- *Regulating services* are the benefits obtained from the regulation of ecosystems processes (climate regulation, flood prevention or erosion control, etc.)
- *Cultural services* are non-material benefits obtained from ecosystems (sense of place, stress relief spiritual and recreational benefits, etc.).
- *Supporting services* are services necessary for the production of all other ecosystem services (biodiversity, nutrient recycling, photosynthesis, soil formation, etc.)

Mondul Kiri's abundant natural resources provide valuable ecosystem services. But these benefits are under threat due to unsustainable land use practices (deforestation, land conversion, homogenization of agrarian systems, etc.). An evaluation of these services and the degree to which they are threatened is thus central in spatial planning decisions.

To facilitate this process, a set of tools called InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) was used to spatially map and value different ecosystem services in Mondul Kiri province (Watkins et al, 2016). Even if the baseline data used were from 2010, the conclusions the authors drew are still very relevant today.

2.5.1 Specific ecosystem services⁸

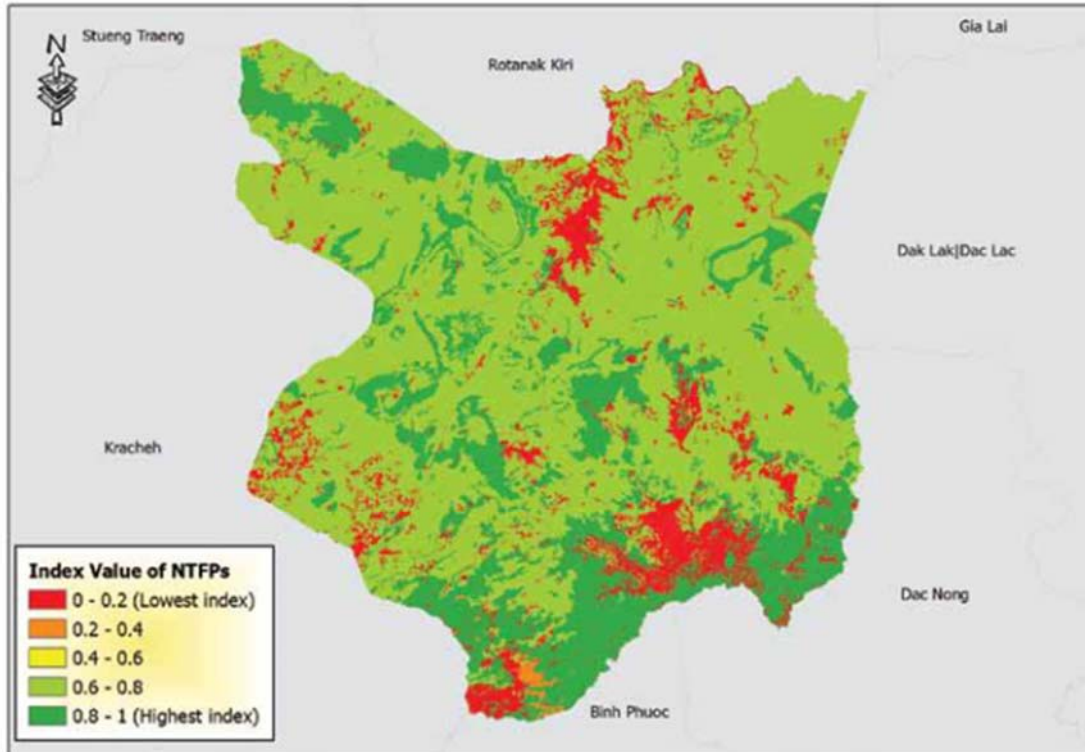
The team that used the In-Vest model produced maps of six main ecosystem services to visualize 'hotspots' of priority ecosystem services and, in turn, areas that provide less of these services (in pixels and by sub-watershed). All the maps present index values standardized on a scale from 0 (lowest value) to 1 (highest value).

Carbon storage (regulating service)

Carbon storage or carbon sequestration is one of the most important ecosystem services provided by forest ecosystems. Trees remove carbon dioxide from the atmosphere through the natural process of photosynthesis and store the carbon in their leaves, branches, stems, bark and roots. Carbon storage helps regulate the climate and water cycles. The value of carbon storage decline if a forest is converted through logging or burning (Aerts and Honnay, 2011). Map 17 shows the areas with the highest carbon stock in Mondul Kiri (in dark brown) and the ones with the lowest carbon stock in Mondul Kiri (in pale yellow). The areas with the highest amount of carbon stock are mainly located in Protected Areas (Kaev Seima and Phnom Prich Wildlife Sanctuaries) and the REDD+⁹ (Reducing Emissions from Deforestation and Forest Degradation) project site. Even Protected Areas that have not been legally zoned such as Phnom Namlear have a high carbon stock and therefore are worth further protection and careful management.

⁸ Section derived from Watkins, K., C. Sovann, L. Brander, B. Neth, P. Chou, V. Spoann, S. Hoy, K. Choeun, and C. Aing. 2016. *Mapping and Valuing Ecosystem Services in Mondulkiri: Outcomes and Recommendations for Sustainable and Inclusive Land Use Planning in Cambodia*. WWF Cambodia. Phnom Penh. In this report, we do not intend to provide a detailed and comprehensive summary of the assessment. We mainly aim to present the foundation of the ecosystem services assessment and draw its implication for the provincial spatial planning.

⁹ The sign + suggests that REDD+ goes beyond simply deforestation and forest degradation (REDD) but also includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks.



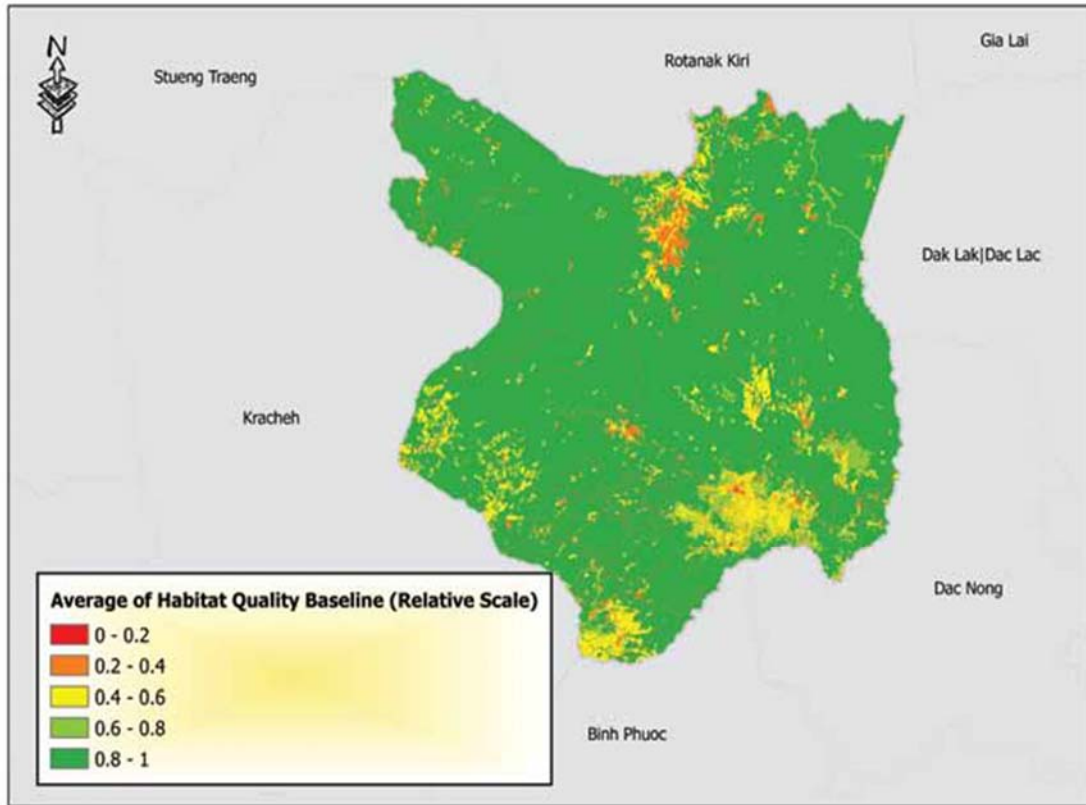
Map 18. Provision of Non Timber Forest Products in Mondul Kiri province

Source: Watkins et al. 2016

Habitat quality for wildlife (supporting service)

Habitat quality was defined by the authors as habitats that are suitable for the following wildlife species: Asian elephants (*Elephas maximus*), white rumped vultures (*Gyps bengalensis*) and tigers (*Panthera tigris corbetti*)¹¹. They play a role in the food chain on which we all depend. The areas of land that would be considered as suitable habitat for these three wildlife species are located in Phnom Prich, Srea Pok and some parts of Kaev Seima wildlife sanctuaries (Map 19). Habitat quality is highest in areas with intact forest. These areas offer the most suitable places for shelter as well as a variety of sources of food for these animal species. Based on 2010 forest cover data, the majority of Mondul Kiri provides suitable habitat quality for wildlife (Map 19). Areas in green are conducive for wildlife habitat, while areas in yellow, orange and red, indicate areas less suitable or unsuitable for wildlife. The areas in yellow are district centers.

¹¹ The tiger is considered functionally extinct in Cambodia but various stakeholders are trying to bring back into the wild by creating more enabling conditions such as enhancing the quality of potential habitats

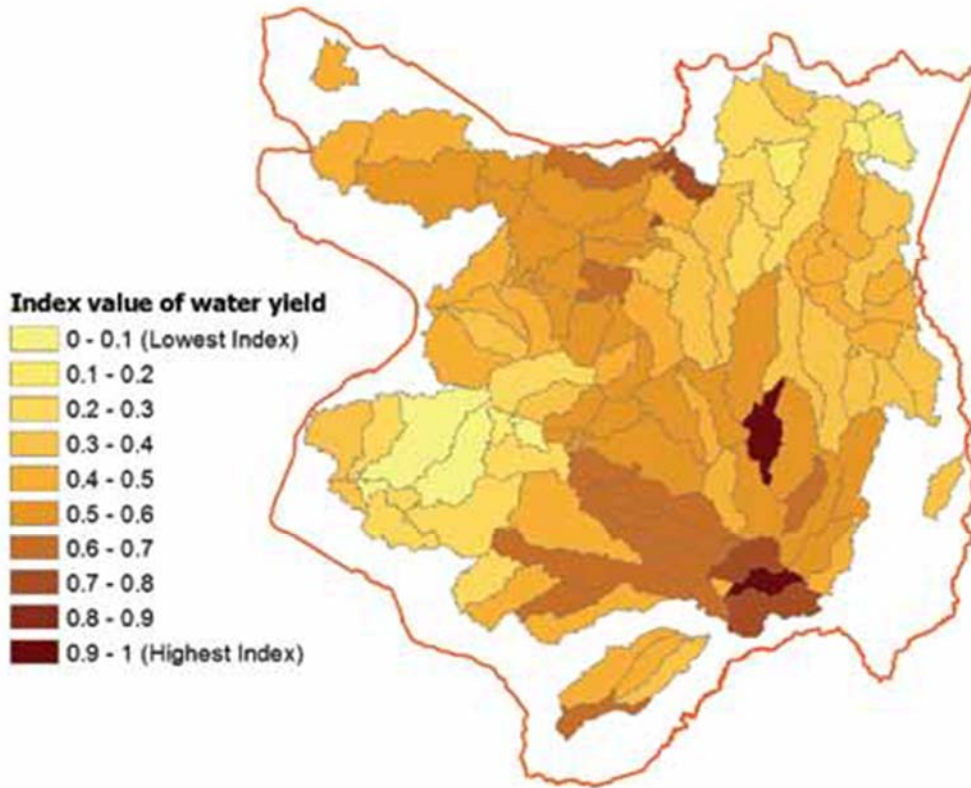


Map 19. Provision of habitat quality in Mondul Kiri province

Source: Watkins et al. 2016

Annual water yield (regulating service)

The annual average water yield on a landscape is defined here as the annual average quantity of water produced by a watershed, i.e. which is not emitted from the earth to the atmosphere by evapotranspiration. Natural forests are key water cycle regulators as they absorb and store water in tree roots during the rainy season and release them back into the streams in the dry season. Without natural forests, more extremes in water availability are likely to occur. In the short term, more water entering the stream can increase the occurrence of flash floods and of pollutants entering the water supply. In the longer term, it can result in the soil losing water retention capacity, which could lead to flash flooding in rainy seasons followed by water shortages in dry season. As shown in Map 20, the areas with higher water yield (dark brown) are the areas with higher precipitation and least amount of natural forest available to absorb this excess surface water.

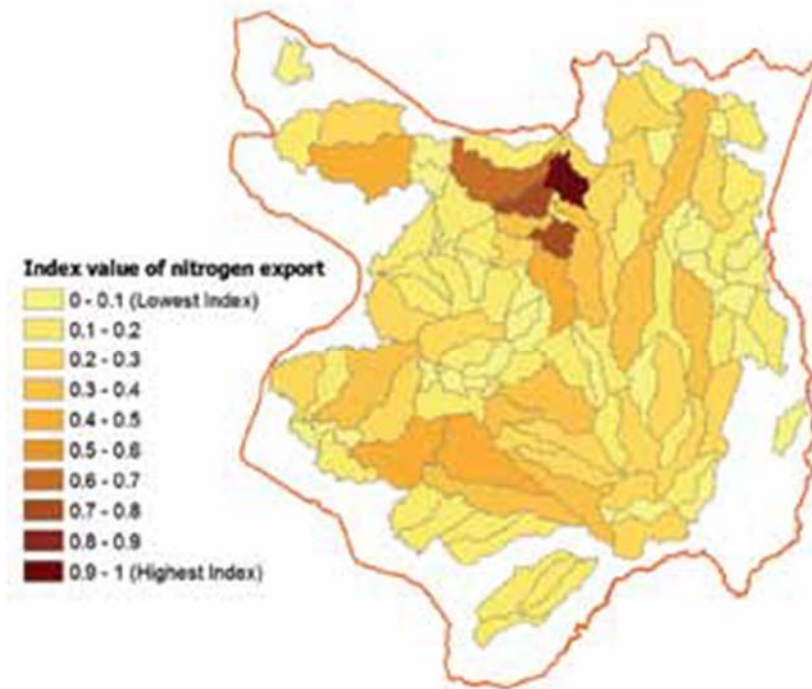


Map 20. Water retention in Mondul Kiri province

Source: Watkins et al. 2016

Nutrient retention (regulating service)

Nutrients are required for plant growth. Nitrogen, phosphorus and potassium are the most important contributors to growth. Soil is a major source of natural nutrients. Forests maintain the levels of nutrients in the soil by retaining them in networks of tree roots thus limiting their runoff into nearby rivers and streams. Deforestation can thus result in reducing nutrient retention and an increase in the flow of nutrients into water systems (Lines-Kelly 2004). This InVEST study estimated the relative importance of nutrient retention using a 'water purification- nutrient retention' model to simulate nitrogen and phosphorus loading into streams and water bodies, i.e. the nitrogen and phosphorus nutrients that go unabsorbed by the trees. The sub-watersheds in dark brown in Map 21 are those with highest export of nitrogen in streams and rivers.



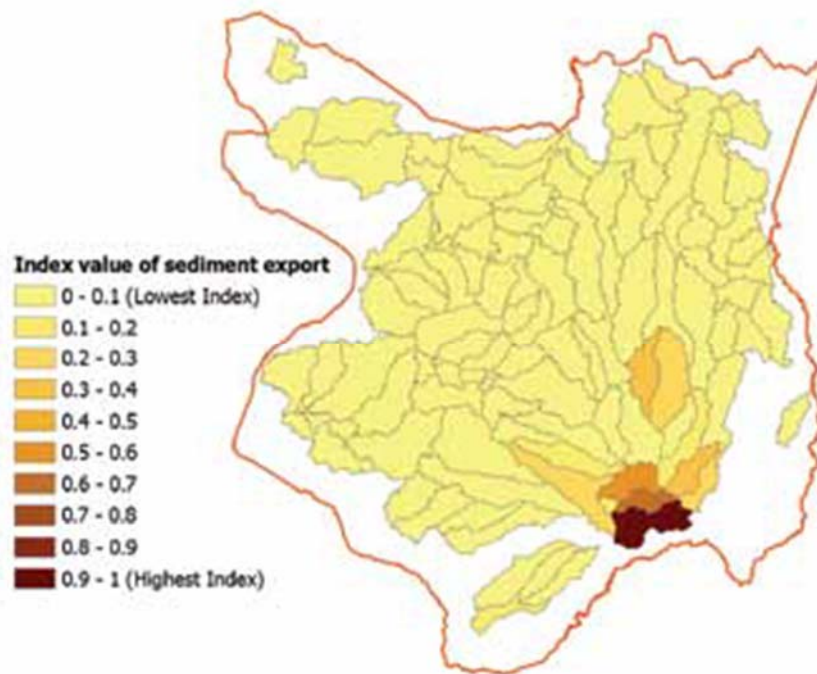
Map 21. Nutrient retention in Mondul Kiri province

Source: Watkins et al. 2016

Sediment retention (regulating service)

River sedimentation occurs when erosion upstream leads to higher sediment loads (or sediment export) in rivers and deposition of sediment downstream. Changes in land use activities upstream may lead to significant increases in the amount of sediment entering a river system (Van Paddenburg et al. 2012). Excessive amounts of sediment can lead to: the deterioration of water quality, as a result of pollutants and harmful bacteria that may be attached to soil particles; algal blooms which block out light that other plants need to grow and reduce the amount of oxygen in the water available for fish; excessive sedimentation often destroys fish habitats, smothers spawning beds and can clog fish gills, impairing their function and causing mortality (Walker et al 1996).

Many sub-watersheds with high levels of sediment export are located in the Southern part of Mondul Kiri (Map 22). The areas with high sediment export are areas where land has been degraded and soil has entered the water supply. Areas with low sediment export, shown in pale yellow / yellow in Map 22 are located in natural forests that are regulating soil processes, for example the sub-watersheds located in Phnom Prich Wildlife sanctuary have low quantities of sediment export.



Map 22. Sediment retention in Mondul Kiri province

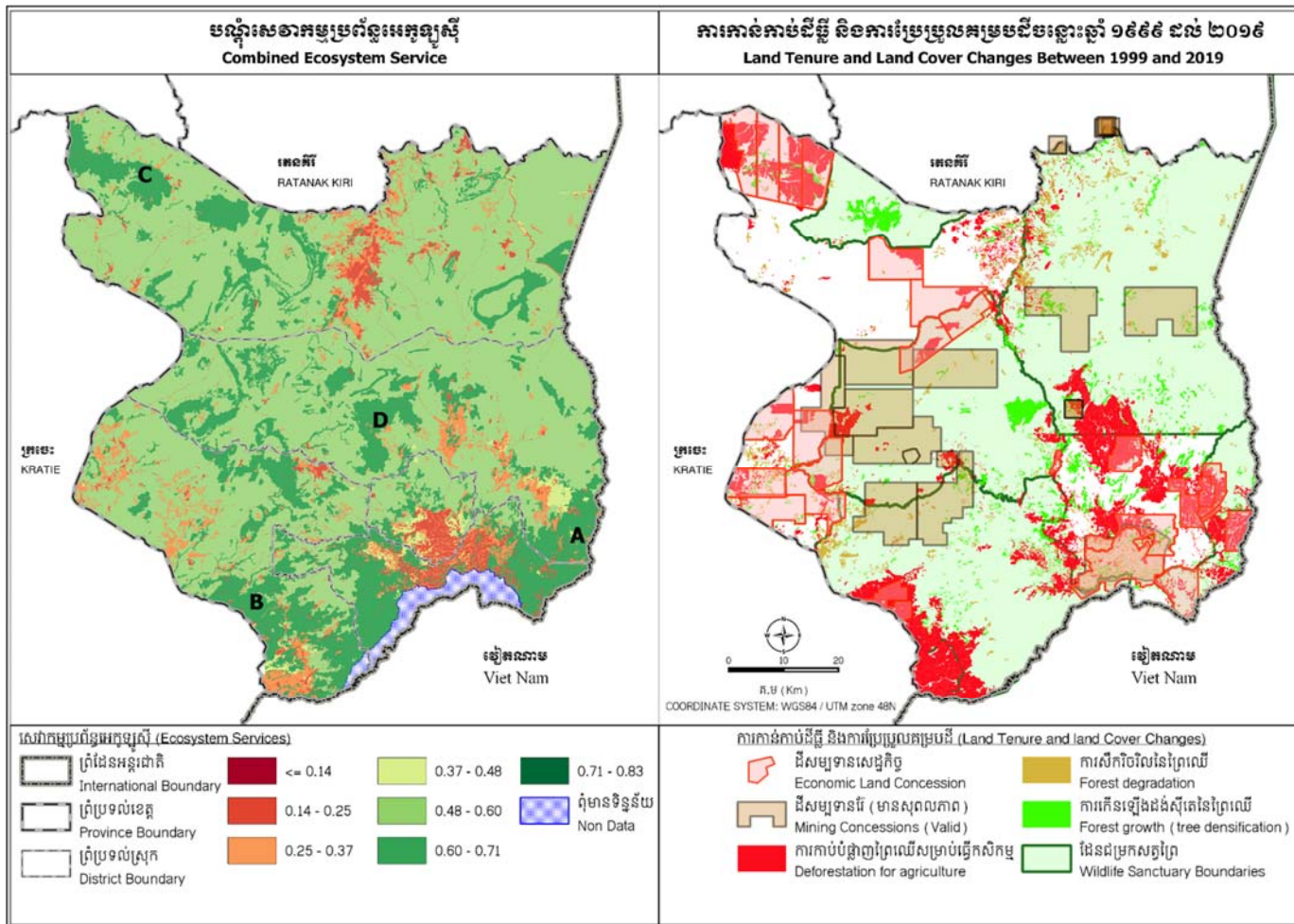
Source: Watkins et al. 2016

2.5.2 Combined ecosystem services

The six ecosystem services that this study assessed were added with equal weighting into a combined ecosystem services composite index. Map 23 presents the combined ecosystem services across the province. Overall, the combined ecosystem map is highly correlated spatially to the factors that present much differentiated values and distribution across the province, namely carbon storage and NTFP.

In view to understanding the main drivers and factors that threatened the provision of ecosystem services, it is useful to mirror the ecosystem services map with a map showing land cover changes (1999-2019) and land tenure systems (Map 23). We will focus our analysis on 4 specific ecosystem services hotspots.

- A. This area is characterized by the high provision of ecosystem services but it is threatened by the homogenization of the agrarian landscape driven by economic land concessions, massive deforestation for agriculture and the risk of forest degradation driven by mining (bauxite) activities. Forest protection efforts inside Phnom Namlear protected area is arguably a key instrument in ensuring forest protection and the more sustainable provision of ecosystem services.
- B. Located in the Southwest of the Kaev Seima district, this area has also witnessed massive deforestation. Most of these land transformation has been driven by smallholder farmers and economic land concessions. Like in the previous case, forest protection efforts inside Kaev Seima wildlife sanctuary are crucial to maintaining ecosystem services in the long run.
- C. In the Northwest corner of the province, another ecosystem services hotspot is threatened by the homogenization of landscape driven by the expansion of rubber production on Economic Land Concessions. On the other hand, the forest area located inside Lumphat wildlife sanctuary offers a high value of ecosystem services. Their relatively good conservation in the past suggests that some ecosystem services in some places are or were well protected.
- D. This hotspot is threatened by deforestation for agricultural land expansion and by mining activities.



Map 23. Combined ecosystem services in Mondul Kiri province (baseline 2014) (left) and land cover change/land tenure systems (right).

Data sources: Administrative boundaries: PDLMUPCC, 2019 - Ecosystem services: Watkins et al., 2016 (mapping by the authors) - Land cover change 1999-2019: CWG, 2020 - Wildlife sanctuary: PDoE, 2020 - Economic Land Concessions: PDA, 2020b - Mining concessions: PDoME, 2021

Note: The areas in blue and green have a high volume of combined ecosystem services, while the areas in yellow have the lowest values. The areas in red represent the areas with no forest and therefore with the least amount of combined ecosystem services.

2.6 Physical infrastructures

2.6.1 Road network

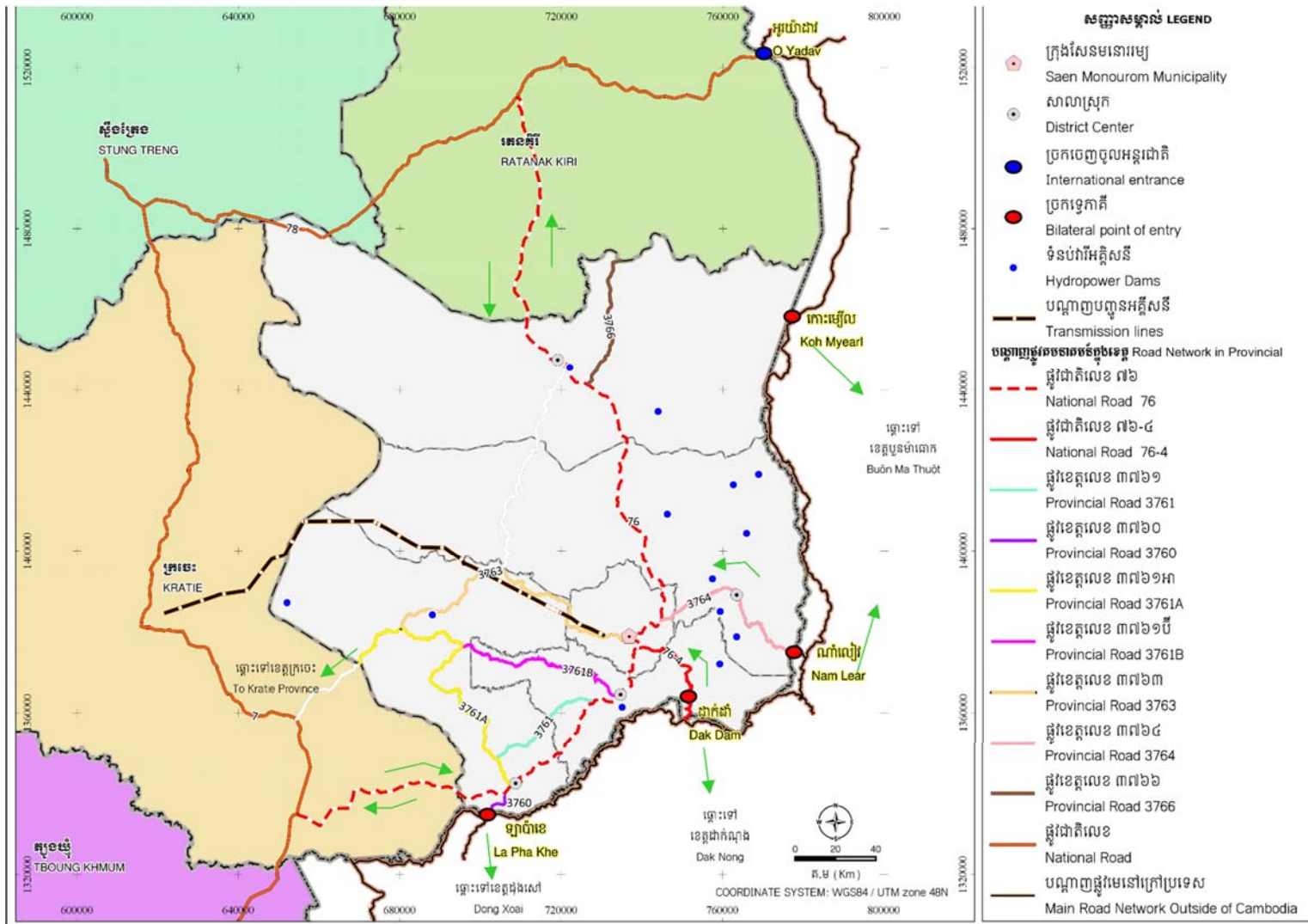
The road network is a key feature in the provincial spatial structure. Mondul Kiri is located in the heart of the Cambodia-Laos-Vietnam (CLV) development triangle and as such, occupies a strategic position in the regional development. The government is keenly encouraging infrastructure development to promote better transport links for further development in the region. As a result, the road network in Mondul Kiri province has considerably expanded over the past few years, as well as the density of the network (Table 8). A strategic policy to frame the development of road infrastructures in Cambodia is the Road Network Development Master Plan (MoPWT 2006)

Table 8. Recent expansion of the road network in Mondul Kiri

Description		2017	2018	2019
Road length		672,793	750,083	1,029,431
Including	Commune/ Sangkat road length	69,263	84,481	141,530
	Provincial road through commune/ Sangkat	31,268	31,508	31,748
	National road through commune/ Sangkat	34,028	34,028	32,608
Road length ratio commune/ Sangkat area		4.5	5	6.3

Source: PDoP, 2020

Map 24 shows the network of national and provincial roads in Mondul Kiri province. The national road network in Mondul Kiri consists of 2 roads (totaling 211.7 km). The first one (NR 76, two-lane, DBST, 185.32 km) crosses the province from Southwest to the North, connecting Kaev Seima district to Kaoh Nheaek district, through Saen Monourom. The second stretch of national road (NR 76.4, paved road, 26.45 km) connects the provincial capital to Dak Dam border crossing to Vietnam. Altogether there are 10 provincial roads totaling 410.41 km, of which two types of paved road (DBST) with a total length of 42.44 km and hand paved roads with a total length of 6.9 km. Red gravel road network has a total length of 76.6 km and the total length of the road is 284.47 km. The province has 84 rural roads with a total length of 623.48 km. They are categorized into four categories based on the administrative status of their endpoints (administrative center, road). These roads are not presented here as a Provincial Spatial Plan (PSP) focuses on national and provincial roads⁹



Map 24. Road network and electricity transmission line in Mondul Kiri province

Data sources: Administrative boundaries: PDLMUPCC, 2019 – Roads: PDoPWT, 2018 – Hydropower dams and electric transmission line: WWF, 2019

The 2014 Law on Roads aims to develop and manage road infrastructure and to ensure traffic safety. It also aims to strengthen the national, regional, sub-regional and international cooperation and integration in the infrastructural development sector. Road infrastructure plays an important role as a backbone for economic development, trade movement, and serves as a means of transport for people traveling to different destinations. In addition, human settlements are generally found along the road. While roads in Cambodia are classified into different categories, such as highway, national road, provincial road, rural road and capital, municipal and urban road, etc., the Law also points to determine a clear right-of-way, which is to keep a specific setback from the middle of the road private property boundary (Articles 7 and 8). That is, the Law dictates to spatial/land use planning in order to guide all types of development.

The Law also states that when constructing new roads, there must be reserved space for road infrastructure expansion. When constructing roads in the city, gated communities or new development areas, there must be footpath for the disabled and other facilities for traffic safety (Article 14). As well, Article 14 has great implications for spatial planning. It says, “... *there must be public dissemination of all reserved right-of-way and land for the future construction of road infrastructure and send their land use maps to MLMUPC and Ministry of Interior for cooperation and taking actions to protect them...*” The Law provides many other provisions relevant to land use/spatial planning. Articles 30 and 31 address the association between different types of roads including highways (high-speed road), national roads and provincial roads, and different land-use functions, especially for buildings that attract crowds of people and generate traffic. They emphasize a clear, specific setback of a private property boundary from the external line of right-of-way. It is clearly relevant for land use/spatial planning as well as land registration.

The expansion of a road network comes with impacts. A road connects places and induces movement of people and goods. It also incentivizes local dwellers and migrants to settle along it, which induces land use change. The past experience in Mondul Kiri showed that the forest cover has been lost when road infrastructure expands. It has negatively impacted biodiversity and wildlife. Looking at the future, planners and authorities need to address the trade-offs between development (people mobility, infrastructure and economic development) and the need to preserve intact forest for biodiversity and wildlife conservation.

2.6.2 Electricity

In Mondul Kiri Province, there are two small fuel plants with a power capacity of 185 kW in each station, including a generator with a capacity of 300 kW for Saen Monourom city. In addition, the province purchases 2MW from Vietnam via the Dak Dam cross-border point in Ou Reang district and via the La Pha Khe cross-border point in Kaev Seima district.

Map 24 shows the location of a high-voltage power line connecting Kratie province to Saen Monourom sub-station for further distribution. There are two lines, the Northern line being traversed by Phnom Prich Wildlife Sanctuary, 34 km. Cable posts are already installed (PDoME, 2018).

Mondul Kiri Province has the potential to build medium and small-scale hydropower thanks to rivers, streams, mountains, plateaus, and valleys. Map 24 presents the potential areas for the hydropower development in Mondul Kiri. As of 2020, all of them are in the study phase. The upper part of the Srepok River in Vietnam is under construction (Grimsditch, 2012).

As in the case of road network expansion, the development of infrastructure affects surrounding ecosystems. The construction of an electric line or the operation of a hydropower dam induces forest clearing and various forms of disturbance (vibrations, noises, etc.) that impact the structure, functions and access to forest systems. It is very important to address trade-offs involved in the following planning steps.

