EXPERIENCE NOTE

GIS IMPLEMENTATION IN A LOCAL DEVELOPMENT PROGRAMME

LOCAL DEVELOPMENT PROGRAMME FOR BOKEO, BOLIKHAMXAY, KHAMMOUANE AND VIENTIANE PROVINCE - LAO/030

July 2022

LUX DEV
Luxembourg Development Cooperation Agency

MPI

LUXEMBOURG AID & DEVELOPMENT

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LIST OF ACRONYMS

DONRE	District Office of Natural Resources and Environment
DPI	Department of Planning and Investment
DPO	District Planning Office
GIS	Geographic Information System
LSB	Lao Statistics Bureau
MPI	Ministry of Planning and Investment
NGD	National Geographic Department
PONRE	Provincial Office of Natural Resources and Environment

LIST OF FIGURES

DEFINITIONS

Geographic Information Systems	Geographic Information Systems (GIS) are software and tools used to create, or capture, store, manage, analyse and map data that have a spatial attribute. Approximately 80% of global data has a spatial attribute which makes the use of GIS relevant for decision-making. GIS helps users see, analyse and understand patterns and relationships in a geographic context. Many industries and government agencies use GIS to better communicate, perform analysis, share information, and solve complex problems around the world from urban planning to climate change.
Remote sensing	Remote sensing is the acquiring of information about an object or phenomenon by measuring and recording emitted and reflected radiation at a distance. Remote sensing detects and monitors the physical characteristics of an area without making physical contact. This method of data collection typically involves aircraft-based and satellite-based sensor technologies.
Spatial analysis	Spatial analysis includes any of the formal techniques which study entities using their topological, geometric, or geographic properties. This process examines the locations, attributes, and relationships of features in spatial data through overlay and other analytical techniques. Spatial analysis extracts or creates new information from spatial data.
Spatial data	Spatial data can be referred to as geospatial data or geographic information. It describes the shape and location of features and boundaries combining location information and attribute information with temporal information. Geospatial data can be processed and analysed using GIS and it is most useful when it can be discovered, shared, analysed and used with traditional business data.
Spatial modeling	Spatial modeling combines both visualization and exploration techniques. It is an important instrument to conduct geospatial analysis to understand the world, assess spatial patterns and guide decision-making. The spatial model that is created is based on a set of tools that apply operations on the data to create new results.

PRESENTATION OF THE PROGRAMME

The local development programme for Bokeo, Bolikhamxay, Khammouane and Vientiane Province – LAO/030 - supports the Lao Government's poverty reduction strategy for rural development. It focuses on the 14 poorest districts in four provinces, particularly 229 target villages (see Appendix A) with a population of 152,000, 73% of whom are ethnic minorities. At village level, the programme supports a wide range of community-led development activities based on village development plans, as well as improved access to education facilities, clean water, irrigation, and road connectivity. The programme also supports governance strengthening for poverty reduction at national and local level. This two-tiered approach, combining practical rural development with governance strengthening, means that government systems can be informed and improved through demand-driven priorities, field evidence, and actual practice. At the same time, practical development work can benefit from improved application of policies, programmes, regulations, and local planning.

The LAO/030 budget is 34 million EUR, including a 1.5 million EUR contribution from the Swiss Development Cooperation. The five-year programme started in 2017 and is now in its final year. A second phase is due to start in 2023 with similar objectives and modalities, but with more integration with the three other Luxembourg-supported intervention areas (especially at local level) in health, vocational skills development, and governance and rule of law.

PURPOSE AND OBJECTIVES OF THE DOCUMENT

Within LuxDev's headquarters, regional and country offices, and its many projects, GIS has been used only to a limited extent and without an overall strategy, system, and standards. GIS has largely been used in an ad hoc fashion by individuals or programmes and has been underutilised for management and documentation purposes. Opportunities have rarely been taken for data sharing, developing common base maps, and carrying out GIS-based analysis. Furthermore, LuxDev currently lacks a common framework defining GIS objectives, applications, software and capacity strengthening.

This experience sheet will highlight a concrete example of how GIS was used in a rural/local development programme in Lao PDR. It will demonstrate how and why LAO/030 supported processes for GIS implementation, clarify the objectives underpinning this work, identify challenges and constraints faced, lessons learned, and potential applications in the future.

The wider purpose of this document is to explore and develop the use of GIS within LuxDev by capturing and sharing good practices and lessons learned from LAO/030.

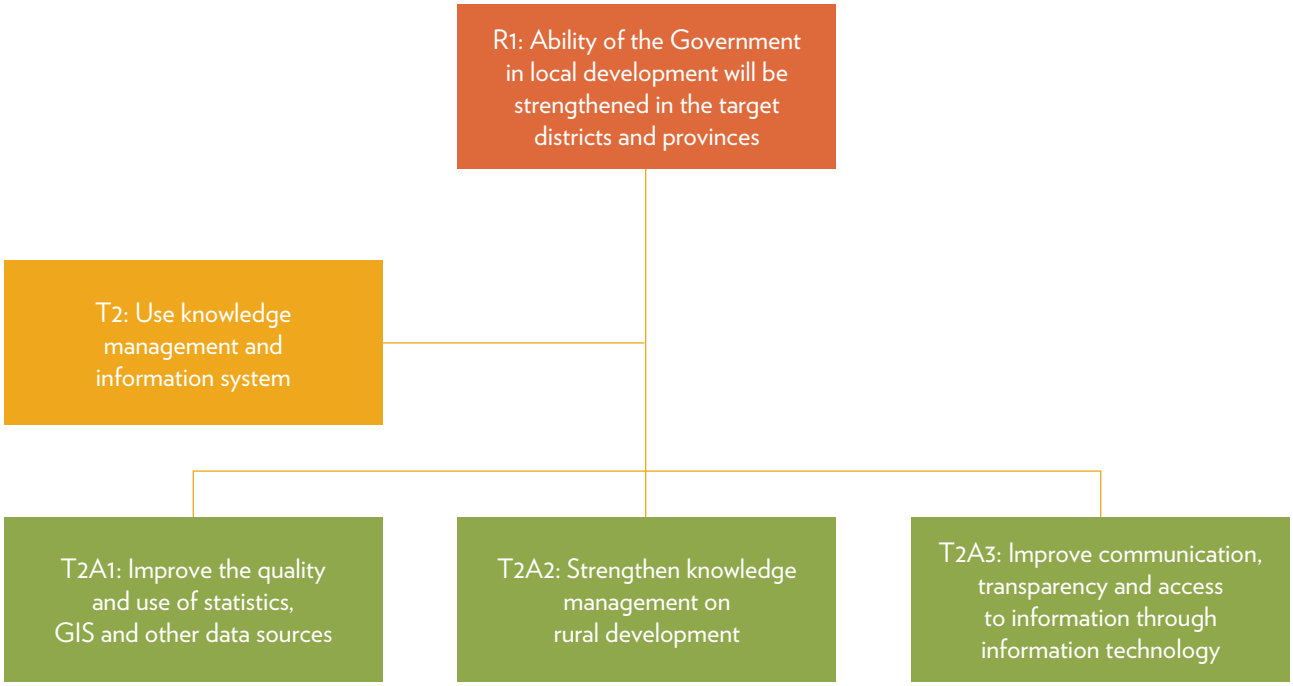
The paper is based on a cooperation started in September 2021 between the LAO/030 programme, the regional office for Laos, Myanmar, and Vietnam, and LuxDev HQ aiming to:

- strengthen LAO/030's on-going GIS work;
- contribute to the current preparation of the Fifth Lao-Luxembourg Indicative Cooperation Programme (ICP V - 2023-2027);
- encourage other LuxDev programmes to draw on and adapt this work to their specific contexts;
- promote increased reflections and exchanges at an organisational level on the development of a common framework for GIS.

