Mangsebung Rural Municipality
Office of the Rural Municipal Executive
Mangsebung, Ilam
Province No. 1, Nepal

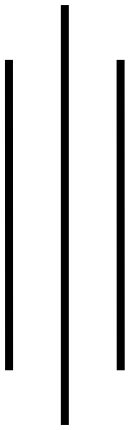
Municipal Land Use Plan of Mangsebung Rural Municipality

Final Report

2021

Submitted by:
Intensive Study and Research Center Pvt. Ltd.
Anamnagar, Kathmandu

Final Report
Land Use Plan of
Mangsebung Rural Municipality, Ilam



Submitted to

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Executive Summary

Land Use Act 2019 has come into effect, which has assigned rights, responsibilities and duties to the federal, provincial, and local governments. Nepal has yet to practice land-use planning for the country as a whole, the Mangsebung rural municipality is not an exception. Some attempts were made for balanced use of the country's existing natural resources in the past through different policies and national planning efforts.

Mangsebung rural municipality has not experience significant population growth in the recent decades. However, it experiences lack of adequate physical infrastructure, scattered small-sized land parcels and haphazard subsistence farming practices resulting in low productivity and food deficit.

The landlessness, poverty, and prevailing unemployment have led to encroachment of forest, public land and hazardous areas for squatter farming and settlement. These issues of land use have challenged the balanced and sustainable development of the municipality. In this context, Mangsebung rural municipality has taken initiative to prepare a land use plan which aims for attaining a balance between environment and development, food security, soil and watershed management, climate and disaster-resilient development, and human settlements. The objective of this project is to prepare a scientific and comprehensive land resource inventory at the Municipal level, assess and delineate land use zones as per Land Use Act 2019 based on land system and associated soils and land capability classes, and thereby to formulate sound and sustainable land use planning.

Land use zonation and planning is a multi-sectorial and disciplinary task. Information and data from various sources such as maps, imageries, and field observation were obtained. Besides group discussion and consultation with elected members and government officials of Mangsebung municipality-both at the center and ward level as well as the local community was carried to get their suggestions and information on current, planned, and envisioned activities about land use and development activities. Likes published documents such municipality profile and other relevant documents about socio-economic and demographic, and development and conservations activities were also obtained from municipality.

The primary data source used for the land use classification in this project is a high-resolution satellite image (0.5 m spatial resolution). Various other vector and raster and other data sets such as DEM, geological maps, land system maps, climate were used to generate topographic hazard maps, land system map, land capability map, and climate maps. Besides, the present land use, land capability, and soil maps were prepared as essential components of the land use zonation and planning.

For the land use zonation, eleven land use zones were considered as land use policy 2015's specification. Zone 1 describes the area preferably suitable for cereal/food crop production area, cash crops, animal husbandry, cash crop, horticulture, animal husbandry, fish farming,

agro-forestry. Zone 2 is an appropriate location for residential purpose, both existing and potential. Zone 3 is a commercial zone, prescribed location for government institutions and service areas as well as business areas. Zone 4 is for industrial use. Zone 5 is set aside for existing forests as well potential forest areas including barren lands, wetlands etc. Zone 6 is the public utility zone. Zone 7 is the area prescribed for Mines and Minerals. Zone 8 is Public use area. Zone 9 is covered by water bodies such as river and water bodies. Zone 10 is cultural and archaeological area and zone 11 represents area utilize for other purposes.

The area of Mangsebung municipality is 172.41 km^2 comprise of Lower Siwalik (42%) to Mahabharat range (58%). The terrain is underlain the quaternary to recent deposits in the south (Bhawar), and Siwaliks and Lesser Himalayan rocks towards the north. Siwaliks are highly fragile and susceptible to erosion and landslides.

The elevation ranges from 191 m to 2061 masl above mean sea level. About 17% of land lies in the slope below 12 degrees, nearly 60% of the land lie in the slope 20 to 30 degree. About 23% of the land lies above 30 degrees, which is not suitable for human settlement and highly sensitive to development activities.

The hills of Mangsebung rural municipality are highly susceptible to landslides. Similarly, valley areas along the river are susceptible to flood, respectively. The peak ground acceleration (PGA) value ranges between 100 to 200 gal, which produces low to moderate risk during the earthquake, which implies low and medium earthquake hazard.

From the recent house hold survey, Mangsebung Rural Municipality had 3769 households and 18549 populations with 9701 males and 8848 females, and population density was 107.96 people per square kilometer. The literacy rate is 84% and the population is composed Limbu and Rai as dominant ethnic (Adivasi Janjati) groups, followed by Chettris, Brahmins, socially disadvantaged groups, and others.

There is a poor network of the road in Mangsebung Rural Municipality. Damak-Chisapani Sadak, Bhedetar-Rajarani-Rabi and Urlabari-Madhumalla-Daregauda Sadak are the major roads of this Rural Municipality. Every ward of this municipality has been connected by the earthen road.

The current health facility in Mangsebung seems unsatisfactory as only 4 health centers are located in the entire municipality. Out of the 3769 households, 2002 houses are equipped with piped tap water resources while 1143 houses were using public spout/tap for water. Others depended on stream, river and covered/uncovered wells. Electricity (64 % hhs) kerosene (9 % hhs) and solar (27 % hhs) are the main source of energy for lightening and other energy uses.

The land cover change of Mangsebung Rural Municipality in between 2005 to 2019 shows that there is no dramatic change in all land cover types. During 10 years, the built-up area has been increased by 115 %. On the other hand, the decrease of bush, cultivation and forest was

observed within 15 years. It indicates that some of the agricultural and forest area has been converted into the built-up area

Ten land system units (LSU) were identified based on the pattern and process of landforms, geologic materials, terrain slope, soil, and limits of arable agricultural land. Land system 1 represents Active alluvial plain, sand, gravel bars and channel, Slope <1 degree; Land system 2: active flood Plain, sand and gravel bars, and grass, frequently flooding, and slope <1 degree; Land system 3: flood plain, sand gravel or grass, occasional flooding, Slope <1 degree; Land system 4: Peripheral piedmont, silt, sand and finer gravels, well developed soil horizon, Slope less than <1 degree; Land system 5: Middle piedmont, fan deposits, sand and gravel deposits, developed soil horizon, slope 1-3 degree; Land system 6: Upper piedmont, fan deposits, sand, gravel, cobble, well developed soil horizon, slope 1-5 degree; land system 7: Gently sloping hilly or mountainous terrain, slope 5-10 degree; land system 8: Moderately sloping hilly or mountainous terrain, slope 10-20 degree; Land system 9: Moderately to steeply sloping hilly and mountainous terrain, slope 20-35 degree; Land system 10: Steeply to very steeply or hazardous hilly or mountainous terrain, slope > 35 degree. The area covered by the land systems unit in the above order (1-11) is 209.6, 23.56, 170.8, 109.43, 2149.35, 5095, 16.34, 1.64, 564.87, 4830.38 and 4069.03 ha respectively.

Five land capability classes were identified based on characteristics of the land system unit which puts a varying degree of limitation and as well offers options and opportunities to particular land use types. Class IV covers largest part (63 %)of the rural municipality area which represents steep terrains and not suitable for agriculture and settlement. Land capability class III covers about 31 % of land area of Mangsebung rural municipality. This land capability class III is suitable for cereal crop production such as maize and wheat. Besides this, fruits production and tree plantation is also suitable for agriculture practice. Only a small portion of rural municipal area fall under the land capability class I and II (5.58 %) which are very suitable for agriculture practice.

A multi-criteria analysis considering the factors of constraint and opportunities were considered for land use zoning. Land use zoning was done by using a two-step approach. At the first step, the land use zoning was done by considering the inherent capabilities of the land evaluated based on the biophysical characteristics such as topography, soil, climate, natural hazard, and drainage condition. In the second step suitable residential, commercial, industrial, cultural, and archaeological areas, were identified based on the disaster risk evaluation, road network, and connectivity, and present status and market centers and commercial area indicating potential growth in the future as well as the historic, cultural and aesthetic value of the area. The envisaged agricultural pocket areas by local government were also considered for land use zoning.

Following the multi-criteria method, eleven land use zone has been proposed. These zones are 1. Forest area, 2.Agriculture area, 3. Residential area, 4. Commercial area, 5. Cultural and Archaeological area, 6. Industrial area, 7. Mines and Minerals, 8. Public use area, 9. Riverine /lake area; 10 Fruit or horticulture; and 11 others. The proposed forest area occupies about 78 % of the total area, which is equivalent to the present land use. As per the Land Use Act 2019, no land under the existing forest area has been proposed for other use. The forest area covers the rugged hilly terrain which is vulnerable to landslides and erosion process. Similarly, the proposed agricultural land accounts for 40.79 km^2 (16.6%). Likewise proposes residential, commercial, cultural and archaeological, industrial area and mines and mineral sites area, covers 4.16 km^2, 0.24 km^2, 0.05 km^2, 0.05 km^2, and 0.2 km^2, respectively.

Scientific and comprehensive mapping of land resources and socio-economic conditions and status of development infrastructure led to the development of land use zonation maps. These maps provided a groundwork for preparing a land use plan for Mangsebung rural municipality. Strength, Weakness, Opportunity, and Threats (SWOT) analysis was done to assess the constraints and scope for the successful implementation of the land use plan. A participatory approach was also an element of planning. By participatory process of discussion and induction, the planning team set out the following vision:

Nepali: "सत प्रतिशत जमिनको सदुपयोग माङसेबुङ गाउँपालिकाको दिगो विकासमा उपयोग"

"Optimum use of land for the sustainable development of Mangsebung Rural Municipality"

Land use plan envisioned to achieve a goal of sustainable development of its available resources and create a vibrant socio-economic growth of the municipality.

The objectives set for achieving the goals were to i) provide strategic guidance for the future land development, ii) protect the prime agricultural and forestland from encroachment, iii) propose a suitable location for settlement, industrial, and commercial purpose, iv) identification of hazard area, v) watershed conservations, vi) biodiversity conservation, vii) promote greenery and planned urban spaces, viii) make land use climate-resilient, ix) risk sensitive land use, x) physical infrastructure planning to address the needs of urbanization, xi) sustainable management of natural resources and increase economic opportunities.

The plan intends to achieve the objectives over 15 years, with a breakdown into short term 5-year, mid-term 10-year, and long-term 15-year.To achieve the objectives, a logical framework approach (LFA) comprising clear cut goals, verifiable indicators, sources, and means of verification was developed for the land use plan.

Activities to be carried out in different time duration and estimated cost has been a workout.

Acronym

DoF: Department of Forest

RM: Rural Municipality

MoLMAC: Ministry of Land Management, Agriculture & Cooperative

MoALD: Ministry of Agriculture and Livestock Development

PCTMCD: President Chure Terai Madesh Conservation Development

DoSCWM: Department of Soil Conservation and Watershed Management

DWIDP: Department of water induced disaster prevention

DUDBC: Department of Urban Development and Building Construction

1. Introduction

1.1 Background

Land is one of the most important and precious natural resources of the earth. It is an important natural asset for human being, so, overall standard of the economic development and livelihood of the people living in certain geographical space depends on wise utilization of land resources. In addition, all kinds of human activities and the fundamental requirement of production or development depend on the human use of land. Hence, status of land cover or the natural outer cover of the land is the primary spot where concentrates the human activities. Gradually, people use and extract the resources from the land cover which is called the land use. Hence, proper land use practice for making the best use of the limited land resources is inevitable.

Land use planning is the systematic assessment of land and water potential, alternatives for land use, economic and social conditions in order to select and adopt the best land use options. In addition to fulfill livelihood demands, land use planning is one of the fundamental options in disaster risk management.

The goal of planning is to benefit land users in a sustainable manner and safeguard land resources and the environment rather than exhausting or degrading them. The land resources such as farmland, forest, pasture, urban settlement, parks and conservation areas has to be managed to keep its productivity at a certain level. Exploitation of these resources should optimally be done to benefit for both the individual land users and society as a whole. Land use plan will avoid the misuse, overuse and under use of land and environmental resources which will lead to unsustainability of the development and will promote to maximize the social and economic benefit keep balance with environment through proper land management practice.

Planning offers many advantages in terms of economic, social and environmental criteria and therefore it represents a logical step ahead in diminishing the traditional dependence on mitigation measures and post-disaster assistance that have historically characterized flood and landslide disaster management. Land use planning requires of course the assistance of specialized technical skills producing hazard maps which are as accurate as possible. Instruments such as remote sensing and geographical information systems are fundamental to define areas of risk and therefore assist in the authorization of possible land uses and in the prohibition of others. Both authorizations and prohibitions are legally grounded in a number of laws at national, regional and local scales.

Nevertheless, land use planning also presents a number of drawbacks. First, by restricting development, for some it may hamper economic growth and therefore hurt local economies in need especially during times of economic recession. Second, forms of complementarily with other options such as the adaptation of the built environment to certain flood levels or the purchase of insurance must be explored. Interestingly enough, perhaps land use planning could be more effective and socially acceptable if, instead of focusing only on security issues, if moves towards a wider consideration of the benefits of flooding and of floodplains.

The 'Constitution of Nepal 2072' Part 4 'Directive Principles, Policies and Obligations of the State' Clause 51 'Policies of the State" Sub-clause (e) (3) provides the need of land management and land use practices for different purposes. It also adopts the policies to improve agriculture production and other activities. Toward these directions, the Constitution articulates that mentioned 'land management and commercialization, industrialization, diversification and modernization of agriculture is possible by pursuing land-use policies to enhance agriculture product and productivity, while protecting and promoting the rights and interests of the farmers. Sub-clause (e) (4) is about making proper use of lands, while regulating and managing lands on the basis of, inter alia, productivity, nature of lands and ecological balance. Following these directives of the Constitution, the 'Local Government Operation Act 2074' has made the provisions for the local authorities to manage their local resources through proper planning and zoning of land according to its category.

Federal Democratic Constitution of Nepal has defined local levels as autonomous governments with special rights to make plan, policies and programs of the immediate public concern like land use, agriculture, road, environment and so on. Therefore, every local authority should have to work for their betterment according to their local needs. However, several municipalities are constituted by restructuring and setting new boundaries, those units have extensive geographical areas in comparison to previous political boundaries. Therefore, those units have been facing several challenges in the new changing contexts. Many such local units have some challenges like:

- Requirements of infrastructural development – because of newly set boundary of the constituent municipalities' additional new infrastructural development are needed.
- Municipalities require identification of income generating sector for their betterment and sufficient fund-raising activities as well as for their welfare scheme, but, so far, they have to work from the scratch of the information.
- Because of extensive geographical area municipalities have several challenges including disaster risk and management within their territory. To overcome such challenges, they require total information within their geographical territory.
- Land use and environmental management within the municipalities should be tackled as per their responsibilities based on informative plan, but needs working on it.
- Maintaining livelihood of the local people has to be managed by the local authorities along with environmentally friendly sustainable development of the municipality.

To address these challenges municipalities are suggested to work for the preparation of detail database on Land Use Plan. Hence, the current assignment "Preparation of Land Use Plan of Mangsebung Rural Municipality, Ilam" will be conducted under the framework provided by the central and provincial government.

1.2 Review of land use policies, act and practices

Land use has been defined in various ways (Turner et al. 1995; Verburg and Veldkamp 2005; Lambin and Geist 2006). Both land cover and land use have been viewed in relation to several natural phenomena like climate change, food security, human health, urbanization, biological diversity, trans-boundary migration, and environmental refugee, water availability and quality, ecosystem functioning, and more and thus a significant cause of local as well as global changes (Turner et al. 1995:24-28; Skole 1996:6-7).

Land use has important impacts on the functioning of socioeconomic and environmental systems with important tradeoffs for sustainability, food security, biodiversity and the vulnerability of people and ecosystems to global change. Land cover changes over the time which is sometime characterized by complete replacement of one cover type by another, e.g. deforestation, or increasing fallow or wasteland. Land use change includes the modification of land cover types, e.g. intensification of agricultural management or other changes in the farming system (Lesschen et al. 2005). It has also an important role on managing the food security, social and economic vulnerability, land management and development for both human and natural health.