2.7 Demography and population

The detailed results of the recent 2019 population census are not available as of yet and demographic data we rely on for the PSP are derived from the commune database. When relevant, however, we use data from previous population censuses (1998, 2008 and 2019) to help define trends.

2.7.1 Population by district

With a total population figure of 90,949 in 2019, Mondul Kiri province has one of the smallest populations in Cambodia (Table 9). Ou Reang and Kaev Seima are respectively the less and most populated districts (6,476 and 26,248 people). While the provincial population density of 6.3 /km² - the lowest in the country - Saen Monourom municipality is logically the most densely populated district (26.4 Km⁻²). Map 25 shows that population density at the commune level varies greatly across the province.

Based on Commune Database (CDB) data, the demographic growth during the last decade is 4.56 percent/year, with variation by district (from a low of 3.36 percent/year in Kaoh Nheaek to a high of 6.69 percent/year in Pech Chreada). On an annual basis, the demographic growth rate tends to decrease i.e. a decline of both mortality and fertility rates. However the population growth rate remains high, indeed much higher than the national average of 1.2 percent/year between 2008 and 2019 (NIS 2019).

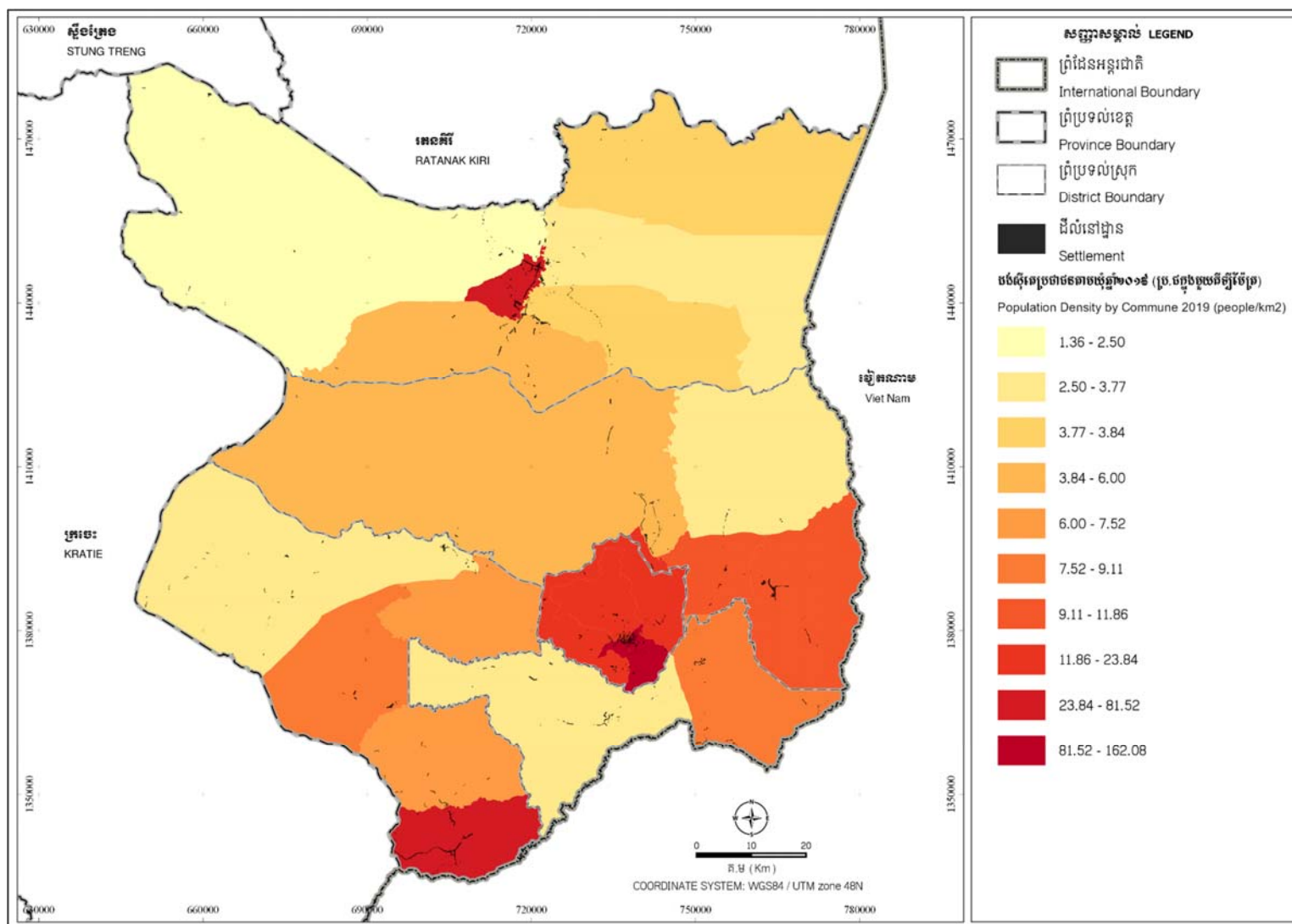
Table 9. Population by district in Mondul Kiri, 2009 and 2019

District	Population		Demographic Growth Rate 2009-2019 (percent/year)	Population Density in 2019 (people/km ²)
	2009	2019		
Kaev Seima	16,886	26,248	4.41%	9.0
Kaoh Nheaek	16,239	22,718	3.36%	4.0
Ou Reang	4,077	6,476	4.63%	5.3
Pech Chenda	10,892	21,255	6.69%	5.3
Saen Monourom	9,572	14,252	3.98%	26.4
Total	57,666	90,949	4.56%	6.3

Source: Commune database 2019 (PDoP 2020)

Between 2009 and 2019, the average number of people per family had declined from 4.5 to 4.2 people per family. The sex ratio (ratio of males to females) changed from 1.00 to 1.06, signifying that the male population tends to increase faster than the women.

More significantly, the dependency ratio (ratio between inactive to active people) has dropped from 0.84 to 0.71 between 2009 and 2019. This means that the share of the working-age population in the total population has increased considerably compared with the non-working age population. This shift in the age structure represents the so-called 'demographic dividend', a key asset and potential for the economic growth of the province.



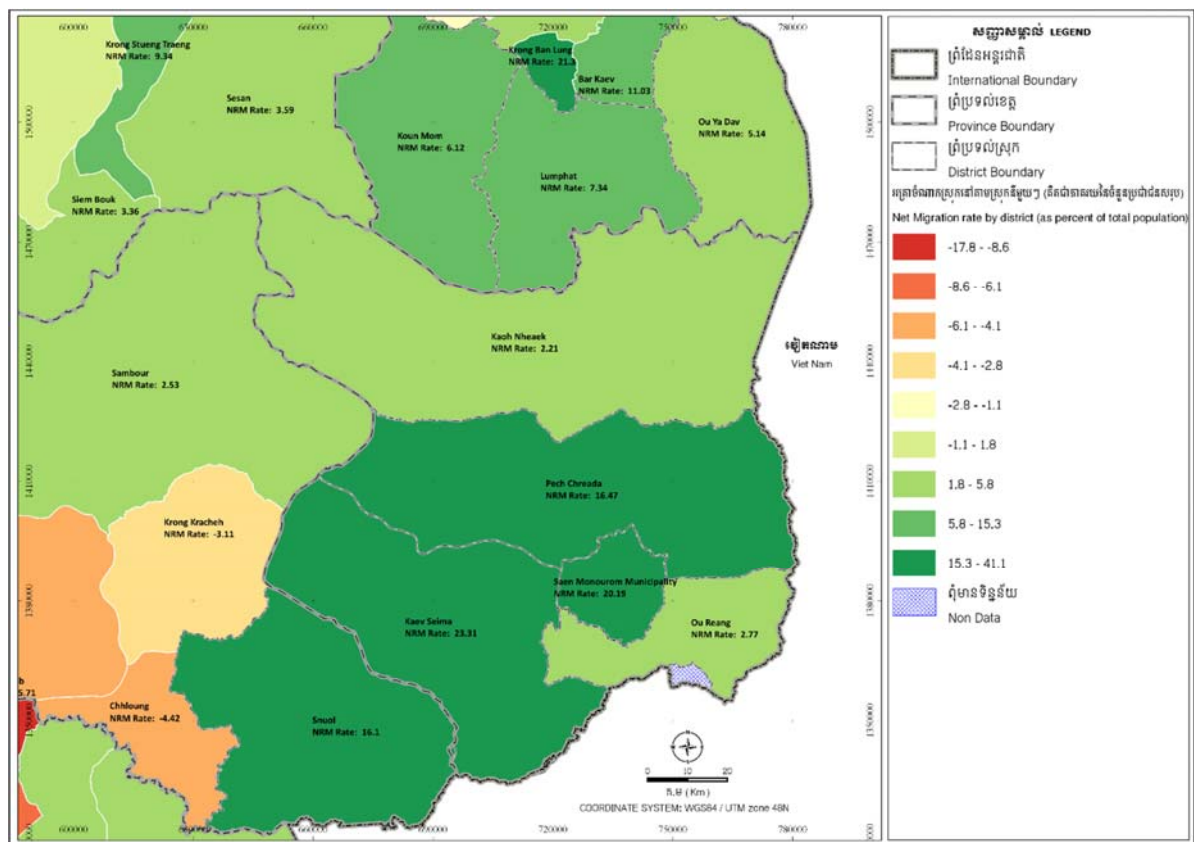
Map 25. Population density by commune in 2019, Mondul Kiri province

Data sources: Administrative boundaries: PDLMUPCC, 2019 – Demographic data: PDoP 2020 - Settlement: Land use 2019: CWG, 2020

2.7.2 In-migration

A significant demographic feature of Mondul Kiri is the preponderance of in-migration. The analysis below is based on the 2008 population census. The dataset is somewhat outdated but the analysis remains meaningful as it helps understand the importance of demographic growth rate recorded in the province and the current population dynamics.

Map 26 below shows the net migration rate (NMR) per district¹², which is equivalent to the number of people who have come into the district minus the people who have left (as a percentage of total population of that district). A negative value of NMR means that more people left the district than people came in. In reverse, a positive NRM means that the district has received more migrants coming in than people leaving. The map shows that NRM per district in Mondul Kiri range from 2.2 to 23.3 percent, much higher than the national mean of 0.86. Neighboring district (Snuol in Kratie, Koun Mom, Lumphat and Ou Ya Dav in Ratanak Kiri) present high values of NRM, showing that the in-migration dynamic does not affect Mondul Kiri province alone



Map 26. Net migration rate (5-year migration) per district (Mondul Kiri and neighboring district)

Data sources: Administrative boundaries and Migration data: National Institute of Statistics, 2008 (data analysis by Diepart and Ngın, 2020)

In-migration is essentially driven by the search for agricultural land. For many farmers across the country and in particularly those living in lowland areas, a strategy to cope with limited agricultural land and job shortage has been to migrate to upland regions in search of economic opportunities. Indeed, most of those who migrated to rural areas up to 2008 are employed in agriculture and were working on their own farms. Wage labor is significant among migrants currently living in Mondul Kiri and their number has become proportionally more important since 2003, suggesting that the migrants

¹² $NMR = [(Inflow - Outflow) / population \times 100]$

have shifted to wage employment because less land is available for agricultural expansion (Diepart and Ngjin, 2020).

Without a doubt, the expansion of agricultural landholdings identified earlier has been fueled by in-migration. The process has slowed down after 2008 but there are indications that they remain significant. The arrival of migrants represents a potential for the development of the province but also puts pressure on forest resources and agricultural land that requires appropriate management and regulations.

A corollary of in-migration is the transformation of ethnicity in Mondul Kiri (Figure 7). In 2009, the Bunong a group of indigenous people, represented a majority of the population (51 percent) whereas, in 2019, they represent only 44 percent of the provincial population. In reverse, the sub-population consisting of Khmer and Cham ethnic groups made only 46 percent of the provincial population in 2009 but 53 percent in 2019. The reason for this transformation is that in-migrants are mainly of Khmer or Cham ethnicity. The influx of migrants' puts pressure on IP groups who already very vulnerable to central State policies of forest and agricultural modernization.

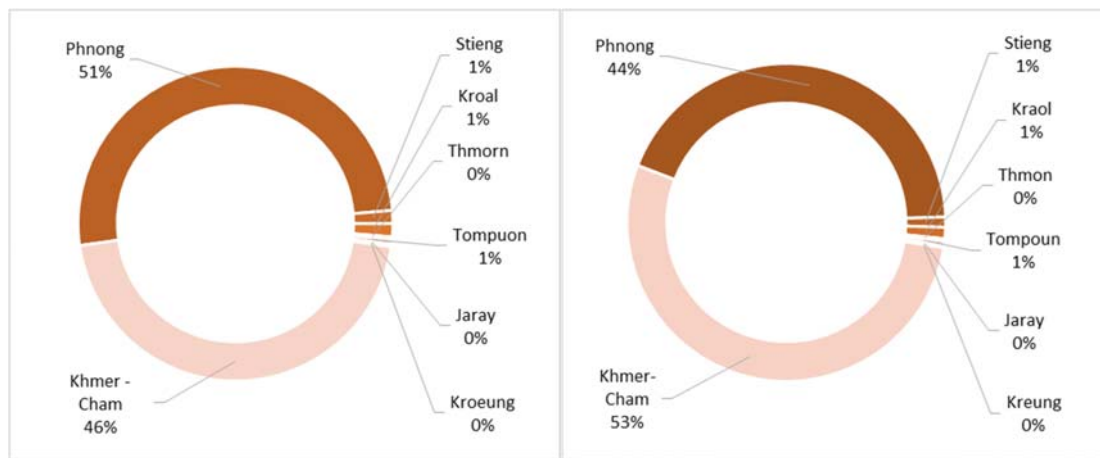


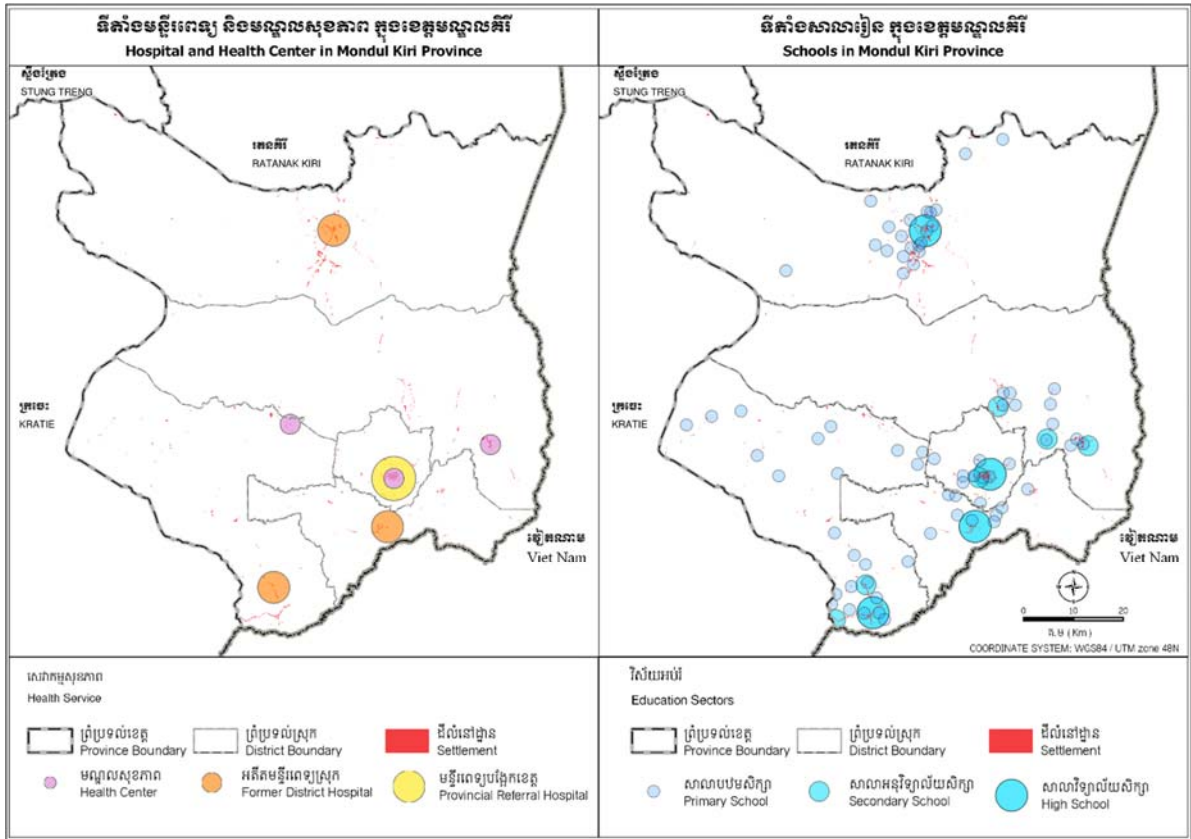
Figure 7. Distribution of ethnic group size in Mondul Kiri (percent of families), 2009 and 2019

2.7.3 Provisions of social services

The social infrastructure considered for the purposes of the spatial plan are related to the health and education sectors.

The organization of health services in the province follows a different pattern from the usual administrative division (by province, district and commune). Districts are aggregated in operational districts to optimize access to health services for the population. Each operational district has its referral hospital and entails a number of health posts (50,000 people+) or health centers (5,000 people). In Mondul Kiri province, there is just one operational district, including three former district hospitals and 3 health centers (Map 27). However, given the incidence of in-migration and the area of widespread settlements across the province, a wide area has insufficient or difficult access to those services (Map 27).

As far as schools are concerned, Map 27 shows their distribution across the province. The number of primary schools is higher than the number of secondary schools, which is in turn always higher than the number of high schools. The average distance to access school therefore logically increases with the age of the students. Access to secondary and high schools can be very problematic in some areas such as Northwest of Kaev Seima or Kaoh Nheak district.



Map 27. Location of social infrastructure in Mondul Kiri province

Data sources: Administrative boundaries: PDLMUPCC, 2019 – Health services: MoH, 2008 - Schools: MoEYS, 2012

2.7.4 Employment

The employment structure in the province reflects the predominance of forest and agriculture in land use. On average, 82 percent of men and women above 18 years of age are employed in agriculture as their primary occupation (Figure 8). Another 15 percent is engaged in the services sector, essentially as a wage worker. If we now look at employment as a secondary occupation, 68 percent of people engaged in agriculture. This means that in Mondul Kiri a significant proportion of the population is living exclusively on farm land. Twenty five percent of people are engaged in NTFP or fisheries as secondary occupations, meaning that job diversification combines agriculture and collecting of natural resources.

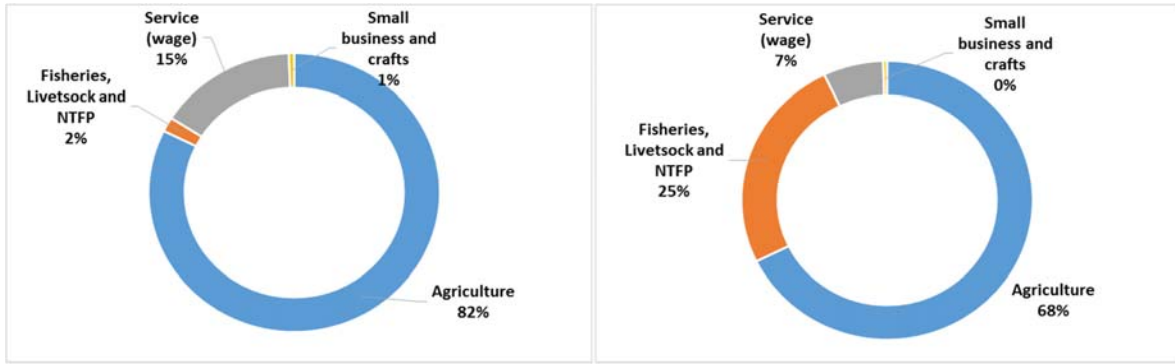
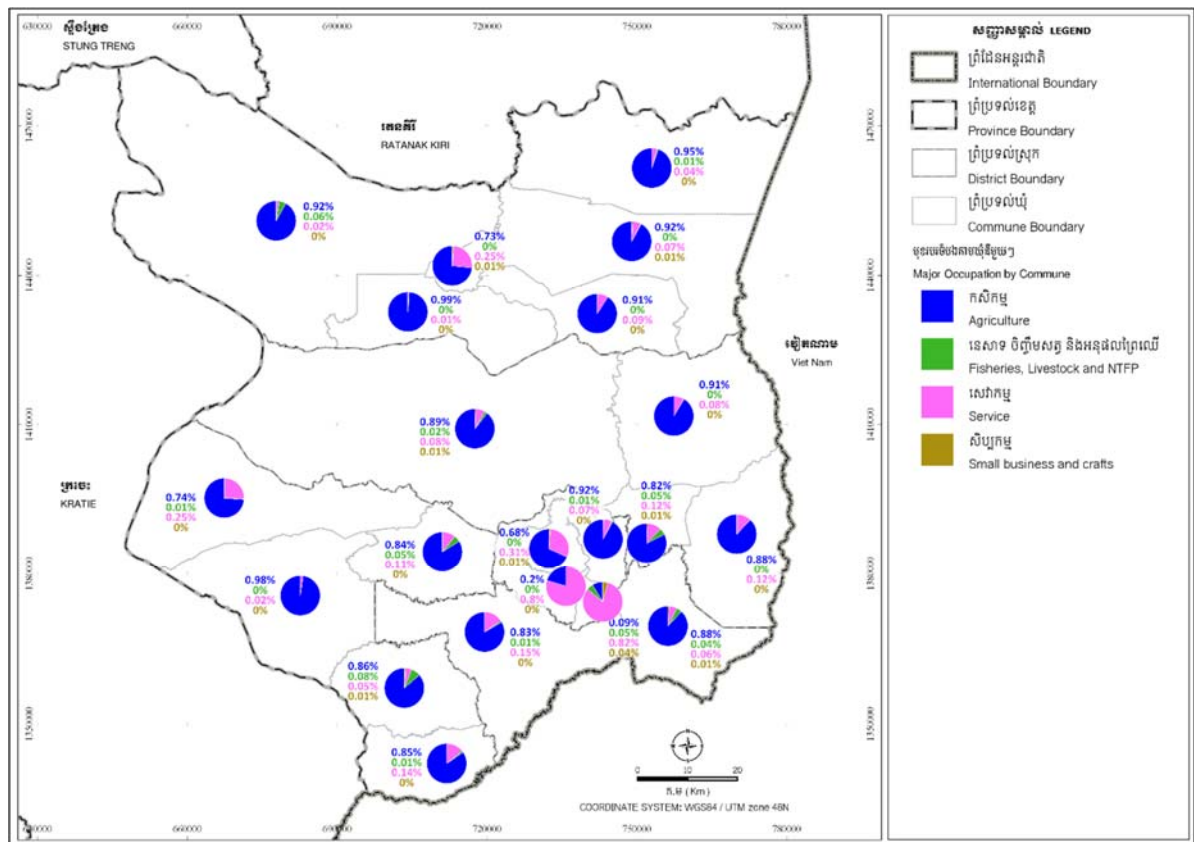


Figure 8. Share of primary (left) and secondary (right) occupation in Mondul Kiri province

Map 28 shows the reliance on agriculture as the primary occupation is widespread across the province. Distinctly, the communes located within or close to important urban centers, have a more diversified employment structure with a higher proportion of people engaged in service sectors (Kaoh Nheak, Saen Monourom, Kaev Seima).



Map 28. Distribution of primary occupation by commune in Mondul Kiri province

Data sources: Administrative boundaries: PDLMUPCC, 2019 – Employment, PDOP, 2020

2.8 Key elements of spatial structure

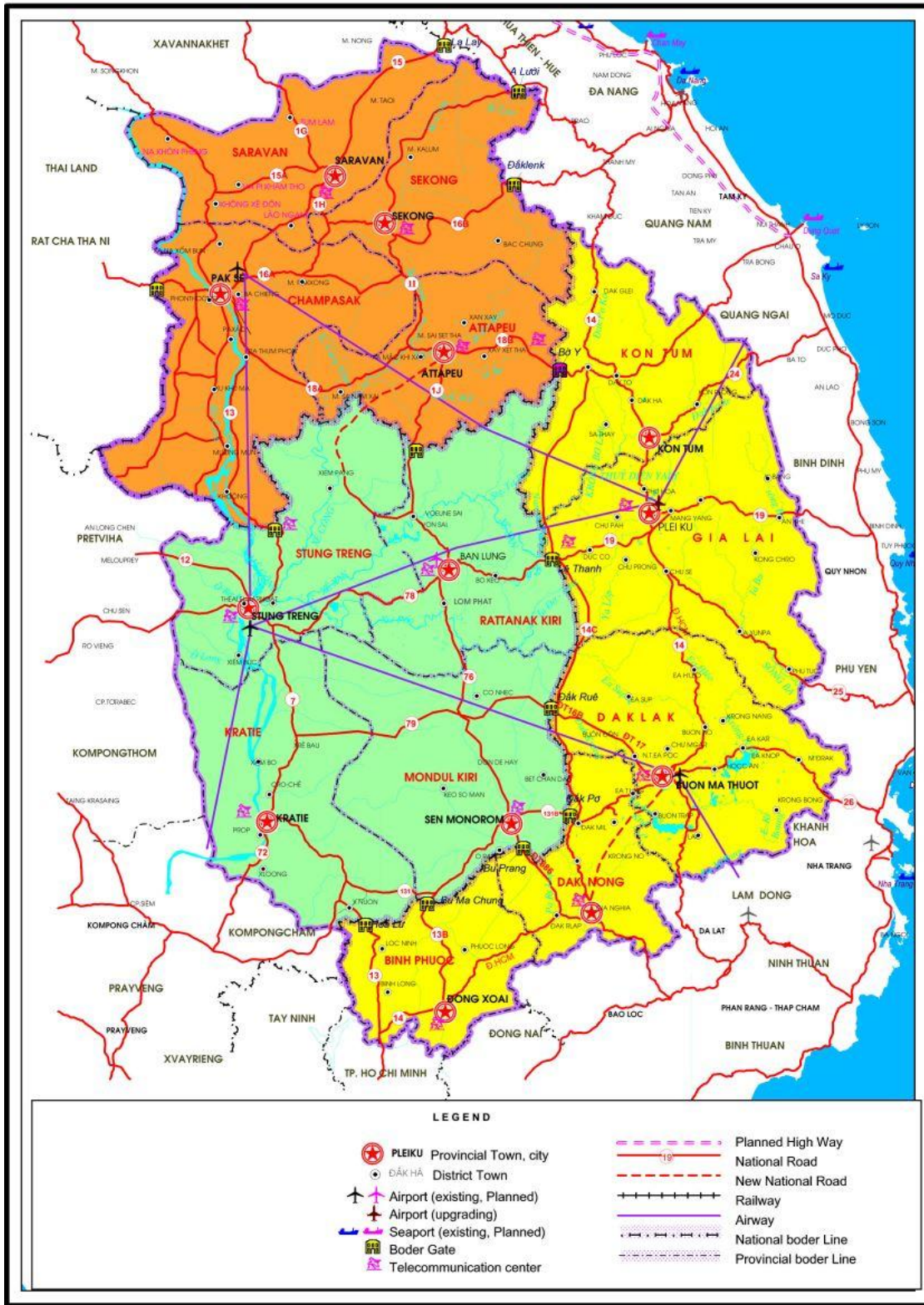
2.8.1 Regional connectivity and road network

2.8.1.1 At regional level

The 2004 Socioeconomic Development Master Plan for Cambodia-Lao-Vietnam (CLV) Development Triangle consists of 10 provinces, later in 2009, 3 more provinces were added (agreed at the 4th JCC Meeting in Dak Lak on December 21-22, 2009). It is a border area of the three countries, having a connection with the common borders namely Mondul Kiri, Ratanak Kiri, Stung Treng and Kratie (Cambodia); Attapeu, Salavan, Sekong and Champasak (Laos); Kon Tum, Gia Lai, Dak Lak, Dak Nong and Binh Phuoc (Vietnam). The total natural area is 143,948 km². The total population in 2011 was 6.663 million people (population density of 46 people/km²). The master plan prioritized certain projects in the development areas, including: infrastructure, agriculture, fishery, and forestry, services, industry, social area and science and technology, environmental protection and efficient land management, national and regional security and defense, and trade and investment facilitation. Mondul Kiri Province is one of the four provinces of Cambodia; it is located in the Northeastern part of the country bordering three Vietnamese provinces, Dak Lak, Dak Nong and Binh Phuoc (Map 29). Based on the master plan, Mondul Kiri province has reaped a great deal of the benefits of the triangle development initiatives, positioning itself in the CLV region. Investment and construction of transportation, power and water supply were then initiated. However, the master plan acknowledged that the development of services including tourism did not match up to the area's potential¹³.

¹³ Overview Report on Reviewing and Adjusting the Socioeconomic Development Master Plan for Cambodia-Laos-Vietnam Development Triangle (after the 5th JCC Meeting on 18 March 2010 in Ban Lung, Ratanakiri Province, Cambodia)

THE ADMINISTRATIVE MAP OF CAMBODIA - LAOS - VIETNAM DEVELOPMENT TRIANGLE AREA



Map 29. Regional connectivity in the CLV development

Data sources: <http://clv-development.org/en/Pages/tinbai.aspx?idTin=13794&idcm=39>

2.8.1.2 At national level

Road networks and infrastructure are arteries that support the country's economic development and growth. They play a vital role in reducing poverty, thereby enhancing social and economic development to a new developmental stage, a so-called "New Change," towards a status of high medium-income country by 2030 and high-income country by 2050. This was stated in various government policies and strategies, including the Rectangular Strategy Stage 4 (RS4) and National Strategic Development Plan 2019-2023 (NSDP 2019-2023). Road networks and infrastructure facilitate trade, movement of goods and services as well as promoting tourism, rural development, and fostering the integration of domestic markets and integrating the country's economy into the region and the world. The Rectangular Strategy, Phase 4 (RS4) also addresses the importance of logistical systems and enhancing transport, energy and digital connectivity in supporting economic development and diversifications of the country (Rectangle 2), balancing development benefits, bridging the gap of rural and urban development, and keeping pace with regional and global change, reaping maximum benefits from technological growth and digital economy, especially in the context of Industry 4.0 (RGC, 2018). However, the RS4 also emphasizes effective management, protection, and preservation of natural resources, ecological system, as well as an adaptation and mitigation of climate change. In this regard, road network and infrastructure development in the Mondul Kiri province must not overlook the richness in natural resources and biodiversity.

The commitment of the Royal Government of Cambodia (RGC) to link the country to the region, especially with neighboring countries, has long been acknowledged. In this respect, corridor and cross-border development have been considered. However, how to take advantage of this plan is a matter of how well integrated planning and policy intervention, and regional cooperation, is established and implemented. According to RS4, as of late 2017, Cambodia has built a total of 16,292 km of the national and provincial roads, of which 8,526 km are bituminous asphalt and concrete pavements, equivalent to 52.33 percent of the total length. Also, the Royal Government has upgraded other physical infrastructure to support national economic activities through the improvement and development of infrastructures such as rural roads, ports, railways, airports and other urban infrastructure. For logistics, Cambodia's ranking has been remarkably improved from 129th in 2010 to 98th in 2018 in the World Bank's Logistics Performance Index (LPI) (RGC, 2018).

Nevertheless, the RS4 also points out that when planning and constructing infrastructure Cambodia still faces key challenges in the above sectors, including high logistics cost, relatively weak institutional coordination in the development and maintenance of infrastructure, insufficient infrastructure for rising demands in the new phase of development, and lack of consideration for enterprise or factory locations by the master plan for urban planning and land management. The spatial planning of Mondul Kiri should play a critical role in providing a spatial framework for integrating different sectorial aspects to meet the long-term development of the province and the nation.

The 2009 Road Network Development Master Plan serves as a key policy document for the transport sector and a reference for other sector policies such as trade, tourism, agriculture, and urbanization. As such it is a key document to implement the rectangular strategy and other government policies. Six strategies are outlined in this master plan to achieve road network development goals: (1) Enhancement of multi-growth pole development, (2) National integration, (3) Development of international corridors for Cambodian Regional Integration, (4) Enhancement of rural socio-economic development mainly agriculture for poverty reduction, (5) Strengthening economic, growth corridor development, and (6) Promotion of tourism development. In Mondul Kiri province, several road networks have been proposed, improved and developed accordingly (Map 30).

In the Road Network Development Master Plan, Mondul Kiri province and Saen Monourom municipality are referred to as isolated provinces and isolated provincial cities (MOPWT 2009). To promote national integration, the second strategy of the master plan aims to enhance the national road 76 from Kaev Seima to Kaoh Nheaeak in view to connect the province with GMS corridors that nurture new emerging economic poles (ADB, 2015) (Map 30). To the West, the national road 76

connects Mondul Kiri with the Central Corridor (from Kunming to Sihanoukville via Lao PDR, the Cambodian segment is Trapeang Kreal-Phnom Penh-Sihanoukville). To the North, the national road 76 connects the province with the Southern GMS corridor (Bangkok to Quiy Nhon, the Cambodian segment is Poipet-SiemReap-Steung Treng-Ratanak Kiri). Better national integration results in the whole territory of Mondul Kiri province being more balanced in spatial terms.