CONTEXT AND APPROACH OF THE INTERVENTION

The use of GIS within LAO/030 was based on prior use of GIS in the preceding local development project LAO/021 (2010-2016), which focused on a single province (Bolikhamxay). At the start of LAO/030, it was thus expected that the practical application of GIS would continue within LAO/030 and planned through a dedicated task/activity line in Result 1 (governance) of the Technical and Financial Document (T2A1: Improve the quality and use of statistics, GIS and other data sources) - see figure 1.

Figure 1: GIS implementation logical framework



Although use of GIS and mapping is still in its nascent stages with both the counterpart – Ministry of Planning and Investment (MPI) and Department of Planning - and responsible line Ministries – Ministry of Home Affairs, Ministry of Agriculture and Forestry and, Ministry of Natural Resources and Environment (MoNRE) - it was foreseen that LAO/030 could raise awareness on the importance of these systems through trainings and the piloting of GIS applications relevant to socioeconomic development planning and monitoring, land management, and documentation (e.g. atlas, graphs, maps) – hence serving both the needs of the programme and its national/sub-national counterparts.

Enhancing the quality and use of GIS strengthens management information systems in the four target provinces (which are linked to upstream national systems), improves the quality and use of statistics and, through improved visualisation of plans and activities, facilitates knowledge sharing on rural development.

IMPLEMENTATION APPROACH

The local development programme for Bokeo, Bolikhamxay, Khammouane and Vientiane Province – LAO/030 - supports the Lao Government's poverty reduction strategy for rural development. In this section, a focus will be made on the implementation approach of the GIS strategy which covers the acquisition of IT, data collection and a presentation of the GIS capacity strengthening approach.

Capacity strengthening

Direct support for GIS was primarily comprised of training, IT equipment and software. Funds for these activities were channelled through Governance Delegation Agreements for Funds and Implementation, signed with Department of Planning and Investment (DPI) of the MPI within each target province. The DPIs were therefore responsible for managing and coordinating capacity strengthening activities (mainly trainings) targeting provincial and district level representatives from planning departments and other relevant line agencies (DONRE, PONRE, Provincial Home Affairs etc.).

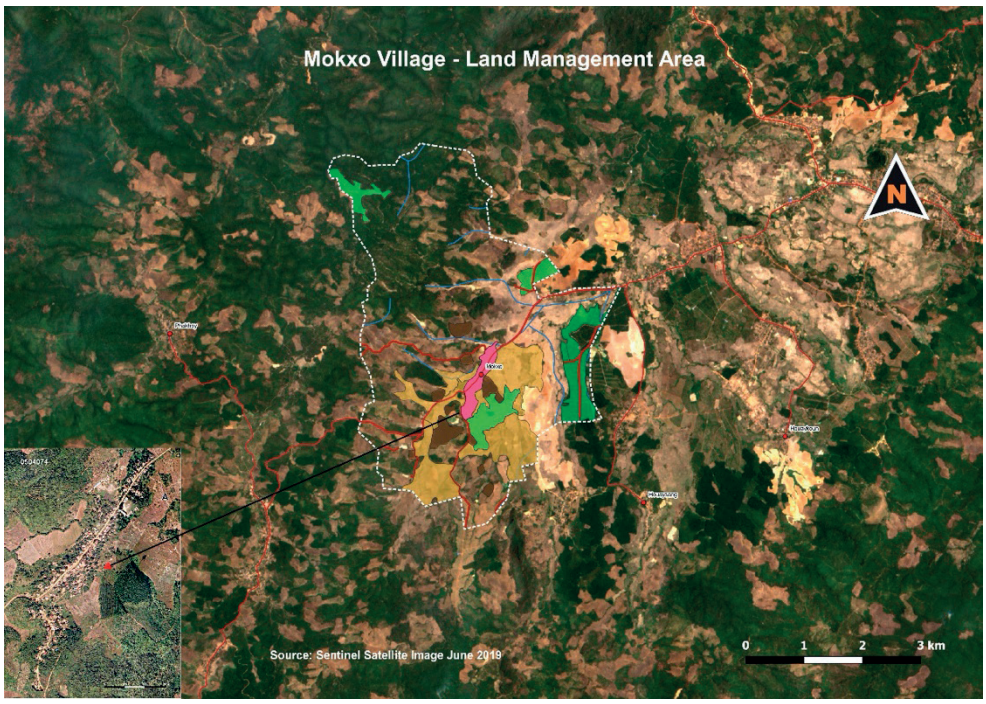
Figure 2: Mapping foreign direct investments and domestic investments at the DPI in Bokeo

Considering that existing GIS capacity is relatively weak among government staff – even though Lao PDR has been supported with the GIS work since early 90s by other cooperation agencies - training modules have focused on basic applications of QGIS, Google Earth Pro and QFIELD at village level. These trainings included understanding how to move points on a map, digitizing important features such as households, rivers, or lakes, collecting GPS data – and finally - composing and designing the maps.

It's important to note that LAO/030 primarily supports government staff in the production of thematic maps which can be subsequently used at district and provincial levels to discuss and coordinate on the sensitive issue of land use and land management.

GIS and Google Earth have also been successfully introduced and used at village level with village leaders, village development committees, and community members involved in participatory decision-making processes, village boundary preparation and village level GIS data collection. GIS is used in decentralized planning, programme monitoring (e.g., GIS has supported the monitoring process with data and maps of where and when implementation took place) and visualization/tracking of socio-economic and environmental conditions in the target villages – see Figure 3.

Figure 3: Preparation of land management plan using Sentinel Satellite Image



Working at these levels (district and village) ultimately served to provide qualitative improvements to the national spatial database through the development of up-to-date maps covering all villages in the four target provinces. The maps include unified names in Lao and English, unified village codes, correct locations, and accurate district boundaries. Prior to this intervention, the baseline for many villages in Lao PDR was still based on spatial data from 1985! This meant that many village locations and names were severely outdated, especially in the mountains and uplands where village relocations, amalgamations, and voluntary movement have been common.

In total, LAO/030 trained a group of 40 government staff from central and local level, as well as 12 programme staff. Other government staff (12) and programme staff (8) received guidance on the use of GIS and maps.

Figure 4: QGIS training at MoNRE Vientiane

These trainings are part of an ongoing capacity strengthening process, which will enable better use of GIS as part of the agencies' regular planning work through mapping to help users understand patterns, relationships, and geographic context within districts and villages.