Land use plan is essential to overcome the issues and challenges of land management. Plan of certain geographical space is made with a view to cope the food security problems, mitigation of hazards and disasters, adaptation from the climate change and to promote environmental management, environmentally friendly and sustainable development. Therefore, preparing a land use plan of any development or administrative geographical entity gives an overall specification of quality of land for the prescription of its amicable use in the future with a perspective of broader goal of environmental friendly sustainable development. Within the framework, land use plan requires integrating several spatial variables. Some of those can be depicted from the available latest maps, imageries, photographs and rest can be collected from the direct observation, social survey and field investigation. The integration of such information of various sources and nature within a single platform is always a cumbersome job, despite that, following a holistic approach for analysis is a safe side for the realistic outcome.

1.2.1 National/provincial Plan, Policy Acts, and Efforts

An overview of relevant plans, policy/Strategy, act and efforts, which have implication for the land use zonation and planning, is presented as under:

Before 1950s, royal orders were used to guide land use in Nepal. After the establishment of democracy in 1951, the traditional system of land tenure was changed and a new one introduced. The Jagir system was abolished in 1951, the Birta system in 1959, the Rakam in 1963 and the Kipat in 1968. The first codified law of Nepal, Muluki Ain (1854), was amended in 1952. This act emphasized land reclamation through tax exemption and the transfer of ownership rights if the land is not used properly by the land owner.

The Fifth Development Plan (1975–80)

The fifth development plan introduced land use policy for the first time in the country. It encouraged livestock production and the growth of tourism in the high mountain areas, by developing pasture land and the protection of wildlife.

Ninth Development Plan (1997-2002)

The concept of land use planning through zonation was emphasized. It aimed to achieve envisaged goal of sustainable land use by (a) implementation of a land use plan through zoning; (b) making people aware of the role and importance of a land use plan in agricultural production, environmental protection, and other developments; (c) strengthening technical and institutional capacity; and (d) discouraging the practice of keeping land fallow.

The Tenth Plan (2002-2007)

The Tenth Plan envisioned a need for developing rural infrastructure for the economic uplift of the rural populace; continuous modernization of agricultural practices; and rationalization of pricing policy for increased agricultural production. It also emphasizes on rural energy development program to develop rural economy in order to alleviate poverty.

Guided by the Ninth (1997-2002) and Tenth Five Year Plan (2002-2007), Ministry of Land Reform and Management, established the National Land Use Project in 2057/058, to prepare the lands resource maps at the local administrative level, VDC, which were used as a basis for preparing maps of land use zonation.

Land Revenue Act 2034 (1974)

The land revenue act specifies procedure of land revenue collection. It is expedient to amend and consolidate the provisions relating to collection and recovery of the land revenue and to make some additional provisions on cultivation of land. It also has different provisions like remission of Land Revenue in Cases of River Cutting or Land- slide, Non-yielding crops owing to drought or other natural calamity.

Town Development Act 2045

Town Development Act provides an elaborate legal framework for executing town planning. This act has necessary provisions in order to provide necessary services and facilities to the residents of the town by reconstructing, expanding and to develop existing towns and by constructing new towns and to maintain health, convenience and economic interest of general public.

Land Acquisition Act-1997

The Land Acquisition Act (1977) and its subsequent amendment in 1993 specify procedures to be followed for land acquisition and compensation. The Act empowers the GoN to acquire any land, on the payment of compensation, for public purposes or for the operation of any

development project initiated by government institutions. The Act also includes a provision for acquisition of land through negotiations and thus provides a space for voluntary donation. The LA Act is not adequate in it to deal with and address several resettlements and associated technical issues of diverse infrastructure sector. Thus, it is also being supplemented by different subsequent Acts, Rules and policies and Guidelines.

The Forest Act 1993

The Forest Act 1993 categorized forest into seven management types-national, government-managed, protected, community, leasehold, religious, and private. The Forest Sector Policy 2000 was brought in to strengthen the community forestry programs including leasehold and collaborative forestry programs, especially in the Terai region. The Agricultural Policy 2004 aimed to increase agricultural production and productivity, to develop commercial and more competitive agriculture, as well as to promote, utilize, and conserve biodiversity and natural resources.

National Urban Policy 2007

National Urban Policy 2007 has adopted the strategy of discouraging the scattered settlements and of promoting development of compact settlements in order to protect the natural resources as well as for reducing investment costs in providing infrastructure and basic services. It also has highlighted a need for implementing the required planning standards for discouraging environmental degradation due to the scattered settlements.

The Constitution of Nepal 2015

The Constitution of Nepal establishes the right to property for every citizen to earn, use, sells and exercise their right to property under existing laws. However, the state is empowered to acquire the private property with compensation if it is necessary for social welfare (Refer Article 25-1, 2 and 3)

National Land Use Policy 2015

The National Land Use Policy (NLUP) was initially formulated by the government in 2013 with the objective of sustainable socio-economic and environmental development through the optimum use of land and its resources. This policy made provision for classification of land into 7 different zones—agricultural, residential, commercial, industrial, forest, public utility, and others where needed. Legal and institutional management for Lands and Land Resources (LLRs), and protection, use and management thereon are done under this Policy. The National Land Use Policy, 2013 A.D. prioritized the protection of arable lands ensuring food security.

The devastating earthquake of April 25, 2015 A.D. and aftershocks thereto have exposed us to non-vulnerable secured human settlement in the country. In order to address all these contemporary issues on a long-term basis, the Land Use Policy, 2015 has come into existence upon making a review over the Land Use Policy, 2013 A.D.

Land Use Act, 2019

The Land Use Act, 2019 has assigned rights, responsibilities and duties to the federal, provincial and local governments. The act has assigned the responsibility for implementing the act to not only the federal government but also to the provincial and local governments. As per the act, three tiers of the government should constitute councils to bring provisions of the act into implementation. The federal government should draft maps of all the local levels and ensure that all the local governments are abiding by provisions of the act. The local governments, on their part, should ensure that the people are adhering to provisions of the act.Some of the key provisions under the Act for local governments include: formation of municipal land use bodies, acquisition of land use maps from the federal government, development of land use plans, and carrying out zoning process, land use change, land title update, land valuation and taxation. The local land use council and local land use implementation committee are the two bodies mandated by the Act. The local governments are empowered to review the land use plan as and when required. Such a review can be made on the basis of changing patterns of demography, urbanization, specific needs for land use for economic and infrastructure development and so on.

1.3 Objectives and Scope of work

Objectives

To overcome the challenges faced by the municipalities, preparation of detail land use plan is proposed incorporating the following specific objectives:

i. Identification of existing land use/cover based on available recent detail maps and satellite imageries
ii. Mapping the existing use/cover identified from the maps and satellite imageries in the Geographic Information System (GIS) platform
iii. Integration and analysis of those identified units of land as per the need of the municipalities along with the field knowledge and other collateral information.
iv. Zoning the area of the municipalities according to the land quality and capabilities, natural hazards and recommend its scientific use. It includes future prospects of the area for settlement (urban or rural context), income generating activities i.e. agriculture, commercial or industrial purpose and environmental or disaster risk reduction and management
v. Setting long term vision, mission, goals, strategies and programs of land use for the development of the area in the future.
vi. Prepare land use plan for 5, 10 and 15 years.

Scope of the Study

The study concentrates within the territory of the Mangsebung Rural Municipality and covers the followings:

- Description of all types of land use types
- Review of existing relevant maps, documents, and database of the municipality
- Detail mapping of topographical, land use cover, settlement, infrastructure and environmental, and hazard parameters.
- Prepare topographic layers (slope, aspect, relief, drainage, topographic position, topographic wetness index)
- Prepare land use zonation map and identify the opportunities and challenges
- Prepare landslides, erosion and flood prone area using satellite imagery, field visit, and topographic layers.
- Prepare water resource maps, forest and biodiversity, minerals from the field visit and available database,
- Field validation for accuracy, reliability and consistency of data
- Recommend solution measures
- Set vision, mission, strategies, programs, goals and expected outcomes.
- Study the existing contexts and situation and set the changes over the time in the past
- Study the future scenarios
- Recommend the action plan.
- Prepare short term (5 years), middle term (10 years) and long term (15 years) land use plan

1.4 Limitations

- No detail soil survey has been done
- Unavailability of latest census data
- Lack of recent high-resolution image

1.5 Methodologies

This chapter of the report provides comprehensive information on methodologies to be adopted for undertaking “Land Use Plan of Mangsebung Rural Municipality”. The approach and

methodology has been developed based on Terms of Reference (ToR) and other related literatures related to the assigned task. The following section illustrates the detail procedures starting from the data gathering, analysis and design of assignment's components and finally report production. The overall conceptual framework of the assigned task is shown in (Figure 1).

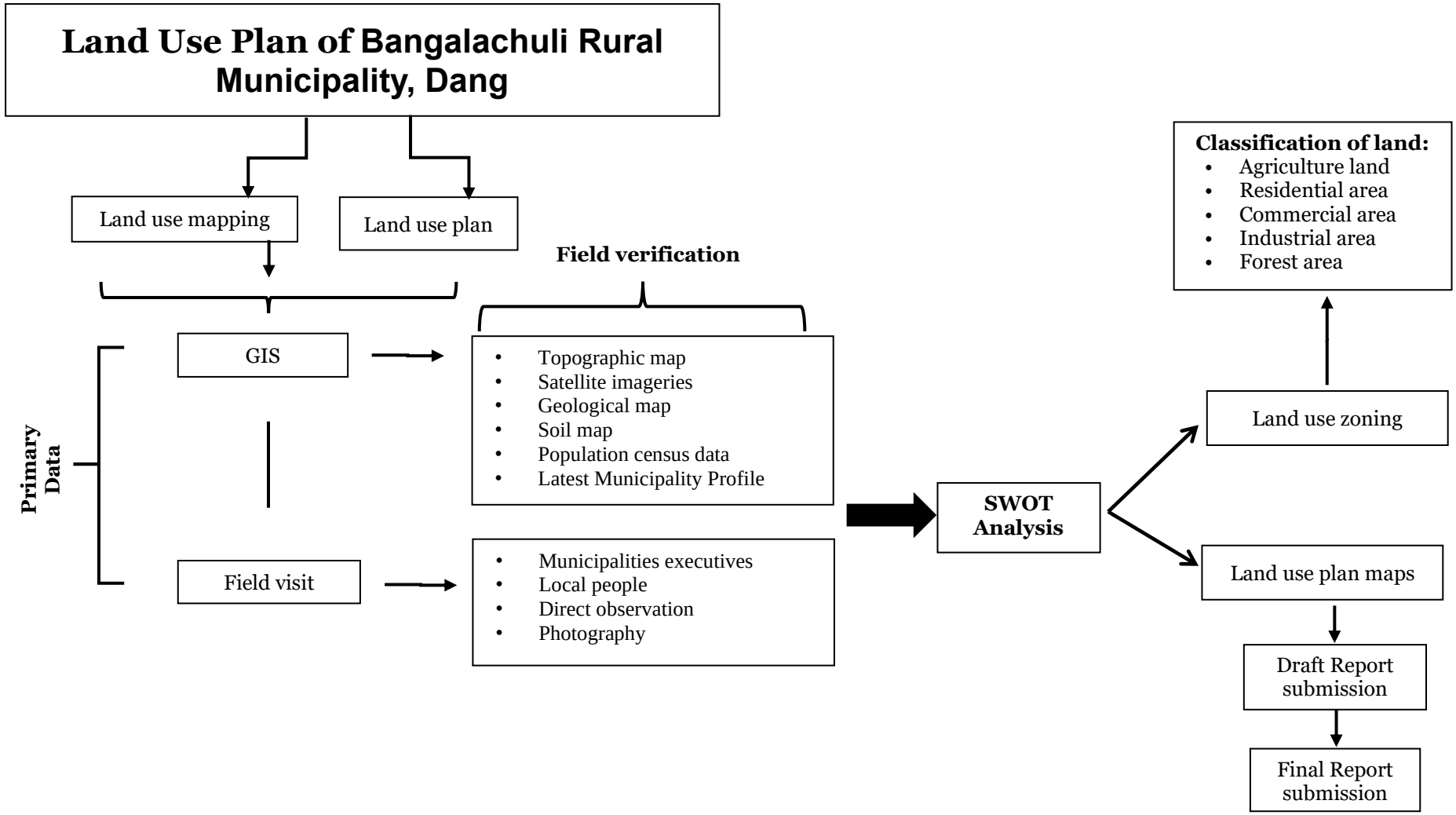


Figure 1: Conceptual framework of the LUP

1.5.1 Data Types and Sources

Geographical data of the rural municipality was collected from the maps and satellite imageries. Those geographical data are:

1. Municipality boundaries
2. Ward boundaries
3. Geological formation and structure
4. Physiographic characterizes i.e. elevation, aspect, slope
5. Rivers/streams
6. Types of Soil
7. Existing land use – cultivated land, forest land, settlement or built up, bush/shrub, grassland, lake/water bodies, sand, wasteland
8. Infrastructure – road, canal, bridge, health post, school
9. Population – settlements, building, distribution density,
10. Environmentally sensitive and hazard area, waste dumping sites, landslide, flood etc.
11. Park and open spaces

The sources of these data were:

1. Topographical map 1:25,000 scale published by the Department of Survey Government of Nepal
2. Satellite imageries (open source i.e. ESRI base map, Google Earth, ASTER)
3. Geological Map of Nepal 1:250,000 scale, Department of Mines and Geology, Government of Nepal
4. Soils Map of Nepal 1:250,000 scale Government of Nepal
5. Population data of CBS 2011 and Rural Municipality Survey 2017
6. Municipality Profile latest available
7. Municipality and ward boundary provided by the Department of Survey Government of Nepal

1.5.2 Field Visit

Field verification and observation was made as per the need of the triangulation of the data in Mangsebung Rural Municipality. Field visit comprises of:

- Interaction with the Rural Municipal Executives
- Interaction with the local people
- Interaction with the locals of the land induced disaster if any
- Site visits/ land type observation
- Photographs

1.5.3 Field observation, checklists, meetings and discussion

After having collecting data and information from the technical reports, manuals and policies related documents, the consultant team prepared checklists, questionnaires and formats for the field work. Field works was basically focused on the collection of baseline information through series of consultation with local authorities and local people using focus group discussions and ward level and municipality level meeting. The extensive field work was conducted in first week of Baishakh 2078. Checklists, formats and questionnaires have been included in Annex 1 of the current Inception Report.

Table 1: Ward level meeting details

S.N.	Ward No.	Date
1	1	06/01/2078
2	2	05/01/2078
3	3	07/01/2078
4	4	08/01/2078
5	5	08/01/2078
6	6	06/01/2078

2. Overview of Mangsebung Rural Municipality

Mangsebung Rural Municipality of Ilam District, Province no 1 is located in the western part of Ilam district between 26° 43′ 42″ N to 26° 55′ 35″ N Latitude, 87° 38′55″ E to 87° 47′ 29″ E Longitude (Figure 1). It covers an area of 172.41 km^2. Mangsebung Rural Municipality is one out of the 10 administrative division of Ilam. The district is occupied both by the mountainous regions (Churia Hills and Mahabharat Range) in the northern part and the plain areas (Indo-Gangetic Plain) in the southern part. The term 'Mangsebung' is from Limbu language which means the land of god's origin or god's favorite place. In 2016 (2073 B.S), previous Gajurmukhi, Banjho and Evang V.D.C. were merged to form the new Mangsebung Rural Municipality consisting six wards. According to the Rural Municipal House Hold Survey 2018 (2075/76) the Rural Municipality had 18549 populations with 9,701 males and 8,848 females, and population density was 107.96 people per square kilometers. There were 3,769 households and the major ethnic groups are Limbu and Rai.

The municipality lies in the foothill of the Himalayas at the elevation ranging from 190 masl (meter above sea level) to 2061 masl. About 17 % of total area lies in the slope below 12°, and 59% lies between 12-30° and the rest (~23%) above 30°. The study area comprises mainly of two different geological units, i.e. Siwalik Group in the north and Indo-Gangetic Plain in the south. The Siwalik Zone consists of sedimentary rock namely mudstone, sandstone and conglomerate (Pathak, 2017). These hills are very susceptible to landslides and erosion. River flows from the Mahabharata Range and cut through Siwalik Hills before reaching the Terai. At the foothill this river produces wide riverbed and fans consisting of course sediment deposits. Landslides, flood, forest fire and drought are common natural hazard.