The Master Plan also addresses the need for remote areas to have supporting roads to contribute to the promotion of rural industries, expansion of investment and increase in employment opportunities. Mondul Kiri is also identified in this context. The so-called strategy for the Enhancement of Rural Economic Development for Poverty Reduction (Strategy 3) aims to inject and attract investment to turn this isolated center into a sub-regional integrated pole (MOPWT 2009). In the case of Mondul Kiri this integration is regional as it also involved exchange and trade to and from Viet Nam. See details in the section “Economic development hubs” below.

Another relevant aspect of the Road Network Development Master Plan is the identification of Mondul Kiri as a province at the core of an area to promote tourism, along with Phnom Penh, Siem Reap and Preah Vihear and the coastal area (Strategy 6, MOPWT 2009). Diverse ecosystems and the rich culture of indigenous peoples' community are prime assets for promoting eco-tourism development with the advantage of good accessibility to and from the region. See detail below.

2.8.2 Land use systems

The concept of Land Use System is useful to synthesize the information about land use, land cover change, and land management regimes presented earlier. As such, it is an important aspect of the provincial spatial structure. Simplified information about land use is also useful to analyze land use in relation to the polycentric structure of urban centers, the economic development poles, and the transport network (see below).

Five distinct Land Use Systems are identified in Mondul Kiri: Conservation Area, Protected Areas-based Collaborative Management, Economic Land Concession, High Intensity Smallholder Agriculture and Low Intensity Smallholder Agriculture (Map 31).

The land-use system named **“Conservation area”** consists of the core zone and conservation zone of the protected area system (Map 31). As such, it is under the management of the Ministry of Environment. Even if the local population has access to the conservation zone for the collection of NTFP for subsistence purposes, it is mainly a people-free area to protect wildlife. This land-use system forms a contiguous area stretching from Kaev Seima in the Southwest to Kaoh Nheaek in the Northeast (as well the Southern corner of Lumphat wildlife sanctuary). The main land use is deciduous, semi-evergreen and evergreen forest. The main land-cover change over the past 20 years is deforestation and forest degradation due to illegal timber exploitation. As noted earlier, however, there are also areas where forest regrowth is spotted, revealing the relative success of forest protection efforts.

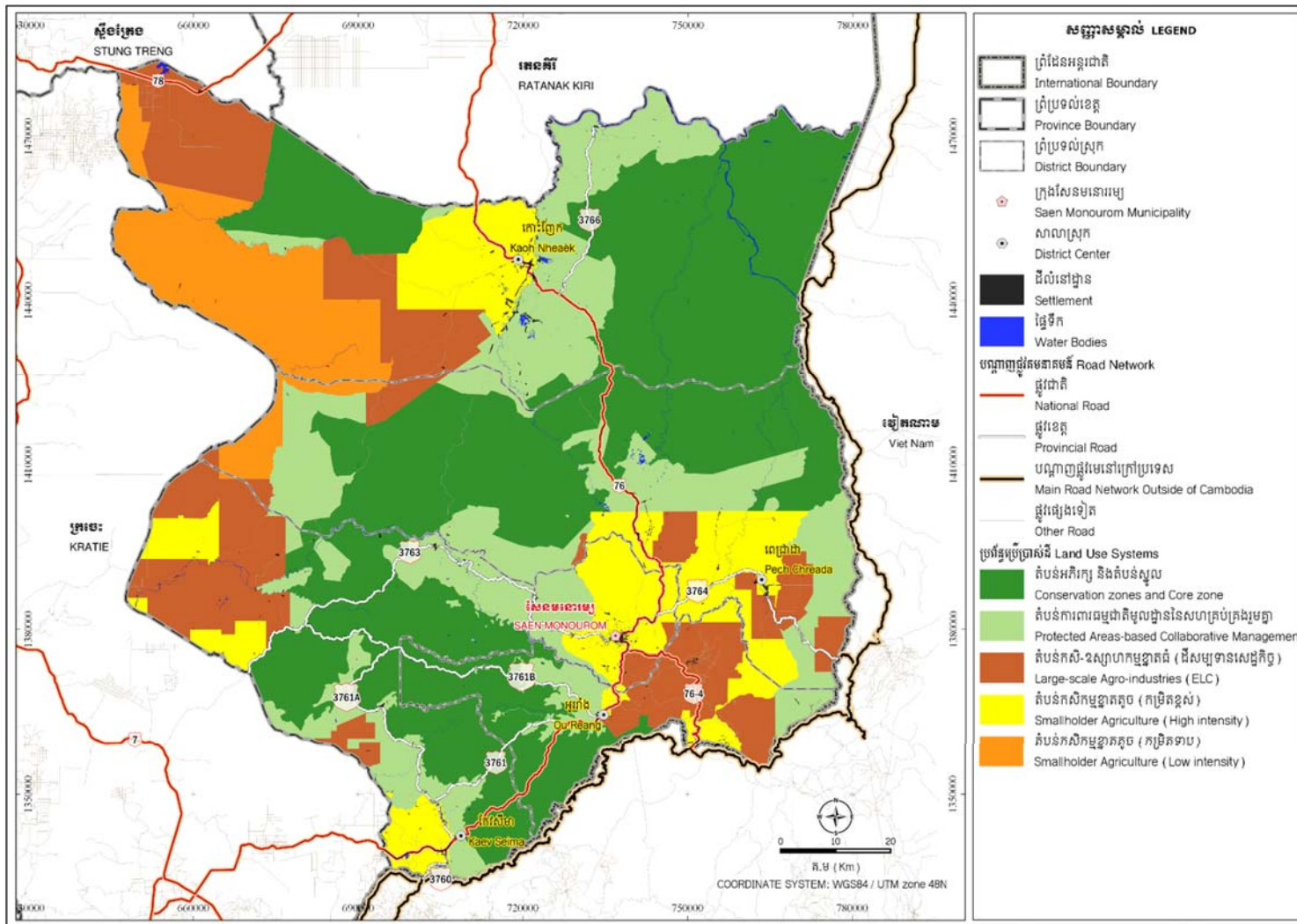
The land-use system named **“Protected areas-based collaborative management”** consists of the sustainable use zone and community zone of the protected area system (Map 31). The main land-cover change that has occurred over the past 20 years in this Land-Use System has been migrant-driven deforestation and the current land use system entails a mosaic of forest, settlements, and agriculture. The management of the area is coined in the term ‘collaborative management’, which is central in the Environmental Code. When adopted, the Environmental Code will be one of Cambodia’s key laws breaking new ground in a large variety of areas and would provide higher levels for environmental protection, openness, and accountability than is the case with virtually all of Cambodia’s existing laws (Cooper, 2019; RGC, 2019). Collaborative management is designed as an enhancement to the current CPA system. Collaborative Management creates deeper community engagement in overall conservation efforts while providing increased livelihood opportunities (Beresford, 2017). It transforms the CPA mechanism from the allocation of small pieces of land into a broader management system, an essential aspect of Protected Areas (PA) management and local livelihoods development. Collaborative management is limited in protected areas but it can also apply to other co-management schemes (current and proposed) such as community forestry, community fisheries, other state public lands, and aquatic resources, forest management lands, and indigenous peoples’ customarily conserved lands. In collaborative management, communities undertake greater responsibilities to support overall PA management and gain increased livelihoods through a greater management role and enhanced land rights throughout the Sustainable Use and Community Zones. However, all activities within these zones must be in compliance with government-approved zoning and management plans. Collaborative management is a multi-stakeholder entity, including communities, local authorities, MoE, the private sector and NGOs in a collaborative decision-making structure. The roles of the community committees are expanded and clarified to enable it to effectively undertake these new roles and responsibilities.

Another distinct land use system is the **“Economic Land Concessions”** (ELC). ELCs are large tract of private state land that has been rented out by the State to companies, for large-scale plantation (main Rubber in Mondul Kiri). As previously showed, ELC have been an important driver of deforestation in the province. Companies granted an ELC contract with the state usually operate on their own with little or no interaction with neighboring smallholder farmers. Often, the management of ELC has induced social conflicts because the land that was granted to companies was either cultivated or used by

smallholder farmers living in the area. Limited linkages with smallholder agriculture have been developed as a result of the land titling campaign and assessment of ELC performance that was conducted as part of Order 01. Either the company offers employment opportunities as wage labor to the local population or offer commercial arrangement and contracts with smallholder farmers to access technologies and market. ELCs are spatially distributed across the province and as such, they create a fragmented agrarian landscape populated primarily by smallholder farmers (Map 31).

The Land Use System named “**High Intensity Smallholder Agriculture**” refers to an area mainly used for smallholder agriculture with the exception of built-up areas. This land-use system is highly dynamic given the important land cover change and population dynamics that have occurred over the past two decades. The key characteristic of this land use system is the long-enduring process of in-migrant driven deforestation that has taken place over the past 20 years or so. The cropping systems established by smallholder farmers along the forest periphery consist of a mosaic of annual (mainly cassava and mung bean) and perennial crop (mainly rubber and cashew). A notable exception is Kaoh Nheaek where paddy rice cultivation is intensively practiced as well. As Map 31 shows, this area of smallholder agriculture is highly fragmented and occurs mainly around Saen Monourom town and in the interstices around protected areas and economic land concessions.

The land-use system named “**Low Intensity Smallholder Agriculture**” occurs in low population density areas. It is used mainly by smallholder farmers for agriculture but forest patches are important as well. This area has witnessed limited deforestation in the past because the arrival of in-migrants has remained limited. The area mainly corresponds to the bio-diversity corridor.



Map 31. Existing land use systems in Mondul Kiri province

Data sources: Administrative boundaries: PDLMUPCC, 2019 – Roads: PDOPWT, 2018 – Land use systems & Settlements: CWG, 2020 – Water body: Arunas techn., 2014

2.8.3 Polycentric structure of urban centers

2.8.3.1 Identification of urban areas

In Cambodia, a commune is declared an 'urban area' based on three criteria that characterize the size, density, and occupation of its population of the commune (NIS 2012). A given settlement is classified as urban when:

- The total population of the commune exceed 2,000 people;
- Population density higher than 200/km²;
- Percentage of employment in agriculture below 50 percent of the total labor force

Following these criteria, however, none of the communes and Sangkats in Mondul Kiri can be classified as an urban center. All communes and Sangkat do not comply with the set criteria, except Sangkat Monourom complies with the second criterion with a population density of 214 people/km² and 13 percent of the total population employed in agriculture is over the age of 18, but this Sangkat has a total population of 1,945 people residing in the area. Consequently, these criteria are not suitable for the classification of urban centers in Mondul Kiri province (Annex 10). A more functional classification of urban centers may be preferred in order to identify a polycentric organization of urban centers in Mondul Kiri province.

2.8.3.2 Functional classification of urban centers

Service provision is central in our classification of urban centers for Mondul Kiri province. Services here are to be considered in a broad context. They include social services, cultural and recreation services, and economic services (Table 10).

A total of 28 services are selected to score each urban center (each service has an equal score) in Mondul Kiri Province. The high-level urban centers have a score ranging from 25 to 28, medium-level urban center score from 17 to 24 and the low-level center have a score from 9-16. Based on these criteria, we identify 1 higher-level center (Krong Saen Monourom), 2 medium-level centers (Srae Khtum in Kaev Seima district and Srae Sangkum in Kaoh Nheaek), and lower-level centers (Memang and Srae Preah in Kaev Seima district, Saen Monourom in Ou Reang district, and Pu Chrey and Bou Sra in Pech Chreada District). Though Krong Saen Monourom does not have a private hospital and university, many potential facilities and services have positioned Krong Saen Monourom to be a high-level center in Mondul Kiri province. The hierarchy of urban centers is also shown on Map 32 and in Table 11.

Table 10. Facilities used in the classification of urban center in Mondul Kiri province

Low-level center	Medium-level center	High-level center
<p>Facilities in lower-level centers:</p> <ul style="list-style-type: none"> ● Health center ● Pharmacies and sub-pharmacies ● Public kindergartens ● Public elementary schools ● Public secondary schools ● Commune administrative center ● Medium-size market places (normal market selling all day) ● Stores selling grocery and consumer goods ● Stores selling clothes, shoes, incenses ● Stores selling office and sports equipment 	<p>Facilities in medium-level centers (in addition to those in lower-level centers):</p> <ul style="list-style-type: none"> ● District administration ● Public high schools ● Clinical sites ● Flat residents ● Guesthouse ● Bank (branch of bank) ● Microfinances ● Electronics stores ● Stores selling construction materials ● Small market locations (market selling only morning or evening) 	<p>Facilities in higher-level centers (in addition to those in medium-level centers):</p> <ul style="list-style-type: none"> ● Administration headquarters ● Post office ● Referral health center ● Private hospitals (if any) ● Higher education institution (if any) ● Hotel locations ● Restaurants ● Night market locations (market selling only at night)
	<p>Medium-level centers also have to serve as gateways to other places of importance or as hubs by connecting at least two roads of provincial importance</p>	<p>Higher-level centers also have to be connected to at least one road of national importance, and the minimum distance to a same-level center (at least 20 km)</p>

Table 11. Facilities of urban center classification in Mondul Kiri Province

Facilities/indicators of the urban center classification	Name of urban center in Mondul Kiri province							
	Mem ang	Srae Khtum	Srae Preah	Srae Sangkum	Saen Monourom	Pu Chrey	Bu Sra	Krong Saen Monourom
Population in commune/sangkat(2019)	2850	12356	3905	7255	3721	9489	6543	14,252
Population density in commune/sangkat (2019) (persons/km ²)	7	38	7	73	5	4	11	83
Employment outside agriculture in commune/sangkat (%)	24	29	26	34	23	25	23	62
Social services								
Public kindergartens	1	1	1	1	1	1	1	1
Public elementary schools	1	1	1	1	1	1	1	1
Public secondary schools	1	1	1	1	1	1	1	1
Public high schools	0	1	0	1	1	0	1	1
Higher education institution	0	0	0	0	0	0	0	0
Health center	1	1	1	1	1	1	1	1
Referral health center	0	0	0	1	0	0	0	1
Private hospitals	0	0	0	0	0	0	0	0
Clinical sites	0	1	0	1	0	1	0	1
Post office	0	0	0	0	0	0	0	1
District administration	0	1	0	1	1	0	1	1
Administration headquarters	0	0	0	0	0	0	0	1
Recreation services								
Restaurants	0	0	0	1	0	0	0	1
Hotel locations	0	0	0	0	0	0	0	1
Guesthouse	0	1	0	1	0	0	0	1
Economic services								
Medium-size market places (normal market selling all day)	1	1	1	1	0	1	1	1
Small market locations (market selling only morning or evening)	0	1	0	0	0	0	0	1
Night market locations (market selling only at night)	0	0	0	0	0	0	0	1
Stores selling grocery and consumer goods	1	1	1	1	1	1	1	1

Stores selling clothes, shoes, incenses	1	1	1	1	1	1	1	1
Electronics stores	0	1	0	1	0	1	1	1
Stores selling construction materials	0	1	0	1	1	1	1	1
Stores selling office and sports equipment	0	1	1	1	0	1	0	1
Small business location (rice, noodles, groceries, beverages)	1	1	1	1	1	1	1	1
Pharmacies and sub-pharmacies	1	1	0	1	0	1	1	1
Flat residents	0	1	0	1	1	1	1	1
Microfinances	0	1	0	1	0	0	0	1
Bank (branch of bank)	0	1	0	1	0	0	0	1
Total indicators (28)	9	20	9	21	11	14	14	26

Score value classification:

- Lower-level center (09-16)
- Medium-level center (17-24)
- Higher-level center (25-28)

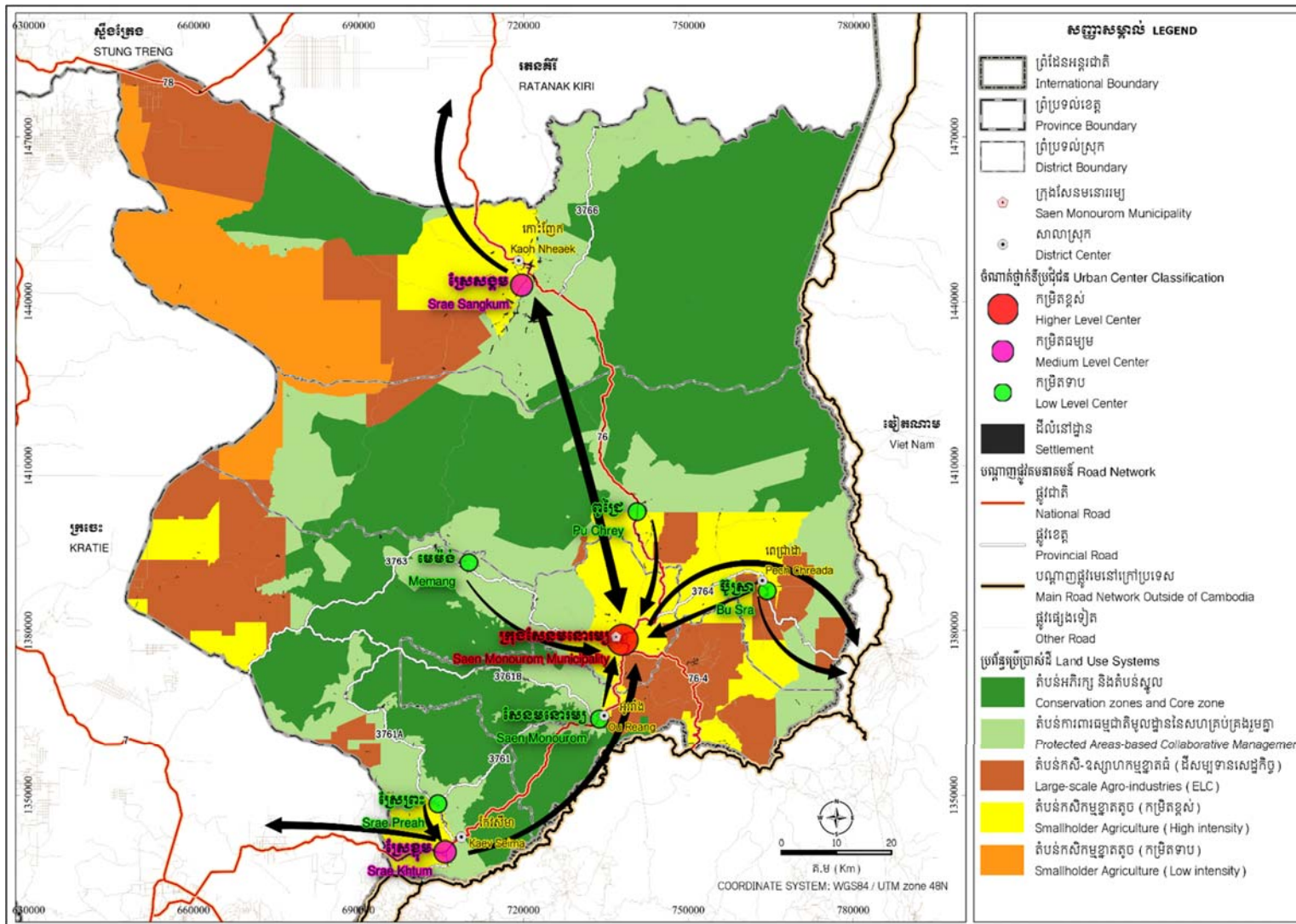
2.8.3.3 Relationships between urban centers

We now examine the main functions and roles played by each center and the relationship between them. This helps determine how the facilities and the services they provide relate to each other across the province.

- Krong Saen Monourom, with a population of 14,252, is a high-level center that provides important services such as a referral hospital, health professionals, choices of accommodations (hotels, resorts, guesthouses), special events for sport and cultural celebration, variety of restaurants, modern eating and entertainment places, post office, financial institutions (both public and private), and provincial administrative centers. Besides, Krong Saen Monourom center is the transportation hub between National Road 76 and other districts of Mondul Kiri province (Map 32). 38% of Krong Saen Monourom population is above 18 years of age, whose primary occupation is in agriculture. In a context of the CVL Development Triangle Project, Krong Saen Monourom center plays a crucial role in the exchange of local products such as rubber, cassava, and other secondary crops between Ratanak Kiri province, other districts and between the Vietnamese provinces of Dak Lak, Dak Nong, and Binh Phuoc.
- Srae Khtum commune center, with a total population of 12,356, has become the medium-level center of Kaeu Seima district that provides important facilities to its lower-level centers and communes. These key facilities include health institutions (health centers, pharmacies, and private clinics), education (high school), financial institutions, various types of accommodations, cultural and sports events, district administrative services, and other markets and stores. 71% of Srae Khtum population is above 18 years old, whose primary occupation is in agriculture, this urban center plays an important role as a gateway or often known as the mini-transportation hub for connecting and transferring different modes of transports (Map 32). This mini-transportation hub serves as transport interchange where passengers and cargo are exchanged between vehicles or/and between transport modes. It is the connecting point of National Road 76 to Ou Reang district and Krong Saen Monourom, to Snuol district of Kratie province, and to Cambodia-Vietnam border. This mini-transportation hub also plays an important role in exchanging local products including rubber, cassava, cashew nut, sugarcane, and other secondary crops with other districts

of Mondul Kiri, Snuol district and Binh Phuoc province of Vietnam. On the other hand, the people of Srae Ktum also need to come to use other facilities in the high-level urban center including the provincial administrative services, post office, better social infrastructure, better utilities, and better eating and entertainment places.

- Srae Sangkum commune center, with a total population of 7,255, is the medium-level center of Mondul Kiri. This urban center is located in Srae Sangkum commune, Kaoh Nheaek district and is 93.6 km far from the Krong Saen Monourom. Srae Sangkum urban center has 66 percent of the population above 18 years old, whose primary occupation is in agriculture. However, this urban center is transforming its potential as a social, economic and transportation development pole in Mondul Kiri province. Socio-economic development has been concentrated in Srae Sangkum commune center in which other communes come to Srae Sangkum for using key facilities including, district administrative services, health services (referral hospital, private clinics), financial institutions, various types of accommodations, cultural and sports events, and other entertainment activities. Also, Srae Sangkum plays an important role as a gateway and mini-transportation hub for the interchanging of passengers and cargos between Pech Chreada district, Krong Saen Monourom, Kaev Seima district, Krong Balung of Ratanak Kiri province, Snuol district of Kratie province, and as well as Stung Treng province (Map 32). This urban center becomes an economic pole of Mondul Kiri province due to its strategic location between Krong Saen Monourom and Krong Ban Lung of Ratanak Kiri province. It is also the gateway for exchanging local products between Pech Chreada, Krong Saen Monourom, and Kaev Seima district of Mondul Kiri province and Krong Ban Lung Ratanak Kiri province, and Stung Treng province, as well as provinces of Lao PDR. Another flow of local products and passengers is between Koah Nheaek center and provinces of Vietnam through an Oyadav-Le Thanh cross-border. This helps to increase the opportunities to enhance socio-economic development, social and physical infrastructure and competitiveness with other districts of Mondul Kiri province. On the other hand, the people of Srae Sangkum urban center also need to come to use other facilities in the high-level urban center including the provincial administrative and post office services, better social infrastructure such as health specialist clinics, and better utilities, better eating and entertainment places, for instance, KTVs, pubs, night club, and luxury hotels and resorts. Moreover, the people of Srae Sangkum center also come to the provincial capital for sports competitions, and cultural and traditional celebrations such as Songkran festival.
- There are other five low-level centers in Mondul Kiri Province, including Memang, Srae Preah, Saen Monourom, Pu Chrey, and Bu Sra. These centers are small urban areas that provide basic facilities such as local market, stores (grocery, clothes, shoes, incenses, electronic devices, and some construction material), commune health centers, pharmacies and lower educational institutions. However, these centers have limited capacity to meet the needs of local people in their areas. As result, the people of these centers need to travel to the medium-level center or higher-level center in which they can access important facilities such as district and provincial administrative services, post office and better social infrastructure such as professional health and higher education , public and private financial institutions and variety of eating and entertainment places. Each lower-level center also plays its important role to support and provide its basic facilities to surrounding communes.



Map 32. Urban center classification in Mondul Kiri Province

Data sources: Administrative boundaries: PDLMUPCC, 2019 – Roads: PDOPWT, 2018 – Land use systems, settlements and urban centers: CWG, 2020

2.8.4 Economic development poles

2.8.4.1 Cross-border

The province shares the border with Vietnam (Dak Lak, Dak Nong and Binh Phuoc provinces) to the southeast with a total length of 312 km. Previous cross-border cooperation was not easy but now it is better. There are 4 International border crossings within the province to Vietnam:

- La Pha Khe, (major) in Kaev Seima
- Dak Dam, (major) in Ou Reang
- Nam Lear (under development) in Pech Chreada
- Kaoh Romyearl or Ji Meat (unpaved road) in Kaoh Nheak

Laos is accessible by road through Ratanak Kiri and Stung Treng. In terms of trade, Mondul Kiri imports agricultural products, vegetables, machinery and construction materials; and exports timber, coffee beans, rubbers, peppers, and other raw materials to Vietnam, through 2 major checkpoints at Dak Dam, while La Pha Khe close to Kaev Seima market allows locals to sell their products easily. Over the years, maintaining a good relationship with Vietnam has seen an advantage which generates employment opportunities and economic growth in the province.

2.8.4.2 Tourism development

As a sparsely populated area, Mondul Kiri is a city gateway destination. Mountainous regions and lush green rolling hills provide this province with a breathtaking landscape. Mondul Kiri has abundant natural resources including protected areas, forest, wildlife, as well as upland agrarian landscape. Additional to these natural resources, the indigenous people also become another attractive destination for national and international tourists who can visit their community, to immerse in indigenous culture and to try their traditional food and wine.

These potential tourist attractions have captivated both national and international tourists. Tourism now becomes a key driver of socio-economic development for the province. In 2017, Mondul Kiri received a total of 114,349 tourists (102,590 Cambodian and 11,759 foreigners), an increase of 14 percent compared with 2013 (MoT, 2018).

Tourism has always been a major development sector and is considered as a green industry for this province because it generates jobs, and creates business activities for small or medium enterprises such as transportation, hotels, guesthouse, resort, restaurants, coffee shops, and other informal economies.

Mondul Kiri province has 15 tourism attraction sites that can be divided as ecotourism, ecotourism with built-up infrastructure, eco-and cultural tourism, cultural tourism, agro-tourism, and religious tourism. These attraction sites are managed by private companies (47 percent), community (33 percent), and public (20 percent). In addition, these tourism attraction sites, Mondul Kiri province also has many potential places that can be promoted as the tourism sites (Annex 11).

The tourism attractions are concentrated around Krong Saen Monourom and in Pech Chreada district, and Ou Reang (Map 33). Krong Saen Monourom is the primary destination for tourists due to the variety of tourist sites around the city. These include Phnom Doh Kromom and Sea Forest. Krong Saen Monourom also provides facilities that support tourism including administrative offices, social infrastructure, access to transportation and financial institutions, a selection of eating and entertainment venues and small or medium business activities. Most tourist sites of Saen Monourom are not located in protected areas, except Chrey Yo which is located in the biodiversity corridor.

In Pech Chreada district, Bou Sra waterfall, Ou Phlay, and Dah Ey are the main eco-tourism sites. Busra waterfall, managed by a private company, is one of the country's most impressive falls. It is 43 kilometers or about 45 minutes journey northeast of Mondul Kiri provincial town. The road still requires

a lot of attention¹⁴. Most of the tourists do not stay overnight at Pech Chreada district or Bou Sra commune because of limited facilities. Most of the tourists need to come and stay at Krong Saen Monourom instead.

Ou Reang District also has many eco-tourist sites including Romear Waterfall, Chrey Thom waterfall, Laeng Khin Laeng Ang Waterfall, and Hilltop Observatory & Resort which are choices for local people, national and international tourists to come and enjoy natural landscape views and waterfalls. The Chrey Thom Waterfall is one of the loveliest tourist attractions in Mondul Kiri that can be accessed by the red pebble path. The provincial tourist service is working with the local authority to prepare this site as a tourist destination in place of Bou Sra waterfall, which is inaccessible during the rainy season¹⁵.

However, some ecotourism sites in Ou Reang, Pech Chreada, and Kaoh Nheaek district are located in the protected area (Dah Ey and Laeng Khin Laeng Ang Waterfall), biodiversity corridor area (Chrey Yos), and deciduous forest area (Phnom Kroul). Moreover, most of the potential tourism sites are also located in protected areas and biodiversity corridors. These ecotourism locations may have direct and indirect impacts on wildlife habitat, create landscape changes, increase the expansion of settlements, over-exploitation of forest resources, and wildlife disturbance. High settlement and population resulting from eco-tourism development will put additional pressure for the conversion of forests to cultivation and plantations that will have negative impacts on forests and species. In order to avoid these adverse impacts tourism development in the province needs to take into account key components including the development of tourism facilities, community participation, government and NGO cooperation, proper monitoring mechanisms, and effective enabling policies and legal frameworks.

2.8.4.3 Agro-industry and agro-processing

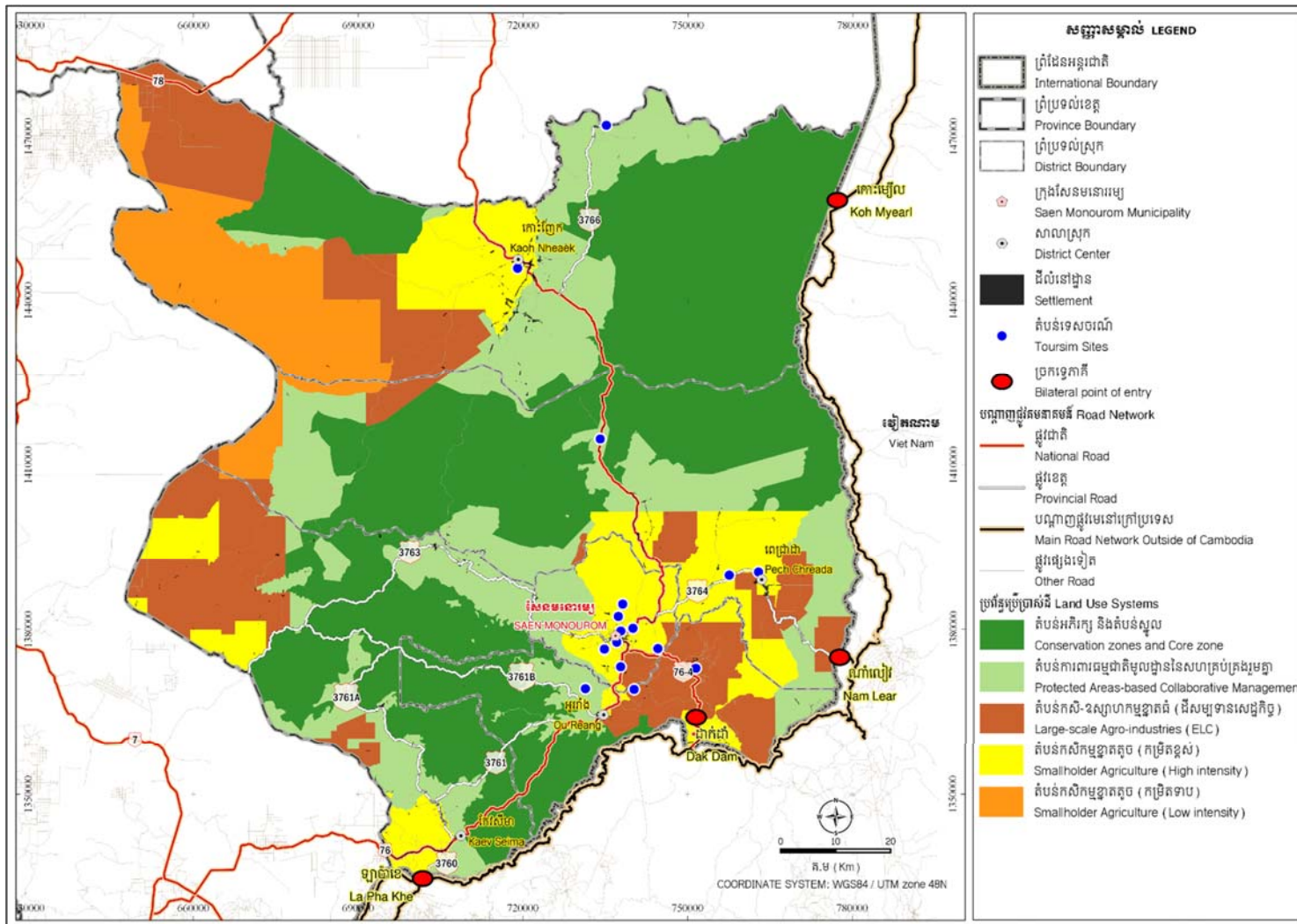
Mondul Kiri like Cambodia is predominately agriculture based. A large area of arable land and fertile soil makes it suitable for the agro-industry sector.