However, the development of geographic maps (except in LAO/030's target provinces and districts where the programme benefits from the endorsement of the MPI) is the sole responsibility of the National Geographic Department (NGD). It is important to mention that the NGD and the Census Bureau do not systematically work together on the topic of mapping, which is unusual.

Participatory mapping also took place for data collection to prepare District and Provincial Investment maps with various sector departments (e.g., Ministry of Energy and Mining, Ministry of Commerce and Industry, Ministry of Agriculture and Forestry).

GIS equipment, trainings and software

GIS technology depends on the use of IT equipment (laptops, computers, screens) and specific software. LAO/030 initially provided generic IT support to DPIs and District Planning Offices (DPO) but adjusted its approach by providing IT equipment at village level and establishing and equipping (desktop computers) IT centres in each target district to provide trainings on basic GIS software. As the work on mapping gathered momentum and considering the more demanding technical requirements for GIS operations and trainings, the programme provided laptops to each DPO and high-performance laptops to each DPI.

GIS interventions were funded through the programme's T2A1 budget line (improve the quality and use of statistics, GIS, and other data sources). Costs are primarily linked to trainings (see Appendix D) and equipment (laptops, screens, computers, internet access) while other costs for GIS are integrated in activities like village boundary delineation, data collection and coordination. GIS trainings and IT equipment cost approximately 74,000 EUR over five years of programme implementation. These expenses were directly managed by the provinces.

Figure 5: IT equipment bought by the programme LAO/030

Actor	Number of laptops/desktops bought by the programme for GIS activities	Budget	
		LAK	EUR
National	4	207,403,850.80	20,711.07
Provincial	8		
District	9		

Data collection

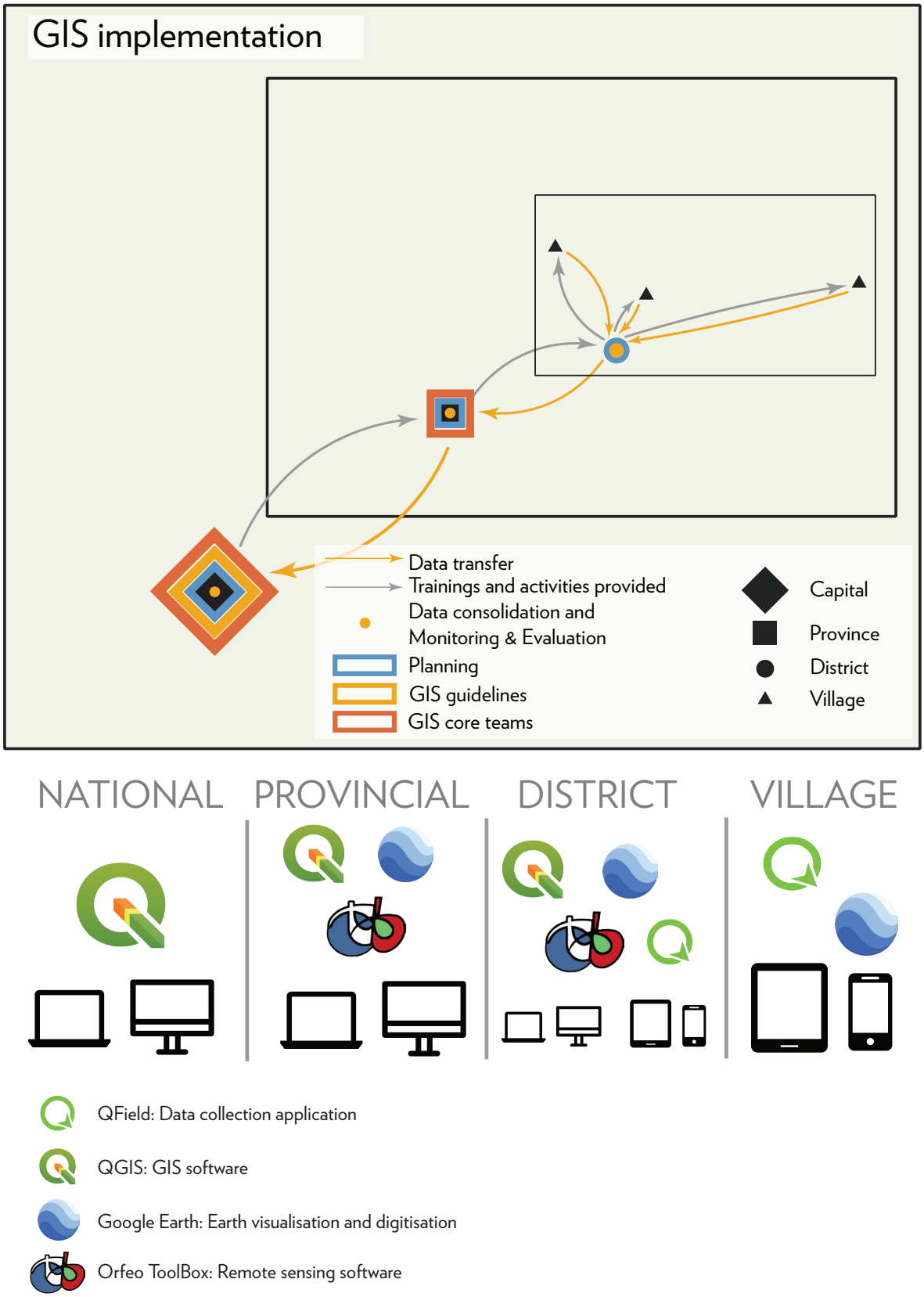
Data collection is a bottom-up process which begins at village level using QFIELD on smartphones or tablets. QFIELD is a mobile data collection application that allows the user to conduct surveys and digitalise data.

Data gathered at village level is sent to the district, consolidated and, aggregated on computers using QGIS. Satellite imagery can be used to enhance data collected in the field. Data collected at district level is subsequently sent to the provinces where it is consolidated and incorporated in the monitoring and evaluation matrix. The provinces then send the data to the national level where it is treated a final time and aggregated at national level to be incorporated into national planning and the Five-Year Plan.