There are all the four seasons: spring, summer, autumn and winter appears in the rural municipality. The mean monthly temperature recorded at nearby Kanyam Tea State station is between 8-20° C. May to August is hottest months with average monthly temperature above 19° C, while December to February is the coldest months with average monthly temperature around 9° C. The average annual rainfall is 2625.97 mm, with above 80% rainfall during four months of summer monsoon (June-September).

2.1 Administrative division of the municipality

An administrative division or region is a portion of a country or other region delineated for the purpose of administration. Administrative divisions are granted a certain degree of autonomy and are usually required to manage themselves through their own local governments. Municipalities are divided up into these smaller units to make managing their land and the affairs of their people easier. Mangsebung rural municipality is divided into 6 administrative regions (Ward 1 to Ward 6). Ward no. 4 is the largest ward (55.21 sq.km) and ward no 5 (12.68 sq.km) is smallest ward in the rural municipality in terms of area.

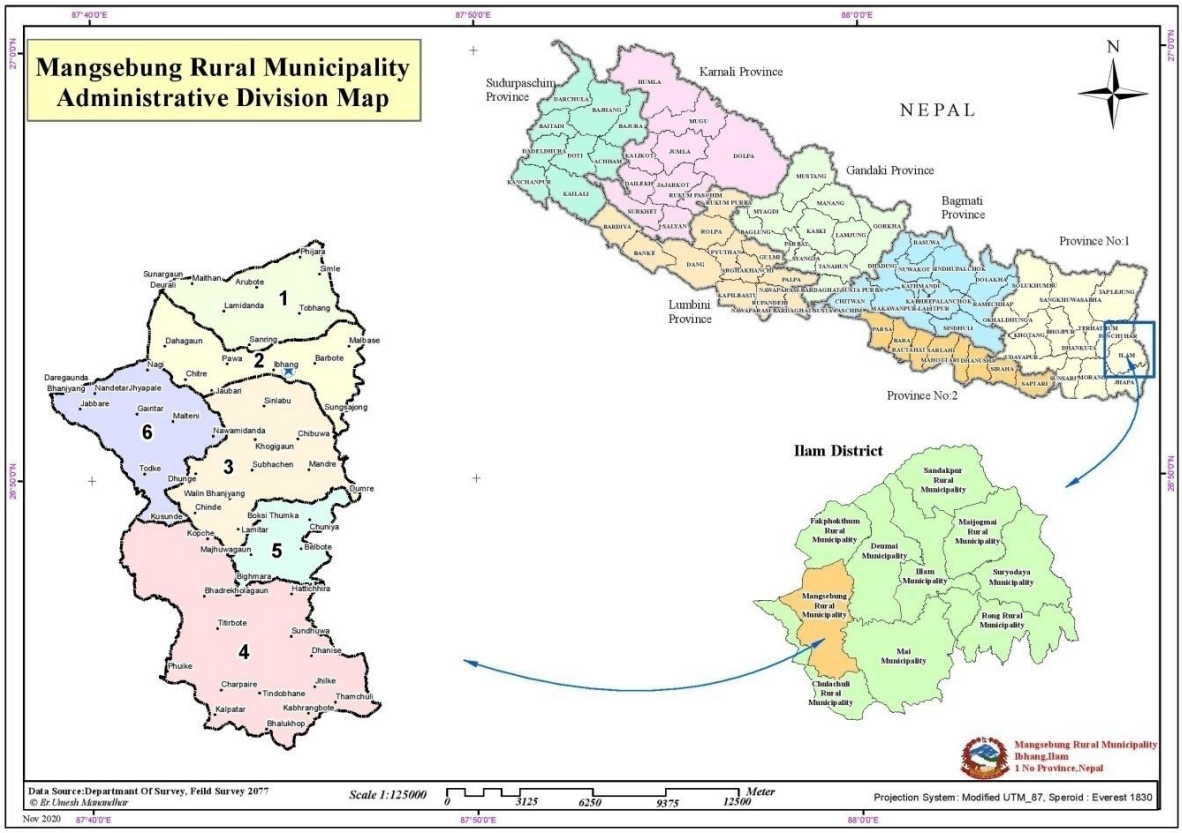


Figure 2: Administrative map of Mangsebung Rural Municipality

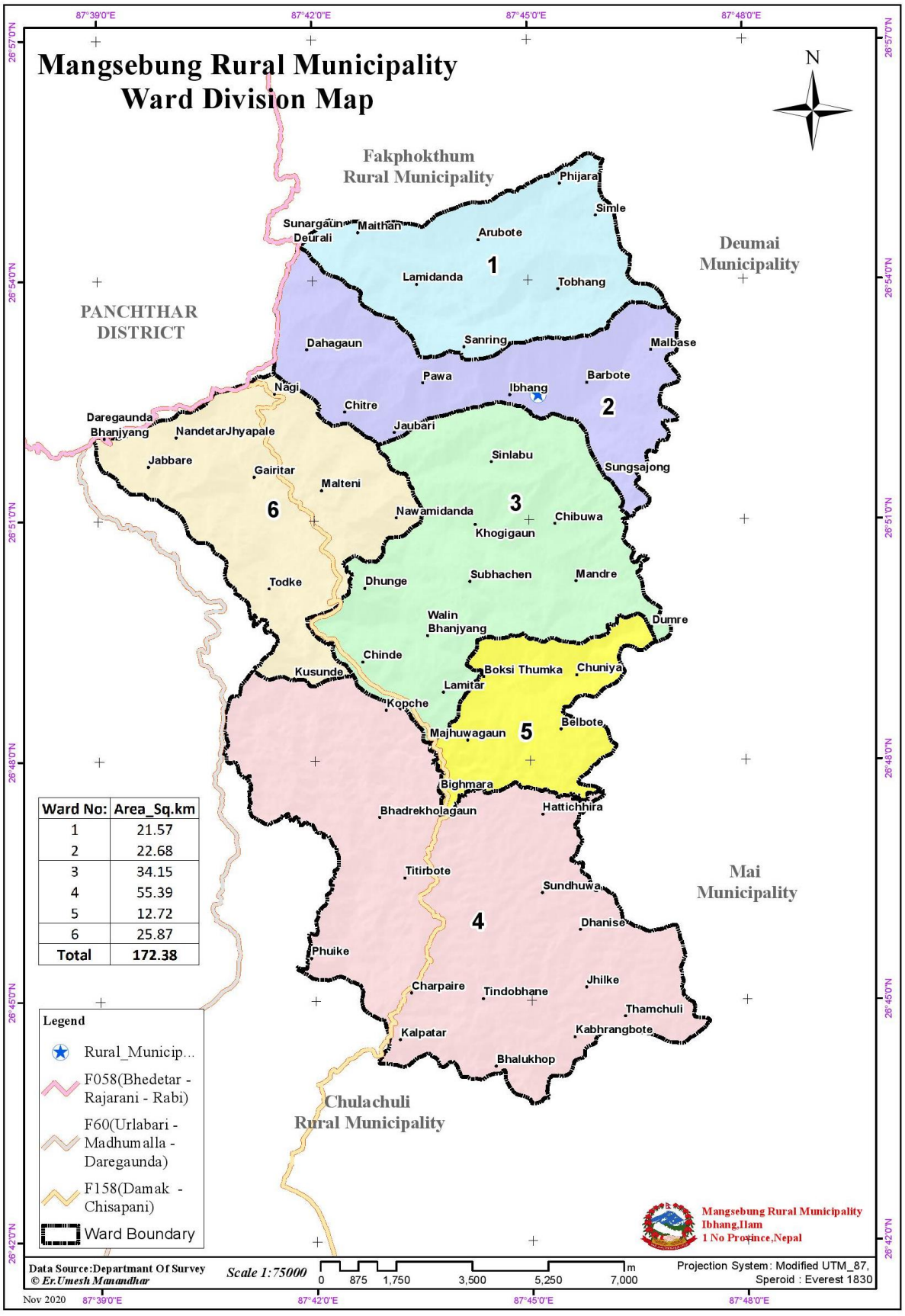


Figure 3: Administrative map of Mangsebung Rural Municipality with area of each ward.

2.2 Present land use

General land use of the municipality at first hierarchical level of classification is shown in the figure (Figure 4). Out of total 172.41 sq. km land, 63.87% (110.11 sq. km) area is covered by forest followed by agriculture with 29.05% (50.09 sq. km). The residential area covers 3.49% (5.97 sq. km) area of the municipality. Likewise, Riverine and Lake Area covers 2.66% (4.59 sq. km) of the total area. Other coverage is not potentially significant

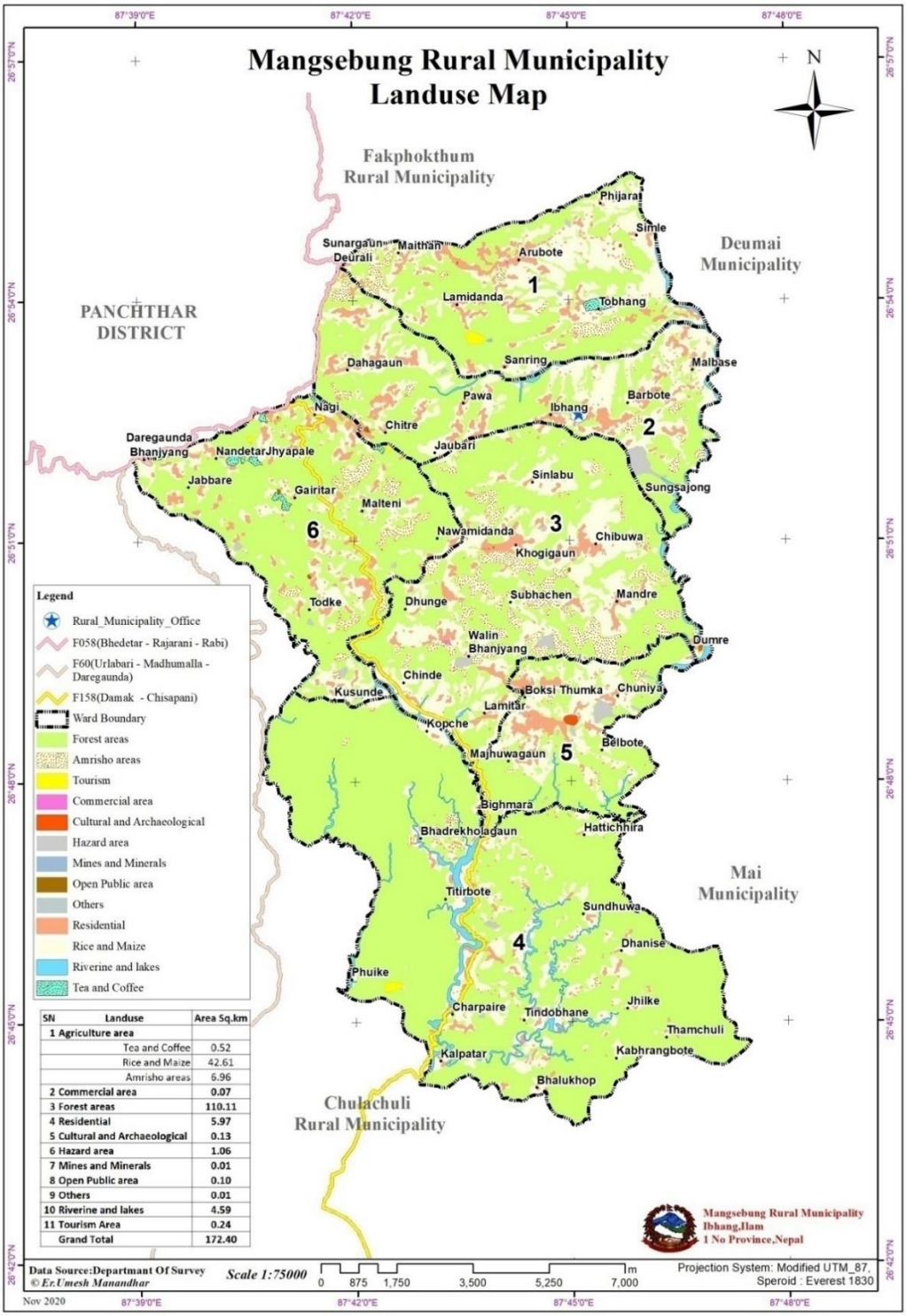


Figure 4: Present Land use map of Mangsebung Rural Municipality

3. Physical setting

3.1 Physiography

The physiography of Mangsebung Rural Municipality is situated in the Mahabharat range of middle mountain and Chure hillslopes in the south. Mahabharat range is situated in the north side of the Chure ranges. Beside this several narrow and shallow to deep depressions, river valleys are found in this rural municipality. The elevation of this Rural Municipality ranges from 190 to 2061 meters above mean sea level. Mahabharat Range occupies 58 % and Chure Hillslope42% of the total area of this rural municipality (Table 2 and Figure 5).

Table 2: Physiographic units and area

SN	Physiographic unit	Elevation range (m)	Area	Percent
1	Mahabharat	>650	9972.1	58.0
2	Chure Hillslopes	650-170	7212.7	42.0
Total			**17184.8**	**100.0**

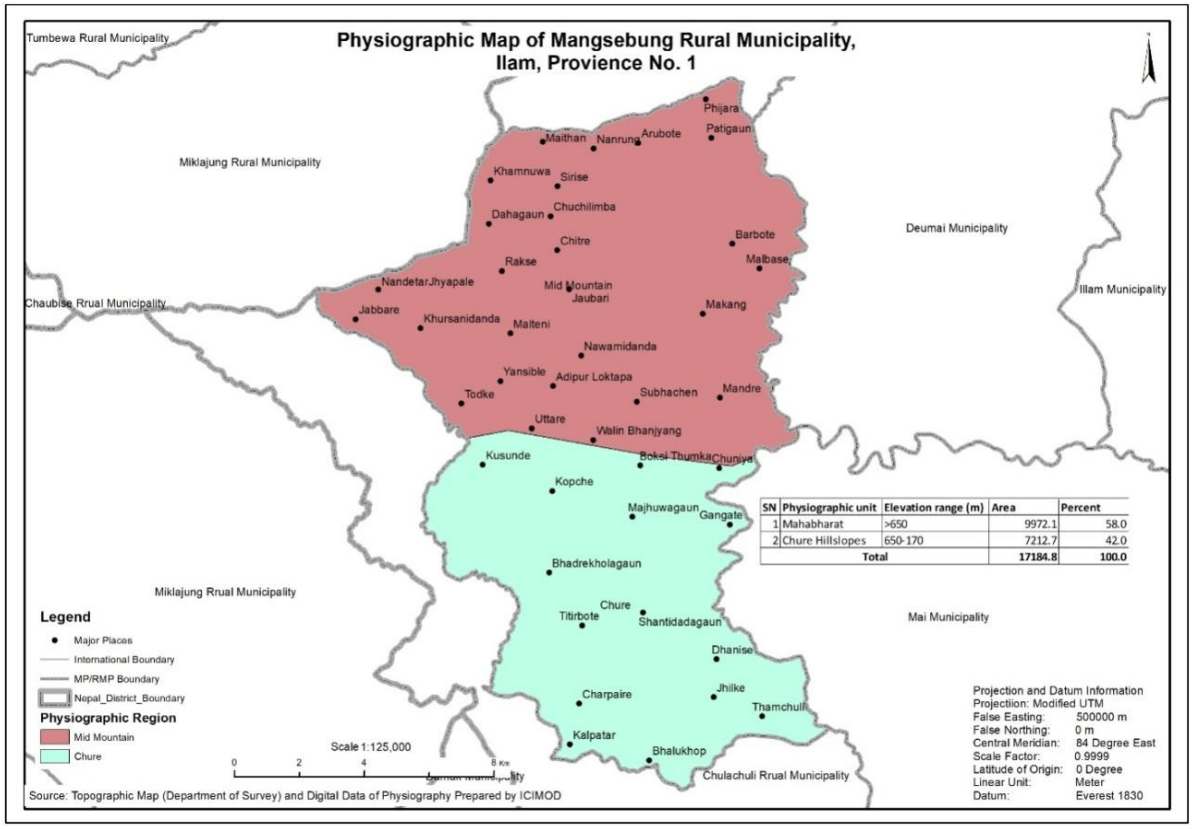


Figure 5: Physiographic divisions of the study area

3.2 Geomorphology

Mangsebung Rural Municipality is situated in the mid-hill mountainous region. The area is undulating with a gradient towards the south. Several river River terraces are some to several meters higher than the river beds. Terraces generally form gradual slopes over the stream bed.This rural municipality consists of Mahabharat Lekh of the Nepal Himalaya. Mahabharat

lake is situated just north side of the Siwalik and ranges from 1000-2500m in elevation and 10-35km width. This zone comprises schist, phyllite, gneiss, quartzite and limestone belonging to the lower Himalayan zone.