The province produces a notable amount of raw material such as rubber, cassava, pepper, maize and cashew nut. Yet with a high economic growth rate, the agro-industry consists of only 2 industries in Pech Chreada engaging in rubber production and a few SMEs that engage in coffee production. For cassava, pepper, and cashew nut traders purchase directly from farmers and sell to processors either in nearby provinces or to export depending on market demand and price.

Cambodia values the role of agro-industry and especially small and medium enterprises as key drivers of future growth.. However, there should be a mechanism to restructure policy to attract investors for the agro-industrial sector and food processing sectors.

¹⁴ https://www.tourismcambodia.com/travelguides/provinces/mondulkiri/what-to-see/192_bou-sra-waterfall.htm

¹⁵ https://www.tourismcambodia.com/travelguides/provinces/mondulkiri/what-to-see/110_chrey-thom-waterfall.htm



Map 33. Economic development poles in Mondul Kiri

Data sources: Administrative boundaries: PDLMUPCC, 2019 – Roads: PDoPWT, 2018 – Land use systems, settlements and cross-border points: CWG, 2020 – Tourism sites: PDoT, 2020

3 Envision the future

The provincial spatial plan of Mondul Kiri aims to give direction for the spatial development of the province until 2040. The spatial structure intended for the future has been elaborated based on the situation analysis, existing planning documents elaborated by provincial administration and line departments, and consultation with stakeholders (see annex 5).

The spatial planning team developed several scenarios to anticipate future development pathways and to identify the positive or negative implications of different development trajectories. The discussion with stakeholders led to the formulation of an overarching vision for the development of the province. The vision was further detailed into a strategy matrix structured along the four key elements of the spatial structure identified in step 2, namely the land use systems, the regional connectivity and road network, the economic development poles and the polycentric structure of urban centers. At this stage, the strategy matrix includes long-term goals and strategic objectives. It forms the basis to identify future spatial development strategies (step 4).

3.1 Scenario development

To get a sense and anticipate future directions for the development of the province (need and constraints), the spatial planning team developed several scenarios concerning land use, ecosystem services, demography, and climate change. The first set of scenarios relating to the land use and ecosystem services was developed in Mondul Kiri based on 2010 land use information and fieldwork conducted between 2014 and 2016 (Watkins et al. 2016). As these scenarios were created to support policymaking and provide information useful for land use planning, their results were directly integrated into the provincial spatial planning process. Demographic projections were developed based on different land use/eco-system services scenarios. Furthermore, two different climate change mitigation options were elaborated in line with nature conservation in wildlife sanctuaries and with smallholder agriculture.

3.1.1 Land use and ecosystem services scenarios

The development of scenarios related to land use and ecosystem services is primarily based on the work that WWF commissioned in 2015 to a research team of the Royal University of Phnom Penh and Royal University of Agriculture (Watkins et al., 2016). This research project is described by the authors as follows: *“During this research project, key stakeholders were invited to discuss and develop different future land-use scenarios. Scenarios were developed based on ‘storylines’ (or descriptions in which each different future scenario was imagined, visualized, and produced into a map) and were developed by stakeholders, including provincial-level government officials from Mondul Kiri and civil society representatives, in workshops facilitated by WWF and RUPP. Three different scenario maps have been developed as options for comparison of land-use change and its underlying impacts on future development, economic growth, conservation, and community livelihoods in Mondul Kiri province.”* (Watkins et al., 2016, p. 30). Based on the ecosystem services model designed by the authors and presented above, the research team evaluated the implication of the three different land-use trajectories on the ecosystem services of the province.

This study was based primarily on 2010 data and projected future land use and ecosystem services to the year 2030. To conform to the time horizon of the Provincial Spatial Plan of Mondul Kiri (2020-2040), the spatial planning team re-discussed these scenarios in 2020 and updated their implication with this new time horizon.

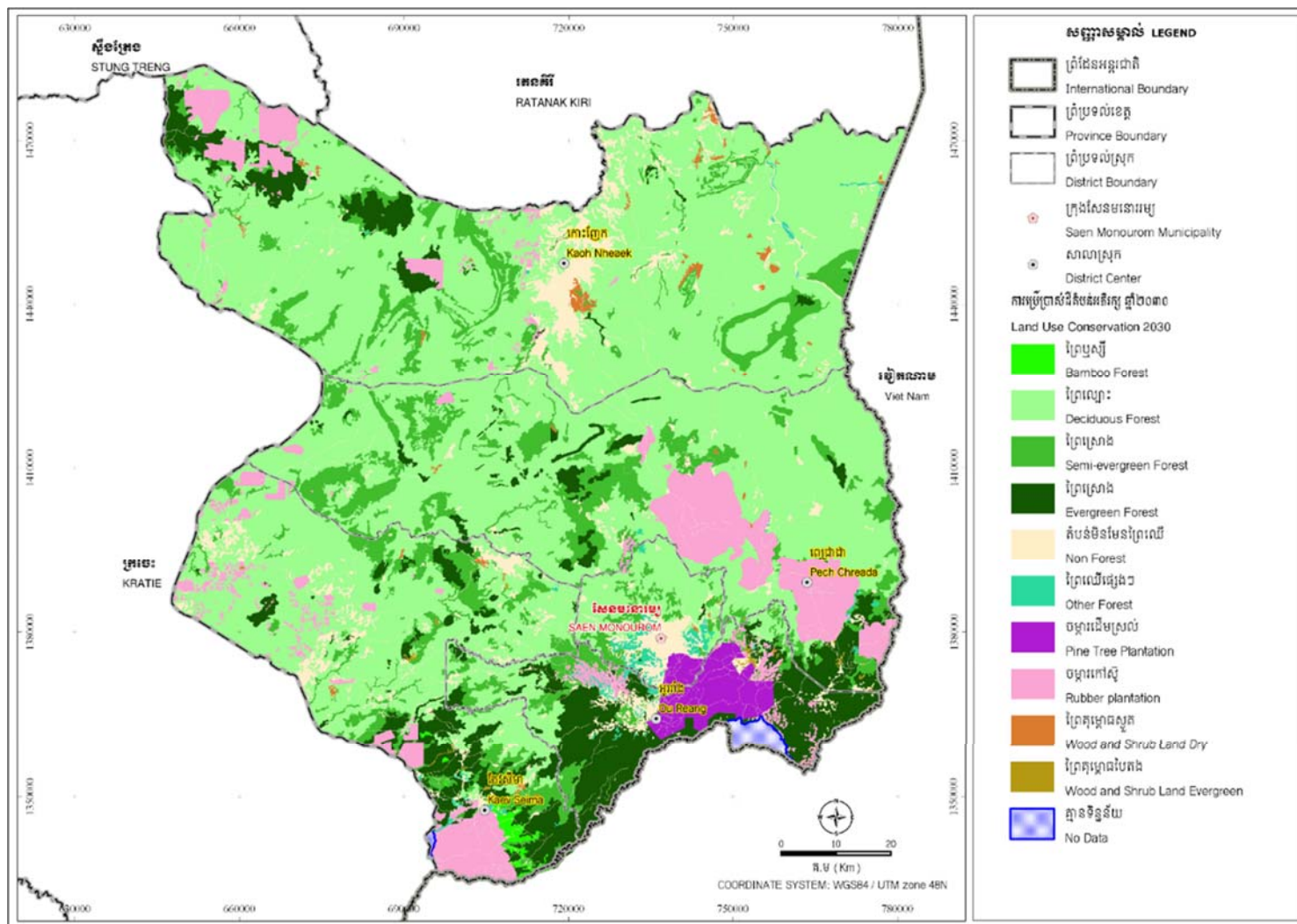
Conservation Scenario

The low deforestation or “conservation scenario” places a high value on the conservation of significant natural resources particularly those located inside the wildlife sanctuary and biodiversity conservation corridor. Most of the forest remains protected and the forest cover of Mondul Kiri

province will remain (85% of total provincial area) by 2030 (Watkins et al., 2016). According to this scenario, development activities (in particular ELC-based agriculture and mining operations) are allowed mostly in areas outside of wildlife sanctuary and biodiversity conservation corridors (Map 34). In terms of ecosystem service, the conservation scenario implies that ecosystem services hotspots are maintained outside the area that has already undergone significant development (rubber and tree plantation as well as mining extraction activities south of Saen Monourom city) (Map 35).

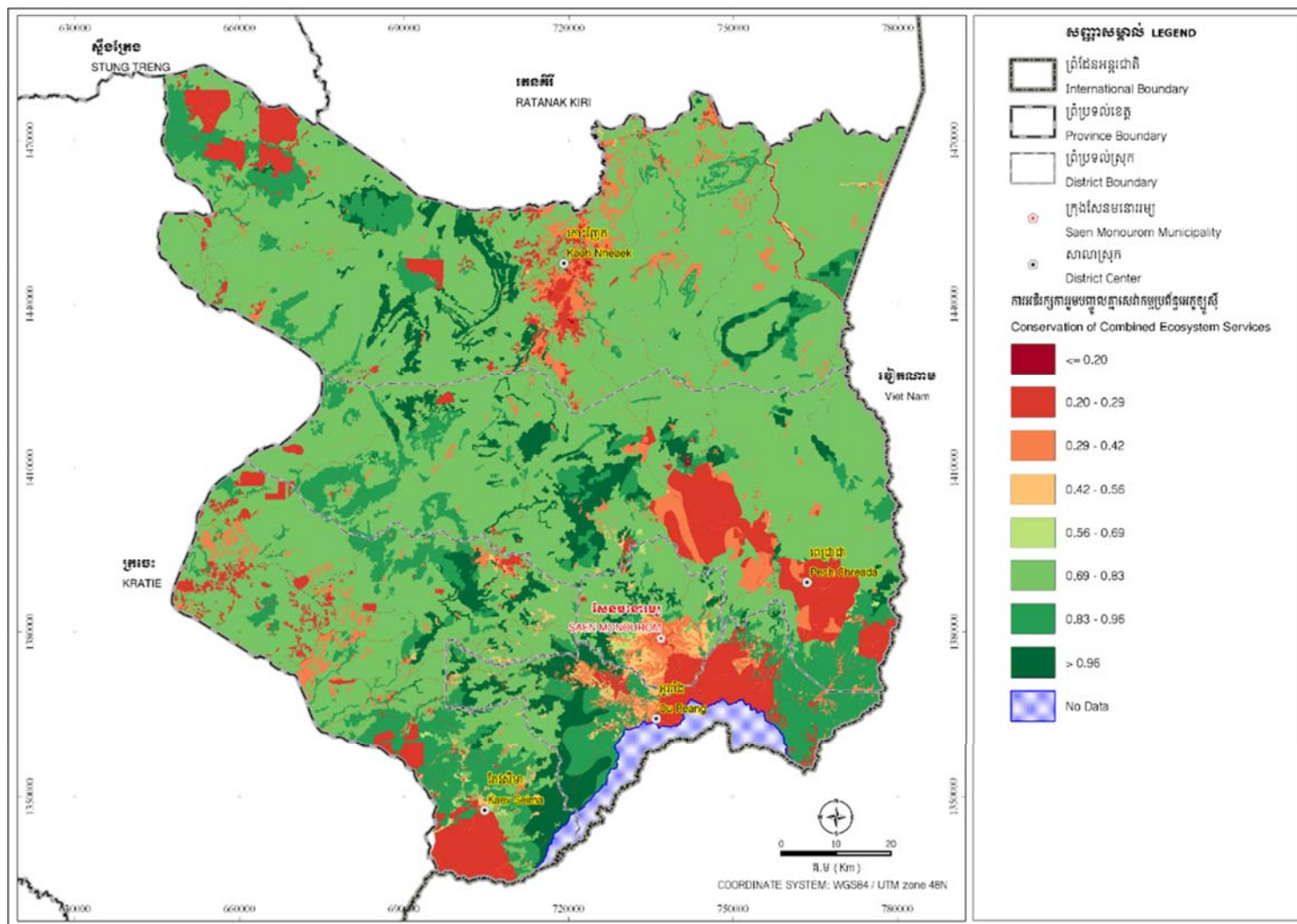
Also, financial incentives are assumed to be mobilized for the conservation of significant resources located within or adjacent to development areas (Watkins et al. 2016). This is particularly the case of eco-tourism areas that will generate revenue but will be harmoniously integrated into the overall protection efforts. This is also the case of areas earmarked for their cultural relevance and importance insofar for indigenous people communities.

The implementation of this conservation scenario comes with important trade-offs. First, conservation efforts are difficult to sustain given the strength of networks supporting illegal logging, forest clearance and intense poaching/snaring and because the demand forest resources remains high. As such, it is important to include local communities into the conservation efforts and provide them incentives to patrol and sustain their livelihood in areas outside core and conservation zones. This can be supported through the development of sustainable agricultural practices in community zones and commercially viable Community Protected areas (CPA) management in the sustainable use zone of wildlife sanctuaries. However, these efforts should not be limited to wildlife sanctuary as sustainable agriculture practices should be promoted across the province with other forms of natural resources co-management schemes such as community forestry, community fisheries and eco-tourism community are also part of these collaborative management efforts. As discussed in the Business as Usual scenario below, the maintenance of areas with high ecosystem service values are threatened by the development of mining activities, infrastructure and agro-industrial development. Specific attention and protection measures must be designed and implemented in these areas. This is not only for the sake of nature conservation but also because these activities are threatening economic, environmental and social sustainability and human well-being in general.



Map 34: Future land use in Mondul Kiri province (2030) based on the conservation scenario.

Source: Watkins et al. 2016. Mapping by the authors.



Map 35. Future ecosystem services in Mondul Kiri province (2030) based on the conservation scenario.

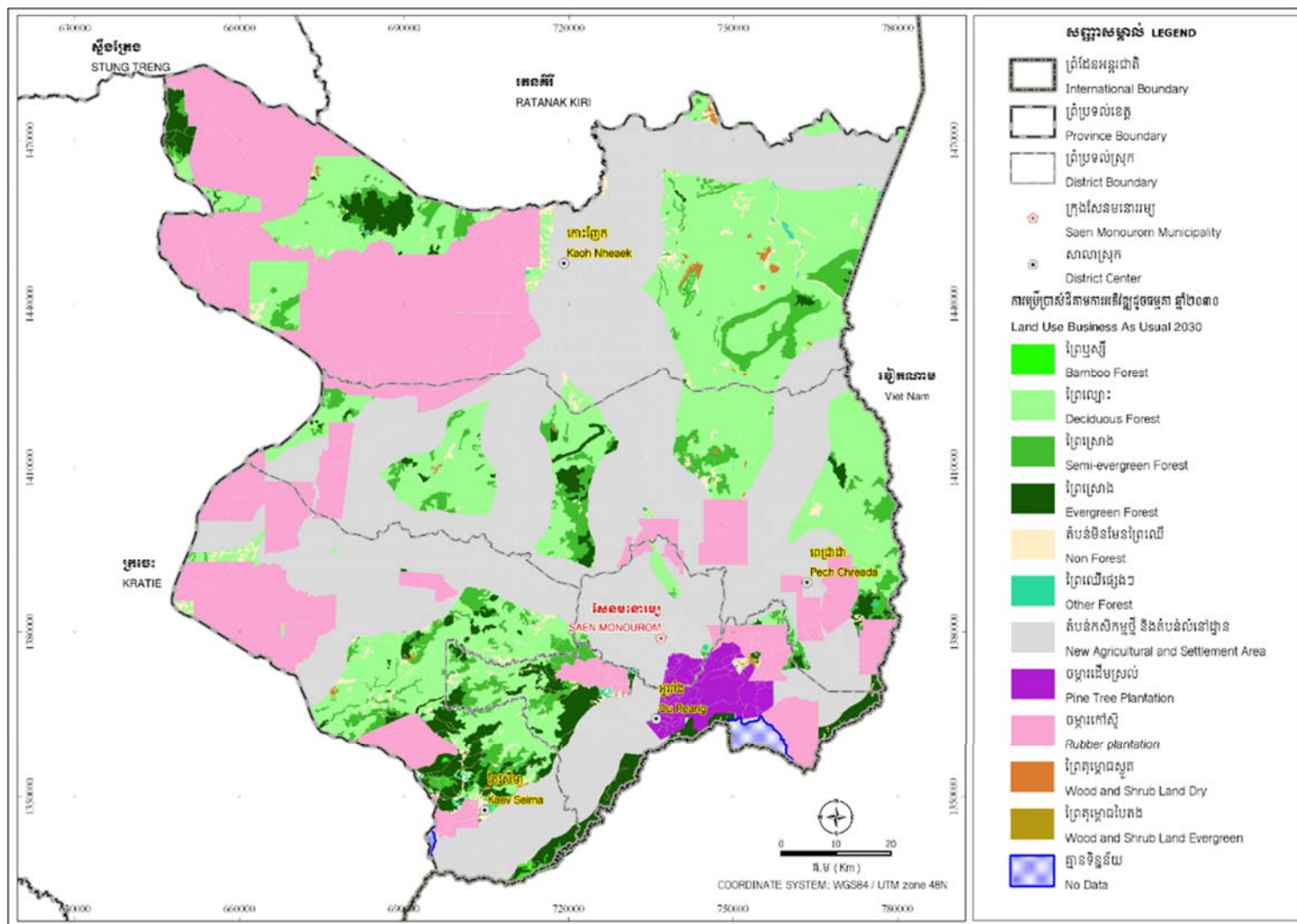
Source: Watkins et al. 2016. Mapping by the authors.

Business-as-Usual Scenario

This scenario assumes that development will follow its current trajectory, with weak governance and limited financial incentives for sustainable development. This scenario is realized through weak forest protection enforcement and a high rate of deforestation. According to this scenario, the forest cover in Mondul Kiri province will be 34 percent by 2030 as opposed to 92 percent in 2010 (baseline year) (Map 36). Forest inside and outside wildlife sanctuary and non-forest areas are a target for economic and agricultural development, in the continuity of existing trends, namely:

- Expansion of road network outside and inside wildlife sanctuaries, accompanied by linear urban sprawl along roads
- Expansion of Saen Monourom via the construction of a new airport in Ou Reang district
- Expansion agro-industrial plantations and mining activities, particularly the bauxite mining activities in the south-eastern part of the province
- Development of cross-border area as places of agro-industrial processing and trade
- The implication of this land-use trajectory on ecosystem services is obvious: Ecosystems services will be reduced to a low level, including inside protected areas (Map 37).

In the short run, these development trajectories are likely to generate quick and sizeable profits for the province or country, investors, existing population, and migrants. Part of the benefit of this growth will serve private interest and part of it may be invested in the provisions of social services to the population. This is what makes it very appealing to many stakeholders and difficult to prevent. However, the interest for a quick profit in the short run will have many long-term consequences and impacts. The productive potential for the development of the province will be eroded. This includes the provisioning services that support the livelihood for the local population, the supporting and regulating services given the key role of forest in watershed management, and the importance of sustainable soil conservation to sustain the agricultural potential of the province. As experienced in other parts of the world, the environmental, social and economic impacts caused by unregulated bauxite mining activities will be tremendous in the short and long run (Donaldson and Raahauge, 2016). The landscape will be less resilient in coping with the increased risk of floods and longer droughts; and local people will be using water that is likely to be contaminated by chemicals used in mining activities and harmful to fish, other aquatic life, and human health. These effects will only be exacerbated by climate change given the high vulnerability of Cambodia in this regard (Yusuf and Francisco, 2009). Not the least, it also damages the socio-cultural services insofar as the business-as-usual scenario threatens the ethnic diversity of the province which is one of its key features (see Step 2. Situation analysis) and it would undermine the potential of eco-tourism development which is one of the key pillars of the future development of Mondul Kiri province.



Map 36 Future land use in Mondul Kiri province (2030) based on the Business-as-Usual scenario.

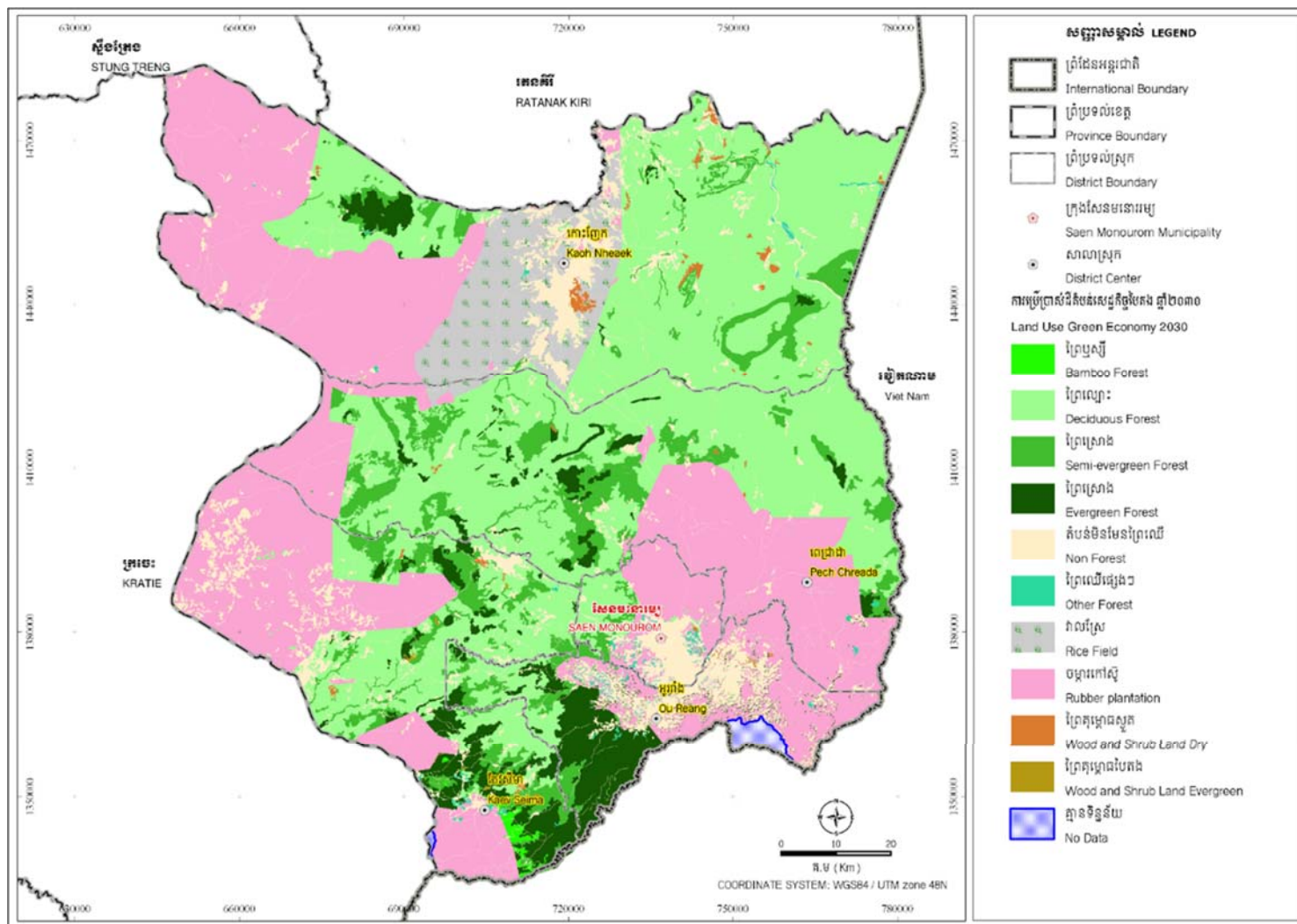
Source: Watkins et al. 2016. Mapping by the authors.

Green Economy Scenario

The green scenario lies in between the conservation and business as usual scenarios. It welcomes development but tries to strike a balance with the conservation needs. It assumes i) no forest loss inside the wildlife sanctuary and ii) that forest outside wildlife sanctuaries and non-forest areas are targets for different development efforts, including in the agricultural, transport, tourism sectors. In particular, it anticipates the expansion of the paddy rice field in Kaoh Nheaek district (Map 38). As a result, the forest cover in Mondul Kiri province by 2030 would be 53 percent as opposed to 92 percent in 2010 (baseline year) (Map 38).

As Map 38 shows, the scenario foresees spatially distinct and differentiated conservation efforts (in existing wildlife sanctuaries) and development (outside these areas). Impacts of these land use changes on the ecosystem services present similar contrast (Map 39). Yet, protection and development are not conceived as antagonistic. Protection is part and parcel of development efforts. In reverse, development should contribute directly to protection efforts. This is noted above in the conservation scenario for eco-tourism, cultural heritage development and the development hub between Saen Monourom and the future airport.

The green economy scenario requires a high level of effective stakeholder involvement and committed resources. While it recognizes the value of natural capital, it requires increased protection efforts in areas with high ecosystem services, through improved governance and adherence to the guidance of this provincial spatial plan. It requires enforcing conservation efforts in close collaboration with local communities and, at the same time, ensures a strong control over the development of agriculture following the principles of agro-ecological intensification. Environmental and social impact assessments are central to the success of this scenario, from the design to the monitoring and evaluation of any project that might impact land use.



Map 38: Future land use in Mondul Kiri province (2030) based on the “Green Economy” scenario.

Source: Watkins et al. 2016. Mapping by the authors.

3.1.2 Demographic projection

Demographic scenarios were established based on population censuses conducted in 1998, 2008, and 2019. From 1998 to 2008, the provincial population increased from 32,407 in 1998, to 61,101 in 2008 and to 88,649 in 2019 (Figure 9). In other words, the population of Mondul Kiri is low but has increased significantly over the last 20 years. However, the annual demographic growth rate¹⁶ has decreased gradually over the same period. Between 1998 and 2008 it was on average 6.34%.year⁻¹, whereas it was 3.4%.year⁻¹ between 2008 to 2019 (Figure 9).

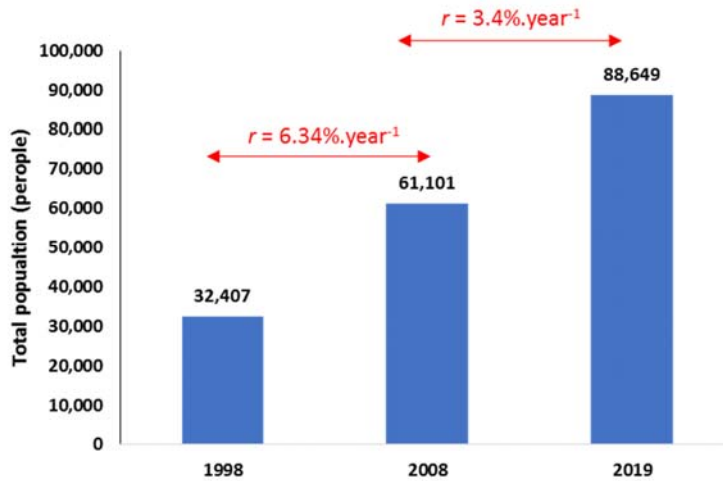


Figure 9: Evolution of population in Mondul Kiri province

Source: NIS, 2019

The reason why the demographic growth rate has declined is multifold and is best understood in the context of the demographic transition (Todaro, 2000). The early stages of the demographic transition in Mondul Kiri stretch from the early nineteen eighties (1980s) to the late nineteen nineties (1990s). During this period, the mortality rate - and particularly the infant mortality - rate fell very quickly while the fertility rate remains relatively high. This phase is associated with a rapid demographic natural increase. From the early 2000s to the present day, the infant mortality rate has continued to fall but less rapidly than the fertility rate. According to the National Institute of Statistics (NIS, 2010a), the infant mortality rate fell from 169 deaths per 1,000 live birth in 2000 to 156 deaths per 1,000 live birth in 2008, while the fertility fell from 6.3 births per woman in 2000 to 4.5 birth per woman in 2008. As a result, the natural increase of the population slowed down. By 2019, the annual demographic increase rate in Mondul Kiri was 3.2%.year⁻¹ (Figure 10), which is relatively higher when compared to the national average (1.36%.year⁻¹). This is due to an important influx of migrants into Mondul Kiri province over the last 20 years or so.

¹⁶ where r = Annual Demographic Growth Rate, P_0 = Population in year 0, P_t = Population in year t and t = Number of years elapsed

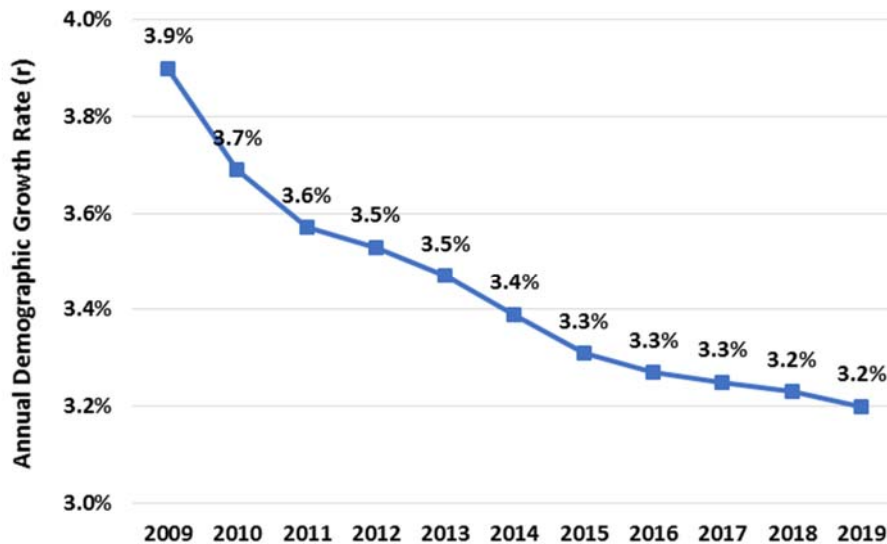


Figure 10: Evolution of the annual demographic growth rate in Mondul Kiri province.

Source: NIS, 2010b

As noted above, the growth of a population depends on multiple factors such as fertility rate, mortality rate or migration which are determined by the socio-economic and health situation on the one hand and the economic activities on the other. These different factors are now considered to project population figures for the planning period 2020-2040. In the context of the demographic transition observed, we assume the trends observed in fertility and mortality rates decline to continue and we integrate these trends in the computation of demographic projections. But given the preponderance of migration in the population dynamics, we identified demographic scenarios based on different land-driven and economic investments, the nature conservation efforts and urbanization levels that influence the evolution and the contribution of migration to the overall increase of the population. On the one hand, migration is encouraged by the economic development of the province such as agricultural land-driven migration by smallholder farmers, urbanization or an increase of wage labour opportunities in large-scale projects driven by new investments, etc. On the other hand, it can be discouraged by nature conservation efforts that will limit access to land inside protected areas and biodiversity conservation corridors. The five scenarios are described below and presented in Figure 11:

- S1: Strong control over in-migration:** according to this scenario, the migration influx into Mondul Kiri will be strongly controlled by effective conservation measures on protected areas and biodiversity conservation corridors. Along this trajectory, land-driven migration is reduced considerably, and the annual demographic growth rate in 2040 is expected to be 1.61%.year⁻¹.
- S2: Moderate control over migration:** according to this scenario, the migration influx into Mondul Kiri will be partly controlled by effective conservation measures on protected areas and biodiversity conservation corridors. Along this trajectory, land-driven migration is reduced moderately, and the annual demographic growth rate in 2040 is expected to be 2.11%.year⁻¹.
- S3: Unchanged trajectory:** the annual demographic growth rate will continue to decline following the trends observed since 2010. Along this trajectory, the annual demographic growth rate is expected to be 2.61%.year⁻¹ in 2040 (NIS, 2010b)
- S4: Pro-migration economic policy (moderate level of in-migration).** According to this scenario, in-migration is moderately promoted through policies such as ELC cancellation and land

redistribution to smallholders, labour-intensive tourism, etc.). Along this trajectory, the annual demographic growth rate in 2040 is expected to be 3.11%.year⁻¹.

S5: Pro-migration economic policy (high level of in-migration): in-migration is strongly encouraged through policies such as ELC cancellation and land redistribution to smallholders, labour-intensive tourism, or the development of agro-industries along with the future development hub created around the new airport. In this scenario, the trend of the annual demographic growth rate will reverse to increase again. In 2040, it would be expected to be in 2040 = 4.11%.year⁻¹.

The future population of Mondul Kiri province is then projected based on these five different trajectories¹⁷ (Figure 12). By 2040, the total population in the province would be multiplied by 1.64 according to the most conservative scenario and by 2.15 if the level of migration is the highest (Table 12). Based on the 2019 average household size of 4.2 people in 2019 (PDoP, 2020). This is equivalent to an increase of respectively 13,557 (S1) to 24,181 (S5) households in Table 12.

Table 12: Projected population of Mondul Kiri province by 2040.