Figure 6: Data collection with QFIELD[1] on tablet

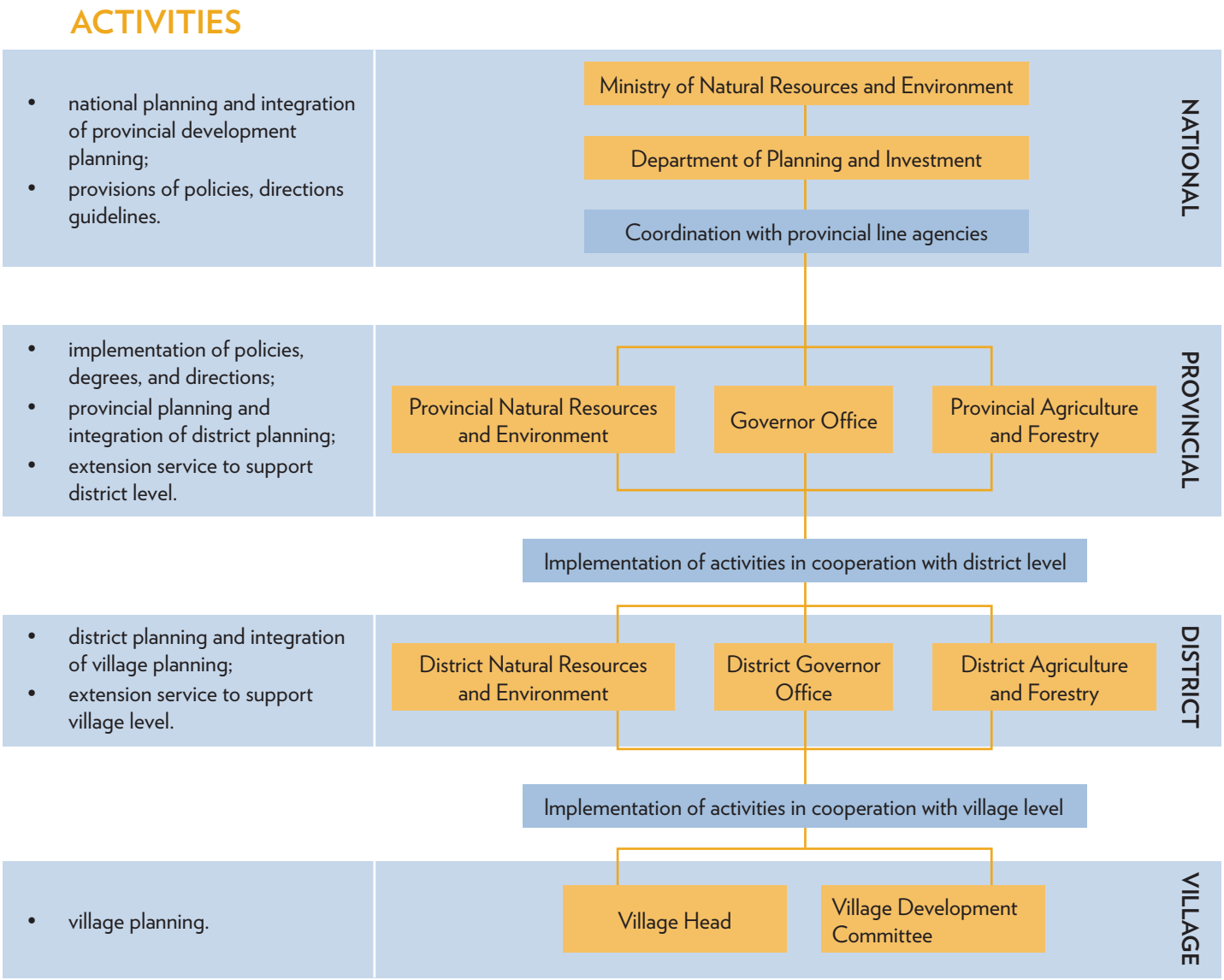
1 QFIELD is an open-source mobile data collection application. It allows the user to collect georeferenced data and combine them with metadata and/or surveys. QFIELD can be synchronised with QGIS and is available on Android and IOS.

Figure 7: GIS work interactions between the different actors



THE DIFFERENT ACTORS AND THEIR RESPECTIVE ROLES

Figure 8: The different actors involved in the GIS work and their respective roles



PROGRESS AND RESULTS

At this stage of implementation, achievements can be measured at output level in terms of increased awareness, strengthened capacity and improved information and knowledge management. A more systematic use of GIS has led to:

- a dedicated GIS framework for LAO/030 including a strategy, spatial databases, GIS software, training programmes;
- increased awareness and strengthened capacity of government and programme staff in the use of GIS for local development;
- spatial databases, analyses, and maps for supporting practical planning, implementation, documentation);
- piloting of remote sensing for large-scale land cover and topographic mapping, which can in turn be used for strategic and local development planning in conjunction with socio-economic spatial data;
- improved development monitoring through enhanced management information systems;
- an up-to-date, comprehensive, and high-quality document repository (i.e., images, drone photos, videos and – most importantly - administrative (see Appendix B and C), thematic (land cover maps, slope maps, elevation maps) and geographic maps of target areas available for government and programme documentation).

The programme has been able to progressively develop the application of GIS. Early on, the focus was on establishing correct spatial databases on village locations and names of the target villages, and later for all villages in the four provinces. Gradually, district and provinces maps were improved with updated information on infrastructure and topographic features. Socio-economic data and programme interventions were included in thematic maps, and latterly also remote sensing was piloted.

The scale and scope of the LAO/030 has enabled the application of GIS across a range of administrative levels (village, district, provincial, central), and purposes (development planning, monitoring, information management, etc.).

Through comprehensive piloting, the programme could gradually target GIS application in areas that offer the most added value (localisation and visualisation of activities, increased efficiency and effectiveness of the Monitoring & Evaluation (M&E) systems for evidence-based decision-making (e.g., dialogue with provincial authorities now based on updated provincial and district maps) and the use of quality spatial databases for development planning).

Significant progress was also made in integrated information systems sharing.

CHALLENGES

As a pilot, many of the basic expectations have been met, with useful application of GIS for programme implementation and development planning. However, some of the higher-level ambitions of GIS application have been thwarted by institutional constraints and limited collaboration and coordination between sectors in the use of GIS.

Standalone local development programme

LAO/030 is primarily seen as a standalone local development programme covering just four out of the seventeen provinces in Lao PDR which means that there's less leverage for national scale-up of the standards it uses and promotes within its target provinces.

Coordination and harmonisation

Awareness of the potential use of GIS is also limited in many government agencies. It is for instance worth noting that geographical and thematic maps are not included in national and local Five-Year Plans. This is reflective of coordination problems between entities responsible for data collection (e.g. LSB) and map production (NGD, Census Bureau, MPI, etc.). It is important to remember that the production of geographic maps is the sole responsibility of the NGD, which for many villages operates with outdated databases. The lack of reliable local boundaries, village names, locations and codes have, however, already partially been mitigated by the GIS support in the four target provinces.

Wider uptake within government systems will require significant coordination and harmonisation efforts during the next phase of the local development programme.

Data visualisation/Data analysis

Finally, despite some promising signs of increased GIS application for evidence-based decision-making (particularly within the framework of government M&E systems), the tool has until now mainly been used for data visualisation as opposed to data analysis. In that sense, GIS has not generated new insights or led to new activities. However, a promising foundation has been laid, which the future phase of the programme can build on and systematically use for practical planning and implementation of local development interventions.

No georeferenced data is used in LAO/030's monitoring mechanism due to technical limitation of or awareness of potentials for LuxDev's current information systems.

Staff rotation

The rotation of provincial and district staff trained in GIS has impacted the maintenance of GIS capacity and routines in the programme. The automation of GIS workflows will help tackle this challenge through the implementation of processing chains (see Appendix E) reducing the time required on data treatment and staff training.

KEY SUCCESS FACTORS

Integrating a dedicated activity line in the logical framework

One of the major success factors was simply integrating a dedicated task/activity line in LAO/030's logical framework. This ensured endorsement of GIS as a development planning and visualisation tool by the counterpart(s) since its use was linked to achievement of higher-level development results. This also meant that a dedicated budget line was made available to the DPIs to manage and implement GIS interventions hence ensuring increased sustainability and ownership. Considering the starting points of GIS application at the level of MPI and the LSB, expectations were set at realistic levels, and a piloting approach was foreseen to progressively build awareness and capacity.