The elevation of this rural municipality is range from 190 to m to 2061m and external process as denudation consisting of alluvial deposit and internal physiographic process as tectonic movements are responsible for making landforms such as active and recent alluvial plain, alluvial fans and terraces and depositional basins which have affected the soil formation. The gently slope is rising from the north and river terraces are in the central part and then river valley in the south. Rivers, slopes, peaks, saddles and ridges are distributed in the northern side of the area, whereas gentle slope is located in the southern part.

3.3 Geology

The entire Himalayan belt is subdivided into five tectonics units: Indo-Gangetic plain, Sub-Himalaya, Lesser Himalaya, Higher Himalaya and Tethys Himalaya. The Geology and landforms of the Mangsebungrural municipalityconsists of lesser Himalaya and Higher Himalaya. The Siwaliks are broadly divided into three groups, i.e., the Upper Siwaliks (US), Middle Siwaliks (MS) and the Lower Siwaliks (LS)(DMG 2007) (**Error! Reference source not found.**6). The US is composed of conglomerates, sandstone and few mudstone beds. The Upper Siwaliks are represented by sorted or an unsorted loose, boulder-sized conglomerate with grey sandstone and mudstone. This unit typically contains the Siwaliks sandstone boulders. The US rocks are highly erodible and susceptible to gully erosion.

The MS is comprised of fine to very coarse-grained sand as well as pebbly sandstone, which alternate with mudstone. The proportion of sandstone beds is higher than that of the mudstone—the proportion and coarseness of the sandstone increase towards the upper formation of the MS.

Lesser Himalaya is represented here by Midland Groups, where Kathmandu Group consists of SarungKhola Formation and ShiprinKhola Formation. SarungKhola Formation consists of fine textured, dark grey to greenish white quartzite biotite schists, quartz feldspar biotite shcists, occasionally garnetiferous interbedded with quartzites and micaceous quartzites with intrusions of pegmatities Cs-Calc, silicate rocks and marble bands whereas ShiprinKhola Formation Coarse textured, highly garnetiferous muscovite biotite-quartz schists, calc.silicate rocks light green chlorite schists and metabasic rocks.

Higher Himalaya is represented by Himal group which consists of UndifferentedHimal Gneiss, Panglema Quartzite and DwareJharka Schist. Himal Gneiss consists of two Mica gneisses, granitic gneisses, banded gneisses, Kyanite bearing gneisses and migmatites and thin bands of marbles. Panglema Quartzite is composed of fine grained compact quartizic schists and quartzites occasionally crystalline limestone. DwareKharka Schist consists of medium to coarse-grained quartz muscovite biotite schists, garnetiferous schistose gneisses and kyanite schists.

The quaternary consists of recent and post-Pleistocene alluvial deposits brought by the rivers

draining the upper catchments of Chure hills and other Himalayan belts. These form a piedmont (foothill parts made of alluvial fans) adjacent to the Chure hills (LRMP 1986).

Two major thrust, i.e., Main Frontal Thrust at the foothill, and the Main Boundary Thrust, which delineates the Siwaliks from the Lesser Himalaya trend across the EW of the study area. Besides, several EW or NS trending faults are also located in the study area. These thrust and faults indicate the tectonic movements, and this movement is most active along the Main Frontal Thrust in the Himalayas where Indian Subcontinent Plate collide and sub duct beneath the Eurasian Plate. The rate of uplift in the Siwaliks is between 10-15mm/year (Lavé and Avouac 2001).

About 25.91 % (44.68 sq. km) of the total area in Mangsebung rural municipality falls in the Lower Siwaliks region. It is followed by Shiprin khola formation 23.01 % (39.69 sq. km), Sarung Khola formation 22.13 % (38.15 sq. km) and Middle Siwalik 21.05 % (36.29 sq. km). Seti formation and Takure formation covers 5.06 % (8.72 sq. km) and 2.84% (4.89 sq .km) respectively (Figure 6).

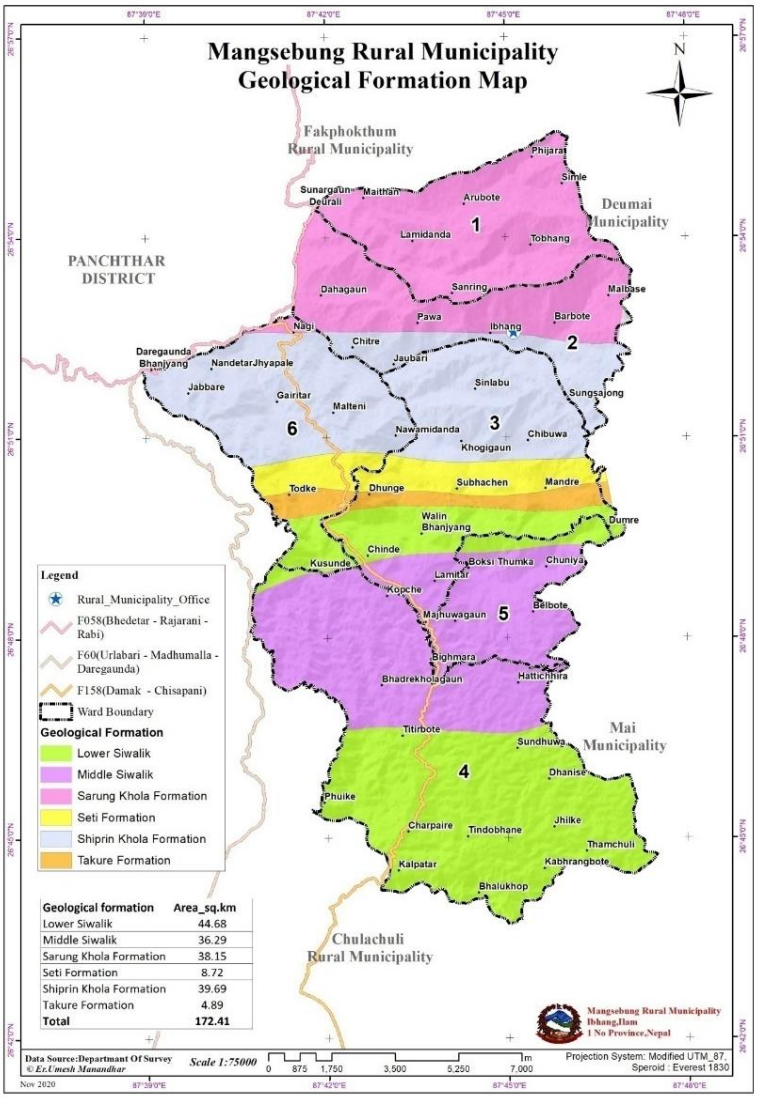


Figure 6: Geological Map of Mangsebung Rural Municipality

3.4 Slope, aspect, elevation and hill shade

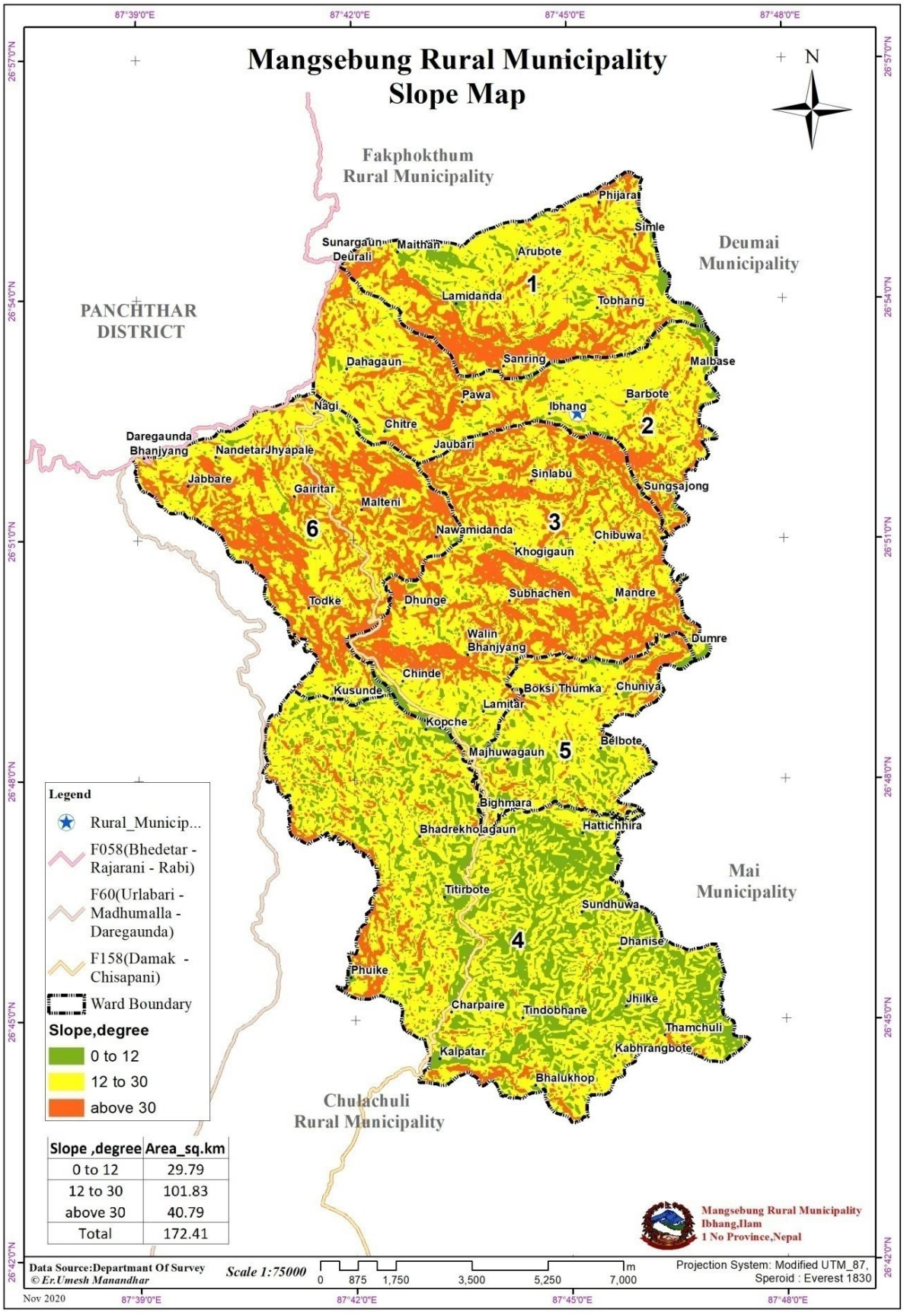


Figure 7: Slope map of Mangsebung Rural Municipality

The slope of the land directly affects human activities and land use. Slope is prime factor affecting the current and potential development works directly and indirectly. It affects directly through land capability and indirectly through its contribution on slope instability. It influences the soil formation, controlling soil erosion and water movement in the soil along with the other soil forming factors and affecting the soil characteristics. It is also used as the basic tool for the demarcation of landform, land types and land units. In Mangsebung rural municipality, slope ranges from 0 to above 40 degrees. 59.06 % (101.83 sq. km) of land lies in slope between 12 to 30 degrees, 23.66 % (40.79 sq. km) of the land lie in the slope above 30 degree. Only 17.28 % (29.79 sq. km) of the land lies below 12 degree (Figure 7). Generally, less than 30 degree slopes are suitable for human development, settlement, farming and other activities. Ward no 1, 2, 3, and 6 are found steeper than other wards.

Aspect indicate the directions the physical slopes face. It describes the direction in which a slope faces and relates to the degree of solar exposure. Aspect has a profound influence on vegetation, snowpack and construction. Southeastern face covers 15.60 % of total area followed by Southern face 15.53% whereas eastern and northeastern face covers nearly 14.99 % and 14.32 %, respectively. Likewise 13.16% of the total area Mangsebung rural municipality is facing southwest. 11.53% 7.62%, 7.23% the total area of rural municipality are facing north, west and northwest, respectively (Figure 8). Moderate elevation and large portion of area facing east and southern direction makes Mangsebung rural municipality suitable for tea farming.

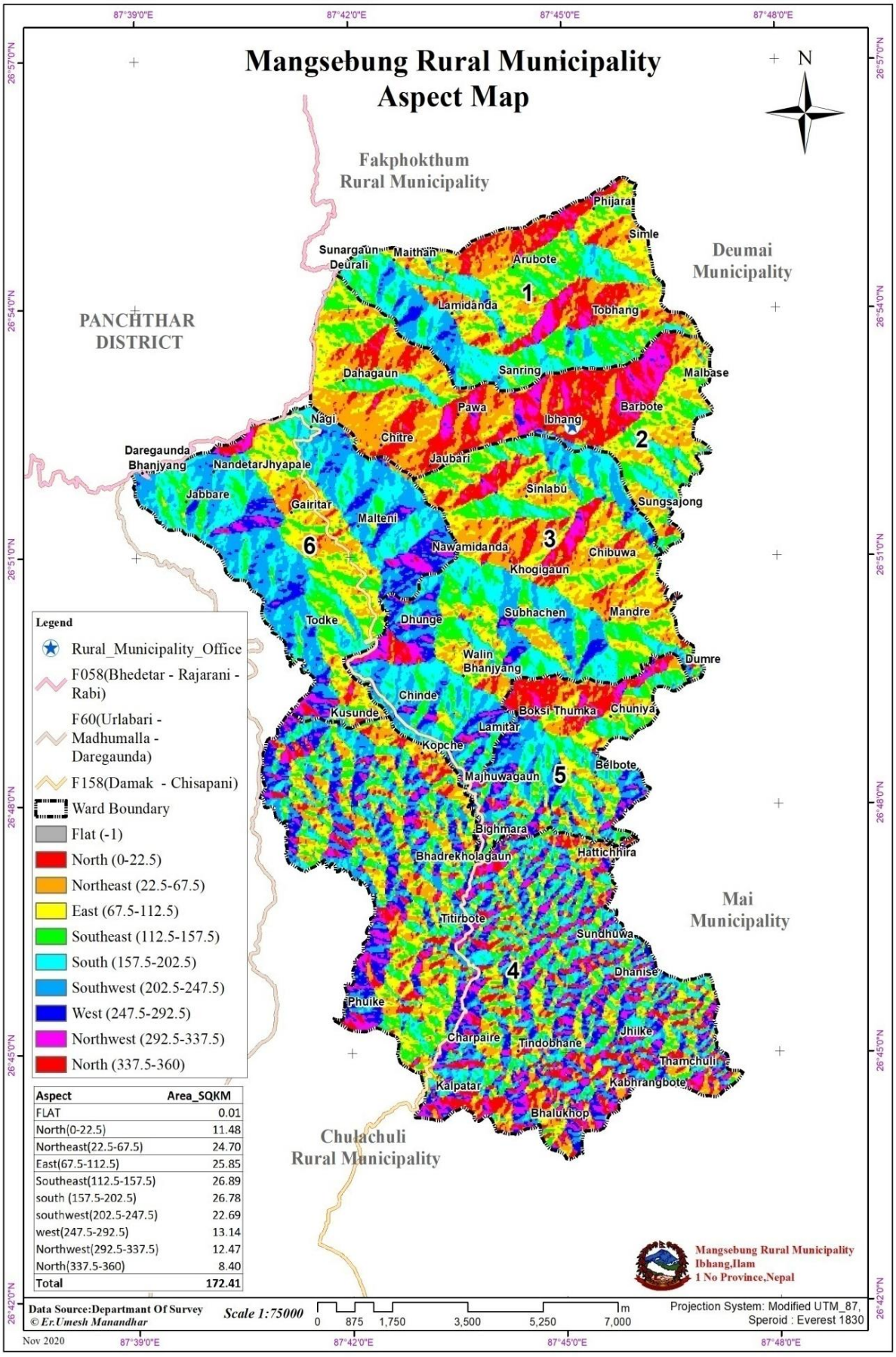


Figure 8: Aspect map of Mangsebung Rural Municipality

An elevation map shows the various elevations in a region depicted on a map. Elevations are usually measured in meters or feet with reference to the sea level. Elevation influences climate, as well as where and how people live. In The elevation ranges of the Mangsebung Rural Municipality is 190-2060 meter above mean see level (MALS) and the average relief is 1100masl. The highest elevation is Chisapani, located northwest part of the study area in the Mahabharata Range. (Figure 9).