	S1	S2	S3	S4	S5
Total population by 2040 (people)	145,589	153,030	160,868	171,878	190,208
Multiplier	1.64	1.73	1.81	1.94	2.15
Increase in population 2019-2040 (people)	56,940	64,381	72,219	83,229	101,559
Increase in population 2019-2040 (household)	13,557	15,329	17,195	19,816	24,181

Source: data computation by the authors

¹⁷ where P_t = Population in year t , P_0 = Population in year 0, r = Annual Demographic Growth Rate, and t = Number of years elapsed

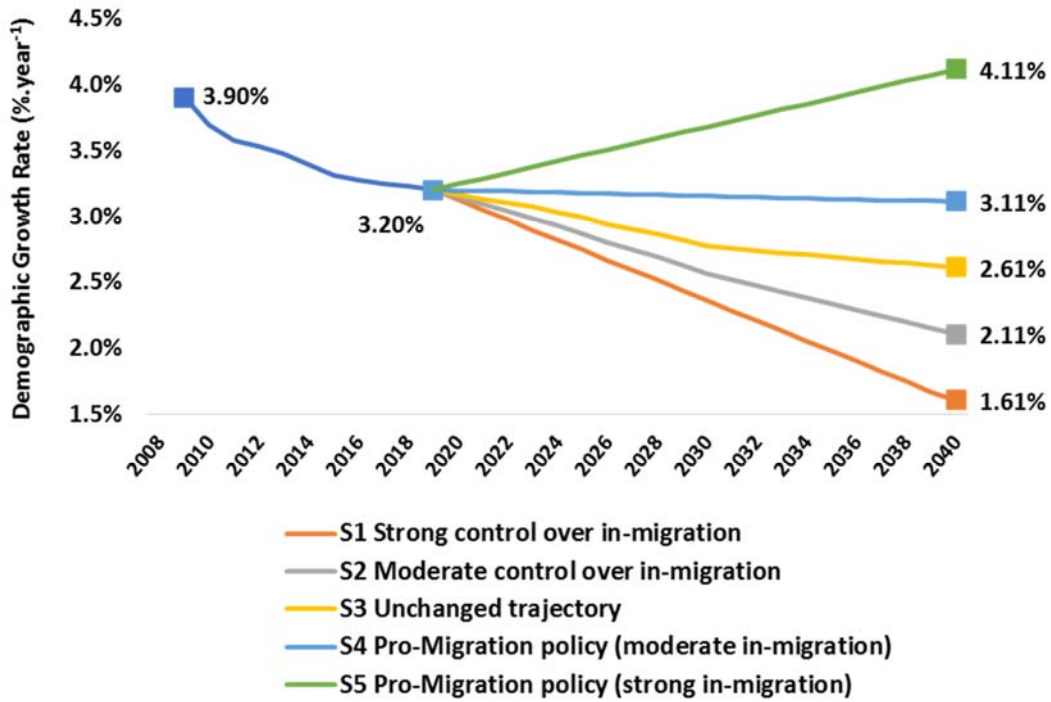


Figure 11: Projected evolution of the annual demographic growth rate based on 5 different demographic scenarios.

Source: Authors

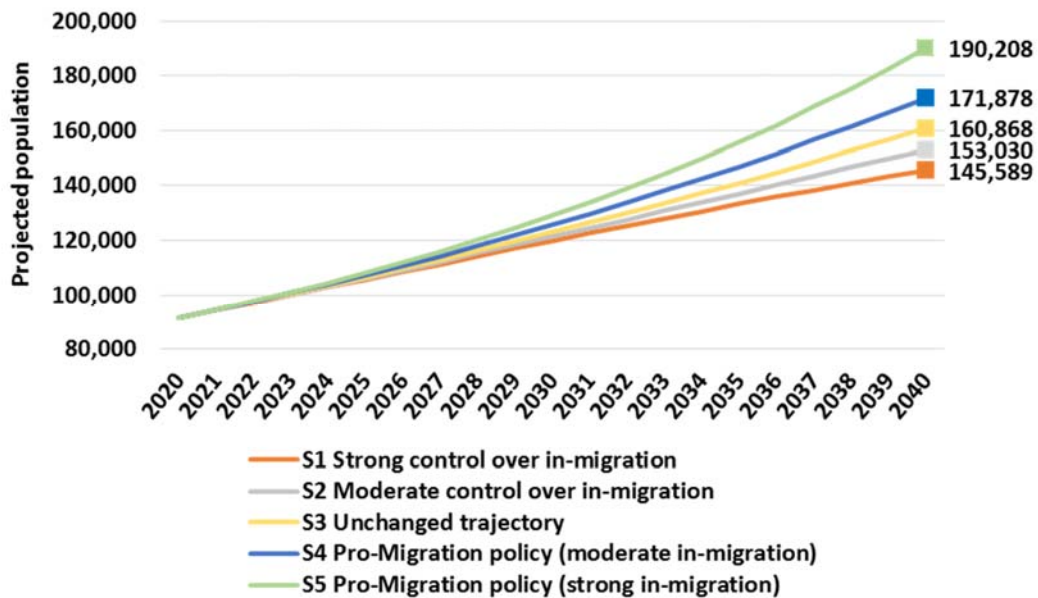


Figure 12: Projected evolution of the annual demographic growth rate based on 5 different demographic scenarios.

Source: Authors

Implications of demographic increase on the spatial development of Mondul Kiri province

The implication of this demographic increase to 2040 has a significant impact on the population in terms of employment, livelihoods, social services, and urbanization in general.

→ Agriculture

Assuming that the population will continue to rely primarily on agriculture, we can project the future need of agricultural land by 2040. This is based on two assumptions:

1. Based on the current employment rate in agriculture is 82% (see above), we have assumed that 80 to 70 percent of the household will need agricultural land to meet their livelihood need.
2. Two scenarios of land allocation to smallholder farmers: each household would need 3-5 ha to generate decent income agriculture to sustain their family livelihood.

The results of this projection are given in Table 13. These figures are indicative and cannot serve as an accurate basis for actual land allocation. They do, however, indicate the magnitude of the situation at the provincial level and help envisage the future. For the sake of this discussion, let's consider both extremes. In the case of high demographic increase (S5) combined with high reliance on agriculture (80 percent of employment) and an ambitious land allocation (5 ha/HH), the future need of land for smallholder farmers will be nearly 100,000 ha, approximately equivalent to 50 percent of the exiting agricultural area (see above). On the lower side, if the migration is controlled (S1) in conjunction with a lesser reliance on agriculture (70% of employment) and less ambitious land allocation (3 ha/HH), the future need for land will be 28,470 ha, 3.4 times less.

Table 13: Land needs projection for future population in Mondul Kiri province.

	S1 Strong control over migration	S2 Moderate control over migration	S3 Unchanged trajectory	S4 Pro-Migration policy (moderate in-migration)	S5 Pro-Migration policy (strong in-migration)
Increase in population 2019-2040 (people)	56,940	64,381	72,219	83,229	101,559
2019-2040 increase in population (HH)	13,557	15,329	17,195	19,816	24,181
Employment (80% of population in agriculture) (HH)	10,846	12,263	13,756	15,853	19,345
Agricultural land per household (5 ha/HH) (ha)	54,228	61,315	68,780	79,266	96,723 (upper figure)
Agricultural land per household (3 ha/HH) (ha)	32,537	36,789	41,268	47,559	58,034
Employment (70% of population in agriculture) (HH)	9,490	10,730	12,037	13,871	16,926
Agricultural land per household (5 ha/HH) (ha)	47,450	53,651	60,183	69,357	84,632
Agricultural land per household (3 ha/HH) (ha)	28,470 (lower figure)	32,191	36,110	41,614	50,779

Source: authors

Without a doubt, agricultural land will need to be allocated to smallholder farmers, and particularly in the northwest region (Kaoh Nheaek district) where population density remains low and migration movements are expected in the years to come. Detailed land use planning will be required to differentiate between new settlements, new agricultural land, and the area that should remain under protection.

However, given that wildlife sanctuaries and biodiversity conservation corridors place limitations to land access, it is also important to promote the agro-ecological intensification of agriculture to increase the yield on the same land area.

→ **Labor policy**

Whatever demographic growth scenario is envisaged, a key challenge will be the creation of jobs and the required skills.

First and foremost, an important share of the increasing active population will be involved in smallholder farming, as a self-employed farmer or wage labourer. The need for agricultural wage labour will rise as the volume of production in large-scale plantation increases. Agricultural support services will be required not only for the new generation of farmers but also for those already involved in the sector. As discussed later, skills that will be particularly required relates to agro-ecological intensification with a focus on techniques that enhance soil conservation and sustainable water management. The need to develop these skills is not limited to the small-scale family farming sector but also applies to the entire agro-industrial production sector.

With the continued development of agro-industrial production, the agricultural post-production industries will gain importance. This includes infrastructure and specific services and skills to store, package, and process agricultural commodities, principally those destined to export markets.

The challenge of job creation also concerns the non-farm sector that grows relatively faster (see above). Amongst the services that require special attention are those in the eco-tourism sector that emerges a future key development pillar for Mondul Kiri province (see below).

→ **Nature conservation efforts**

Measures to control in-migration need to be strict if S1 and S2 are to be followed. This requires strong collective efforts from various stakeholders. However, past experiences have shown that migration control is not easy to achieve given the spontaneous and relatively uncontrolled nature of these migration movements (see above). On the other hand, the establishment of new settlement areas in the core and conservation zones is prohibited (see the zone conservation system in the land use system map). As a result, it is important to conduct more detailed land-use planning in the community zone of each wildlife sanctuary to accommodate the future need for settlement and agricultural land for an increasing population.

→ **Urbanization and provision of social services**

The increase of population will put pressure on existing social services that are crucial to the population (schools, health services, etc.). The construction of new infrastructures or the expansion of existing ones is required and planning about future functions of urban centres will need to take this into account.

Likewise, the population increase will create new demand for settlement land. And given the limit to land access placed by protected areas, it is important to envisage urban expansion around the existing centres (the compact approach) rather allowing for the expansion of settlement along the road (the spread or linear approach), which will create urban sprawl into agriculture and wildlife sanctuaries areas.

3.1.3 Climate change vulnerability and mitigation and adaptation options

Land and land-based activities are simultaneously contributing to and influenced by climate change, making it hard to separate anthropogenic from natural CO₂ fluxes (IPCC 2019). Land use and land-use change are thus a critical interface for the mitigation of and adaptation to climate change. The IPCC special report on climate change shows that warming associated with climate transformation has resulted in an increased frequency, intensity, and duration of heat-related events, including

heatwaves in most land regions (IPCC, 2019). According to the authors of the report the “*frequency and intensity of droughts have increased in some regions and there has been an increase in the intensity of heavy precipitation events at a global scale*”. They add that “*climate change can exacerbate land degradation processes including through increases in rainfall intensity, flooding, drought frequency and severity, heat stress, dry spells*” (IPCC, 2019, page 8). These direct effects of climate change materialized in conjunction with other circumstances that pertain to the political, economic social environments in which farmers and forest users are embedded. Thus vulnerability to climate change impacts cannot be understood in isolation but needs to be examined in a systemic approach concerning other drivers of change (Diepart 2015).

Some land-based activities that contribute to climate change adaptation, mitigation, and sustainable development have been already tested. These options include, but are not limited to, sustainable food production, improved and sustainable forest management, soil organic carbon management, ecosystem conservation and land restoration, reduced deforestation and degradation, and reduced food loss and waste. These response options require the integration of biophysical, socioeconomic, and other enabling factors. The successful implementation of response options depends on consideration of local environmental and socio-economic conditions, namely the concerted, transparent and accountable political will of key governance, social and economic actors interacting in decision making and implementation in Mondul Kiri province. Given the site-specific nature of climate change impacts on food system components and wide variations in agro-ecosystems, adaptation and mitigation options and their barriers are linked to the environmental and cultural context at regional and local levels (IPCC 2019).

Vulnerability to climate change in Mondul Kiri province

In Mondul Kiri, climate change is predominately felt through extreme weather events such as drought, flood, fungal diseases and insect infections on crops. An assessment conducted by Thuon and Sumaylo (2009) reveals a high level of vulnerability to flooding and drought in Mondul Kiri indicated by high exposure and sensitivity. The authors show that drought and flooding are both increasing in frequency and duration and have negatively impacted crop outputs and quality in numerous villages across the province and affect the food security of the local population. The general perception in Mondul Kiri is that deforestation and land use change are driving an increase in the intensity and frequency of these hazards.

Options for climate change mitigation and adaptation

In this section we explore two different options for climate change mitigations. Both exist in Mondul Kiri province and we discuss the potential and risks associated with their scaling up.

Agro-ecology

Agro-ecology combines environmentally-friendly technical solutions allowing farmers to reconcile productivity with low pressure on the environment and sustainable management of natural resources. It takes into account interactions between the soil, water, plants, animals, and the landscape to integrate the activity into its environment (Agri-Sud, 2010). As such, it encompasses a group of agricultural practices such as conservation agriculture, integrated farming/home gardening / VAC, organic agriculture, the system of rice intensification, Integrated Pest Management, and agroforestry (Castella and Kibler 2015). Altogether, these practices render agricultural systems more resilient to the impacts of climate change and, at the same time, mitigate the contribution of agriculture to climate change. It opens the way for more sustainable and efficient intensification than conventional farming systems which have gradually homogenized towards a more external-input dependent agricultural environment.

The scope of agro-ecology goes well beyond the adaptation and mitigation of climate change (Côte et al., 2019). It offers a set of practices that limit the pressure on land and natural resources. It is knowledge-intensive and gives value to local knowledge of farmers about the particular biophysical and socio-economic environment. By combining more affordable practices, reducing the costs of production, and encouraging the use of locally available resources as well as simple agricultural techniques, it limits indebtedness, production costs, dependence on suppliers, collectors, creditors. In short, agro-ecology is a source of resilience at multiple levels (from landscape to household and plots level). This is why agro-ecological intensification will be a key strategic development direction in the provincial spatial plan of Mondul Kiri province.

However, the development of the different practices grouped under the term agro-ecology is different from conventional agriculture based on tillage and chemical inputs. It requires professional and sustained support, thus a commitment from state and non-state supporters. Solid extension services are needed along with pilot farms and experimentation fields to showcase innovative agro-ecological practices and nurture farmer-to-farmer learning.

REDD+

The Kaev Seima Wildlife Sanctuary REDD+ (see chapter 2) project is the largest carbon emission reduction program in Cambodia's land-use sector (<https://seimaredd.wcs.org/>). It has been a test site for a national framework for selling carbon credits.

Yet, the Kaev Seima is subject to dynamic deforestation and it is difficult to maintain carbon credits under such conditions (Mahanty et al., 2015). A similar dynamic of deforestation, yet less intensive, occurs in other wildlife sanctuaries and implies that the establishment of REDD+ in these areas would be confronted with the same difficulty.

As Ken et al. (2020) show in the case of Kaev Seima, REDD+ can provide some benefit. But the long-term success of REDD projects in Cambodia requires maintaining sustained carbon financing to ensure continued benefit for local communities. This is seen as a necessary condition for the success of the scheme. As a result, the scarcity of carbon-credit buyers and the inability of the REDD+ to generate carbon-based revenues result in dissatisfaction among local communities, which further induce illegal logging activities (Ken et al. 2020).

In reality, the unpredictability of carbon-based revenues and volatile carbon markets is the norm rather than the exception. In these circumstances, it is important to create alternative sources of income through various REDD+ project activities such as investment in sustainable agriculture, production of efficient cooking stoves, renewable energy for rural electrification, eco-tourism, and social enterprises for NTFP for online or offline sales. With sustainable income from any of these investment opportunities, local communities are likely to focus on forest protection and enable a functioning REDD+ scheme.

3.2 Vision

This vision represents a future ideal state of development for the province that can and should be accomplished within the time horizon of the Provincial Spatial Plan (2040).

During the different consultation workshops and meetings conducted at the provincial and district levels to discuss different development scenarios and associated trade-offs (see detail in chapter 1), there was a wide consensus to consider both economic development and nature conservation goals and to strike a balance between both. Development goals include the intensification of agricultural activities on smallholders and large plantation land, the development of Mondul Kiri as a growing transport and economic hub in the CLV triangle, and the promotion of eco-tourism. For a good part, these efforts generate numerous jobs and employment for population and thereby gearing towards poverty reduction. Conservation goals include more efficient management of wildlife sanctuaries and close monitoring and evaluation of large scale projects and their impact on ecosystems (economic

land concession, areas licensed for mining operation, hydropower, airport project, etc.). However, these goals are not antagonistic. Environmental sustainability should be directly integrated in the planning and implementation of any economic development effort and economic incentives are important to sustain nature conservation efforts. These efforts, in turn, contribute to not just adapt to but also mitigate climate change, which is a global concern.

A green economy scenario stands out as the way forward. It combines development efforts focused on the collaborative conservation of wildlife sanctuaries, sustainable agriculture as well as the promotion of culturally responsible eco-tourism. These key elements are embodied in the following vision statement:

“Mondul Kiri province is a vibrant and dynamic green economic development center based upon its rich and diverse culture and nature, enhancing the nation’s northeast development pole, following livable and orderly spatial development directions, and thereby promoting the development of ecological and cultural tourism that provide sustainable economic, social and environmental benefits to its ethnically diverse population, visitors and investors”

Five main pillars are constitutive of this vision (Figure 13):

- **Collaborative protection and management of ecosystem services**

Mondul Kiri is endowed with a wealth of natural resources that provide a considerable amount of natural, economic, social, and cultural services that are essential for the sustainable development of the province. The institutional framework set up to manage these assets benefits from the support and the collaboration of various stakeholders and places local communities as key actors in these conservation efforts. Forest conservation is also part of Cambodia contribution to mitigate climate change.

- **Eco-tourism that respects the environment and ethnic diversity of the province**

The environmental and cultural distinctiveness of Mondul Kiri is a solid foundation to nurture the development of tourism. The diversity of the forest and agrarian landscapes as well as the cultural distinctiveness of the province is a key asset to develop the sector. At the same time, environmentally and culturally responsible tourism is essential to preserve the uniqueness of the province.

- **Sustainable agricultural development that respects biodiversity and the interests of smallholder farmers**

Enabling the development of the export-oriented, capital intensive agro-industrial sector (ELC and privately-owned middle-scale plantations) and the growing family-scale smallholder agriculture is crucial for the province. Both sectors shall co-evolve through responsible and mutually advantageous partnerships. The pathway shall follow the principle of agro-ecological intensification that allows for the increase of production and productivity, the preservation of natural assets such as soil and water, and enhance the resilience of households and farmers' livelihood in times of climate uncertainty.

- **An active northeast pole of the nation that links with the CLV regional economic integration**

Mondul Kiri province is located in the economically dynamic Cambodia, Laos and Vietnam (CLV) triangle development area and as such contributes to regional economic integration efforts through the provision of transport services, the production of high quality agricultural products the development of light industry based on knowledge, technology and innovation, digital business promotion and as a trade route between Vietnam and the region.

- **Urbanization that raises the value of the nature and its landscapes**

In a context of economic growth and a high rate of in-migration the increase in the future urban population in the province will put pressure on land infrastructure, and services. In this regard

current and newly emerging urban centers need well-structured plans to avoid undesirable sprawl and ad-hoc development patterns. In response to this challenge planned urbanization is necessary to guide future spatial development and to ensure that additional sector development, urban centers and settlements are more livable and sustainable. Promoting green urban development will also reduce the green-house gases and limit the impact of urbanization to climate change.



Figure 13: Representation of the Development Vision for Mondul Kiri 2020-2040

To realize this vision, a core foundation underlying the design, implementation, and monitoring of relevant activities, projects and -programs consists of the development and enhancement of human capital of State and non-State institutions. This centers on the principles of Good Governance. Decentralization and de-concentration reforms shall be implemented in a transparent, fair, democratic, and legal manner. This requires effective and representative multi-stakeholder participation comprised of community-based organizations, government agencies, civil society, the private sector, and the general public. Innovative public-private regional management partnerships will be established and acknowledging the diverse rural communities as the central actors of local development.

3.3 Long-term development goals and objectives

Long-term development goals (LTDG) are identified to achieve the vision by 2040. They situate the intended spatial development and structure of the province in relation to the key elements of the spatial structure identified earlier (see section 2: Situation analysis). Each Long-Term Development Goal is realized through meeting certain specific objectives (Figure 14).

3.3.1 LTDG 1: Attain sustainable biodiversity conservation and people's livelihood development in protected areas systems (wildlife sanctuaries and biodiversity corridor)

The core challenge for developing land use systems is to strike a balance between strengthening nature conservation efforts and supporting the development of sustainable livelihoods in protected areas. Addressing the trade-offs between conservation and development is based on the assumption that providing forest dwellers with livelihood development opportunities will increase forest protection. At the same time, it is necessary to address the negative impacts that might arise from large-scale state-sponsored projects such as mining, major infrastructure development, hydropower etc. This will be articulated around the following three spatially distinct objectives:

Objective 1.1: Enhance sustainable conservation in wildlife sanctuaries and biodiversity conservation corridors

Objective 1.2: Limit the negative economic, environmental and social impacts of large scale state sponsored development projects

Objective 1.3: Support the development of education centers that promote learning and research about biodiversity and sustainable conservation in Mondul Kiri

3.3.2 LTDG 2: Enhance ecotourism development linked to community-based natural resources management

The economic potential of Mondul Kiri province is linked to its unique biodiversity assets, rich local culture and its position in the CLV region. In this context, Mondul Kiri province is uniquely positioned to become an eco-tourism pole that could attract domestic and international visitors. In pursuit of this goal, two spatially objectives are articulated as below:

Objective 2.1: Strengthen eco-tourism development with linkages to sustainable natural resources management and cultural preservation

Objective 2.2: Support the development of vocational training centers that promote tourism products and services based on local resources

3.3.3 LTDG 3: Promote sustainable agricultural development for smallholder farmers as well as community-based natural resources management outside protected areas

To prevent the farmers in Mondul Kiri from expanding inside wildlife sanctuaries including providing the essential conditions to make a viable living from agriculture. The key to this approach lies in three complementary objectives:

Objective 3.1: Promote sustainable agriculture development for smallholder farmers

Objective 3.2: Promote responsible large scale agro-industrial development that seeks mutually advantageous relationships with smallholder farmers

Objective 3.3: Enhance community-based natural resources management outside the protected area system

3.3.4 LTDG 4: Strengthen the role of Mondul Kiri province in the national development and the regional economic integration

Mondul Kiri province has a role to play as a pole in supporting the development of the Northeastern region of Cambodia and the dynamic CLV triangle. A key aspect of these efforts, the development of transport infrastructure, must also meet the need of the local population and limit the impacts on nature protection. It also includes the development of cross-border gates and industries based on agricultural production or other potentials offered by the province. There is also a need to develop a strategy for the province to take advantage of economic and tourism development from strengthening and connecting the transport network of the Kingdom of Cambodia with the Greater Mekong Subregion's Transport/Economic Corridors (Central, Southern and Southern Coastal Corridors) and with the communication network of the Cambodia-Laos-Vietnam Development Triangle. This will be articulated around three spatially distinct objectives as follows:

Objective 4.1: Promote transport infrastructures and mobility to enhance accessibility to public services for the entire population and to support the development of the CLV region

Objective 4.2: Promote the sustainable growth and planned development of cross-border areas as new growth centers that facilitates trade exchange with neighboring countries

Objective 4.3: Promote the sustainable growth and development of agriculture-based industries and other industries in potential areas and link transport networks and dry port areas to domestic and outside markets.

3.3.5 LTDG 5: Advance sustainable, inclusive, public service-oriented urbanization at multiple levels

Even if Mondul Kiri is primarily a rural province, urban centers are important places for people to access accommodation and support services. To minimize the impact of urbanization on natural resources (urban sprawl occurring along roads), it is crucial to envisage pro-active urban planning as a hierarchical network of low environmental impact urban centers. This will be articulated around the following three spatially distinct objectives:

Objective 5.1: Promote planned and sustainable urban development to address the increasing need of the population for public and private services and limit the impacts of urbanization on the environment

Objective 5.2: Enhance urban landscapes through the promotion of natural greenery systems and urban agriculture in main centers and surrounding areas

Objective 5.3 Ensure efficient and quality-oriented urban management and delivery of urban environmental services in line with urban growth and economic development

4 Spatial development strategies

Spatial development strategies chart specifically how to reach the overarching vision, long term development goals and objectives. For the sake of coherence and consistency one objective is formulated as one overall strategy. Each overall strategy consists of an articulated set of sub-strategies that include a set of activities to be implemented (Figure 14). As such, long term development goals, objectives, overall strategy, sub-strategies and activities form a nested structure that is organized in the strategy matrix (see below). Sub-strategies are made spatially explicit to understand and address the trade-offs inherent to choices being made.

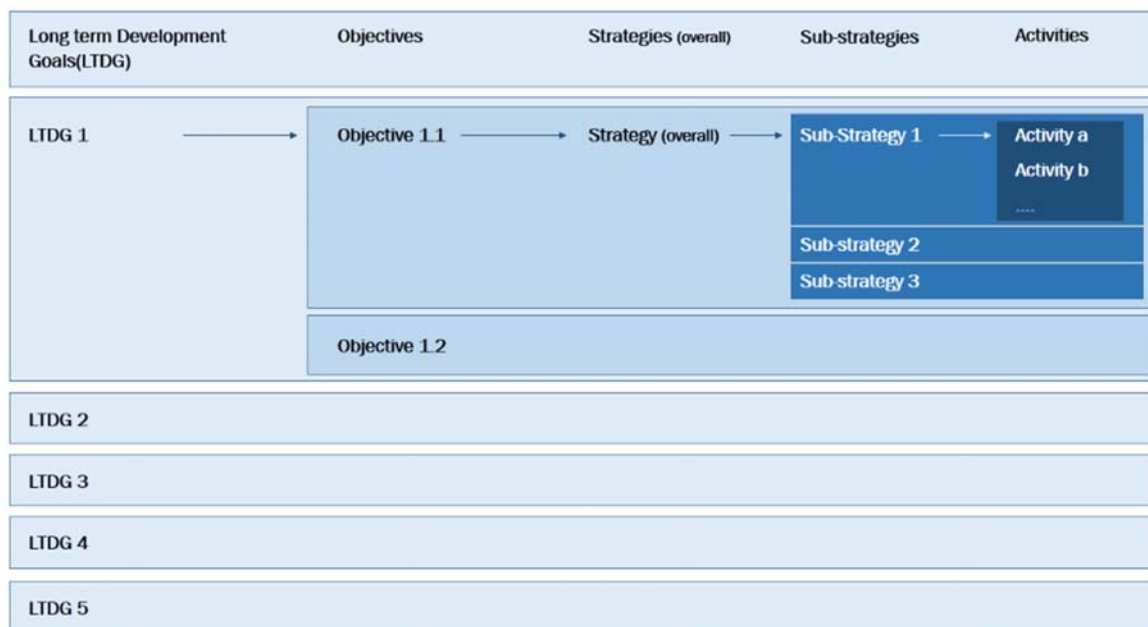


Figure 14: Nested structure of spatial structure element, long term development goals, objective, overall strategy, sub-strategies and activities

4.1 Overall strategy: Enhancing sustainable conservation in wildlife sanctuaries and biodiversity conservation corridors

The enhancement of conservation and community-based livelihood development in wildlife sanctuaries and biodiversity corridors is achieved through the implementation of complementary approaches. In conjunction with each other, they aim to reinforce forest protection inside the core and conservation zone of wildlife sanctuaries, mitigate forest fragmentation to preserve biodiversity and give livelihood incentives to local forest dwellers through the community in protected areas for the sustainable intensification of agriculture in community zones and biodiversity conservation corridors. This will encourage monitoring of forests and limit encroachment inside wildlife sanctuaries and biodiversity conservation corridors

4.1.1 Sub-strategy: Enhancing protection efforts in core and conservation zones in wildlife sanctuaries (conservation land use system)

- Clearly demarcate conservation areas with posts and numerous signboards. The boundaries of the core and conservation zones are not well known to people so this is a very important

activity. The key here is to display a significant number of signboards all around the core and conservation areas.

- Conduct zonation of the Phnom Namlear wildlife sanctuary (core and conservation zones)
- Proceed with registration of all Public and Private State land located within Wildlife Sanctuary (core and conservation zones)
- Strengthen the cooperation between technical line departments, park rangers, provincial, district and commune authorities, and local communities concerning all natural resources management and protection activities
- Strengthen forest conservation through a REDD+ initiative. Conduct feasibility study to establish REDD+ project in Phnom Prich and Sre Pok wildlife sanctuary. It is key here to learn from the experiences of the REDD+ project in Kaev Seima under the leadership of WCS.
- Conduct public awareness campaigns on illegal activities, wildlife trade, wildfire, and biodiversity conservation (village sound speakers, village and community outreach meetings, social media, posters, maps at the key entrance and exit of protected areas, advertisement in restaurants concerning the consumption of bushmeat.
- Develop modern technology for surveillance of illegal activities (CCTV, Drone)
- Monitor and patrol for illegal forest activities inside core and conservation zones. This includes the preparation of firefighters and equipment (local authorities and relevant departments)
- Create bridges/corridors/tunnels to connect fragmented areas of core and conservation zones. This is particularly important to connect Sre Pok with Phnom Prich Wildlife Sanctuaries and Phnom Prich with Kaev Seima Wildlife Sanctuaries (see Map 40). There are two types of bridges: flyovers or underground (the underground tunnel is the preferred choice).
- Implement specific protection measures in ecological hotspots located inside core and conservation zones.
- Build capacity and provide on-the-job training for patrol techniques, planning and modern technology to government rangers

4.1.2 Sub-strategy: Promoting community-based forest management and agro-ecological intensification in sustainable use and community zones in wildlife sanctuaries (collaborative management land use system)

- Conduct zonation of the Phnom Namlear wildlife sanctuary (sustainable use and community zones)
- Enhance sustainable forest management through Community Protected Areas (CPA) for forest protection and community-managed commercial forestry (timber and non-timber forest products). In addition to consolidating boundaries and management of all existing CPA, the creation of new CPA could be envisaged in two different areas where there is potential to do so (Map 40)
- Clearly demarcate sustainable use zone with posts and numerous signboards. As in the case of core and conservation zones, the boundaries of sustainable use and community zones are not well known to people. The key here is to display a significant number of signboards
- Produce a detailed and legally-binding land use plan for the community zone to differentiate future areas for agriculture, settlements, and forest protection (Map 40)
- Proceed with registration of all Public and Private State land located within Wildlife Sanctuary including registration of Communal Land Title of indigenous peoples (sustainable and community zones)
- Promote ecological intensification in community zones via practices such as no-tillage agriculture, permanent cover crops, and reduce the use of chemicals and inorganic fertilizers (Map 40). The key here is to manage soil fertility and water resources for sustained agricultural development.
- Develop water storage and affordable irrigation systems along watercourses to store water and tackle droughts. Water storage can also be used to help mitigate flooding. In both cases, they help to mitigate the impacts of climate change.

- Implement specific protection measures on ecological hotspots located inside sustainable use and community zones
- Provide comprehensive training on sustainable agricultural techniques to smallholder farmers on soil and water management, seeds production, agricultural equipment, marketing, etc.
- Promote sustainable consumption and production (SCP) practices in conjunction with Cambodia SCP roadmap being initiated by the Ministry of Environment and following agro-ecological principles to ensure healthy/safe food consumption and sustainable food production systems with least pressure on natural resources and the environment.