Role definition and data standardisation

Simplified and standardised data collection and mapping were rapidly established for the use of GIS, as was a clear definition of roles and responsibilities between the different actors at national, provincial, district and village levels. The dual approach of IT equipment provision and the roll out of basic GIS trainings was cost efficient and provided a positive return on investment (total cost of GIS interventions estimated at 74,000 EUR), also considering that the work will continue and expand in the next programme phase.

LESSONS LEARNED FROM THIS EXPERIENCE

Budgeting for GIS

The planning and integration of GIS activities in the Technical and Financial Document ensures that both the means (i.e. human, financial and technical resources) and the goals of GIS as a tool supporting local development (e.g. through improved development planning and monitoring, better knowledge management and communication) are defined from the very outset. This has facilitated buy-in from relevant stakeholders and provided an overall strategic direction for the deployment of GIS within a local development programme.

National standards for data collection and map creation

Unified and harmonised standards for data collection and mapping at national level are a prerequisite for wider adoption of good practices in GIS promoted by LAO/030. Efforts are required at the higher levels of responsible government ministries and development partners to establish these standards and provide adequate platforms for exchange and adoption of good practices.

Spatial analysis for planning and resource allocation

The use of GIS tools and spatial analysis during the next programme's formulation and inception phases could help prioritise selection of target villages and districts. Spatial analysis could also help to determine the allocation of resources by identifying clusters of underserved areas. The relation between GIS and M&E could moreover provide an in-depth analysis based on some of the indicators of the monitoring matrix and the SDGs.

NEXT STEPS

During the remaining time of the LAO/030 programme, ending in December 2022, the current GIS work will be further consolidated and new initiatives will also be pursued.

LAO/030 is currently deploying an open-source web application (Lizmap), which dynamically generates a web map based on a QGIS project. This tool provides a visualisation of the work done on the field, allows data sharing with the different stakeholders and programme staff and, enables users to print a map based on a predefined model (see Appendix F).

In addition to the web application, processing models will be set up to automate complex workflows and facilitate the GIS work in the field.

LAO/030 will, on a pilot basis, apply remote sensing for spatial analysis, bringing land cover mapping and topographic features of villages, districts and provinces into local planning at both strategic and practical level.

Village and district selection for the next phase of the programme will be aided with the use of spatial databases and mapping. The DPI within each province will be supported to update its keep track of the five-year National Socio-Economic Development Plan indicators through the visualisation of geospatial information. This work will be conducted in collaboration with the Swiss Centre for Development and Environment, with additional funding from the Swiss Development Cooperation Agency.

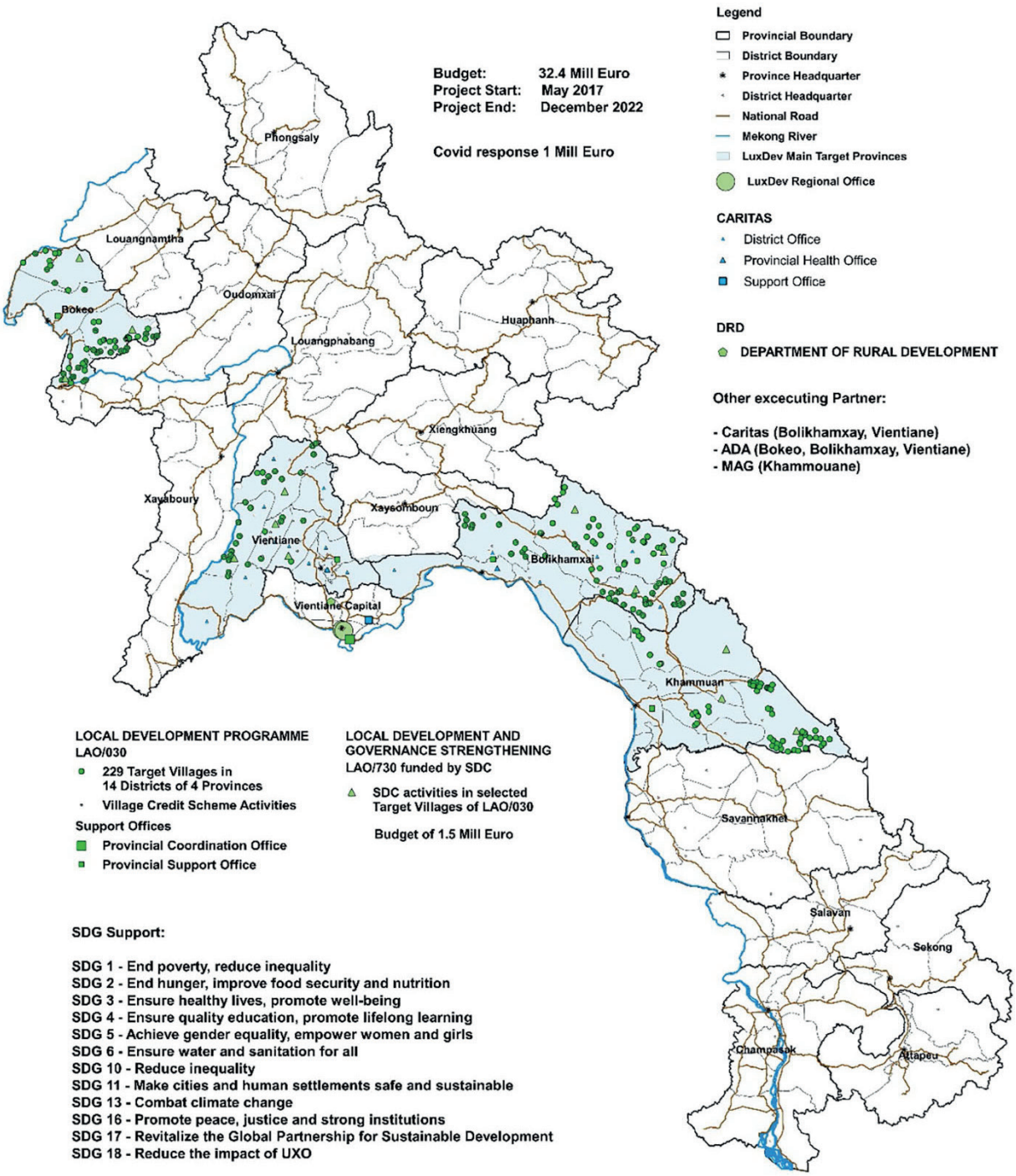
THREE MAIN TIPS TO INSPIRE PEOPLE TO LEARN FROM THIS EXPERIENCE

- the use of GIS can help to strengthen institutional memory and improve the visibility of a programme, notably in terms of the work carried out in the field;
- combining data visualisation with spatial analysis can provide an in-depth analysis on programme impacts;
- designing and implementing GIS during the inception phase of the programme helps to link its use to achievement of specific development outputs/outcomes and establishes initial workflows and capacities.

LIST OF APPENDICES

APPENDIX A

Target villages of the LAO/030 local development programme



APPENDIX B
QGIS training at Bokeo

Objectives

- provide capacity on the use of GIS to development partners at provincial and district level;
- training focus on areas of Lao/030 target villages for land use and land management purposes.