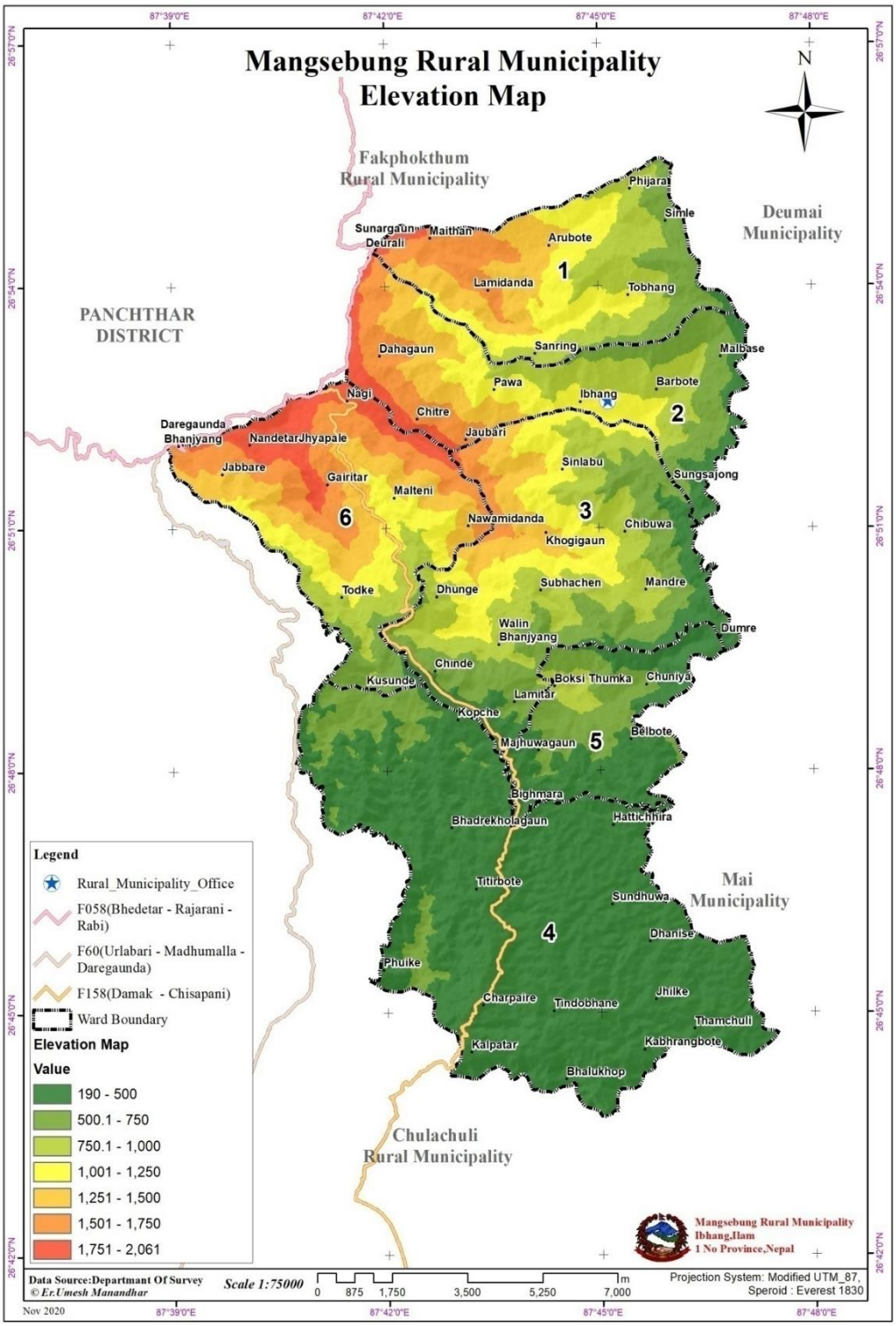


Figure 9: Elevation map of Mangsebung Rural Municipality

Hill shading is a technique for creating relief maps, showing the topographical shape of hills and mountains using shading (levels of gray) on a map, just to indicate relative slopes, mountain ridges, not absolute height. Following figure shows the hill shade map of Mangsebung Rural Municipality.

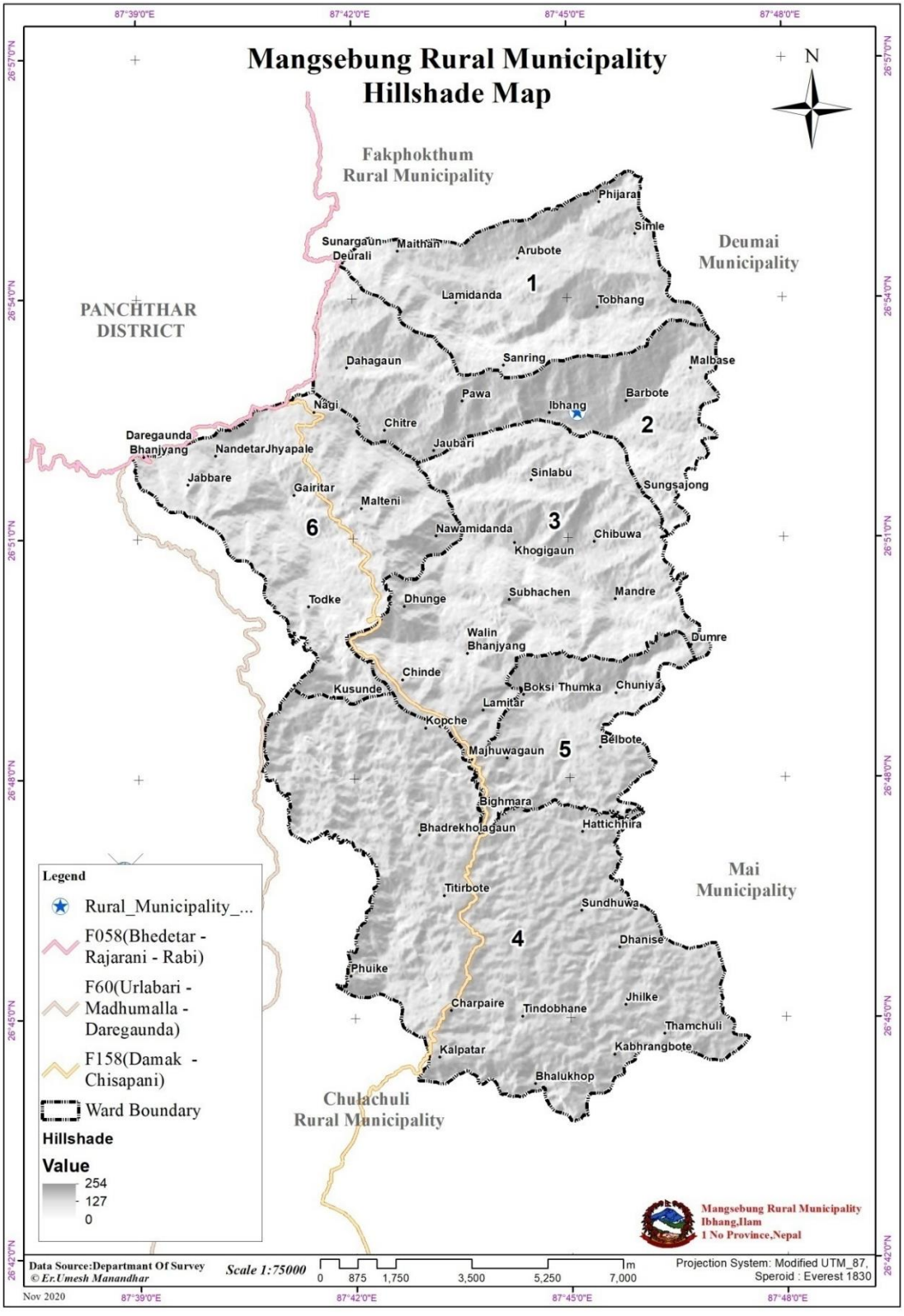


Figure 10: Hill shade map of Mangsebung Rural Municipality

3.5 Drainage/hydrology

The drainage pattern of the study area is controlled by the bed structure, faults and system of joints in the Chure Hills and Mahabharata Range, which is evidenced by trellis (stream orient in parallel) to rectangular drainage pattern.

The stream has strong erosive and enormous enough capability to carry huge sediments, including massive boulders during rainstorms in a monsoon. The river in the hillslope developed the alluvial fan deposit, consisting of boulder, gravel, and sand at the foothill. The slope of the terrain is around 5%. The deposits comprise of boulders, gravels, pebbles and sand. Towards the south, the size of the sediment decreases; gradually, the proportion of boulders decreases, where sand and gravel become dominant. River beds are wide, shallow and tend to be braided. The riverbanks have irregular shapes. These rivers receive vast amounts of sediments from the tributary streams during a flash flood.

In Mangsebung Rural Municipality, there are many rivers and streams. Among them, PhewaKhola, Lamphewa Khola, Tama Khola, Late Khola, Deumai Khola, Mewa Khola, Makthumba Khola, Mai Khola, Ratuwa Khola, Paiya Khola, Phedi Khola, Majhuwa Khola, Dhanduwa Khola, Sundhuwa Khola, Jhike Khola, Sano Chanju Khola etc are major river and streams in this rural municipality.

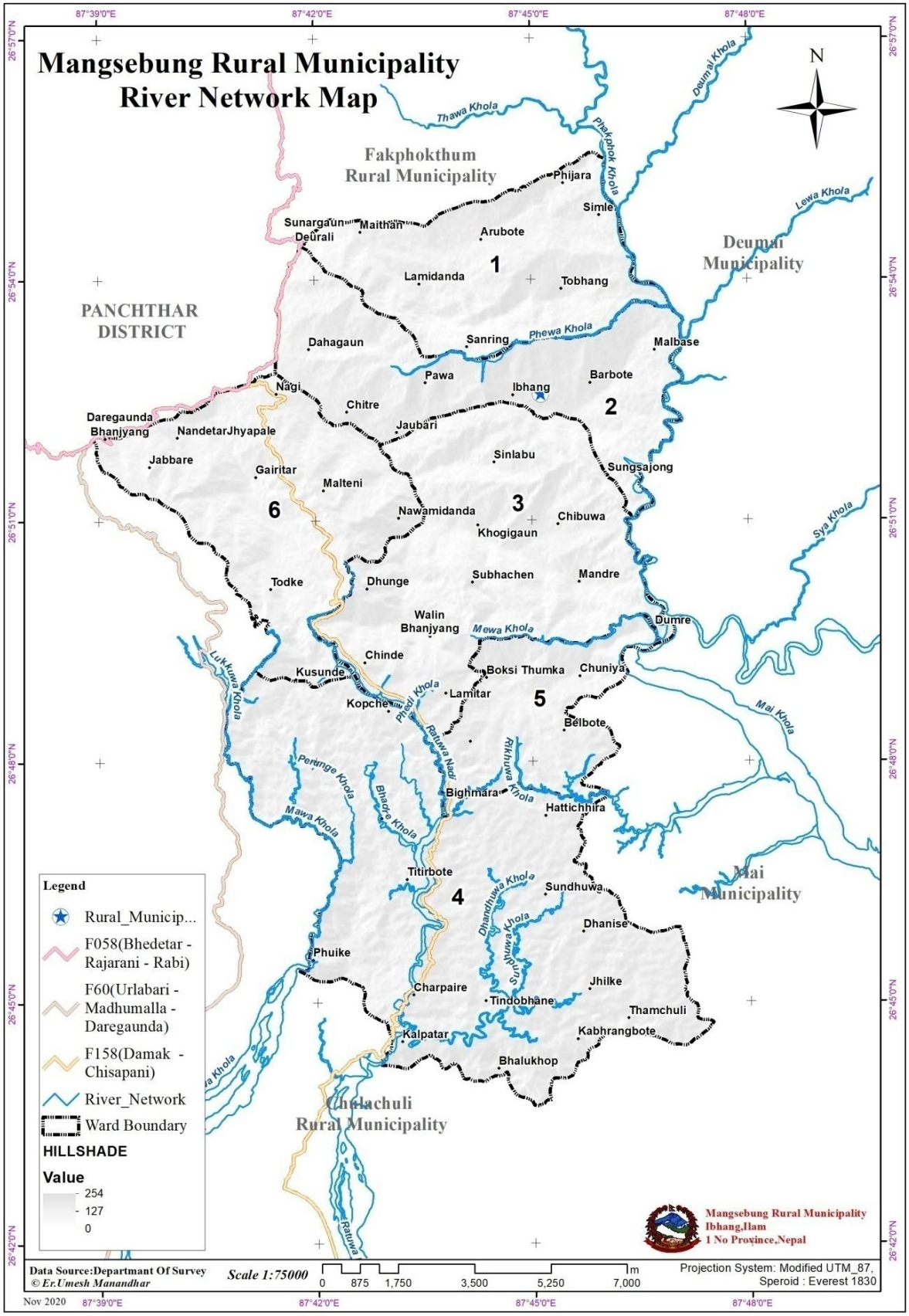


Figure 11: River network map of Mangsebung rural municipality

3.6 Climate

In Mangsebung Rural Municipality, there are different climate according to altitude and seasons, sub-subtropical climate is in the southern Chure region and temperate climate in the northern mountainous region. Dry summer season begins in the month of March when the sun starts to move northward from the equator. Rainy season starts from the month of June and lasts until the last of September. Roughly speaking winter season begins in the month of October and lasts till February as the sun moves southward from the equator. The mean monthly temperature recorded at nearby Kanyam Tea State station is between 8-20°C. May to August is hottest months with average monthly temperature above 19°C, while December to February is the coldest months with average monthly temperature around 9°C. The highest maximum temperature (during the period between 2006-2016) is 29.8°C recorded in September 2009. Similarly, the lowest maximum temperature has recorded 14.7°C in January 2008. Similarly, the highest minimum temperature is 20.8°C recorded in July 2007. The lowest minimum temperature has recorded 6°C in January 2016 The average annual rainfall is 2625.97 mm, with above 80% rainfall during four months of summer monsoon (June-September). The rainfall varies by 735 mm between the driest (November; 2.57 mm) and wettest month (July; 737.08 mm). The detail information of temperature and rainfall are shown in the figure and table below (Figure 11, Table 3).