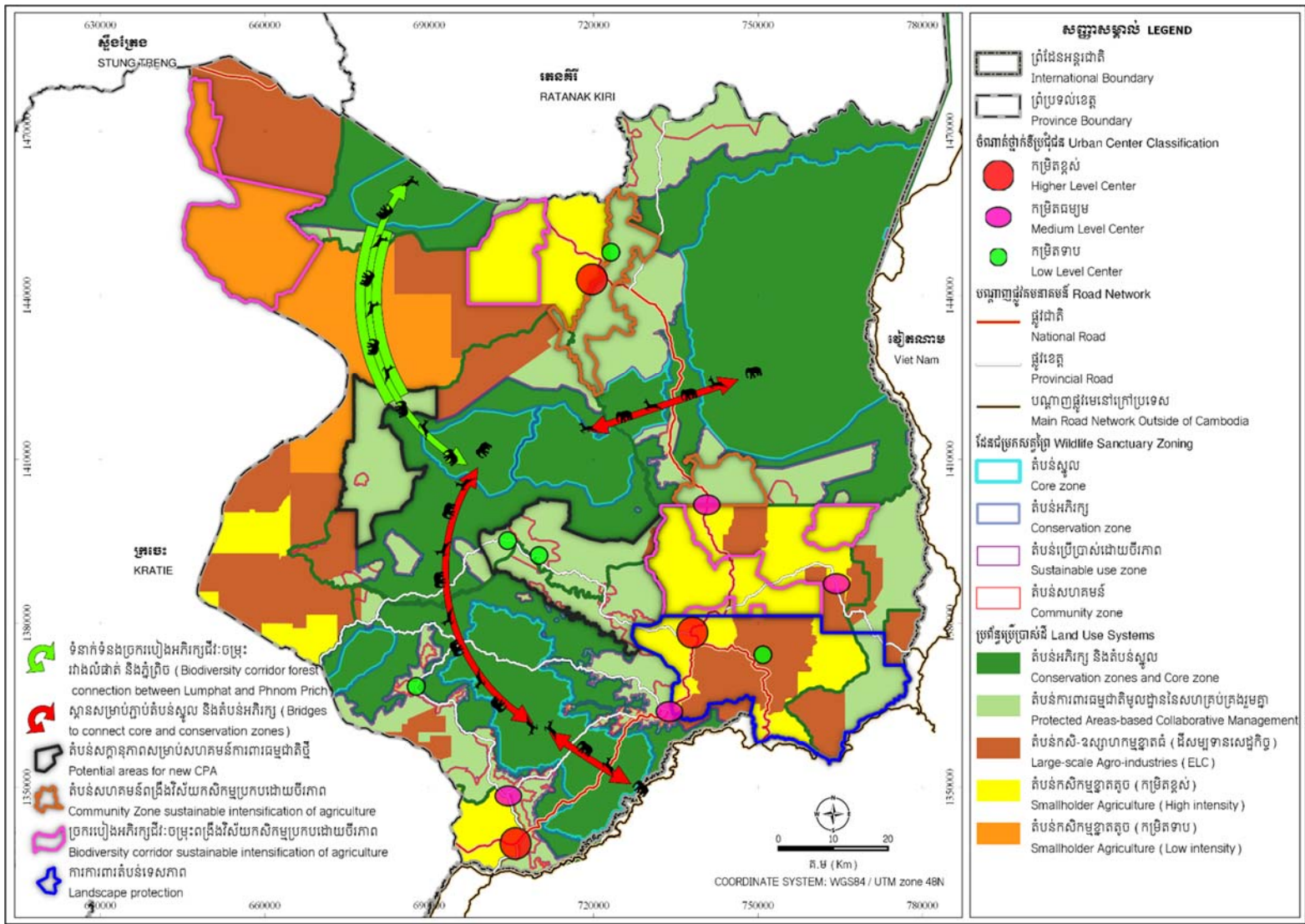
4.1.3 Sub-strategy: Ensuring sustainable agricultural development and forest protection in Biodiversity Conservation Corridors

- Inventory biodiversity corridor resources as evidence to establish management plans
- Ensure the conservation of natural resources to maintain spatial continuity of conservation efforts within protected areas. There is limited potential to establish such a forest conservation corridor across the province. The area where this would be possible is between Lumphat Wildlife Sanctuary and Phnom Prich (Map 40). But this conservation corridor will be challenged by the existing Economic Land Concession and future development of roads.
- Produce a detailed and legally-binding land use plan for the Biodiversity Conservation corridor to differentiate future areas for agriculture, settlements, and forest protection and establish clear guidelines for the issuance of land titles.
- Set-up specific management committee for the biodiversity corridor as instructed by the Ministry of Environment. Strengthen the patrol group as collaborative efforts between local communities and
- Promote agro-ecological intensification measures in smallholder agriculture land-use systems including no-tillage, permanent cover crops and a reduction in the use of agro-chemicals and inorganic fertilizers etc.
- Develop water storage and affordable irrigation system along watercourses to store water and tackle droughts. Water storage can also help to mitigate flooding. In both cases they help mitigate the impacts of climate change.
- Provide comprehensive training on sustainable agricultural techniques to smallholder farmers: soil and water management, seeds production, agricultural equipment, marketing, agricultural commodity value-chain, etc.

4.1.4 Sub-strategy: Protecting landscapes that are part of the socio-environmental and cultural identity of Mondul Kiri province

- Identify protected landscapes and set up regulations to determine land use that is allowed or not allowed within this landscape.
 - Kaoh Nheaek: a landscape of flooded lakes and small bird sanctuaries
 - Saen Monourom: Putang Samuth Cheu Phnom Bay Chhao, Putang Phnom, wide grass field, sea forest
 - Pech Chreada: Bu Sra waterfall
 - Ou Reang: the road between Ou Reang to Saen Monourom offers a unique landscape view as well as the extensive pine forest which itself is a unique forest system for Cambodia and a key environmental identity for Mondul Kiri province (Map 40).

These strategies are detailed in Map 40 below:



Map 40: Spatial Development Strategies relevant to Wildlife Sanctuaries and Biodiversity Conservation corridors management.

4.2 Overall strategy: Limiting the negative economic, environmental, and social impacts of large scale development project sponsored by the State

Mining and hydropower projects have potentially significant negative impacts on natural resources located mainly inside wildlife sanctuaries and biodiversity corridors as well as on the livelihoods of the Mondul Kiri population. The sound identification of impacts and strict monitoring are thus essential to mitigate them while maintaining the potential for green development in the province. Due to the magnitude of mining operations (exploration or exploitation) in the province, a strategic focus on this sector is required

4.2.1 Sub-strategy: Limiting the negative impact of mining operations

- Conduct Environmental and Social Impact Assessment by certified professional and independent SEIA agents in close partnership and consultation with local communities. Impacts may vary according to the location and surrounding land use. Particular attention should be given to core zone management, CPA management, water, agricultural land, or forest fragmentation (Map 41).
- Develop a biodiversity offset framework for mining extraction operators
- Monitor operations and exploitation regularly by certified professional and independent operators according to international standards
- Seek collaboration between mining companies with the community in the forms of community mining to enhance inclusive benefit-sharing mechanisms
- Devise and implement clear post-exploitation measures including Biodiversity Action Plans to rehabilitate areas for the local population after mining operations
- Reduce the number of bauxite mining licenses in the south-eastern corner of the province. Licenses granted to Alumina and Alex Corporation in Ou Reang should be terminated given the impacts these operations will inevitably have on water and forest resources as well as on people and animal livelihood and the potential for eco-tourism development in the region (Map 41).

4.2.2 Sub-strategy: Limiting the negative impact of hydropower development

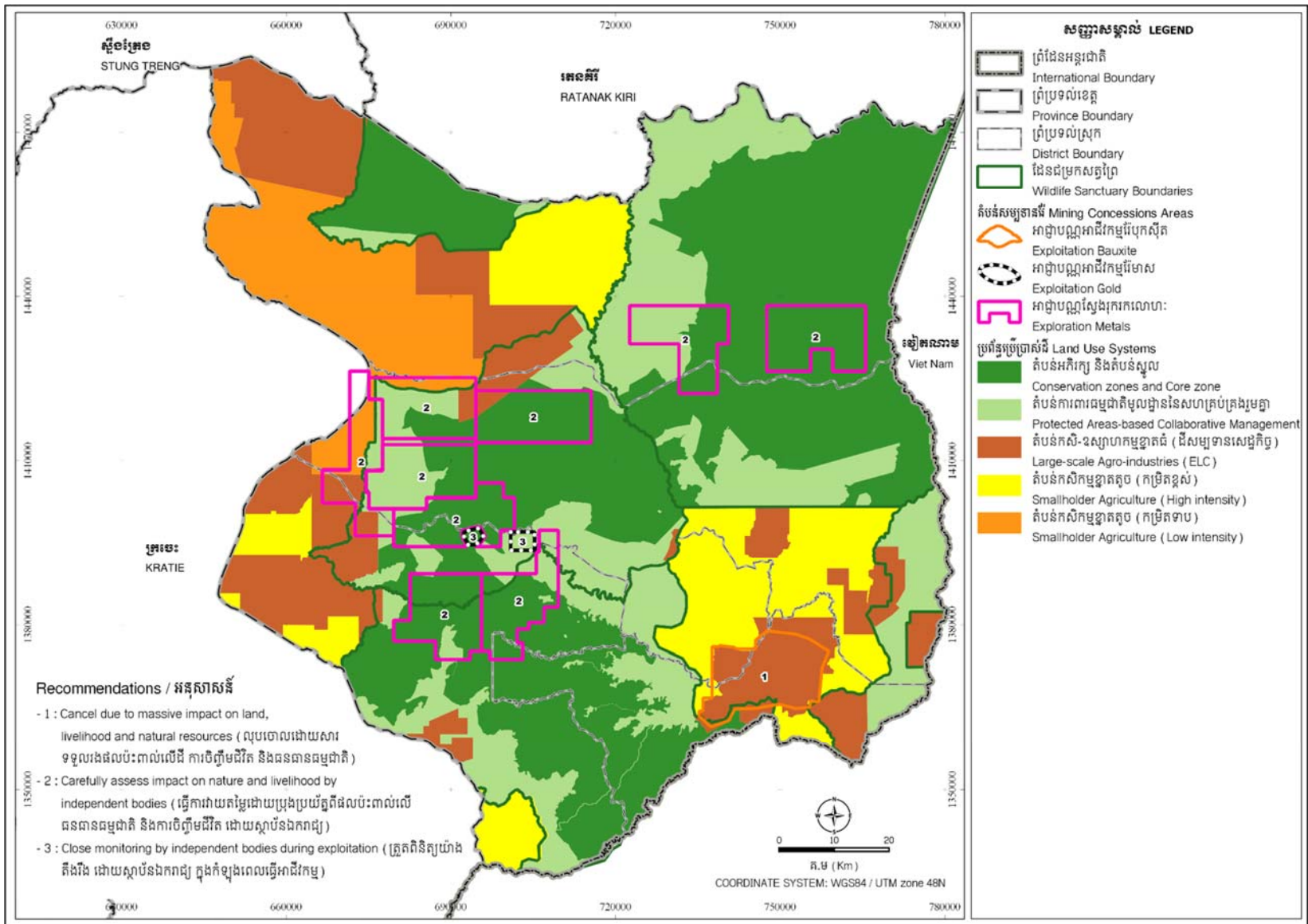
- Conduct Environmental and Social Impact Assessment by certified professional and independent SEIA agents in close partnership and consultation with local communities for each proposed hydropower construction
- Monitor and control regular operations and exploitation of existing hydropower installations
- Identify and pilot alternative sustainable energy sources such as solar or wind power

4.3 Overall strategy: Supporting the development of education centers that promote learning and research about biodiversity and sustainable conservation in Mondul Kiri

Mondul Kiri is uniquely positioned to offer a diversity of educational services concerning biodiversity and natural resource management. This could include facilities for summer camps, research labs, workshops, and fieldwork.

4.3.1 Sub-strategy: promote field-based learning about bio-diversity

- Identify areas to build resource centers for training and field schools
- Identify appropriate locations for a botanical garden
- Cooperate with national and international agencies to develop human resources to promote research and development in the field of biodiversity and nature conservation



Map 41: Spatial Development Strategies relevant to management of mining licenses

4.4 Overall strategy: Strengthening eco-tourism development with linkages to sustainable natural resources management and cultural preservation

Tourism in general and eco-tourism, in particular, is a key sector for the future development of Mondul Kiri province. Tourism development potentially brings a wealth of benefits to a large diversity of sectors and services. But it also comes along with risks for natural resources and the protection of the identity of the indigenous populations of the province. These risks need to be identified and mitigated with appropriate measures. The key strategic approach is to register existing and potential tourism sites, produce specific land use and technical management plan for each area and develop tourists routes based on key themes or locations. For instance, mountain bike or hiking trails, 2-days circuits from/to Saen Monourom, homestay in Bunong villages, and so on.

4.4.1 Sub-strategy: Promote the development of the tourism sector in ways that respect the cultural identity of indigenous people, the environment and provide benefits for local communities

- Register all potential and existing tourism sites, conduct zonation and establish management plans of all existing and potential tourism sites including environmental measures to limit ecological impact of tourism activities and measures that are inclusive of indigenous peoples. Fifty-two potential areas for tourism and culture have been identified and are presented in Map 42 and the list is provided in annex 11.
- Develop and enhance a tourism corridor road connecting tourism linking Saen Monourom to Bu Sra, Namlear Dak Dam then back to Saen Monourom that is (Map 42). This tourism road – also identified in the Tourism development master plan - offer good potential as it links both environmental resorts, unique landscapes and culturally meaningful sites
- Develop thematic tours and routes for tourists with appropriate catering and accommodation services.
- Provide capacity development services on the topic of eco-tourism management to local communities, authorities and other relevant stakeholders involved in the tourism sector.
- Identify and register indigenous and intangible cultural heritage sites of indigenous peoples in the whole of Mondul Kiri province (religious, artistic and cultural sites)
- Strengthen the protection of indigenous peoples' faith, shrines, forests, and demons as a national heritage site in Mondul Kiri province.

4.5 Overall strategy: Supporting the development of vocational training centers that promote tourism products and services based on local resources

To be inclusive, the development of tourism associated with natural resources management requires local communities to develop specific skills and know-how. It is predominantly the case in sectors where people are in direct contact with tourists (lodging and catering, organization of tours, etc.) or sectors that concern the production and commercialization of products or souvenirs that are on-demand or of interest to tourists. The delivery of quality services in these sectors is key to ensure sustained tourism development. Relevant training should address the need of the local population to meet these requirements.

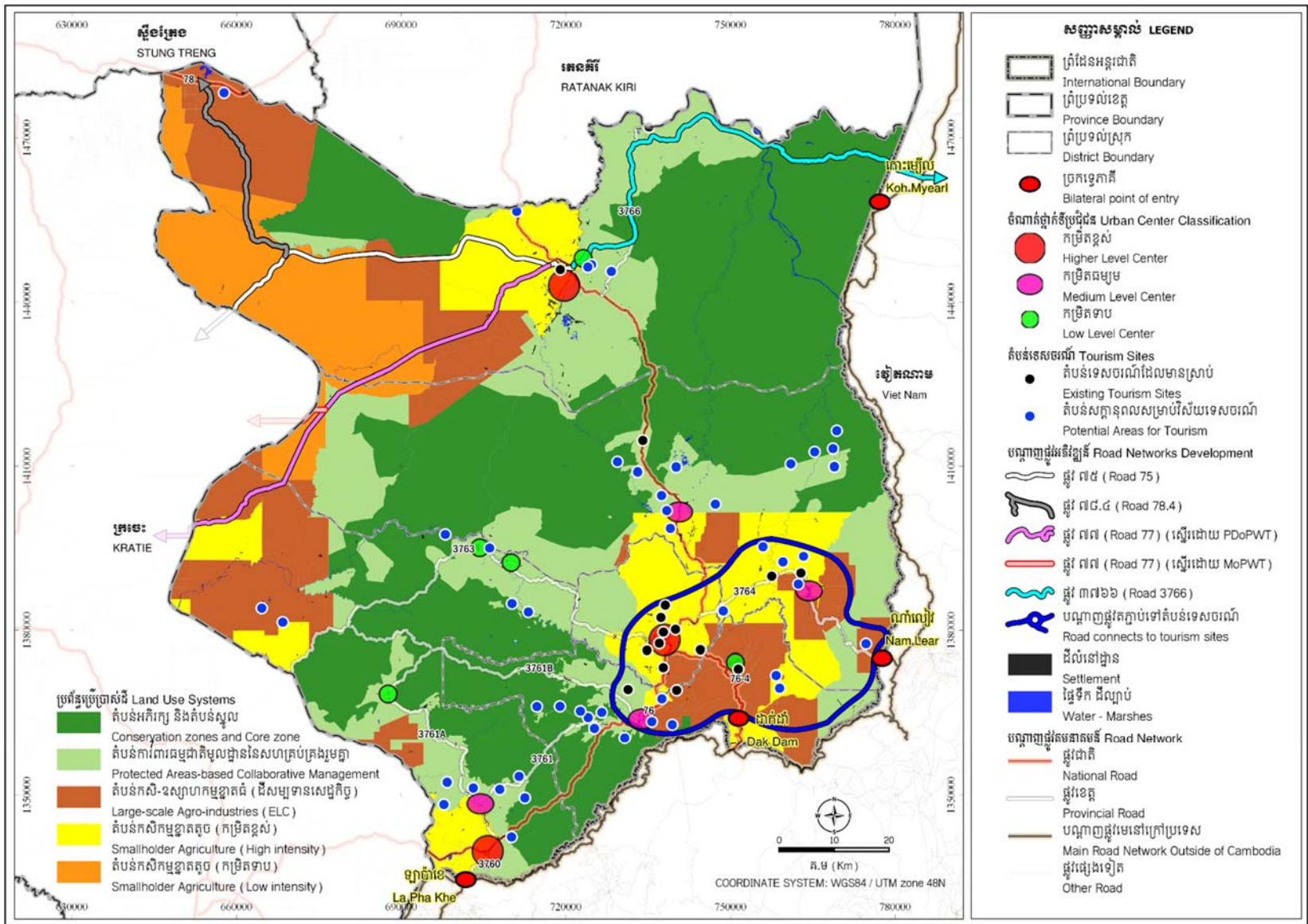
4.5.1 Sub-strategy: Identify, design and conduct professional trainings to develop skills relevant to community-based tourism management

- Conduct need assessment to develop skills and know-how in the tourism sector
- Develop training program on management skills in the lodging and catering sectors such as business management, food, advertisement and reaching out, hospitality and building relationships with customers, maintenance and cleaning, foreign language, construction of eco-friendly guesthouse, etc.

- Develop training program on management skills to support the organization of tours for tourists such as language skills, guiding, rental and repair services (bicycle, motorbike, camping equipment, etc.), botany photography, etc.

4.5.2 Sub-strategy: Identify, design and conduct professional trainings to promote local products made in Mondul Kiri

- Conduct market and consumer studies on the type of products of interest to tourists (agricultural, handicraft, etc.) and how corresponding value-chains could be improved
- Develop training program to enhance the production, packaging, transport and commercialization and sale of these produces



Map 42: Spatial Development Strategies relevant to tourism development

4.6 Overall strategy: Promoting sustainable agricultural development for smallholder farmers

Ensure the farming population in Mondul Kiri can make a living from agriculture on land outside wildlife sanctuaries. This is key to limiting the pressure on forest resources. The key approach here lies in a combination of several complementary strategies: 1) the promotion of agricultural diversification and intensification following the principles of agro-ecological intensification 2) the protection of shifting cultivation landscapes 3) support community forestry and fisheries institutions.

4.6.1 Sub-strategy: Ensure the development of a vibrant family farming sector (economically efficient, socially just and environmentally sound)

- Promote agro-ecological intensification measures in smallholder agriculture land use system including no-tillage, permanent cover crops and a reduction in chemical and inorganic fertilizer use, etc.
- Develop water storage and affordable irrigation system along the streams/rivers to store water and tackle droughts. Water storage can also be used to mitigate floods. In both cases, they help mitigate the impacts of climate change.
- Promote agricultural diversification: food and agro-industrial crops, mixed with small animal raising
- Provide land titles for all land cultivated by smallholder farmers.
- Provide comprehensive training on sustainable agricultural techniques to smallholder farmers: soil and water management, seeds production, seed selection for soil conditions, vegetable production, agricultural equipment, marketing, etc.
- Establish a model farm for dissemination and training to smallholder farmers
- Promote agricultural investment models that are responsible for land rights and economic security of family farmers and are environmentally sound. This activity is targeted to Kaoh Nheaek in the following locations: O Prang (Sre Huy Commune); O'Rayor (Srae Sangkum Commune); Ou Nam (Sokh Sant Commune); O Bak Kham (Nang Khi Lik Commune); Mchu Nga 2 Dam (Roya Commune); O Phout Dam (Roya Commune) and the whole agricultural area of Srae Sangkum Commune.
- Reinforce existing and promote new agricultural cooperatives and associations to enhance market access for smallholder farmers
- Increase agricultural extension services on the topic of agro-ecological intensification
- Promote the development of farmer-led irrigation schemes in Kaoh Nheaek district (Sre Chrey Dam and Sre Chrey Irrigation schemes)

4.6.2 Sub-strategy: Protect existing shifting agriculture and accompany the transition from swidden system to permanent agriculture

Shifting cultivation remains an important mode of agriculture in Saen Monourom, Pech Chreada, Ou Reang, and Kaev Seima. Across the province the system is subject to similar issues: sale of swidden plots to migrants and demographic increase, both of which result in an increased need for agricultural land. As the expansion is considerably limited by the presence of economic land concessions, the expansion of agricultural landholding often occurs into Biodiversity conservation corridors or Wildlife Sanctuaries. This process places ethnic minorities with very little tenure security at risk of eviction (Map 43): Saen Monourom (Sangkat Romnea, Poulong village), Pech Chreada (Prosa commune, Sre Ampum commune, Pou Chrey commune) and Ou Reang (Toul Svay, Purang, Pou Chep villages).

As a result swidden landscapes are being transformed - partly or entirely- into permanent agriculture systems. However, within the community practicing shifting cultivation, including in areas delineated under a Collective Land Collective title there is no clear consensus about the future of shifting

cultivation. Some households still depend on it and want to pursue shifting agriculture. The following activities are thus recommended:

- Conduct a clear study about the future of shifting cultivation, the areas where it is threatened, and potential areas where it should be maintained
- Increase livelihood values of fallow forest
- Design and implement a clear process to control land sale/purchase transactions in the area where swidden agriculture is practiced

4.7 Overall strategy: Promoting responsible large-scale agro-industrial development that seeks mutually advantageous relationships with smallholder farmers

The agricultural landscape in Mondul Kiri consists of land possessed and cultivated by smallholders but also a large tracks of land operated under economic land concession for agro-industrial purposes. The presence and management of these concessions bring benefit to the province but also comes along with effects that are detrimental to smallholders. It is necessary to design and implement a rigorous and transparent management system for the economic land concession that limits encroachment into smallholder agricultural land and nurtures mutual advantages with surrounding smallholder farmers.

4.7.1 Sub-strategy: Enhance Economic Land Concession management that seeks joint benefit with smallholders

- Insist on publically accountable monitoring and compliance of ELC with contract and agreement with RGC
- Complete State Land registration for all ELC that have not finalized the registration process yet (Map 43)
- Identify and implement resolution mechanisms for any area where unresolved conflicts with ELC and smallholders.
- Promote diverse forms of collaboration such as contract farming between ELC and small-scale farmers to achieve win-win benefits for both parties. This includes arrangements for land allocation, labor recruitment, and/or access to processing facilities

4.8 Overall strategy: Enhancing community-based natural resources management outside the protected area system

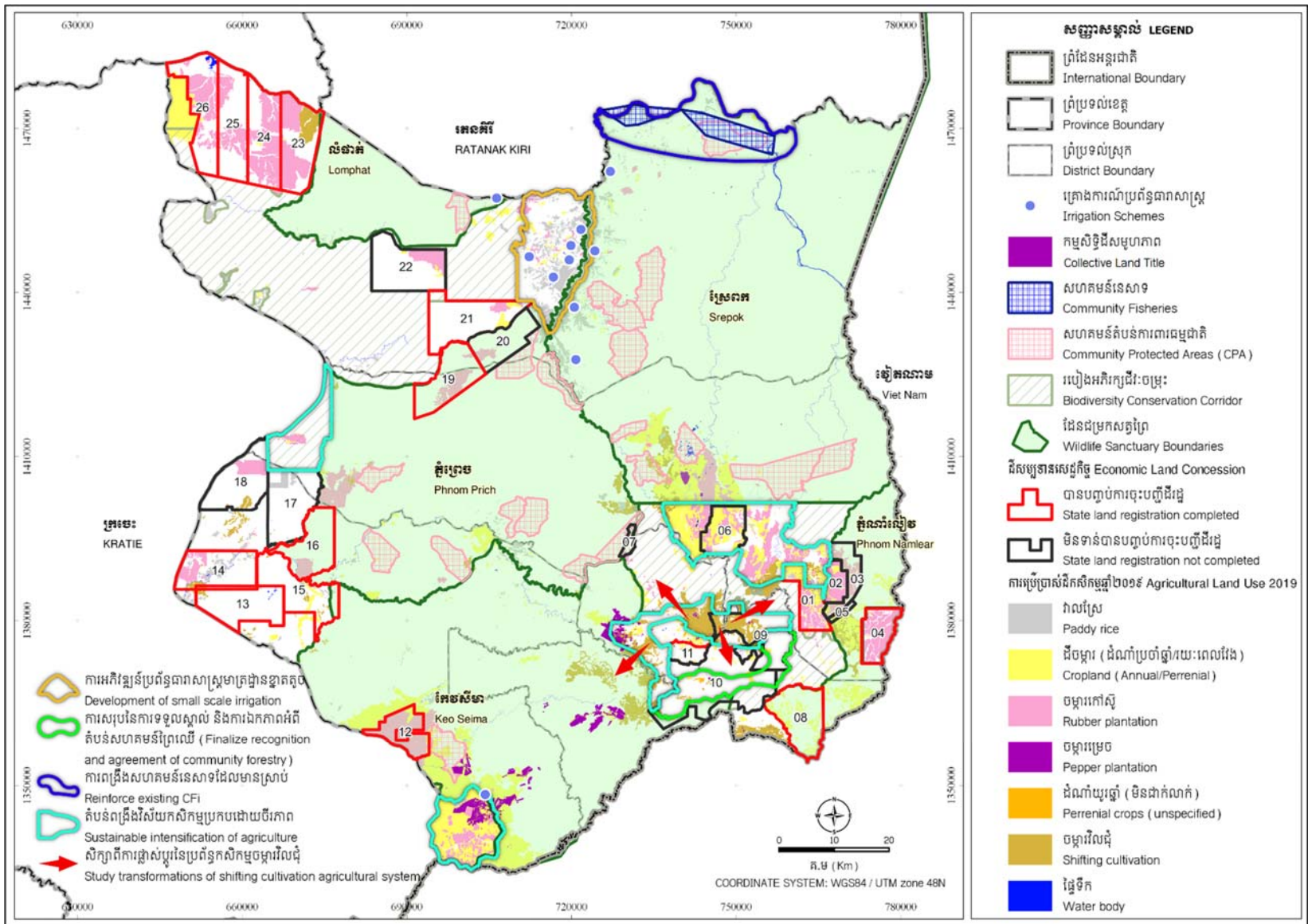
Outside the system of protected areas consisting of wildlife sanctuaries and biodiversity conservation corridors, there are several co-management schemes for the management of forestry or wetland resources. These resources are important for individual household (access to non-timber forest products and fisheries), but also collectively as places to build commons and retain land that is not commoditized. They also represent an opportunity to establish eco-tourism spots.

4.8.1 Sub-strategy: Reinforce all existing community forestry co-management schemes

- Complete registration and agreement for all community forestry across the province.
- Address any pending conflicts surrounding Community Forestry development in Ou Reang district (Map 43). This should be conducted along with a decision about the future of Whuzizan Economic Land Concession (cancellation or state land registration).

4.8.2 Sub-strategy: Reinforce all existing community fisheries co-management schemes

- Complete registration and agreement for all community fisheries across the province.
- Strengthen community fisheries management by establishing and implementing a detailed land use plan in the wetland and riverine areas including spots for eco-tourism



Map 43: Spatial Development Strategies relevant to agricultural development

4.9 Overall strategy: Promoting transport infrastructures and mobility to enhance accessibility to public services for its entire population and to support the development of the CLV region

The development of transport infrastructure is a key element to enable Mondul Kiri province to play a supporting role in the CLV triangle and to enhance the accessibility of public services. This will be achieved through 2 complementary strategies. On the one hand, the new airport will be a strategic hub in this new transport network. On the other hand, the development of provincial roads will help connect the province to main development corridors (and other provinces) as well as enhance internal mobility and access to public services. However, all of these impact natural resources and in particular increase forest fragmentation. These impacts need to be publically acknowledged with plans for mitigation regarding the development of transport infrastructure.

4.9.1 Sub-strategy: Develop an environmentally-sound regional transport hub articulated to the new airport and Saen Monourom city

- Study and mitigate the environmental impacts from the creation of the new airport, particularly on agricultural land and forest resources located in the collaborative management zone (Map 44).
- Study and mitigate the social impacts from the creation of the new airport on Indigenous peoples' land and cultural identity (Map 44). Mitigation measures include appropriate relocation and/or compensation to all families who will be expropriated.
- Design a development corridor from the Airport to Saen Monourom city that includes plans to mitigate impacts on the surrounding environment (sound, lights, and space) (Map 44). The plan needs to anticipate social-economic impacts resulting from the rapid development of this area such as land speculation, eviction, rapid land concentration, etc. Protection measures for vulnerable households need to be a priority.

4.9.2 Sub-strategy: Enhance intra-provincial mobility and accessibility to public services

- Upgrade provincial road networks in ways that limit their impact on wildlife sanctuaries by limiting the fragmentation of their core and conservation zones (Map 44). Particular attention should be given to:
 - Road # 75 from Kaoh Nheaek district center to the west. The upgrade of the provincial road should avoid crossing the southern part of the Lumphat wildlife sanctuary
 - Road (no number assigned yet) from Kaoh Nheaek district center to the south towards Kratie should avoid crossing the Phnom Prich wildlife sanctuary
 - The road 95 (or 3766) from Kaoh Nheaek district center to the east towards the Vietnamese border should follow the Sre Prok river (along the border with Ratank Kiri province) to avoid crossing into the Srek Pok Wildlife Sanctuary
 - A new ring road that connects the airport area to Saen Monourom by the east (Map 44)

4.10 Overall strategy: Promoting the sustainable growth and planned development of cross-border areas as new growth centers that facilitate trade exchange with neighboring countries

The strategic location of Mondul Kiri province along the border with Vietnam is strategic to enhance the processing, storage, and trade of goods (particularly agricultural commodities) to Vietnam. Two complementary strategies are identified to reach this goal: develop and upgrade border facilities along with the development of agro-industrial processing or storage facilities.

4.10.1 Sub-strategy: Support the development of border facilities and mitigate the environmental impacts of this expansion

1. Koh Myel border crossing area (Koah Nheaek district) is a small cross-border area with limited trade. It is located inside Sre Pok wildlife sanctuary and its development would impact the management of the protected area. For this reason, it is not recommended to expand it in its current location but rather shift its location to the upper north end of the new provincial road
2. Namlear crossing (Pech Chreada district) is small and is located within an Economic Land Concession. Current road conditions to the border are very difficult, especially during the rainy season. However, the Vietnamese side of the border is characterized by a higher density of built-up areas (urban and industries). There is a potential to upgrade this cross-border gate to a higher level (i.e international) but it would require considerable investment in infrastructure development and the construction of a Special Economic Zone (including dry port) within the premises of the Economic Land concession.
3. Dak Dam (Ou Reang district) is a small cross border gate. Unlike Namlear cross-border gate (above), the Cambodian side of the border is endowed with infrastructure and potential for agro-industrial production. However, there is no major infrastructure on the Viet Nam side of the border.
4. The La Pha Ke (Kaev Seima district) is a small -border crossing mainly serving the export/import of agricultural products from Mondul Kiri province but also from Kampong Thom, Siem Reap, Kratie, and Stung Treng. There is also an agreement between Kaev Seima district and the district on the Vietnamese side, giving priority to people going to seek health services. However, there are no real facilities for the processing and storage of agricultural products but given its strategic location close to the ASEAN corridor, the potential to develop and upgrade these services is high. This would imply setting up of economic development zones and a dry port.
5. Seek international cooperation with Vietnam authorities to combat illegal timber and wildlife trade across border
6. Provide clear guidance to promote the expansion of cross-border built-up areas as opposed to expansion along the road. This is of particular importance to limit the impact on Wildlife Sanctuaries.

4.11 Overall strategy: Promoting the sustainable growth and development of agriculture and other industries in potential areas linking transport networks and dry port areas with domestic and outside markets

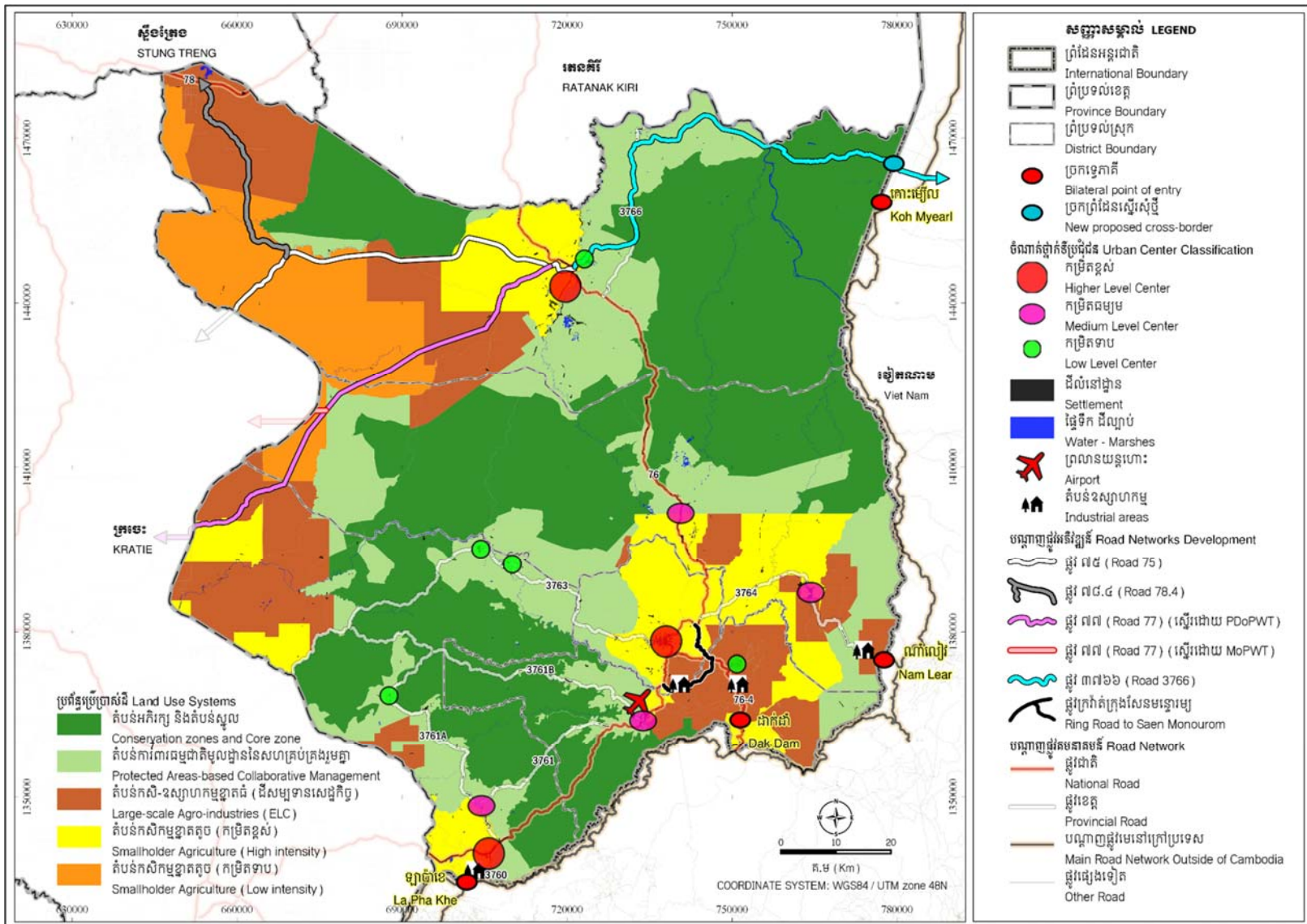
There is a need to promote sustainable and balanced development based on the processing of products, especially agro-industrial products, and the creation of other industries in existing and new potential areas. For these industrial development zones to run efficiently, clear planning in connection with the development of support infrastructure, as well as in cooperation with neighboring countries and regions is needed. At the same time, capacity building, both management and professional capacity, is also necessary and planning and implementation in a clear direction.