Thematic map preparation of Bokeo province (support the 9th SEDP)

Time and place

- 19-23 October, 2020 at DPI meeting room.

Estimation cost of the budget

Items	Amount/ Kip	Note
Accommodation and DSA	13,735,000	19 participants and 4 District-Vice Governors
Travelling cost	1,682,000	Participants from 4 districts (Paktha, Pha Oudom, Meung, Thonpeung)
Trainer fee	1,280,000	40,000 Kip/ day for 5 days
Manual	600,000	20 Ps
Coffee break	1,840,000	20,000 plus 20 Pax Plus 4 days
Cleaning fee	600,000	150,000 per day
Total	19,737,000	Kip

Participants

List	Place
1	PAFO
2	PAFO
3	PAFO
4	Provincial Home Affairs
5	Provincial Information and Culture
6	PWTD
7	PPM
8	PHD
9	PESS
10	2 attendees (1 DAFO, 1 DoNRE)
11	2 attendees (1 DAFO, 1 DoNRE)
12	2 attendees (1 DAFO, 1 DoNRE)
13	2 attendees (1 DAFO, 1 DoNRE)
14	2 attendees (1 DAFO, 1 DoNRE)
Total participants	**19**

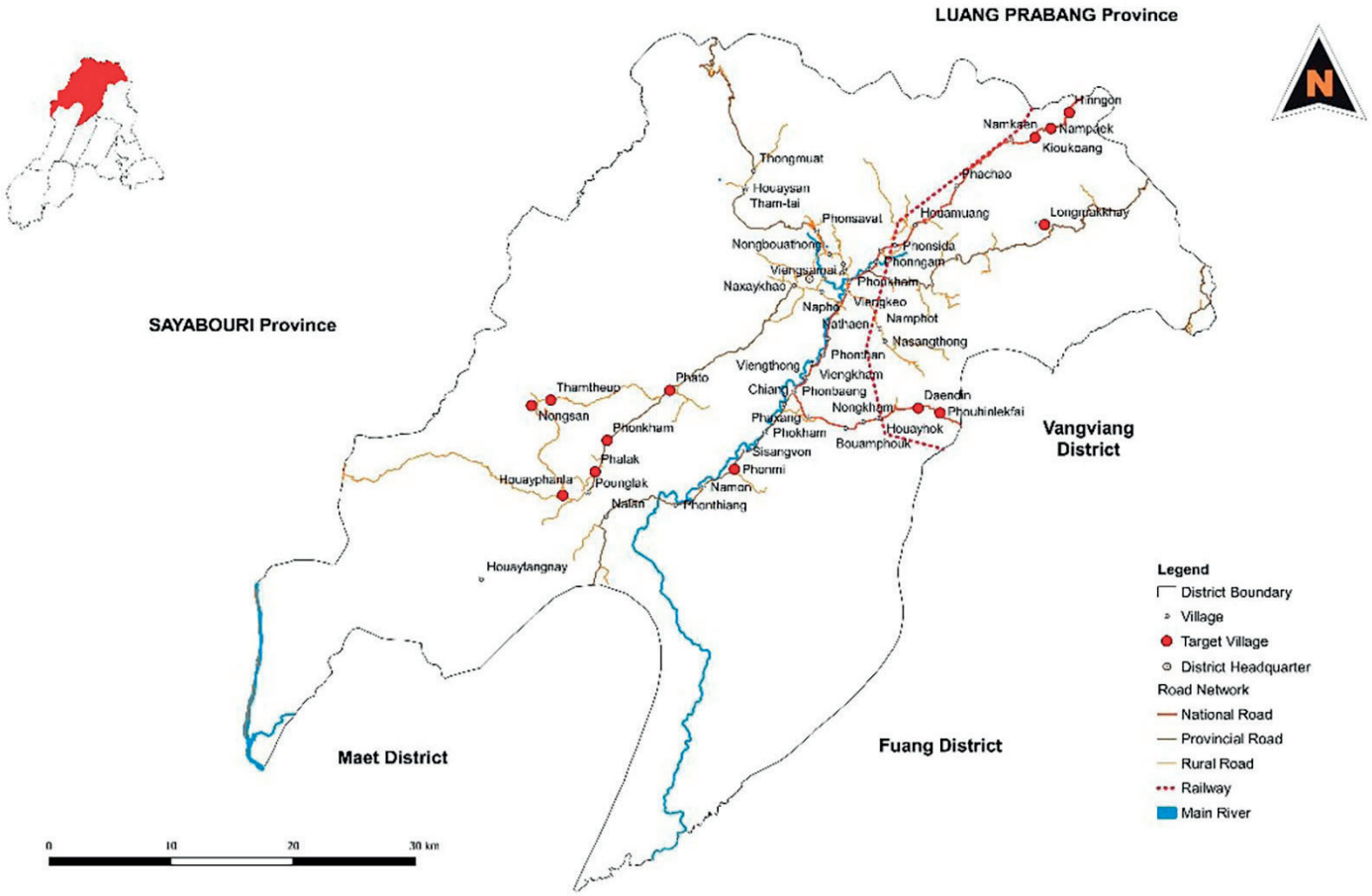
Schedule of the training

Day 1: 19 Oct, 2020	
Time	**Items**
13:30-13:40	Register
13:40-14:00	Open remark
14:00-14:30	Individual introduction
14:30-15:00	About Maps and the value of maps
Coffee break	
15:15-16:30	Installation Q-GIS
Day 2: 20 Oct, 2020	
8:20-9:00	Reflection day 1
9:00-10:30	Present structure of Q-GIS Sources of downloading program Q-GIS Q-GIS latest version: Projection, Coordinate Reference System, Tools and Plugins
Coffee break	
10:45-12:00	Vector layers (Point, Line and Polygon) Shape files – Points, Polygons, Lines with standardized color and size, (attribute table)
Lunch time	
13:00-15:00	Present Raster (Arial photos and Satellite imagery) Downloads with QGIS Plugins (Landsat 8, Sentinel)
Coffee break	
15:15-16:30	Adding Raster (Arial photos and Satellite imagery into base maps) Create Vectors from Satellite imagery , Digitizing HHs, Roads, Rivers, Lake, and other important features Labeling Create categorized styles
Day 3: 21 Oct, 2020	
8:20-9:40	Reflection day 2
9:40-10:00	Practice digitizing on Land use GPS (Global Position System) introduction
Coffee break	
10:15-12:00	GPS data from GPS device GPX to shapefile
Lunch time	
13:30-15:00	Excel Coordinate System/Add Delimited Text Layer Digitizing polygons and points
Coffee break	
15:15-16:30	Map: Point to Map, Map to Image Layout Composer manager
Day 4: 22 Oct, 2020	
8:20-12:00	Reflection day 3 Setting up map scale Inserting gridlines and grid line configuration Inserting scale bar, north arrow Map title Inserting images
Lunch break	
13:30-16:30	Exporting map layout to different graphic formats Mini Project (Each district and provincial department in charge of 1-2 simple maps to be prepare) for upcoming lessons learned workshop