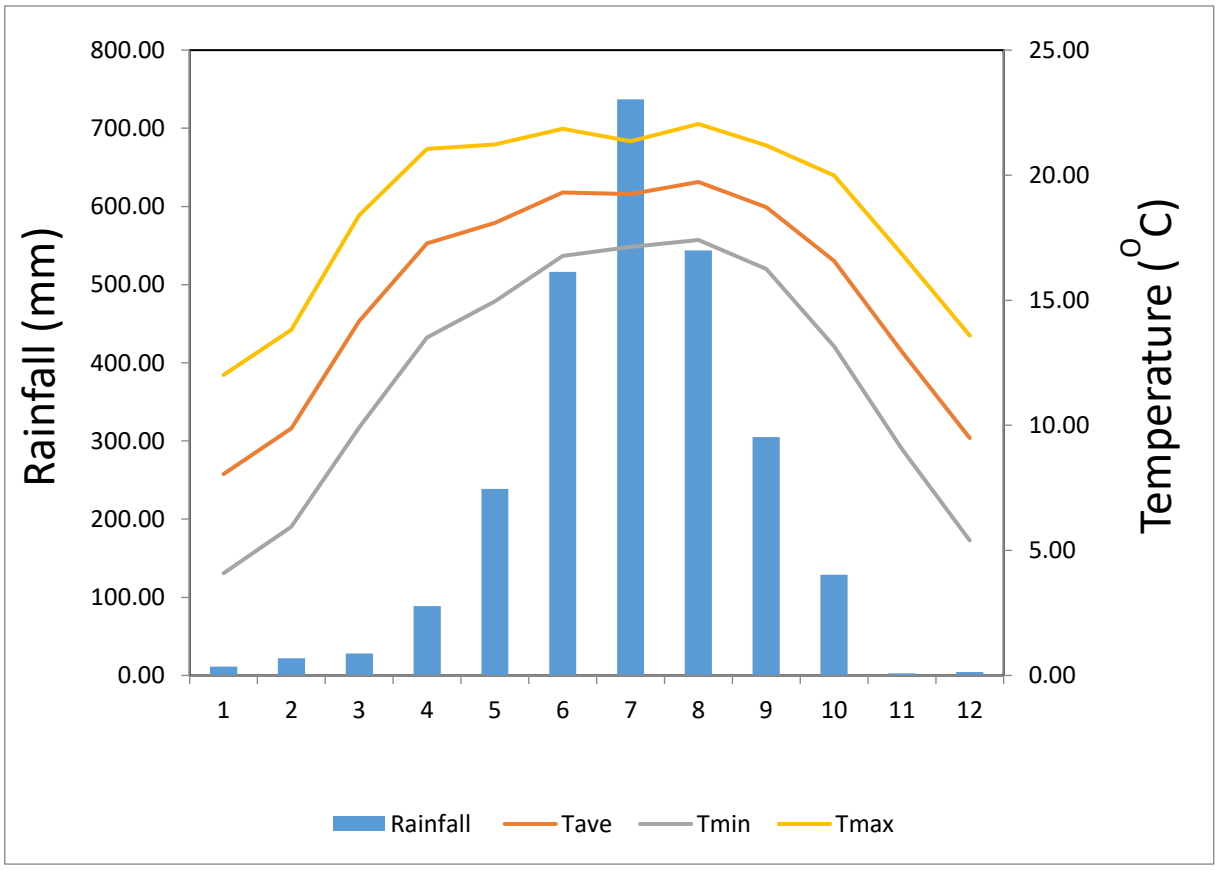


Figure12: Monthly average temperature (Tave), maximum temperature (Tmax), minimum temperature (Tmin) and monthly total rainfall of Kanyam Tea State (Ilam)

Table 3: Monthly mean temperature (Tave, Tmax, Tmin) and rainfall at Kanyam Tea State (Ilam)

Months	Tmax (^{O}C)	Tmin (^{O}C)	Tave (^{O}C)	Rainfall (mm)
January	12.02	4.09	8.05	11.37
February	13.81	5.94	9.88	21.81
March	18.41	9.92	14.16	27.98
April	21.04	13.51	17.28	88.57
May	21.22	14.96	18.09	238.57
June	21.86	16.77	19.31	516.13
July	21.36	17.13	19.24	737.08
August	22.05	17.41	19.73	543.84
September	21.19	16.25	18.72	304.86
October	19.99	13.15	16.57	128.98
November	16.83	9.05	12.94	2.57
December	13.59	5.40	9.50	4.21

3.6 Forest and Biodiversity

The Mangsebung Rural Municipality is diversities in plants and animals, their habitats. As the rural municipality, the coverage of forested land is very good which provides habitats to different species of plants and animals. Forest is one of the prominent natural resource and covers about 64 % area of the municipality. Based on management regimes forests here can be categorized as government managed forests, community forests and private forests.

The major categories of forest in the rural municipality is mixed forest with species like *Schimawallichii* (Chilaune), *Castanopsis indica* (Katus), *Alnus nepalesis* (Uttis), *Pinus roxborghii* (Sallo), *Eurya acuminate* (Jhingane), *Ficus* species (Bar, Pipal, Khasreto, Sami/Swami, Badahar), *Quercus* species (Banjh, Khasru, Phalant), *Rhododendron* species (Gunrans), *Shorearobusta* (hill sal), *Engelhardtia spicata*, *Myrsine*species,

The major faunal species in the rural municipality includes Asiatic Black Bear (*Ursus thibetanus*), Common Leopard (*Panthera pardus*), Golden Jackal (*Canis aureus*), Leopard Cat (*Prionailurus bengalensis*), Hanuman Langur (*Semnopithecus entellus*), Black Giant Squirrel (*Ratufabicolour*), Indian Muntjac (*Muntiacusmuntjak*), Yellow-throated Marten (*Martes flavigula*), Crab-eating Mongoose (*Herpestes urva*), Wild boar, Porcupine etc. As per the communication with the local people, wild boar, porcupine and wild boar are the most problematic animals. They predate crops and cause severe damages to the agriculture crops incurring huge economic losses.

Ilam is also famous for ornithological species as it has good number of Important Bird Aras (IBA). There are several bird species and include, Blue-eared Barbet (*Megalaima australis*), BrahminyKite (*Haliasturindus*), Great Thick-knee (*Burhinusrecurvirostris*), Yellow-vented Warbler (*Phylloscopuscantator*), Whitethroated Bulbul (*Alophoixusflaveolus*), Ruby-cheeked Sunbird (*Anthreptessingalensis*), kalij, cuckooamong others.

3.7 Nature hazards and environment

3.7.1 Nature hazards

Landslides, debris flow, gully erosion, flash flood, earth quake are the prominent natural hazards. Besides forest fire and drought are the other types of natural hazard. Due to the steep topography, active tectonic and deformed and fractured rock, the upper catchments have high numbers of large to small and deep-seated, swallow landslides, and debris flows scars. There is a large landslide near Sungsajong settlement which is 17 ha in area. The average size of the landslide in this study area is 0.82 ha among 240 active landslides. These landslides have contributed huge sediment loads to the rivers and streams at every monsoon. Due to the steep gradient and confined channel, and very limited flood plain in the upstream areas, a sediment load of fine to large size boulders and cobbles is transported through the narrow valleys and deposited onto riverbeds in the foothills and in Terai.

Figure 13: Landslide photos in the study area (Google Earth, 6.29.2021)

Landslides can be classified as rock fall, slides, debris flow, complex failures, and swallow scar type failures. Rock fall and slides including the swallow scar failures are widespread in the steep slopes and escarpments. Shallow landslides are common. Numerous slides of complex types are seen on the stream and gully head, from where the hillslope materials are released into the colluvial streams and further transported downstream. Numerous failures in the foot slopes, due to river undercut, were observed in the Google Earth image and confirmed during the field visit, which indicates a river incision weathering of mudstone and the disintegration of the sandstone through joints and crack networks may have caused large-scale bedrock slumps. Highly weathered rocks also contribute to sediment load through gully erosion and debris torrents.

Apart from the landslides and debris flow, numerous erosion scars and exposed rocks and signs of land degradation are seen on slopes, which are either due to bare steep slopes or escarpments, or sites of overgrazing and deforestation. Gully erosion is moderate to severe in the study area, particularly in the slope underlain by Upper Siwaliks. Flash flood, river shifting, bank erosion is prominent in along narrow river valleys. Loss property and agriculture land, and threat to settlements are experienced.

The rivers and streams here trigger flood hazard during monsoon every year. The floods through bank cutting, scouring, overland flow and sedimentation cause loss agriculture land and other physical properties as well as human and livestock casualties in the municipality.

The other disasters include flood, fire, thunderbolt etc. with damage to agriculture crops by wildlife (especially monkey) in recent years.

Landslide area: Landslide hazards are the main hazard in the Mangsebung rural municipality because of it high degree of slopes and fragile landscape. Therefore, most of the area within the rural municipality is susceptible to landslide related hazard. In the past many small/medium/large size landslides has occurred throughout the rural municipality as shown in the map below (Figure 14 and 15).