4.11.1 Sub-strategy: Enhance the capacity of the province to add value to its agricultural products through better storage and processing

- Identify and develop agro-industrial areas along the ring road within the regional transport hub connected to the new airport and Saen Monourom city or at border crossings (Map 44)
- Identify logistics areas, dry port areas, warehousing areas and other facilities areas to support the development these center.
- Build management capacity and professional capacity to participate in adding value to agricultural products through processing and storage of products.

4.11.2 Sub-strategy: Promote the development of industries based on knowledge, technology and innovation without environmental impact

- Identify suitable areas for the creation of industries based on knowledge, technology and innovation
- Build professional capacity to participate in the knowledge-based industrial production and provide support services and infrastructure for the sustainability of knowledge-based industrial production processes.



Map 44: Spatial Development Strategies relevant to transport network development

4.12 Overall strategy: Promoting planned and sustainable urban development to address the increasing need for public and private services and limiting the environmental impacts of urbanization.

Although Mondul Kiri is a mainly forested province, the development, and management of urban centers is key. The strategic choices that need to be made here are multifold: 1) identify future public services needs of each urban center 2) identify future relationships between urban centers , 3) guide the expansion of urban centers in a way that does not impact surrounding forest resources

4.12.1 Sub-strategy: Ensure balanced urban development offers improved access to public services such as education and health centers

Based on consultations with local stakeholders, the provision of services by each urban center, has been projected to 2040. Table 14 below shows the intended service provisions of each center by 2040 and, on that basis, a new hierarchy and relationship between urban centers is established (Map 45). In addition to these stated services, the following strategies are recommended:

- Study the needs for educational services (at all levels) in each each center in accordance with population distribution, by providing schools as well as vocational training and practical training centers and trainers,
- Study the needs for health services (at all levels) in each city center in accordance with population distribution, by providing health centers and referral hospitals and trainers,
- Study the feasibility of providing advanced education and health services (such as universities and hospitals) in line with the balanced and spatial concentration and development

4.12.2 Sub-strategy: Limit the impact of urbanization on the environment

- Develop and implement detailed land use master plans for urban areas at the municipal and district levels including new development areas in order to give development directions and facilitate management.
- Provide clear guidance to promote the compact expansion of settlements as opposed to expansion along roadways
- Conduct strategic environmental and social assessment of all municipal and district land use master plans

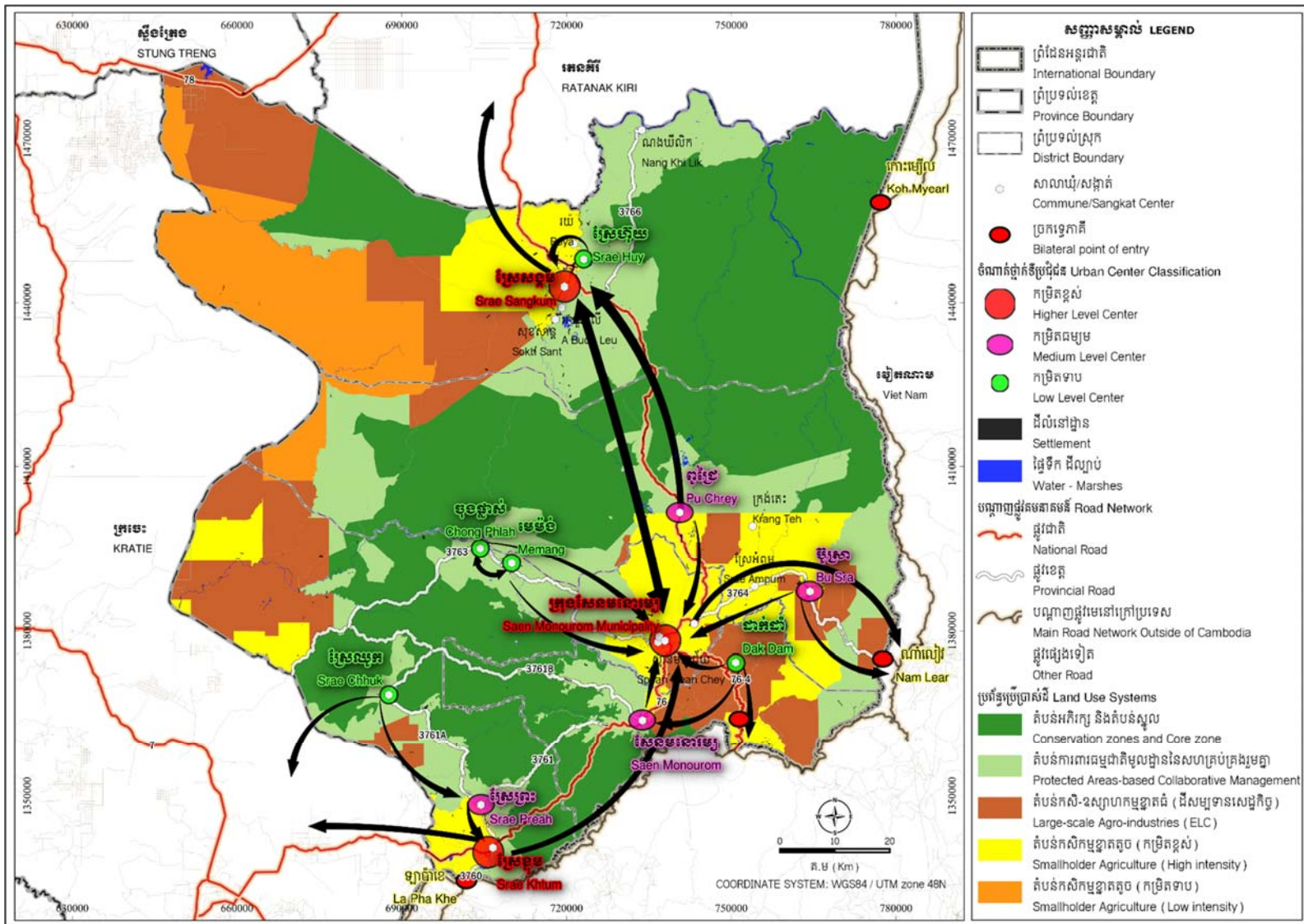
Table 14: Future facilities in main urban centers in Mondul Kiri province

Facilities/indicators of the urban center classification	Name of urban center in Mondul Kiri province											
	Chong Phlah	Memang	Srae Chhuk	Srae Khtum	Srae Preah	Srae Huy	Srae Sangkum	Saen Monourom	Dak Dam	Pu Chrey	Bu Sra	Krong Saen Monourom
Population in commune/sangkat(2040)	5421 - 7083	4,68 1- 6,11 5	7,704 - 10,065	- 20,292 - 26,511	6,41 3 - 8,37 9	4,54 8- 5,94 1	11,915 - 15,567	6,11 1- 7,98 4	4,525 - 5911	15,58 4 - 20,36 0	10,74 6 - 14,03 9	23,406 - 30,580
Population density in commune/sangkat (2040) (persons/km ²)	6-8	12- 16	10- 13	62-81	15- 19	5-7	119- 156	8-10	10-13	7-9	19-25	46- 90
Social services												
Public kindergartens	1	1	1	1	1	1	1	1	1	1	1	1
Public elementary schools	1	1	1	1	1	1	1	1	1	1	1	1
Public secondary schools	1	1	1	1	1	1	1	1	1	1	1	1
Public high schools	0	0	1	1	1	1	1	1	0	1	1	1
Higher education institution	0	0	0	0	0	0	0	0	0	0	0	1
Health center	1	1	1	1	1	1	1	1	1	1	1	1
Referral health center	0	0	0	1	0	0	1	0	0	0	1	1
Private hospitals	0	0	0	1	0	0	0	0	0	0	0	1
Clinical sites	0	0	0	1	1	0	1	0	0	1	0	1
Post office	0	0	0	1	0	0	1	0	0	0	1	1
District administration	0	0	0	1	0	0	1	1	0	0	1	1
Administration headquarters	0	0	0	1	0	0	1	0	0	0	1	1
Recreation services												
Restaurants	1	1	1	1	1	0	1	1	1	1	1	1

Hotel locations	0	0	0	1	0	0	1	1	1	0	1	1
Guesthouse	1	1	1	1	1	0	1	1	1	1	1	1
Economic services												
Medium-size market places (normal market selling all day)	1	1	1	1	1	1	1	1	1	1	1	1
Small market locations (market selling only morning or evening)	1	1	1	1	1	1	1	1	1	1	0	1
Night market locations (market selling only at night)	0	0	0	0	0	0	0	1	0	0	0	1
Stores selling grocery and consumer goods	1	1	1	1	1	1	1	1	1	1	1	1
Stores selling clothes, shoes, incenses	1	1	1	1	1	1	1	1	1	1	1	1
Electronics stores	1	1	1	1	1	0	1	1	1	1	1	1
Stores selling construction materials	1	1	1	1	1	0	1	1	1	1	1	1
Stores selling office and sports equipment	0	0	0	1	1	0	1	1	0	1	0	1
Small business location (rice, noodles, groceries, beverages)	1	1	1	1	1	0	1	1	1	1	1	1
Pharmacies and sub-pharmacies	1	1	1	1	1	1	1	1	1	1	1	1
Flat residents	1	0	0	1	0	0	1	1	0	1	1	1
Microfinances	1	1	1	1	1	0	1	1	0	1	1	1
Bank (branch of bank)	0	0	0	1	1	0	1	1	0	0	1	1
Landfill	1	0	1	1	1	0	1	1	0	1	1	1
Wastewater Treatment	0	0	0	1	1	0	1	1	0	0	1	1
Total indicators (30)	17	15	17	28	21	10	27	24	15	20	24	30

Score value classification:

- Lower-level center (10-17)
- Medium-level center (18-25)
- Higher-level center (26-30)



Map 45: Future hierarchy and relationships between urban centers in Mondul Kiri province.

4.13 Overall strategy: Enhancing urban landscapes through the promotion of natural greenery systems and urban agriculture in main centers and surrounding areas

Urban development is at a very early stage in Mondul Kiri and there is a real potential to plan for greenery systems and urban agricultural areas to enrich urban landscapes and quality of agricultural production that meet the needs of consumers. The development of a green city provides a pleasant living environment for local population and tourists alike.

4.13.1 Sub-strategy: Develop and implement detailed greening plan and relevant regulations

- Study existing green area and potential to enlarge greenery system in line with the expansion of urban centers and create green urban-rural linkages
- Implement the greenery system plan to create green hotspots in cities and green connecting roads/rivers (public park management, river banks, road, etc.)
- Implement green corridor to connect the urban areas and surrounding rural hinterland

4.13.2 Sub-strategy: Develop and implement urban agriculture spaces in main centers

- Identify and control the use of land that should be kept for agriculture inside and around main urban centers
- Provide technical support, appropriate access to water and capacity building for agricultural production of healthy food
- Strengthen short value chains that directly link producers and consumer

4.14 Overall strategy: Ensuring efficient and quality-oriented urban management and delivery of urban environmental services

Providing quality urban environmental services such as clean water, solid and liquid waste management are essential to social well-being, the quality of life and liveable environment for all including tourists and investors. Mondul Kiri province development is still at an early stage and careful consideration of the management and provision of these services for the future is crucial for urban growth and economic development. It will thus improve the development of the province and attract more visitors as well as better and more targeted investments.

4.14.1 Sub-strategy: Enhance the provision of services and facilities for adequate and safe water supply in the urban areas and adjacent hinterlands

- Conserve water source areas, natural reservoirs, slopes and watershed in urban areas and surrounding areas;
- Establish strict management standards for water source and natural reservoir protection in urban areas and surrounding areas for sustainable water supply;
- Encourage the establishment of cost-effective water treatment plants correspondent to the need of households and business demand in urban areas.

4.14.2 Sub-strategy: Ensuring effective wastewater and water runoff management within the urban areas

- Conserve natural storm water collection systems through promoting the use of natural water flow systems such as canals, streams, creeks;
- Support the establishment of efficient wastewater drainage and runoff systems in compatible with urban built-up area development, including households, business

centers and industrial zones to avoid unplanned discharges that pose a risk to water quality and protection systems;

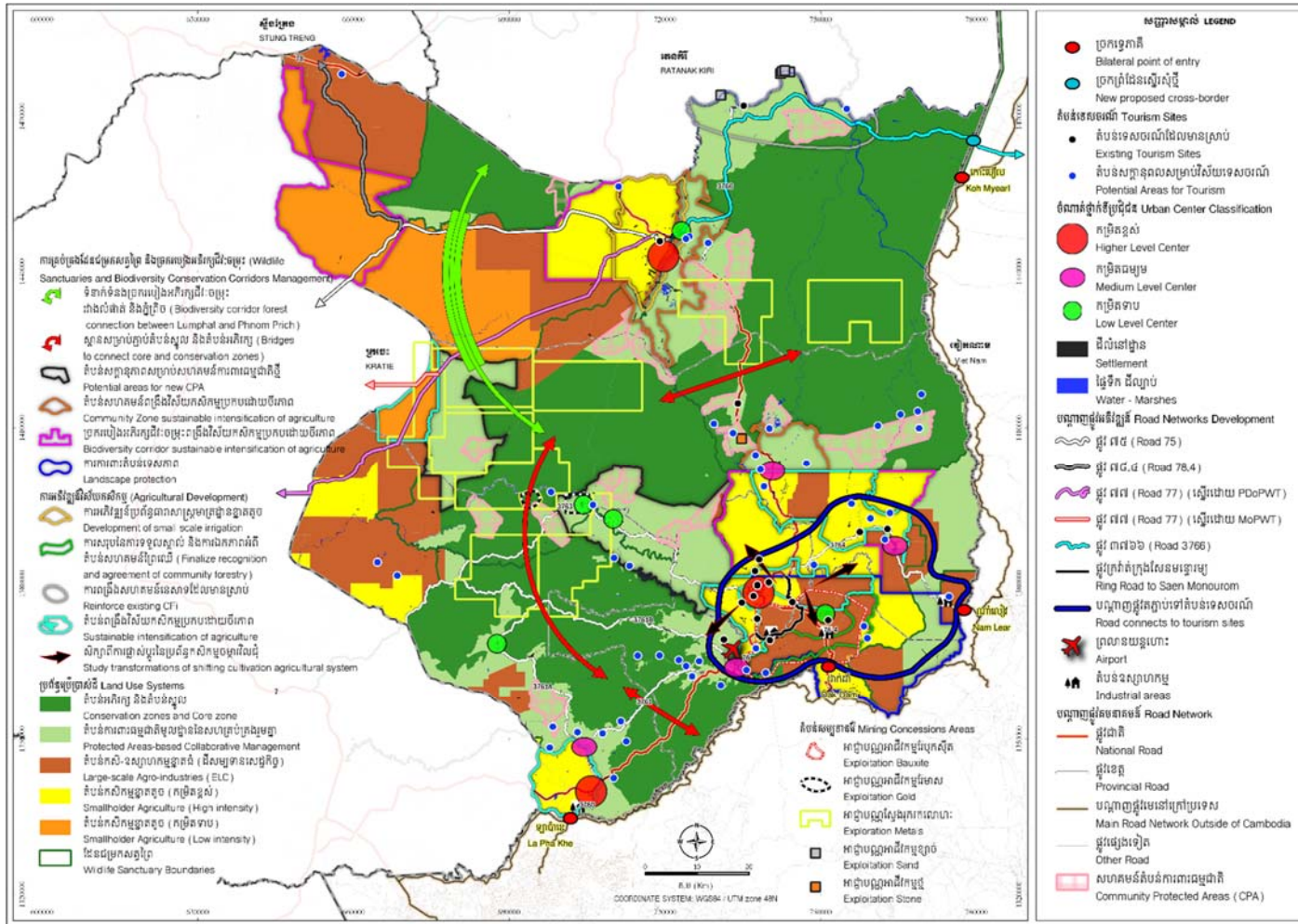
- Study the feasibility to establish bio-wastewater treatment to enhance social well-being and environmental sustainability;
- Raise the awareness of water, sanitation and hygiene (WASH) and impacts of wastewater-related issues.

4.14.3 Sub-strategy: Ensure effective solid waste management in urbanized areas

- Study the feasibility to build sanitation landfills;
- Identify different types of solid wastes such as general solid wastes from households and medical waste from clinics/hospitals and establish management schemes accordingly;
- Improve the urban solid waste collection services including waste depots and waste transportation systems in urban areas;
- Promote the public-private partnership (PPP) and public-public partnership (PuP) in urban solid waste management systems;
- Raise awareness of solid waste management at sources including the principle of reuse, repair, reduce, and recycle (4Rs) and the impacts of urban solid waste management to people and stakeholders at large.

4.15 Integrated spatial development strategies

The Map 46 presents a synthesis of the all strategies forming the core of the spatial development of Mondul Kiri province between 2020 and 2040.



Map 46: Integrated Spatial Development Strategies in Mondul Kiri province

5 Activity Plan

The previous section on spatial development strategies envisaged several activities to be conducted and realized under each sub-strategies, each feeding into overall strategies, objectives and long term development goals. During the consultation, the stakeholders were invited to prioritize these activities and identify projects to be implemented as part of the collective efforts to realize the provincial spatial plan.

5.1 Identification and development of detailed project proposals

The following projects plans are recommended, yet the list may evolve according to upcoming funding and partnership,

	Provincial admin.	District admini	PDLMUPC	PDoA	Forestry Admin.	Fisheries Admin.	PDoE	PDoPWT	PDoRD	PDoME	PDoP	PDoCFA	PDoT	PDoIH	PDoLVT	Other
Overall strategy: Enhancing sustainable conservation in wildlife sanctuaries and biodiversity conservation corridors																
- Demarcation of external boundaries and zone boundaries of all wildlife sanctuaries with posts and numerous signboards.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>
- Proceed with registration of all Public and Private State land located within Wildlife Sanctuary (sustainable and community zones)	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>
- Create bridges/corridors/tunnels to connect fragmented areas of core and conservation zones.	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>
- Complete registration of Communal Land of indigenous peoples	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>
Overall strategy: Limiting the negative economic, environmental, and social impacts of large scale development project sponsored by the State																
- Conduct Environmental and Social Impact Assessment by certified professional and independent SEIA agents in close partnership and consultation with local communities.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>
- Monitor operations and exploitation regularly by certified professional and independent operators according to international standards	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>
- Develop a biodiversity offset framework for mining extraction operators	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>
- Devise and implement clear post-exploitation measures including Biodiversity Action Plans to rehabilitate areas for the local population after mining operations	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>
Overall strategy: Supporting the development of education centers that promote learning and research about biodiversity and sustainable conservation in Mondul Kiri																
- Study the feasibility to establish a botanical garden as a tool to promote tourism	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
- Study the feasibility to establish a research centre to develop human resources to promote research and development in the field of biodiversity and nature conservation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>

	Provincial admin.	District admini	PDI/MU/PC	PDaA	Forestrv Admin.	Fisheries Admin.	PDaE	PDaPWT	PDaRD	PDaME	PDaP	PDaCFA	PDaT	PDaIH	PDaLVT	Other
Overall strategy: Strengthening eco-tourism development with linkages to sustainable natural resources management and cultural preservation																
- Register all potential and existing tourism sites, conduct zonation and establish management plans of all existing and potential tourism sites including environmental measures to limit ecological impact of tourism activities and measures that are inclusive of indigenous peoples.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
- Identify and register indigenous and intangible cultural heritage sites of indigenous peoples in the whole of Mondul Kiri province (religious, artistic and cultural sites)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
- Develop thematic tours and routes for tourists with appropriate catering and accommodation services.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
- Provide capacity development services on the topic of eco-tourism management to local communities, authorities and other relevant stakeholders involved in the tourism sector.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>											<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Overall strategy: Supporting the development of vocational training centers that promote tourism products and services based on local resources																
- Develop training program on management skills in the lodging and catering sectors such as business management, food, advertisement and reaching out, hospitality and building relationships with customers, maintenance and cleaning, foreign language, construction of eco-friendly guesthouse, etc.													<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
- Develop training program to enhance the production, packaging, transport and commercialization and sale of these produces													<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Overall strategy: Promoting sustainable agricultural development for smallholder farmers																
- Provide comprehensive training on sustainable agricultural techniques to smallholder farmers: soil and water management, seeds production, seed selection for soil conditions, vegetable production, agricultural equipment, marketing, etc.																<input checked="" type="checkbox"/>
- Conduct a clear study about the future of shifting cultivation, the areas where it is threatened, and potential areas where it should be maintained																<input checked="" type="checkbox"/>
- Develop water storage and affordable irrigation system along the streams/rivers to store water and tackle droughts																<input checked="" type="checkbox"/>
- Provide land titles for all land cultivated by smallholder farmers																<input checked="" type="checkbox"/>
Overall strategy: Promoting responsible large-scale agro-industrial development																
- Complete State Land registration for all ELC that have not finalized the registration process yet	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>												
- Conduct a feasibility study on contract farming between ELC and small-scale farmers																<input checked="" type="checkbox"/>
- Identify and implement resolution mechanisms for any area where unresolved conflicts with ELC and smallholders.	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>												

	Provincial admin.	District admini	PDI/MU/PC	PDaA	Forestry Admin.	Fisheries Admin.	PDaE	PDaPWT	PDaRD	PDaME	PDaP	PDaCFA	PDaT	PDaIH	PDaLVT	Other
Overall strategy: Enhancing community-based natural resources management outside the protected area system																
- Complete registration and agreement for all community forestry across the province.			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>									
- Address any pending conflicts surrounding Community Forestry development in Ou Reang district.			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>									
- Complete registration and agreement for all community fisheries across the province.			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>									
- Strengthen community fisheries management by establishing and implementing a detailed land use plan in the wetland and riverine areas including spots for eco-tourism			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>									
Overall strategy: Promoting transport infrastructures and mobility to enhance accessibility to public services for its entire population and to support the development of the CLV region																
- Study and mitigate the environmental impacts from the creation of the new airport, particularly on agricultural land and forest resources located in the collaborative management zone	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							
- Implement mitigation measures for the relocation and/or compensation to all families who will be expropriated	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>							
- Conduct detailed study on the new strategic provincial road to the Vietnamese border and towards Kratie province	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						
Overall strategy: Promoting the sustainable growth and planned development of cross-border areas as new growth centers that facilitate trade exchange with neighboring countries																
- Conduct detail study on the requirement and potential to upgrade cross-border gate (transport of people and goods, processing and storage facilities, etc.)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>													<input checked="" type="checkbox"/>	
- Provide clear guidance to promote the expansion of cross-border built-up areas as opposed to expansion along the road	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>												<input checked="" type="checkbox"/>	
Overall strategy: Promoting the sustainable growth and development of agriculture and other industries in potential areas linking transport networks and dry port areas with domestic and outside markets																
- Conduct feasibility to build a ring road as proposed in the plan	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>							
- Identify suitable areas for the creation of industries (agro-processing or knowledge-based)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>							
- Identify logistics areas, dry port areas, warehousing areas and other facilities areas to support the development these center.									<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>	
- Build management capacity and professional capacity to participate in adding value to agricultural products through processing and storage of products									<input checked="" type="checkbox"/>						<input checked="" type="checkbox"/>	

	Provincial admin.	District admini	PDI/MU/PC	PDoA	Forestrv Admin.	Fisheries Admin.	PDoE	PDoPWT	PDoRD	PDoME	PDoP	PDoCFA	PDoT	PDoIH	PDoLVT	Other
Overall strategy: Promoting planned and sustainable urban development to address the increasing need for public and private services and limiting the environmental impacts of urbanization.																
- Develop and implement detailed land use master plans for urban areas at the municipal and district levels including new development areas in order to give development directions and facilitate management.		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
- Prepare a guideline for appropriate management of urban expansion (compact expansion of settlements as opposed to expansion along roadways)		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>													
- Conduct strategic environmental and social assessment of all municipal and district land use master plans		<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>										<input checked="" type="checkbox"/>
Overall strategy: Enhancing urban landscapes through the promotion of natural greenery systems and urban agriculture in main centers and surrounding areas																
- Study existing green area and potential to enlarge greenery system in line with the expansion of urban centers and create green urban-rural linkages		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>												<input checked="" type="checkbox"/>
- Implement the greenery system plan to create green hotspots in cities and green landscapes connecting roads/rivers (public park management, natural green areas, river banks, road, etc.)		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>												<input checked="" type="checkbox"/>
- Provide technical support, appropriate access to water and capacity building for agricultural production of healthy food		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>												<input checked="" type="checkbox"/>
Overall strategy: Ensuring efficient and quality-oriented urban management and delivery of urban environmental services																
- Establish strict management standards for water source and natural reservoir protection in urban areas and surrounding areas for sustainable water supply;		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>								<input checked="" type="checkbox"/>
- Study the feasibility to establish bio-wastewater treatment to enhance social well-being and environmental sustainability;		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>								<input checked="" type="checkbox"/>
- Improve the urban solid waste collection services including waste depots and waste transportation systems in urban areas;		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>								<input checked="" type="checkbox"/>

It is the responsibility of the provincial administration to develop full proposal for these projects and align them with the strategies and their objectives, designed to achieve the ambitious vision of the Spatial Plan in 2040. Different sectoral projects are designed for short-, medium-, and long-term implementation under different levels of government institutions (i.e., national, provincial, municipal/district and commune levels) based on needs for development and special interventions of the government as necessary.

The projects shall be consistent with and integrated into the 5-year provincial development plan and/or the 3-year investment program, or any other plan and programs. This way, some part of the provincial budget can be mobilized to implement the projects. If the budget is secured

through other sources (ministries of development partners), the project does not necessarily need to be part of the provincial 5-year development plan.

5.2 Implementation mechanisms

The roles and responsibilities of stakeholders involved in the implementation, monitoring and evaluation mechanisms for these activities is summarized at Figure 15:

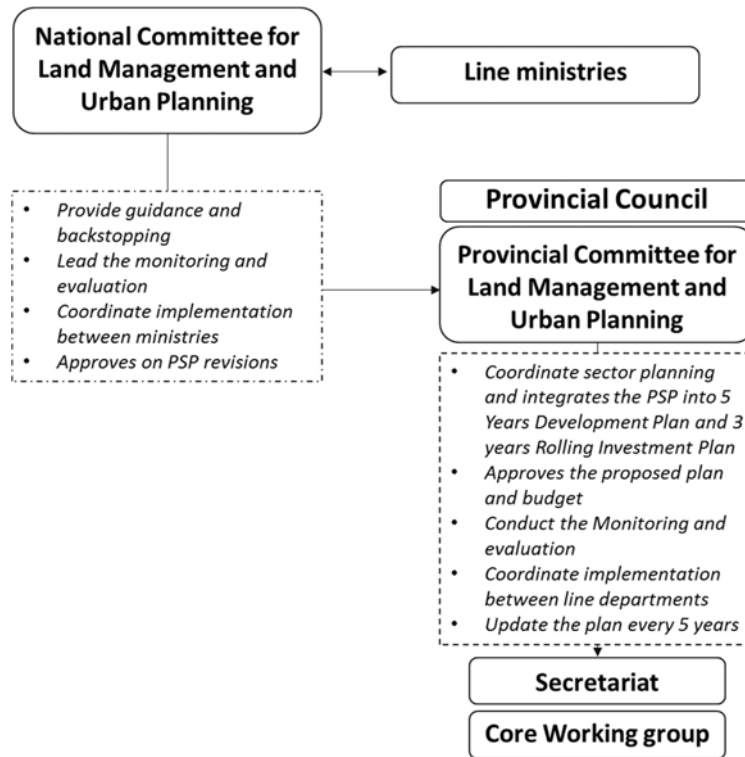


Figure 15. Institutional mechanisms for the implementation, monitoring and evaluation of the Provincial Spatial Plan

The Provincial Committee for Land Management and Urban Planning (PCLMUP), which is one of many current mechanisms, should play a more critical role to develop detailed project proposals of the proposed prioritized activities above to guide the implementation of the Spatial Plan. It shall do so with the participation of any other relevant stakeholders from government institutions of the same, or different levels, the private sector, civil society, and local people. These proposals include objectives, activities, time, financial resources, responsibilities, and key indicators for monitoring and evaluation. Importantly, it shall also include indicators of social and environmental impacts that will allow for monitoring and evaluation.

The role of PCLMUP is central in the process. It oversees the development of project proposal into the 5-year development plan. In doing so, it coordinates with all relevant departments and other provincial level mechanisms, such as state land committee, cadastral committee, to mention a few, are crucial for the Spatial Plan implementation given its multi-dimension nature. The secretariat of the PCLMUP supports the committee in these endeavours. The need of space to accommodate new development and population growth is unavoidable. That is, the need of space to accommodate new development and population growth is unavoidable and this concerns with many sectors requiring to play a role to solve such need collectively.

However, more detailed plans of lower levels, particularly urban and municipal land use master plans, must be conducted further, using the Mondul Kiri Provincial Spatial Plan as a reference and taking into account all aspects of development needs. In this regard, the capacity of local authorities play a vital role in making their plans responsive to their needs. More detailed sector planning also needs to be elaborated by different sector institutions of the government. These sector plans should consider the linkages with other plans done by other sectors at the same level.

5.3 Capacity and institutional development

As indicated in the previous sections, capacity and institutional development, as well as good governance, is a core foundation to implement the Spatial Plan. Members of PCLMUP and of the CWG are amongst those who need to be capacitated to understand and be able to further develop relevant plans and programs of their sectors under the project proposals for effective implementation to reach the purpose of this Spatial Plan. Capacity development is a backbone for strong institution. However, various approaches to enhance and build institutions are also needed for more effective performance.

5.4 Financing

Financial resources for the implementation of the Mondul Kiri Spatial Plan include:

- National budget
- Provincial budget
- Private budget and private sector
- Private Public Partnership
- Development partners
- Contribution from people and community
- Donors
- Other

6 Monitoring and evaluation

6.1 Institutions involved and supporting laws and policies

The main institutions involved in the monitoring and evaluation of the implementation of the Mondul Kiri Provincial Spatial Plan are the Provincial Board of Governors, the Provincial Committee for Land Management and Urban Planning whose members represent the provincial and district administrations as well as the different provincial line departments and . These institutions are also responsive to lower-tier administrative bodies at the district and commune level as well as to civil society organizations working in Mondul Kiri province.

At the national level, the leading institution for the monitoring and evaluation of the implementation of the Mondul Kiri provincial spatial plan is the National Committee for Land Management and Urban Planning (NCLMUP) chaired by the Ministry of Land Management, Urban Planning and Construction (MLMUPC). The national committee shall guide the provincial committee and play a facilitation role to address any issue that might require intervention from the national level.

The monitoring and evaluation of the implementation of the Mondul Kiri provincial spatial plan is carried out based on the approved technical report of the Spatial Plan as adopted by the government, the legal framework consisting of laws, policies of each sector. The role of the Committees for Land Management and Urban Planning (at the provincial and national level) is to coordinate the sectors toward a coherent and integrated implementation.

6.2 Procedures for monitoring and evaluation of the Provincial Spatial Plan

The PCLMUP should scrutinize all investment projects related to any aspect of the spatial plan. It is important to pay a close attention to the coherence of the proposed investment with the spatial development proposed in this plan, the technical feasibility and the social acceptance of the project for the local communities (for instance through implementation of appropriate social safeguards). Social and environmental impact surveys are critical elements of monitoring.