Day 5: 23 Oct, 2020	
Time	**Items**
8:30-9:30	Reflection on learned previous inputs
9:30-10:00	Overall objectives of Q-GIS particularly land used planning, land management and thematic maps
10:00-11:00	Clarification and take action to start land used planning process and thematic map production
11:00-11:30	Wrap up session and closing remarks

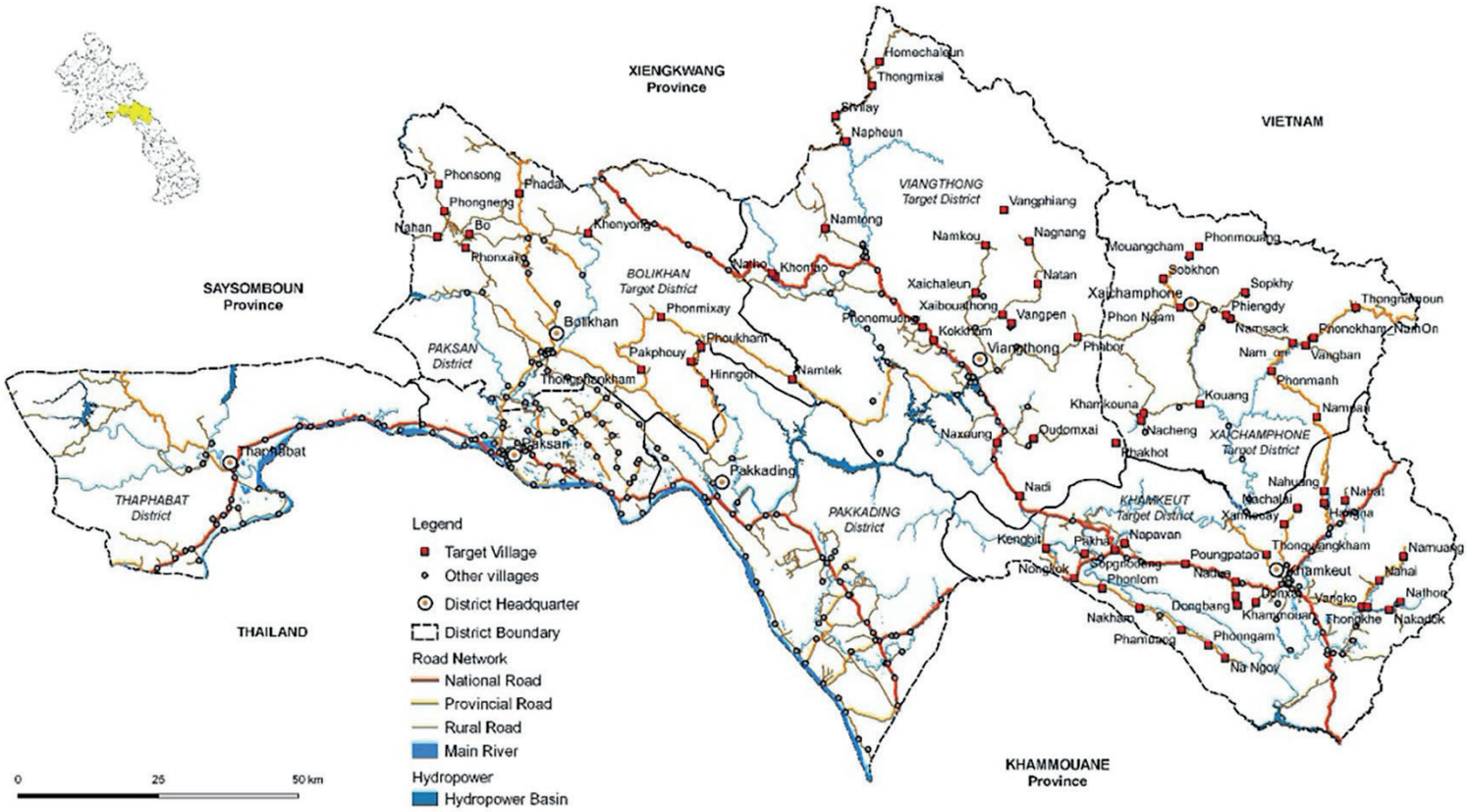
APPENDIX C

Administrative map of Kasi District – Vientiane Province



APPENDIX D

Provincial administrative map of the Bokeo Province

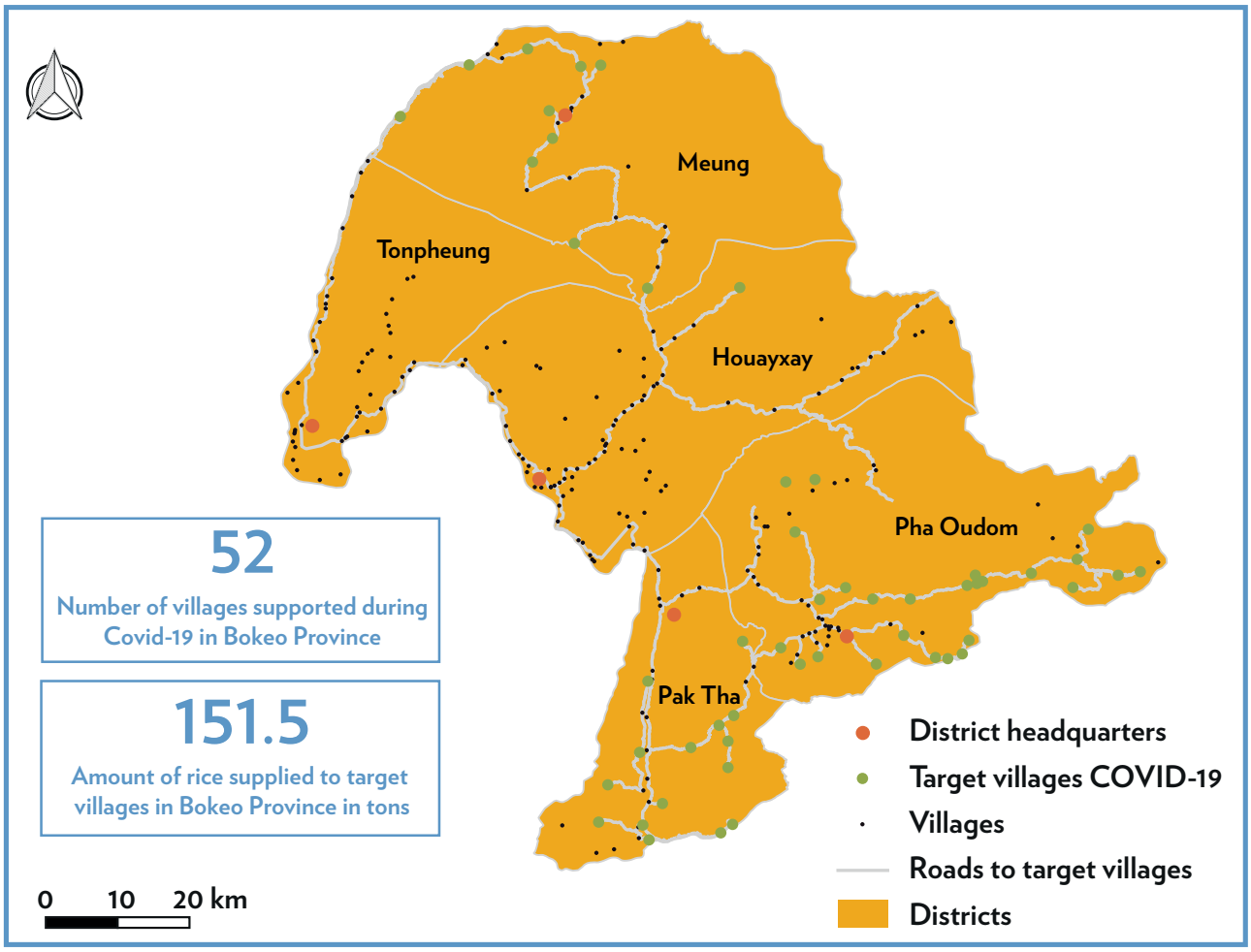


APPENDIX E

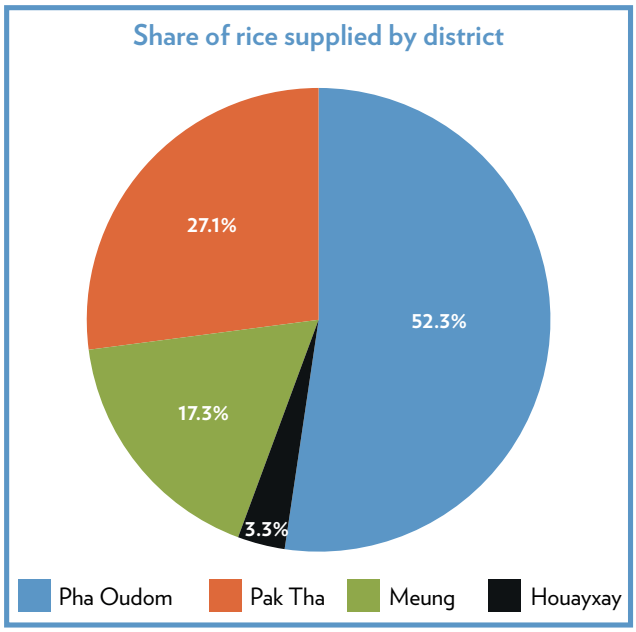
Processing chain for slopes classification

```python
"""
Model exported as python.
Name : slopes
Group : 
With QGIS : 31611
"""

from qgis.core import QgsProcessing
from qgis.core import QgsProcessingAlgorithm
from qgis.core import QgsProcessingMultiStepFeedback
from qgis.core import QgsProcessingParameterRasterLayer
from qgis.core import QgsProcessingParameterRasterDestination
from qgis.core import QgsProcessingParameterBoolean
from qgis.core import QgsCoordinateReferenceSystem
import processing


class Slopes(QgsProcessingAlgorithm):

    def initAlgorithm(self, config=None):
        self.addParameter(QgsProcessingParameterRasterLayer('DEM', 'DEM', defaultValue=None))
        self.addParameter(QgsProcessingParameterRasterDestination('Slopes_classified', 'slopes_classified', createByDefault=True, defaultValue=None))
        self.addParameter(QgsProcessingParameterBoolean('VERBOSE_LOG', 'Verbose logging', optional=True, defaultValue=False))

    def processAlgorithm(self, parameters, context, model_feedback):
        # Use a multi-step feedback, so that individual child algorithm progress reports are adjusted for the
        # overall progress through the model
        feedback = QgsProcessingMultiStepFeedback(3, model_feedback)
        results = {}
        outputs = {}

        # Warp (reproject)
        alg_params = {
            'DATA_TYPE': 0,
            'EXTRA': '',
            'INPUT': parameters['DEM'],
            'MULTITHREADING': False,
            'NODATA': None,
            'OPTIONS': '',
            'RESAMPLING': 0,
            'SOURCE_CRS': QgsCoordinateReferenceSystem('EPSG:4326'),