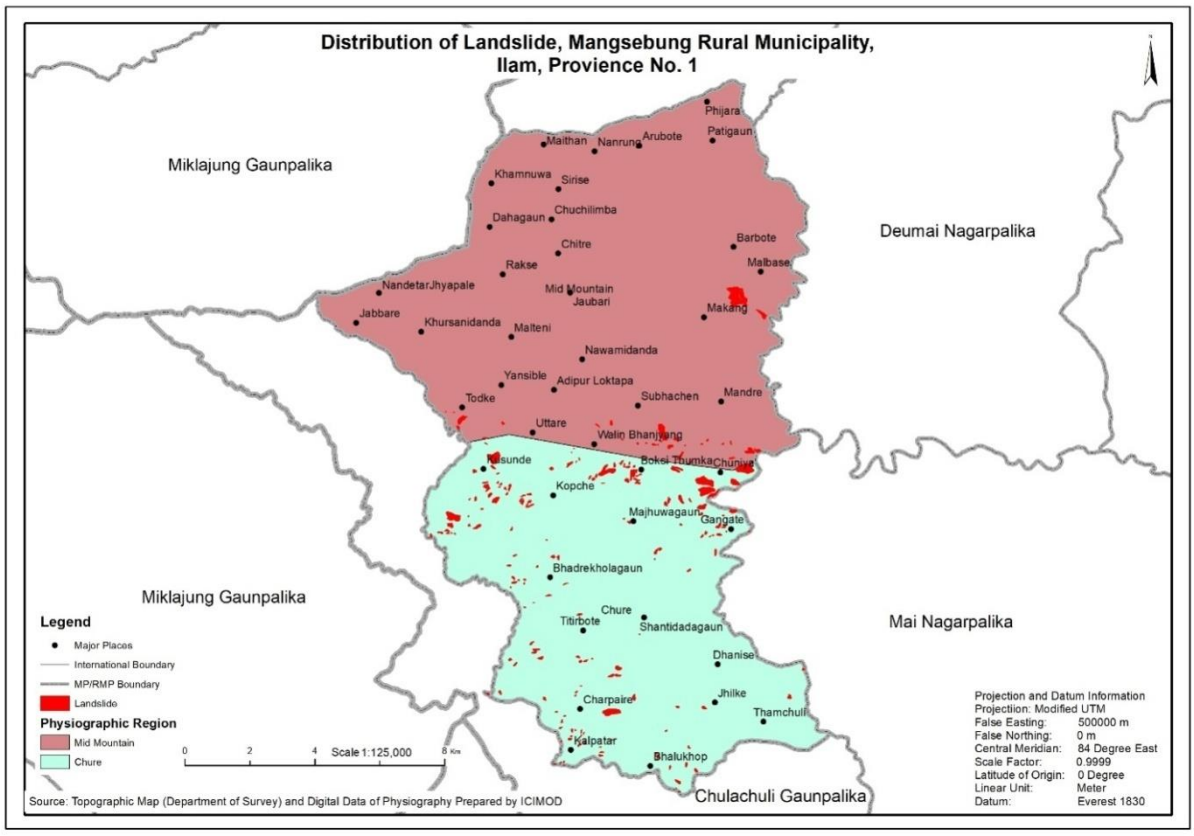


Figure 14: Landslide Distribution of the study area

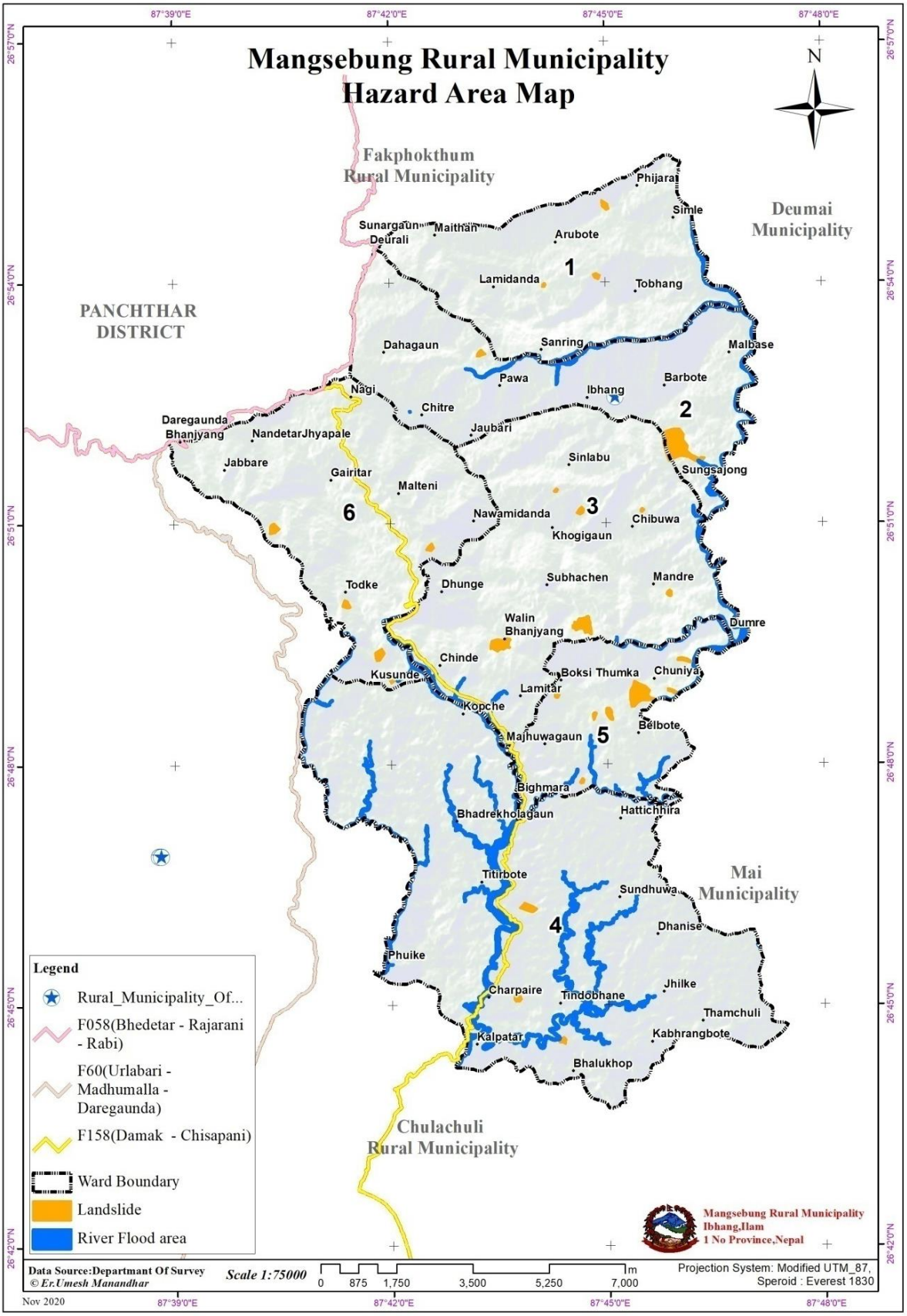


Figure 15: Landslide flood prone area map of Mangsebung Rural Municipality

3.7.2 Landslide Susceptibility

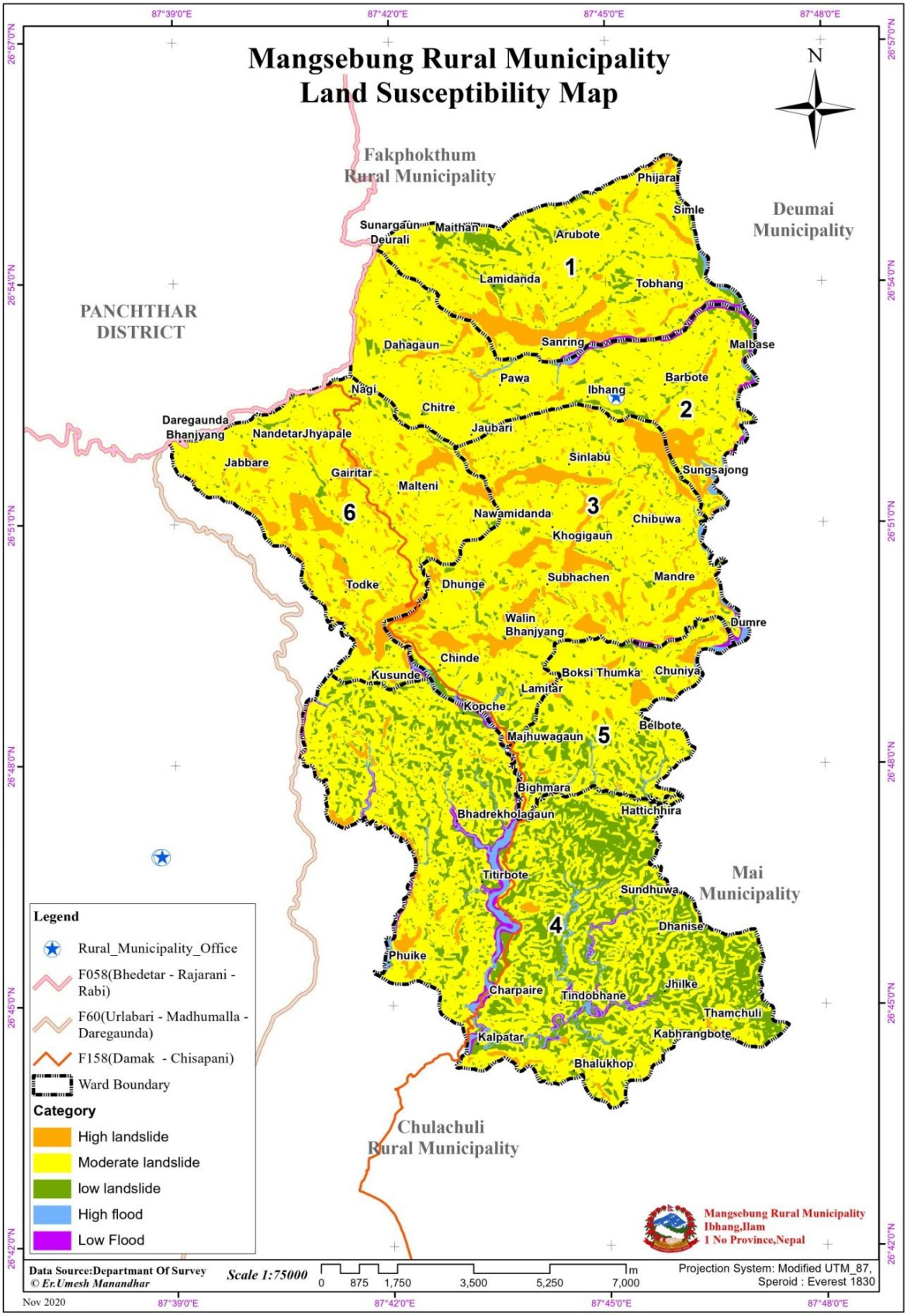


Figure 16: Landslide and flood susceptibility map of Mangsebung Rural Municipality.

Landslide susceptibility map refers to the relative likelihood of future landslide based solely on the intrinsic properties of a locale or site. It is also known as the "landslide potential map). Evaluation of landslide susceptibility was carried out using landslide Index method. Landslide detection was done by using high-resolution images provided by Google Earth. The morphological signatures representing various types of landslides were identified with the help of shape, size, texture, color, topographic location, vegetation characteristics revealed in an image vis-a-vis expert judgment. Landslide susceptibility was classified into High moderate and low type.

As the Mangsebung Rural Municipality entirely lies in the fragile Chure and Mahabharat region, most of rural municipal area is susceptible to landslide hazard. The landslide susceptibility map of Mangsebung rural municipality showed more than one third (~72 %) of the rural municipal area is characterized by moderate susceptibility class (Figure 16). Similarly, approximately 8.9 % area is found under high landslide susceptibility class and only 15 % area is in the low susceptibility zone.

3.7.2 Flood Susceptibility Map

Flood susceptibility map was produced based on the river morphology and flood footprints, old channels, topography, sediment characteristics interpreted from the satellite image, and verified from field observation as information obtained from the local people on the basis of their knowledge on disaster history. Low-lying area along the river and stream are highly susceptible to different level (high, medium and low) of flood hazards. Flood prone areas are shows in the Figure 16. Approximately 1.3 % (4.6 km^2) of total area is characterized by high susceptible class and 1.36 % (2.23 of km^2) area is in the low susceptible class in terms of flood susceptibly.

3.7.3 Seismic Susceptibility

The Peak Ground Acceleration (PGA) value of the area lies between 100-200 gals (Pandey 2002), showing the area is relatively low seismic risk zone. The seismic hazard measured in terms of Peak Ground Acceleration (PGA), i.e., maximum ground acceleration that occurred during earthquake shaking at a location, indicates the high earthquake hazard in the Study area The contours of Peak ground acceleration, expressed in Gal (1 Gal equals to 1cm/s2; 1 g =981 Gal), show PGA between 100-200 gal, which implies the catchment is subjected to violent or extreme shaking; higher intensity in the higher relief (http://seismonepal.gov.np/publications).

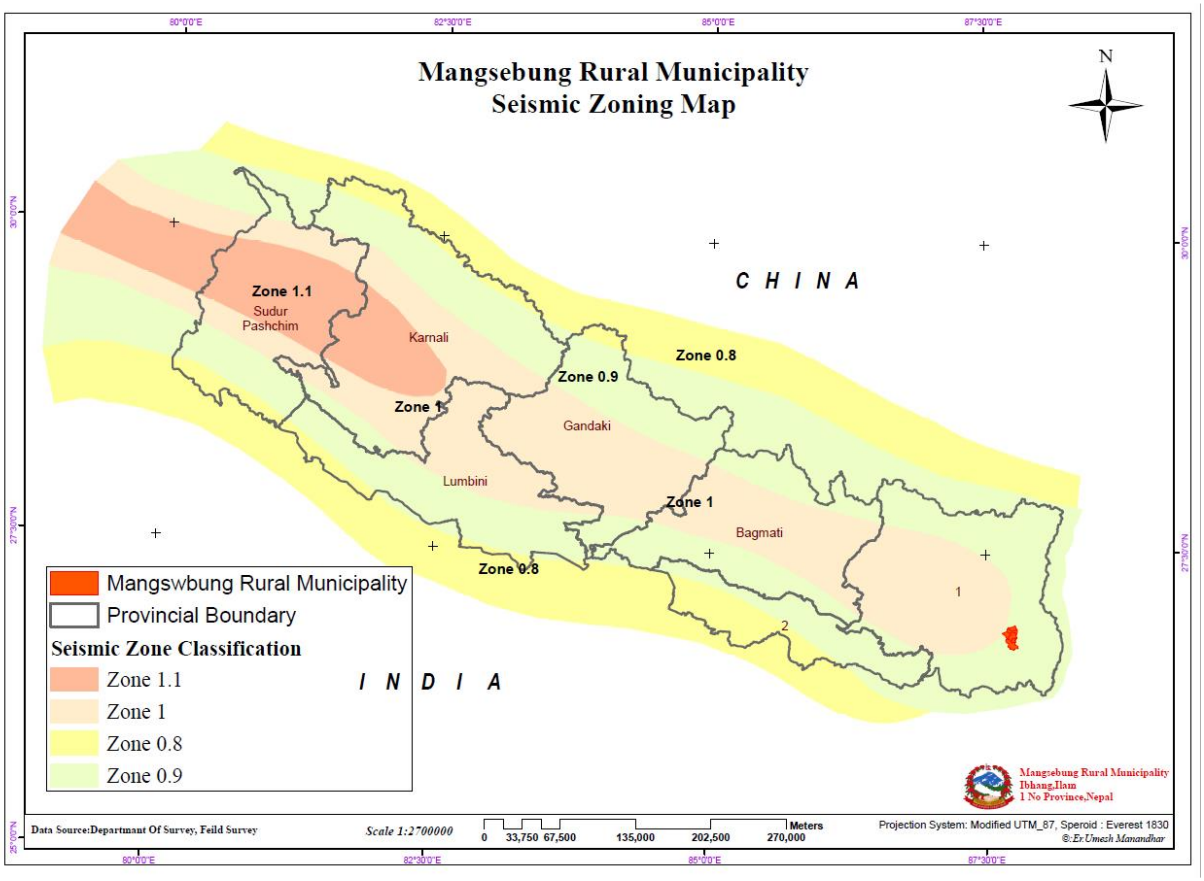


Figure 27: Seismic Zoning Map of Mangsebung Rural Municipality

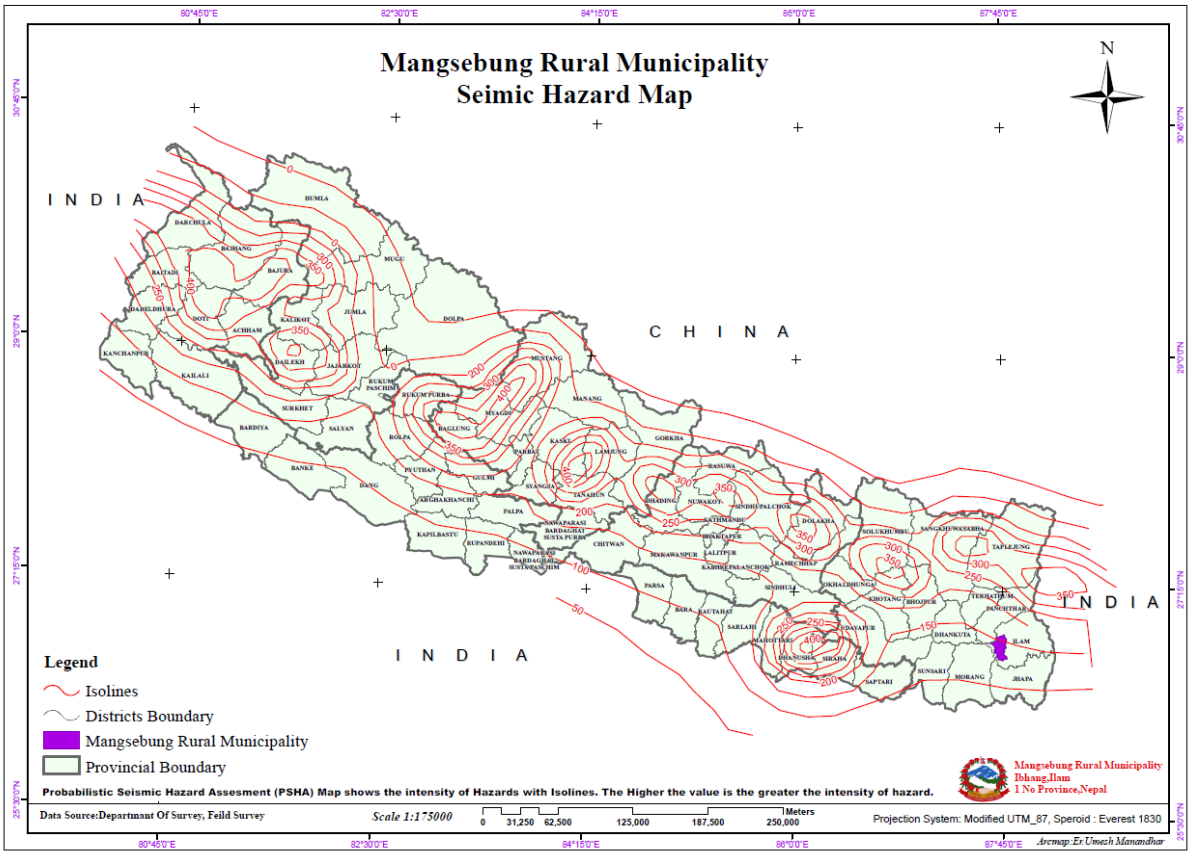


Figure 38: Seismic Hazard Mapping of Mangsebung Rural Municipality

3.8 Environment

Forest is one of the prominent natural resource and covers about 64 % area and 32 % of cultivated land. Maize- wheat is the major cropping pattern in this rural municipality. Beside this rice, millet, tea, cardamom, zinger and etc. are major cereal and cash crops in this study area. The forest types found here are Sal forest, mixed hardwood forest and lower mixed broadleaf forests. The major tree species found here areSal (also known as Sakhuwa), Sajh, Simal, Karam, Katus, Chilaune, Sadhan, Satisal, Paiyu, etc. along with species of medicinal herbs and NTFPs like Amrisho, Kurilo, Amala, Rittha, Tejpat, Rudrakshya, Harro, Barro, bamboo etc.

The main rivers and streams in the Gaunpalika are Phewa Khola, Lamphewa Khola, TamaKhola, Deumai Khola, Mewa Khola, Mai Khola, Ratuwa Khola, Dhanduwa Khola, Sundhuwa Khola and etc. These rivers and springs are also important sources of waters and provide habitats to several rare, endangered and endemic species of plants and animals. Asala (Schizothorax species). The rivers are rich in extractable bed materials that can be extracted as directed through IEE or EIA. No any significant pollution is visible in the municipality till date. However, solid wastes if not managed properly may directly affect the environment polluting the rivers and open spaces here. Till date there is no provision of solid waste collection system.

Natural disasters cause damage to physical properties (house, agriculture land and crops), human settlements and other physical properties along with human and livestock casualties. Soil erosion, mass movement, mud flow and flash floods are common in the municipality.

4. Socio-economic setting

4.1 Demography

4.1.1 Population distribution and density

According to the household survey of 2075/76, Mangsebung Rural Municipality had 3769 households and 18,549 populations with 9,701 males and 8,848 females, and population density was 107.96 people per square kilometer. The average family size was reported as 4.92 and male and female ratio was 100 males per 99 females. Out of all wards, ward number 3 had the largest population. Population of 4,125 in 804 households in ward 3 had 2186 male and 1939 female. On the other hand, ward number 4 had least number of populations. Population of 1913 in 421 households in ward 4 had 1053 male and 860 female. Population density was found highest in ward 5 and lowest in ward 4 with 215 people per square kilometer and 34 people per square kilometer, respectively. Ward no. 4 is the largest ward and Ward no. 5 is the smallest one with area of 55.21 sq. km and 12.79, respectively. The table below shows the population distribution and density of other wards.

Table 4: Population distribution according to wards in Mangsebung Rural Municipality

Ward	Total area	Total HHs	Male	Female	Total population	Population density
1	21.50	697	1801	1678	3479	161.81
2	22.60	757	1980	1820	3800	168.14
3	34.04	804	2186	1939	4125	121.18
4	55.21	421	1053	860	1913	34.65
5	12.68	590	1432	1298	2730	215.3
6	25.79	500	1249	1253	2502	97.01
Total	172.41	3769	9701	8848	18549	107.96

Source: Mangsebung RM house hold survey 2075/76

Recent Rural Municipality house hold survey 2075/76 shows that the population has been slightly increased by 0.25% compare to national census 2068. Total population in the rural municipality were reported 18549 in 2068 national census, whereas 2075/76 house hold survey showed 18549 residents in the Mangsebung Rural Municipality. Out of 6 wards, population is increasing in ward 1, 2, 3 and 6, and decreasing in ward 4 and 5. The largest changes were reported in ward 5 where population was decreased by 16 % (from 3286 to 2730).

Table 5 : Comparison population between National census 2068 and Rural Municipality house hold survey 2075/2076

Ward	Merged VDCs	Census 2068		HHs survey 2075/76		Population Change (%)
		HHs	Population	HHs	Population	
1	Gajurmukhi (1-9)	611	3393	697	3479	2.53
2	Evang (1-5, 9)	727	3445	757	3800	10.3
3	Banjho (7,8) and Evang (6-8)	824	4113	804	4125	0.29
4	Banjho (2)	373	1954	421	1913	-21
5	Banjho (9)	613	3286	590	2730	-16.12
6	Banjho (1, 3-6)	501	2312	500	2502	8.22
Total		3729	18503	8848	18549	0.25

Source: Mangsebung RM house hold survey 2075/76

4.1.2 Age sex composition

Age sex composition is the composition of a population as determined by the number or proportion of males and females in each age category. Information on age-sex composition is essential for the description and analysis of many other types of demographic data. The age sex composition of Mangsebung Rural Municipality shows the maximum population falls on age group 20 to 24 years of age with 11.47 % of total population. Following it is the age group 15-19 years covering 11.01% of total population. However, gender wise largest population age group differs from the total population, such as largest male population falls between 20 and 24 with total 1149 while female population falls between 15 and 19 with total 994 population. The least populated age group was between 65 and 69 with total 509 populations i.e. 2.74 % of total population.