To maintain consistency between the Mondul Kiri Provincial Spatial Plan and the actual development of the province, the PCLMUP shall evaluate the Provincial Spatial Plan every 5 years. The evaluation is conducted under the guidance of the national level if needed. Ideally, the updating and amendment process should take place right before the design of the 5-year strategic development plan of the province. The coordination role of the provincial unified administration (the council and the board of governors) is key. In doing so, the Provincial Spatial Plan can serve as a reference for the design of the development and investment plan in a consistent planning system at the provincial level.

The PCLMUP shall conduct the monitoring and the evaluation of the implementation of the spatial plan based on the framework of indicators identified for each project. The evaluation leads to the update by PCLMUP and eventually to the approval from the National Land Management and Urban Planning Committee, and subsequently, via this national committee, to the adoption from the Royal Government of Cambodia.

7 Conclusion

The preparation and the adoption of the Spatial Plan of Mondul Kiri province is responsive to the actual needs of the local community, which increase due to population growth, to the development challenges, and the important transformation of the socio-economic, cultural and environmental systems in the province. It also reflects the Royal Government of Cambodia's will to pursue democratic development at the sub-national level.

The Spatial Plan was designed thoroughly and collectively to develop the territory of Mondul Kiri province following a vision, development goals, and objectives that do not negatively impact on the environmental sustainability and social equity. As well, the spatial plan provides directions for development related to physical aspects, thereby enhancing aesthetics of regions, and contributing a balanced and equitable distribution of benefits of economic growth; it also provides a strong basis for harmonious sectoral planning at provincial and lower levels to meet the collective purpose of the province.

To achieve the important tasks and activities prioritized to attain its higher-level goals, the Spatial Plan proposes several approaches and strategies that are best conceived as a compass to orientate the development process in all areas, with efficiency and responsibility.

Overall, the Spatial Plan of Mondul Kiri province is an important road map for the effective and responsible management, the use, and the allocation of land, natural resources, technical and social infrastructure following the actual needs of the province, based upon legal principles, participation, and close cooperation between all institutions and stakeholders.

Therefore, the implementation, monitoring, and evaluation of the Spatial Plan of Mondul Kiri province with the participation of all stakeholders is an important contribution to the sustainable development, poverty reduction, and economic growth policies which are framed by the Rectangular Strategy phase IV of the Royal Government of Cambodia (RGC 2018).

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10 Annexes

Annex 1. Composition of Provincial Spatial Planning Committee in Mondul Kiri Province

N ^o	Name	Position	Responsibility
1	Mr. SVAY Sam Eang	Provincial Governor	Chief
2	Mr. PENG Sambath	Deputy Governor	Vice Chief
3	Mr. CHHIM Kan	Director Department of Land Management Urban planning, Construction and Cadaster	Permanent Member
4	H.E. LI Sami	Provincial Council Member	Member
5	H.E. PHLANG Saol	Provincial Council Member	Member
6	Mr. HIEK Sophan	Administration Chief of the Provincial Hall	Member
7	Mr. ROEUNG Phairith	Director of the Provincial Department of Economy and Finance	Member
8	Mr. YUN Saraom	Director of the Provincial Department of Rural Development	Member
9	Mr. MAO Thonearak	Director of Provincial Department of Public Works and Transport	Member
10	Mr. CHHIT Sophal	Director of Provincial Department of Environment	Member
11	Mr. TOV Sotheara	Director of Provincial Department of Industry and Handicraft	Member
12	Mr. SANN Darith	Director of Provincial Department of Mines and Energy	Member
13	Mr. KHEM Phearum	Director of Provincial Department of Water Resources and Meteorology	Member
14	Mr. TIM Sangvat	Director of Provincial Department of Education, Youth and Sport	Member
15	Mr. SONG Kheang	Director of Provincial Department of Agriculture Member	Member
16	Mr. BUN Suo	Director of Provincial Department of Health	Member
17	Mr. SEI Touch	Director of Provincial Department of Culture and Fine Arts	Member
18	Mr. NGIN Sovimean	Director of Provincial Department of Tourism Member	Member
19	Mr. CHIV Thavy	Director of Provincial Department of Posts and Telecommunications	Member
20	Ms. MALY Sokny	Director of Provincial Department of Women Affairs	Member
21	Mr. PUCH Sorya	Director of Provincial Department of Civil Service	Member
22	Mr. HUN Vannara	Director of Provincial Department of Planning	Member

23	Mr. TOUCH Raksmeay	Director of Provincial Department of Cult and Religion	Member
24	Mr. LIM Sreng	Deputy Director of Provincial Department of Commerce	Member
25	Mr. VORNG Sokserey	Director of Rattanakiri Provincial Forest Administration	Member
26	Mr. LONG Vibol	Governor of Sen Monorom City	Member
27	Mr. NUON Sarorn	Governor of Pichreada District	Member
28	Mr. SIN Vanvuth	Governor of Keo Seima District	Member
29	Mr. NORNG Tunaray	Governor of Oraing District	Member
30	Mr. MEUL Soeun	Governor of Koh Nhek District	Member

Annex 2. Composition of the secretariat Provincial Spatial planning committee in Mondul Kiri province

N ^o	Name	Position	Responsibility
1	Mr. YIM Vanna	Deputy Director Department of Land Management Urban planning, Construction and Cadaster	Chief
2	Mr. SOK Sera	Administrative Deputy Director of Provincial Hall	Vice Chief
3	Mr. HOU Raveth	Director of Provincial Department of LMUCC	Member
4	Mr. SOM Makara	Deputy Director of Provincial Department of Economy and Finance	Member
5	Mr. KEUNG Chhean	Deputy Director of Provincial Department of Rural Development	Member
6	Mr. SORN Tha	Deputy Director of Provincial Department of Public Works and Transport	Member
7	Mr. HAN Khorn	Deputy Director of Provincial Department of Environment	Member
8	Mr. SOK Bunthoeun	Deputy Director of Provincial Department of Industry and Handicraft	Member
9	Mr. TY Sophal	Deputy Director of Provincial Department of Mines and Energy	Member
10	Mr. NHAN Kuok	Official of the Provincial Department of Water Resources and Meteorology	Member
11	Mr. KIM Bunthoeun	Deputy Director of the Provincial Department of Education, Youth and Sport	Member
12	Mr. HAN Sopheak	Deputy Director of the Provincial Department of Agriculture	Member
13	Mr. KUCH Vanna	Deputy Director of the Provincial Department of Health	Member
14	Mr. SANN Kil	Bureau Chief of the Provincial Department of Culture and Fine Arts	Member
15	Mr. SAROU Rattana	Deputy Director of Rattanakiri Provincial Forest Administration	Member

16	Mr. KHUN On	Deputy Governor of Sen Monorom City	Member
17	Mr. SAN Kim Eab	Deputy Governor of Keo Seima District	Member
18	Mr. SORN Sarun	Deputy Governor of Oraing District	Member
19	Mr. HOEUN Sokna	Deputy Governor of Pichreada District	Member
20	Mr. NUT Boeun	Deputy Governor of Koh Nhek District	Member
21	Mr. KEO Bunthorn	Finance Bureau Chief of Provincial Hall	Member
22	Mr. YEN Chantong Heng	Bureau Chief of the Provincial Inter-sectors	Member
23	Mr. NGAM Sambath	Bureau Deputy Chief of Provincial Department of LMUCC	Member
24	Mr. OEU Samol	Bureau Chief of Land Management, Urban Planning, Construction and Land Registry of Sen Monorom city	Member
25	Mr. NOU Saren	Bureau Chief of Land Management, Urban Planning, Construction and Land Registry of Keo Seima District	Member
26	Mr. LIM Sokkheng	Bureau Chief of Land Management, Urban Planning, Construction and Land Registry of Oraing District	Member
27	Mr. CHHOR Laipheng	Bureau Chief of Bureau Chief of Land Management, Urban Planning, Construction and Land Registry of Pichreada District	Member
28	Mr. SRUN Vanny	Bureau Chief of Bureau Chief of Land Management, Urban Planning, Construction and Land Registry of Koh Nhek district	Member

Annex 3. Composition of the Core Working Group for Spatial Planning Committee in Mondul Kiri province

No	Name	Gender	Position	From
1	Yim Vanna	Male	Deputy Director of PDLMUPCC	PDLMUPCC
2	Pen Thet	Male	Head of Citizen's Division	MDK Provincial Administration
3	Han Khon	Male	Head of Community Development office	Provincial Department of Environment
4	Pen Chanrattanak	Male	Head of Development & Construction Management	MDK Provincial Administration
5	Teav Sarin	Male	Head of Agro-Industry office	Provincial Department of Agriculture Forestry & Fisheries
6	Ly Narin	Male	Head of Planning office	Provincial Department of Tourism
7	Horn Samnai	Male	Vice-Head of General Affairs office	Provincial Department of Public Works and Transport

8	Mitt Bunpros	Male	Head of Technology office	Provincial Department of Planning
9	Chan Seyhamany	Female	Vice-Head of Development and Construction Management Office	MDK Provincial Administration
10	Kong Sakda	Male	Vice-Head of Cadastral and Geographical Office	PDLMUPCC
11	Hor Raveth	Male	Head of Construction office	PDLMUPCC
12	Ros Rattanak	Male	Officer	Provincial Department of Mines and Energy
13	Ngam Sambath	Male	Head of Housing officer	PDLMUPCC
14	Sok Tykheavuth	Male	Officer	Provincial Department of Culture and Fine Arts

Annex 4. List of supporters

Institution	Name	Position
WWF	Ouch Povmardy	Senior Officer for Spatial Planning and GIS
	Mann Mouy	Chief of Party, USAID WSSP Project
	Milou Groenenberg	Technical advisor
	Thou Sothean	GIS project officer
RUPP	Chansopktrea	Consultant on Ecosystem Service
	Chhou Paneth	Consultant and trainer on Ecosystem Service
RUA	Neang Maline	Consultant and trainer on Ecosystem Service
	Oum Somaly	Trainer on Ecosystem Service
MLMUPC	Meng Bunnarith	Advisor
	Pho Soprheara	Advisor
Consultant team	Seng Touch	Co-team leader
	Sim Visal	Member
	Sok Kimchheng	Administrator and Financer
	Rath Phanna	GIS expert
	Jean-Christophe Diepart	Co-team leader

Annex 5. List of activities and training conducted during the provincial spatial planning of Mondul kiri

From January 2017 to July 2019

No	Date	Name of event	Place of event	Total Participants	List of Participants
1	24 January 2017	Kick-off Workshop	Pichda guesthouse, Senmonorum, Mondulkiri Province	103 participants	<ul style="list-style-type: none"> - Ministry of Land Management, Urban Planning and Construction (MLMUPC) - Provincial committee for land management and urban planning - Provincial Secretariat of land management and urban planning - Provincial NCDD - Speaker from Battambang, and Takeo provinces - Municipal and Districts - Private sector - WWF - NGOs - Students - Other stakeholder
2	07 to 11 March 2017	Study trip and Team building in BTB	Khemara 1 hotel, Battambang Municipality, Battambang province	23 Participants	<ul style="list-style-type: none"> - Deputy Provincial Governor - Representative from one municipality, 4 District in Mondulkiri - Royal University of Agriculture - WWF
3	23 to 24 February 2017	Training on the Linked Indicators for Vital Ecosystem Services (LIVES)	Stueng Treng Provincial Hall	7 Participants	<ul style="list-style-type: none"> - Core working group (CWG) members - WWF

4	28 Feb to 03 Mar. 2017	Initial field visit in Mondul Kiri	1 Municipality and 4 districts	10 Participants	<ul style="list-style-type: none"> - MLMUPC - CWG members - WWF-Cambodia
5	27-28 July 2017	Training on Sustainable Biodiversity, Environmental and Social Benefits in the Protected Areas of the Eastern Plains Landscape	Pichda guesthouse, Saen Monorum	15 Participants	<ul style="list-style-type: none"> - Royal University of Agriculture - Provincial Hall - Representative from Semonorum Municipality - Representative from Koh Nhaek District - CWG members - WWF
6	In August 2017 Conducted 2 days/district	District data verification	<ol style="list-style-type: none"> 1. Kaoh Nheaek, 2. Saen Monourom 3. Pich Chreada, 4. Ou Reang 5. Keav Seima 	163 participants	<ul style="list-style-type: none"> - -district administration, - line offices - representatives of commune/sangkat - representatives of community based organization (CF, CPA, CFi) and - representatives of private sector companies or NGO working in the district
7	30 November 2017	Workshop on Institutional Capacity Assessment using SWOT	Mondulkiri guesthouse, Saen Monorum	38 participants	<ul style="list-style-type: none"> - Representative from Municipality, all districts - Provincial line-departments - Consultant team - CWG members - WWF
	29 January 2019	Inception workshop on Provincial Spatial Planning (PSP)	Pichda guesthouse, Saen Monorum	46 Participants	<ul style="list-style-type: none"> - Representative from Municipality, all districts - Provincial line-departments - Consultant team - CWG members

					<ul style="list-style-type: none"> - Private sectors, - NGOs - WWF
8	7 March 2019	Training on introduction and mainstreaming ecosystem services in PSP	Provincial Department of Environment, Saen Monorum	10 participants	<ul style="list-style-type: none"> -Consultant team -CWGs members -WWF
9	23-24 April 2019	Consultation workshop on Situation Analysis Technical Report	Provincial Department of Environment, Saen Monorum	86 participants	<ul style="list-style-type: none"> - Representative from Municipality, all districts - Provincial line-departments - Consultant team - CWG members - Private sectors, - NGOs - WWF
10	04 July 2019	Training on GIS and InVEST Tool	Provincial Department of Environment, Saen Monorum	12	<ul style="list-style-type: none"> - Consultant team - CWG members - WWF

From January 2020 to February 2021

No	Date	Name of event	Place	Total Participants	List of Participants
1	23 January 2020	Meeting with Core Working Group and review of planning outputs produced so far	Saen Monourom	17	<ul style="list-style-type: none"> - Core working group members - MLMUPC - Consultant team
2	18 February 2020	Training on provincial spatial planning procedures	Saen Monourom	14	<ul style="list-style-type: none"> - Core working group members - MLMUPC - Consultant team
3	19-21.02.2020	GIS training to CWG	Saen monourom	14	<ul style="list-style-type: none"> - Core working group members - MLMUPC - Consultant team
4	23 April 2020	Meeting with Core Working Group – data and spatial analysis towards step 2	Online	20	<ul style="list-style-type: none"> - Core working group members - MLMUPC - Consultant team
5	28 May 2020	Meeting with Core Working Group - data and spatial analysis towards step 2	Online	15	<ul style="list-style-type: none"> - Core working group members - MLMUPC - Consultant team
6	24 June 2020	Meeting with Core Working Group – introduction and training on step 3	Saen monourom	18	<ul style="list-style-type: none"> - Core working group members - MLMUPC - Consultant team
7	31 July 2020	Presentation of preliminary output to MLMUPC delegation + training on demographic projection	Saen monourom		<ul style="list-style-type: none"> - Core working group members - MLMUPC delegation - Consultant team

8	10-11 August 2020	GIS training	Saen monourom	18	<ul style="list-style-type: none"> - Core working group members - MLMUPC - Consultant team
9	31 August 2020	Training on ecosystem services	Saen monourom	23	<ul style="list-style-type: none"> - Core working group members - MLMUPC - Consultant team
10	01 September 112020	Meeting with PCLMUP to present step 2 outputs and vision	Saen monourom	44	<ul style="list-style-type: none"> - Members of PCLMUPC - Members of provincial council - Core working group members - MLMUPC - Consultant team
11	01 September 2020	Meeting with Core Working group - Preparation of consultation workshop at district level		10	<ul style="list-style-type: none"> - Core working group members - MLMUPC - Consultant team
12	23 September 2020	Meeting with Core Working group – Training on strategic matrix		10	<ul style="list-style-type: none"> - Core working group members - MLMUPC - Consultant team
13	16 October 2020	Meeting with Core Working group – Training on strategic matrix		10	<ul style="list-style-type: none"> - Core working group members - MLMUPC - Consultant team
14	19-23 October 2020	Consultation workshop at district level	<ol style="list-style-type: none"> 1. Kaoh Nheaek, 2. Saen Monourom 3. Pich Chreada, 4. Ou Reang 	229	<ul style="list-style-type: none"> - Core working group members - MLMUPC - Consultant team - District governors and council - Commune representatives

			5. Keav Seima		<ul style="list-style-type: none"> - Community-based organizations - Civil Society Organization
15	11 January 2021	Meeting with core working group – presentation and discussion on step 4 results	Online	14	<ul style="list-style-type: none"> - Core working group members - MLMUPC - Consultant team
16	28 January 2021	Meeting with core working group – presentation and discussion on step 4 results	Saen Monourom	??	<ul style="list-style-type: none"> - Core working group members - MLMUPC - Consultant team
17	29 January 2021	Meeting with PCLMUP – presentation and endorsement of Step 3 and Step 4	Saen Monourom	??	<ul style="list-style-type: none"> - Members of PCLMUPC - Members of provincial council - Core working group members - MLMUPC - Consultant team

Annex 6. Land cover categories used in land cover change analysis

Settlements



Forest (D-S-E)



Annual/Perennial
Crop (chamcar)
Note that this land
cover category
includes rubber



Forest (other)
Include forest
plantation, bamboo
forest



Perennial



Degraded forest



Rice



Mosaic Forest-Cropland



Water



Annex 7. Number of people living inside Protected Areas in Mondul Kiri province

	2018
Number of household living inside protected areas	3,495
Percentage of household living inside protected area	16,8%

PDOP, 2018

Annex 8. List of Community Protected Area (CPA), by PDoE, 2019

ID	Name	Area in Prakas (Ha)	Location	Family
1	Rovak	1618	Roya commune, Kaoh Nheaek district (1 village)	106
2	Phnom Rohav	2956	Srae Chhuk commune, Keav Seima district(3 villages)	102
3	Antrong Samki Sen Chey	2021	Pu Chrey communit, Pechreada district (1 villages)	172
4	Ronus-Khnheng	1734	Chong Phlah commune, Kaev Seima district (1 village)	89
5	Nglaoka Katos	2226	Sokh Dom sangkat, Saen Monourom (1 village)	175
6	Poutong-Pouhoung Nam Hang	2913	Chong Phlah commune, Kaev Seima district (2 villages)	161
7	Srae Y-Noum Thoum	1777	Romonea sangkat, Saen Monourom (1 village)	101
8	Phnom Kduk	2815	Memang communit, Pechreada district (2 villages)	187
9	Chiklob-Phnom Choung Kdei Sangkhoem	2989	Sok Sant commune, Kaoh Nheaek district (2 villages)	183
10	Srae Thom-Mleng	3000	Sok Sant commune, Kaoh Nheaek district (3 villages)	171
11	Srae Preah	3438	Srae Preah commune, Kaev Seima district (3 villages)	216
12	A Buon Leu	4528	A Buon Leu commune, Kaoh Nheaek district (1 village)	367
13	Krang Ropuk	1184	Pu Chrey communit, Pechreada district (2 villages)	92
14	Ou Nglav	4635	Srae Huy commune, Kaoh Nheaek district (1 village)	301
15	Trapeang Khaerm	2410	Pu Chrey communit, Pechreada district (2 villages)	152
16	Pu Chrey	2433	Pu Chrey communit, Pechreada district (2 villages)	149
17	Maloel Kong Pros	4654	Nang Khi Lik commune, Kaoh Nheaek district (2 villages)	333
18	Tou Lung	7082	Krang Teh commune, Pechreada disticting (3 villages)	432
19	Lao Romeat	3223	Krang Teh commune, Pechreada disticting (1 village)	64
20	Yuk Namram	4781	Sok Sant commune, Kaoh Nheaek district (3 villages)	775
21	Namelea	661.69	Bu Sra communit, Pechreada district (3 villages)	162
Total		63,079	35 villages	4490

Annex 9. List of Economic Land Concessions

Id (see map)	Name	State Land Registration	Ministry originally in charge	Area after Order 01 (ha)	Crop
1	Dak Lak	Yes	Ministry of Agriculture	4,162	Rubber
2	Varanasi	Not yet	Ministry of Agriculture	1,800	Rubber
3	Sethey Cola	In process	Ministry of Environment	4,273	Rubber
4	Coviphama	Yes	Ministry of Environment	5,345	Rubber
5	K Peace	In process	Ministry of Environment	500	Rubber
6	DTC	In process	Ministry of Agriculture	4,000	Rubber
7	Villa Development	In process	Ministry of Agriculture	728	Rubber
8	Mega First Corporation	Yes	Ministry of Environment	9,477	Unspecified
9	Houlean	In process	Ministry of Agriculture	7,773	Pine
10-11	Vouchisan	In process	Ministry of Agriculture	10,000	Pine
12	Binh Phuc	Yes	Ministry of Agriculture	5,100	Rubber
13	Victory	Yes	Ministry of Agriculture	7,215	Unspecified
14	Mohipha	Yes	Ministry of Agriculture	7,837	Unspecified
15	Glory	Yes	Ministry of Agriculture	7,351	Unspecified
16	Daitanh	Yes	Ministry of Environment	7,807	Unspecified
17	Seang Long	In process	Ministry of Agriculture	7,000	Rubber
18	Land & Developing	In process	Ministry of Agriculture	7,000	Rubber
19	Lim Royal	Yes	Ministry of Environment	9,068	Unspecified
20	Master K Son	In process	Ministry of Environment	6,892	Unspecified
21	Touch Wood	Yes	Ministry of Agriculture	9,018	Unspecified
22	Unigreen	Not yet	Ministry of Agriculture	1,900	Rubber
23	Pacific Green	Yes	Ministry of Agriculture	9,656	Rubber
24	Pacific Price	Yes	Ministry of Agriculture	9,773	Rubber
25	Pacific Pel	Yes	Ministry of Agriculture	9,614	Rubber
26	Pacific Lotus	yes	Ministry of Agriculture	9,014	Rubber
Total area				162,303	

Annex 10. The classification of urban centers based on the population size, population density, and employment

District/ Krong	Commune/ Sangkat	Total population	Percentage of the total population above 18 in agriculture	Population density
Kaev district	Seima Chong Phlah	3 301	66%	4
	Memang	2 850	76%	7
	Srae Chhuk	4 691	87%	6
	Srae Khtum	12 356	71%	38
	Srae Preah	3 905	74%	7
	Nang Khi Lik	3 905	85%	4
	A Buon Leu	1 969	78%	5
Kaoh Nheaek	Roya	2 996	83%	1
	Sokh Sant	3 824	82%	7
	Srae Huy	2 769	90%	3
	Srae Sangkum	7 255	66%	73
Ou Reang	Dak Dam	2 755	77%	6
	Saen Monourom	3 721	77%	5
	Krang Teh	2 993	76%	4
Pech Chreada District	Pu Chrey	9 489	75%	4
	Srae Ampum	2 230	69%	12
	Bu Sra	6 543	77%	11
	Monourom	1 945	13%	214
Krong Saen Monourom	Sokh Dom	3 552	53%	23
	Spean Mean Chey	4 913	7%	84
	Romonea	3 842	79%	13

Annex 11. Tourism attractions in Mondul Kiri province

Name	Categories	Location	Potential	Management	Licence	Services	Status
Chamkar Cafe Resort	Agri-tourism	Chamkar Tae Village, Spean Meanchey Commune, Senmonorom City, 3Km distance from Senmonor	Coffee Plantation & Some Kind of Fruits Plantation	Private Company	Yes	Home Stay, Meal, Natural Coffee, and Natural Fruit	Current
Phnom Kroul	Cultural Tourism	Koah Nheaek district, 111Km distance from Senmonorom City.	Cultural Tourism and Research	Community		Tour Guide	Current
Phnom Dos Kramom	Eco & Cultural Tourism	Sokhdom Commune, Senmonorom City, 1Km distance from Senmonorom City.	Natural View and Cultural Site	Public	No	Sight Seeing and for celebrating traditional ceremony of Punong Indigenous	Current
Chrey Thom	Ecotourism	Dak Dam Village, Dak Dam Commune, Ou Raing District, 26Km distance from Senmonorom City	Natural View and Forest	Community		Swimming and Natural Entertainment	Current
Laeng Khin Laeng Ang Waterfall	Ecotourism	Senmonorom Commune, Ou Raing District, 26Km distance from Senmonorom City.	Waterfall and Natural View	Community		Swimming and Natural Entertainment	Current
Dom Nak Sdach	Ecotourism	Chrey Sen Village, Monorom Commune, Senmonorom City, 5Km distance from Senmonorom City.	Natural View	Community		Meal and Relax Scatter	Current
Bou Sra Waterfall	Ecotourism	PuTil Village, Bou Sra Commune, Pech Chreyda District, 38Km distance from Senmonorom.	Waterfall	Private Company	Yes	Meal, Souvenir, and Natural Entertainment	Current
Chrey Yos	Ecotourism	Lao Ka Village, Sokhdom Commune, Senmonorom City, 7Km distance from Senmonorom City.	Natural View	Public	No	Home Stay, Meal and Relax Scatter	Current
Da Eh	Ecotourism	Thong Phang Village, Pu Chrey Commune, Pech Chreyda District	Wildlife and Natural View	Community		Tour guide adventure in the forest (Natural view and wildlife)	Current
Sea Forest (Lao Ka)	Ecotourism & Man made	Lao Ka Village, Sokhdom Commune, Senmonorom City, 7Km distance from Senmonorom City.	Natural View (Forest)	Private Company	No	Home Stay, Camping, Meal and Suvenir	Current
Romear l Waterfall	Ecotourism & Man made	Pu Tru Village, Senmonorom Commune, Ou Raing District, 17Km distance from Senmonorom Cit	Natural View	Private Company	Yes	Swimming and Sight Seeing	Current
Ou Phlay	Ecotourism & Man made	Pu Kreng Village, Srae Ampoum Commune, Pech Chreyda, 30Km distance from Senmonorom City.	Waterfall and Long water surface	Private Company	Yes	Swimming and ecotourism	Current

Ou Romis	Ecotourism & Man made	Monorom Commune, Senmonorom City, and 4Km distance from Senmonorom City.	Guest house, Vegetable garden, Camping and Restuarant.	Private Company	Yes	Guest house, Vegetable garden, Camping and Restuarant.	Current
Hilltop Observatory & Resort	Ecotourism & Man made	Dak Dam Commune, Ouraing District, 15Km distance from Senmonorom City.	Natural View	Private Company	No	Home Stay, Camping, Meal and Sight Seeing	Current
Wat Senmonorom	Religious	Derm Srol Village, Monorom Commune, Senmonorom City					Current
Romear II Waterfall	Ecotourism	Senmonorom Commune, Ou Raing District, 12Km distance from Senmonorom City.	Natural View	Public	No	No	Potential
Andoung Sne	Ecotourism	Dak Dam Commune, Ou Raing District, 28Km distance from Senmonorom City.	Natural View	Public	No	No	Potential
Lek Pok Bras Waterfall	Ecotourism	Pu Trum Village, Monorom Commune, Senmonorom City, 13Km distance from Senmonorom City.	Natural View	Public	No	No	Potential
Phnom LuPran	Ecotourism	Pu Lu Village, Bou Sra Commune, Pech Chreyda District, 50Km distance from Senmonorom City	Natural View	Public	No	No	Potential
Phnom Baychhao	Ecotourism	Pu Loung Village, Rommonea Commune, Senmonorom City, 12Km distance from Senmonoromm City	Natural View	Public	No	No	Potential
Laeng Mahok Waterfall (Andoung Kroleong)	Ecotourism	Andoung Kraloeng Village, Senmonorom Commune, Ou Raing District, 35Km distance from Senm	Natural View	Public	No	No	Potential
Phnom Namlea	Ecotourism	Pu Teut Village, Bou Sra Commune, Pech Chreyda District, 58Km distance from Senmonorom Ci	Natural View	Public	No	No	Potential
Ou Taing Korn Waterfall	Ecotourism	Pu Lu Village, Bou Sra Commune, Pech Chreyda District, 60Km distance from Senmonorom City	Natural View	Public	No	No	Potential
Prampi Chhoan Waterfall	Ecotourism	Pu Teut Village, Bou Sra Commune, Pech Chreyda District, 40Km distance from Senmonorom Ci	Natural View	Public	No	No	Potential

Source: DoT 2019

Annex 12. List of new potential areas for tourism and culture

ID	Name	District
1	Phnom Nam Ram is located in the community of Nam Ram Protected Area.	Kaoh Nheaek
2	Koh Myel or Neak Tamel is located in Koh Myel Leu village, Nong Khili commune, Koh Nhek district.	Kaoh Nheaek
3	Koh Chrei is located in Koh Meul Leu village, Nong Kili commune, Koh Nhek district.	Kaoh Nheaek
4	Phnom Bak Kheng is located in Roveak village, Rayor commune, Koh Nhek district.	Kaoh Nheaek
5	Phnom Nam Phyp is located in Andres village, Or Buon Leu commune, Koh Nhek district.	Kaoh Nheaek
6	Phnom Ngav Kham is located in Sre Huy village, Sre Huy commune, Koh Nhek district.	Kaoh Nheaek
7	Phnom Toteung Tngay is located in Sre Hun village, Sre Huy commune, Koh Nhek district.	Kaoh Nheaek
8	Phnom Kong Kong is located in Roveak Village, Rayor Commune, Koh Nhek District.	Kaoh Nheaek
9	O Chbar Mleung is located in Chong Phang village, Pou Chrey commune, Pech Chreada district.	Pech Chreada
10	Phnom Mouth is located in Chong Phang village, Pou Chrey commune, Pech Chreada district.	Pech Chreada
11	Phnom Kang Chum is located in Putang village, Pu Chrey commune, Pech Chreada district.	Pech Chreada
12	Phnom Damrey is located in Putang village, Pu Chrey commune, Pech Chreada district.	Pech Chreada
13	Phnom Beng is located in Me Pai village, Pou Chrey commune, Pech Chreada district.	Pech Chreada
14	Trapeang Kameum is located in Putang Village, Pou Chrey Commune, Pech Chreada District.	Pech Chreada
15	O'Ter Waterfall (Leng Pom Tal) is located in Po Chrey Chang Village, Po Chrey Commune, Pech Chreada District.	Pech Chreada
16	O'Pol Waterfall	Pech Chreada
17	Phnom Lutrong	Pech Chreada
18	O'Plai Waterfall	Pech Chreada
19	Peng Kon Nhot	Pech Chreada
20	O Pol Waterfall (No more rushing)	Pech Chreada
21	Leng Tou Waterfall	Pech Chreada
22	Andong Saksith (Luntol, Krang Tes Commune)	Pech Chreada
23	The waterfall is no longer clear	Pech Chreada
24	Waterfall is no longer lonely	Pech Chreada
25	Waterfall (stone pillars)	Pech Chreada
26	Luraong (Phnom Thmor Da) Road to Lao Romiet	Pech Chreada
27	2-story waterfall (Sen Monorom commune)	Ou Reang

28	Leng Klang Waterfall (Sen Monorom Commune)	Ou Reang
29	Le Kring Waterfall (Sen Monorom Commune)	Ou Reang
30	Vulture community (lathe well)	Ou Reang
31	Lathe Well (Cultural Tourism)	Ou Reang
32	Met Waterfall (Sen Monorom Commune)	Ou Reang
33	Leng Kaev Waterfall (Sen Monorom Commune)	Ou Reang
34	Me Prey Dam or Me Prey Dam (Sen Monorom Commune)	Ou Reang
35	Phnom Rolovche (Culture)	Ou Reang
36	Phnom Trech Trai (Culture)	Ou Reang
37	Leng Ranal Waterfall (Dak Dam Commune)	Ou Reang
38	12-story waterfall (Dak Dam commune)	Ou Reang
39	O Khoei (Culture)	Kaev Seima
40	Gati (Culture)	Kaev Seima
41	Anlong Angvech (Culture)	Kaev Seima
42	Trapeang Myab (Tourism)	Kaev Seima
43	Phnom Kaev Seima is on the border of Sre Khtom commune and Sre Preah commune (Tourism + Culture)	Kaev Seima
44	Teuk Kob or Anlong Metro is located in Sre Levi and O'Nach villages (Tourism + Culture)	Kaev Seima
45	O'Tour or O'Kach is located in Pu Tong village, Chong Plas commune	Kaev Seima
46	O'Kvav is located in Pu Tong Village, Chong Plas Commune	Kaev Seima
47	O Taing Lang is located in Pounav village, Memang commune	Kaev Seima
48	O'Pompas Waterfall or Leng Cha Aing is located in Pounav Village, Memang Commune	Kaev Seima
49	Wat Sre Chhouk Waterfall or O Sre Trav Waterfall is located in Chak Char Village, Sre Chhouk Commune.	Kaev Seima
50	Phnom Kous is located in Preah village, Sre Chhouk commune	Kaev Seima
51	Phnom Khiev is located in Preah and Raneng villages, Sre Chhouk commune.	Kaev Seima