            'TARGET_CRS': QgsCoordinateReferenceSystem('EPSG:32648'),
            'TARGET_EXTENT': None,
            'TARGET_EXTENT_CRS': None,
            'TARGET_RESOLUTION': None,
            'OUTPUT': QgsProcessing.TEMPORARY_OUTPUT
        }
        outputs['WarpReproject'] = processing.run('gdal:warpreproject', alg_params, context=context, feedback=feedback, is_child_algorithm=True)

        feedback.setCurrentStep(1)
        if feedback.isCanceled():
            return {}

        # Slope
        alg_params = {
            'AS_PERCENT': False,
            'BAND': 1,
            'COMPUTE_EDGES': True,
            'EXTRA': '',
            'INPUT': outputs['WarpReproject']['OUTPUT'],
            'OPTIONS': '',
            'SCALE': 1,
            'ZEVENBERGEN': False,
            'OUTPUT': QgsProcessing.TEMPORARY_OUTPUT
        }
        outputs['Slope'] = processing.run('gdal:slope', alg_params, context=context, feedback=feedback, is_child_algorithm=True)

        feedback.setCurrentStep(2)
        if feedback.isCanceled():
            return {}

        # Reclassify by table
        alg_params = {
            'DATA_TYPE': 5,
            'INPUT_RASTER': outputs['Slope']['OUTPUT'],
            'NODATA_FOR_MISSING': False,
            'NO_DATA': -9999,
            'RANGE_BOUNDARIES': 1,
            'RASTER_BAND': 1,
            'TABLE': [0,2.86,1,2.86,8.53,2,8.53,14.04,3,14.04,24.23,4,24.23,'',5],
            'OUTPUT': parameters['Slopes_classified']
        }
        outputs['ReclassifyByTable'] = processing.run('native:reclassifybytable', alg_params, context=context, feedback=feedback, is_child_algorithm=True)
        results['Slopes_classified'] = outputs['ReclassifyByTable']['OUTPUT']
        return results

    def name(self):
        return 'slopes'

    def displayName(self):
        return 'slopes'

    def group(self):
        return ''

    def groupId(self):
        return ''

    def createInstance(self):
        return Slopes()
```

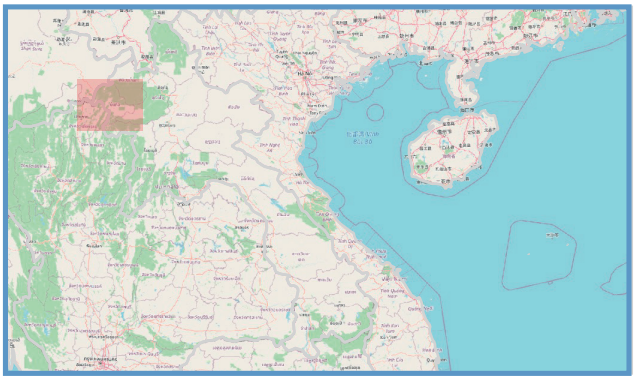
APPENDIX F
Map template with data visualisation



SUPPORT IN THE FIGHT AGAINST COVID-19 IN BOKEO PROVINCE - LAO PDR



Location map



FOR MORE INFORMATION

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