Table 6: Population distribution according to age and sex in Mangsebung rural municipality

Age Group	Total		Male		Female	
	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)
00-04	1085	5.85	544	50.14	541	49.86
9-May	1349	7.27	694	51.45	655	48.55
14-Oct	1691	9.12	857	50.68	834	49.32
15-19	2043	11.01	1049	51.35	994	48.65
20-24	2127	11.47	1149	54.02	978	45.98
25-29	1733	9.34	979	56.49	754	43.51
30-34	1497	8.07	811	54.18	686	45.82
35-39	1270	6.85	704	55.43	566	44.57
40-44	1045	5.63	524	50.14	521	49.86
45-49	960	5.18	462	48.13	498	51.88

Age Group	Total		Male		Female	
	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)
50-54	983	5.30	490	49.85	493	50.15
55-59	735	3.96	389	52.93	346	47.07
60-64	679	3.66	362	53.31	317	46.69
65-69	509	2.74	260	51.08	249	48.92
70+	843	4.54	427	50.65	416	49.35
Total	**18549**	**100**	**9701**	**100**	**8848**	**100**

Source: Mangsebung RM house hold survey 2075/76

4.1.3 Population by cast/ethnicity

The basic population of this municipality comprises of different castes and ethnic groups. According to house hold survey 2075/76 conducted by the Mangebung Rural Municipality, the Rural Municipality is mostly inhabited by indigenous Limbu 7878 (42%) and Rai 7059 (38.06%) communities. Other major ethnic communities residing in Mangsebung are Brahmin, Chhetri, Kami, Tamang, Newar, Magar, Damai, Gurung, Kunwar, Sunuwar, Bhujel, Sharki and Sherpa. This shows that the municipality comprises of multilinguistic, multi religion and diverse ethnic groups.

Table 7: Population distribution by caste/ethnicity in Mangsebung rural municipality

Ethnicity	Female	Male	Total	%
Limbu	3683	4195	7878	42.47
Rai	3415	3644	7059	38.06
Kshetri	764	800	1564	8.43
Kaami	248	250	498	2.68
Newar	181	190	371	2.00
Magar	149	178	327	1.76
Bhraman	117	114	231	1.25
Sunuwar	83	87	170	0.92
Bhujel	68	81	149	0.80
Demai	65	74	139	0.75
Tamang	56	72	128	0.69
Saarki	11	10	21	0.11
Gurung	1	3	4	0.02
Kunwar	3	2	5	0.03
Sherpa	4	1	5	0.03
Total	8848	9701	18549	100

Source: Mangsebung RM house hold survey 2075/76

4.1.4 Population distribution by mother tongue

Majority of the people in Mangsebung can speak Nepali language, but most of them have their own mother tongue. The largest number of people in Mangsebung speaks Limbu fallowed by Rai as their mother tongue.

4.1.5 Population by religion

Majority of the people in Mangsebung are Kirat which represents 72.26 % (13404) of total population. According to house hold survey carried out in 2075/76, 3194 residents are Hindu that contributes 17.22% of total population. Similarly, 4.95% (918) are Christian, 3.15% (585) are Sworgik Marg (स्वर्गिक मार्ग(, 2.27% (421) are Buddhist and 0.09% (17) of the population fallow prakriti religion. Out of total population, only 0.05% (10) have unknown religion. Detail information of religion in Mangsebung is given in table below. Kirat is dominating religion as shown by the data.

Table 8: Population distribution by religion in Mangsebung rural municipality

S.N.	Religion	Population	Percentage
1	Kirat	13404	72.26
3	Hindu	3194	17.22
2	Christian	918	4.95
4	Sworgik Marg (स्वर्गिक मार्ग)	585	3.15
5	Buddhist	421	2.27
6	Prakriti	17	0.09
7	No religion	10	0.05
Total		21582	100.00

Source: Mangsebung RM house hold survey 2075/76

4.1.6 Literacy rate

An educated society is crucial for economic growth. Education provides people with knowledge, skill, technique, information, and enables people to know their rights and duties toward their family, society as well as the nation. Trade & commerce of the country will also be flourished easily if its citizens are well-educated. According to house hold survey 2075/76, 84% (15,724) of the total population above 5 years are literate. Total male literacy rate is 88 % and total female literacy rate is 81.14%. This indicates the higher percentage of literacy rate in the rural municipality then the national average. That means literary rate in the municipality is satisfactory compare to other local levels.

Table 9: Population distribution by literacy rate in Mangsebung rural municipality

Gender	5 years & above	Literacy rate (%)
Both Sex	15724	84.77
Male	8545	88
Female	7179	81.14

Source: Mangsebung RM house hold survey 2075/76

4.2 Economic setting

4.2.1 Agriculture

Agriculture makes up the most important economic sector in this municipality. A variety of food crops are grown in this municipality. The major cereal crops are paddy, maize, mustard, millet and wheat. Besides these crops, fruits, vegetables, cash crops, pulses and oilseeds are also grown in Mangsebung. Tea, coffee, Alaichi, Ginger and Amrisho farming are the major cash crop of this rural municipality. Each year thousands of tons of such products exported from Mangesubung rural municipality. These cash crops are the major economic sources of the local people.

4.2.2 Employment and occupation

According to rural municipality house hold survey 2075/76, majority of the population (7035) are involved in agricultural and livestock sector. Likewise, 491, 988, 171, 125 are engaged in trade and business, foreign employment, private sector and government services, respectively. On the other hand, there are many unemployment populations (1382) in the Mangsebung rural municipally.

Table 10: Engagement in different economic sectors in Mangsebung rural municipality

Economic Sector	Establishments (%)
Agriculture, Forestry and Fishing	7035
Trade and business	491
Daily Wage	586
Private sector	171
Foreign employment	899
Government	125
Self employment	125
Students	2110
Family support	1513
Unemployment	1382
Total	14440

Source: Mangsebung RM house hold survey 2075/76

4.2.3 Trade and industry

The trade in Mangsebung Municipality is primarily based on agriculture. The agricultural products including cash crops and forest products are the main source for the development of small-scale cottage industries. There are small scale industries such as rice mill and furniture, however, no large-scale industries in the municipality were observed.

4.2.4 Source of income

Agriculture and small business sector are the major source of income in Mangsebung rural municipality. Likewise animal farming, vegetable farming, commercial hotel business, market centers, technical business skills, wage labor, government and private jobs, foreign employment also contribute for income source.

4.2.5 Potential income opportunities

Commercial farming may be the best option to generate income opportunities in future through appropriate seasonal and off-seasonal crops production using modern technology in the municipality. The land can be used for commercial fruits/vegetable farming. Tea, coffee, alichi, bee and fish farming are other potential income opportunities. This municipality has historical, cultural and eco-tourism potentials due to presence of cultural and historical sites related to Kirat religion. Commercial cultivation of NTFPs in the Community forests and development of NTFP based microenterprises can open new avenues for income generation for members of CFUGs. Proper Management and trading of medical herds can be the potential income opportunities of the municipality.

4.3 Heritage/historical, culture and tourism

4.3.1 Historical/Heritage

Heritage is precious and irreplaceable resource, crucial to personal and collective identity and necessary for self-respect. Heritage site is an official location where pieces of political, military, cultural, or social history have been preserved due to their cultural heritage value. Mangsebung municipality consists of a number of temples, church, stupas, cultural and historical sites namely Gajurmukhi Dham, Naatalung, Larumba, Andha Raja Andha Rani Fort Religious and historical sites, Khatrakpa, Phulungi etc. Gajurmukhi Dham, Laarumba and Mangmaalung are among the most popular religious sites of the eastern Nepal. Therefore, Mangsebung Rural Municipality has great potential to become one of the top tourist destinations in the eastern Nepal.

Photo: National hero Falgunanda Statue at Mangsebung Ward no. 5

Photo: Gajurmukhi Dham

4.3.2 Culture

Culture is the characteristics and knowledge of a particular group of people, encompassing language, religion, cuisine, social habits, music and arts. In broader sense, it is the cultivated behavior; that is the totality of a person's learned, accumulated experience which is socially transmitted, or socially learned. Mangsebung Rural municipality is rich in cultural diversity as it comprises of different castes and ethnic groups living together. These different castes and ethnic groups have their own customs and traditions. They observe different festivals like Udhauli, Ubhauli, Lohasar, Sakale, Maghe Mela, Maha Guru Falgunanda Day, Gajurmukhi Mela etc.

4.3.3 Tourism

Mangsebung Municipality is full of natural beauty with spectacular view of mountains and river. Mangsebung is rich in cultural and religious heritages and archeological sites which can make it popular tourist destination. The most popular cultural and religious sites Gajurmukhi Dham, Larumba are located in the Mangsebung. The municipality is rich in different kind of species and biodiversity with abundant flora and fauna. Different people from different caste, religion, ethnic groups live here together in harmony which increases the culture aspect of this region. Some of the popular tourist destinations are Andha Raja Andha Rani Fort, Gajurmukhi Dham, Larumba Mangmalung, Aatmananda Guru Ashram, Phulungi, Chamere Cave, Chhange Jharana , Khatrakpa etc. There are other several culturally important sites especially for Kirat communities.

Photo: Andharaja Andharani tourist site

Photo: Spectacular view of Ratuwa Khola

4.4 Infrastructure and services

4.4.1 Road

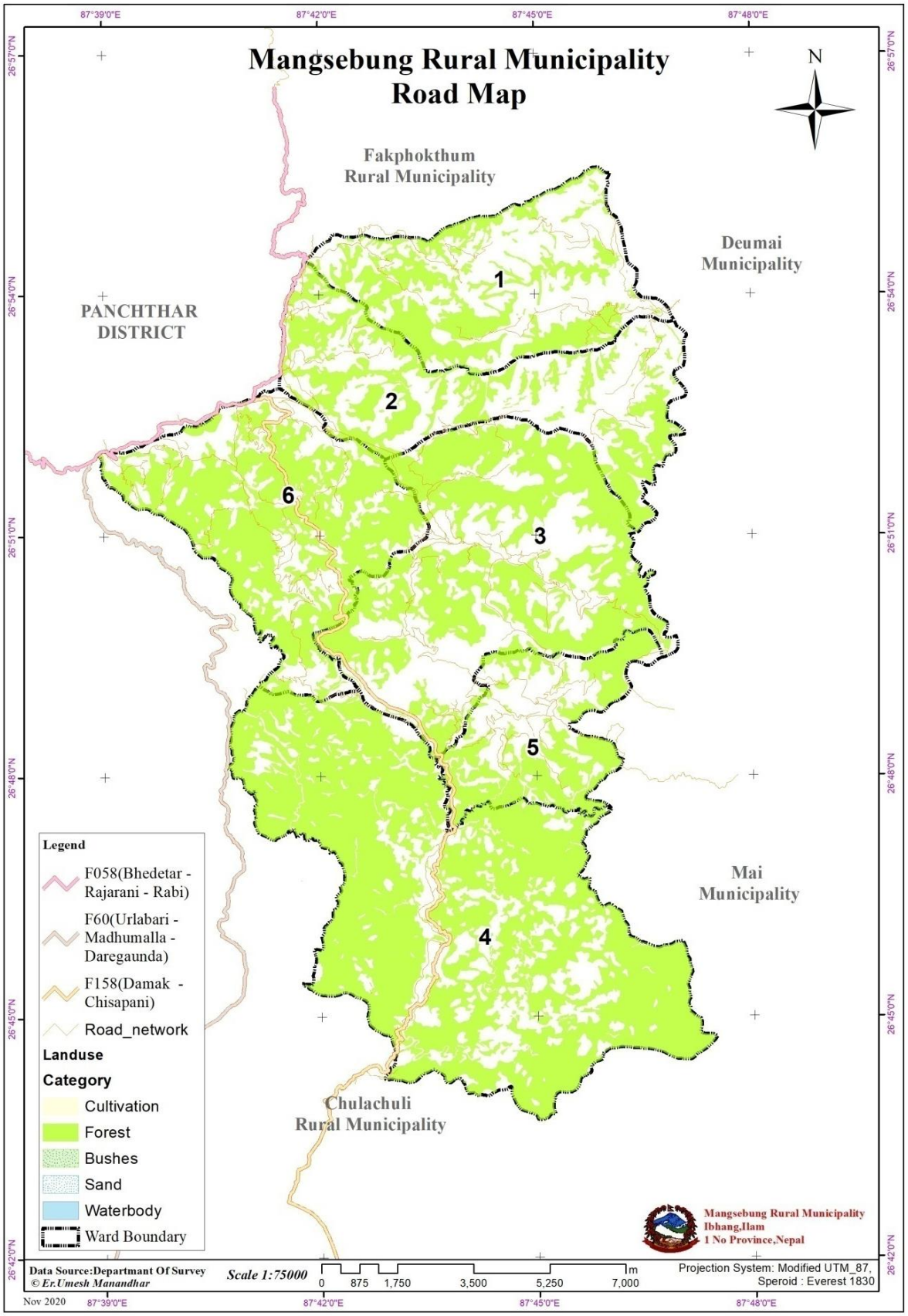


Figure 49: Road network of Mangsebung Rural Municipality

The development of transportation is most essential in order to develop other sectors like industry, trade, communication, electricity, health, education, market, technology, drinking water projects etc. Viable transport helps to enlarge the market and create more employment opportunities. It is only through the transportation we can make best use of available resources and means. Roads are considered as the backbone for the development. The development of transportation reflects the overall status of Municipality. There is good network of road in Mangsebung Rural Muncipality. Damak-Chisapani Sadak the main transportation route from Damak that pass through the center of the rural municipality connecting most of the wards. Bhedetar-Rajarani-Rabi and Urlabari-Madhumalla-Daregauda Sadak are other major roads of this Rural Municipality. Every ward of this municipality has been connected by the earthen road.

4.4.2 Health

Good health is important for human well-being and happiness. Healthy populations make an important contribution to economic progress, as they live longer and are more productive. The current health service facilities in the Mangsebung rural municipality seem unsatisfactory. There are only 4 health facilities including 3 health post and 1 community health unit (https://publichealthupdate.com/number-of-health-facilities-in-province-1-nepal/). No non-public health care facilities are available in the rural municipality.

4.4.3 Water supply

Drinking water is one of the basic needs of human being. In the context of Mangsebung rural municipality, tap/piped and public spout/tap/piped water are the main source of drinking water. Similarly, covered and uncovered well (kuwa), spout water and river and stream are subsequently important sources of water supply in the municipality. Out of the 3769 households, 2002 houses are equipped with piped tap water resources while 1143 households

are depend on public spout/tap/piped water. Similarly, 68 houses had covered well and 558 houses didn't have covered well. Other resources of water facilities were river/stream and spring/Jaruwa.

Table 11: Source of drinking water in Mangsebung rural municipality

Source of Drinking Water	Household No.	Percentage
Tap/Piped Water	2002	53.12
Public Spout/Tap/piped water	1143	30.32
Covered well/kuwa	68	1.80
Uncovered well/kuwa	165	4.38
River/Stream	204	5.41
Spring water/Jaruwa	196	5.20
Total	3769	100

Source: Mangsebung RM house hold survey 2075/76

4.4.4 Electricity

A total of 1369 (36.32%) households had reported of having national grid electricity as the source of their household's lighting. Micro hydro is also reported as one of the important sources of electricity for 1046 (27.75%) households. 1,001 households used solar energy while 345 households still using kerosene as source of light. Only 8 families reported of using bio-gas as a source of light. The encouraging fact is that above 90% of the households are using green energy source (renewable and alternative energy source) as the source of energy.

Table 12: Source of lighting in Mangsebung rural municipality

Fuel used for lighting	Households	Percentage (%)
National Grid Electricity	1369	36.32
Kerosene	345	9.15
Biogas	8	0.21
Solar	1001	26.56
Micro Hydro	1046	27.75
Total	3769	100

Source: Mangsebung RM house hold survey 2075/76

4.4.5 Educational institutions

According to Mangsebung RM house hold survey 2075/76, there were total 3727 students in Mangsebung Rural Municipality with 1897 (50.9%) males and 1830 (49.1%) females. There are total 36 schools (32 community school and 4 private schools.

5. Land use pattern and change

5.1 Land use change between 2010 and 2020

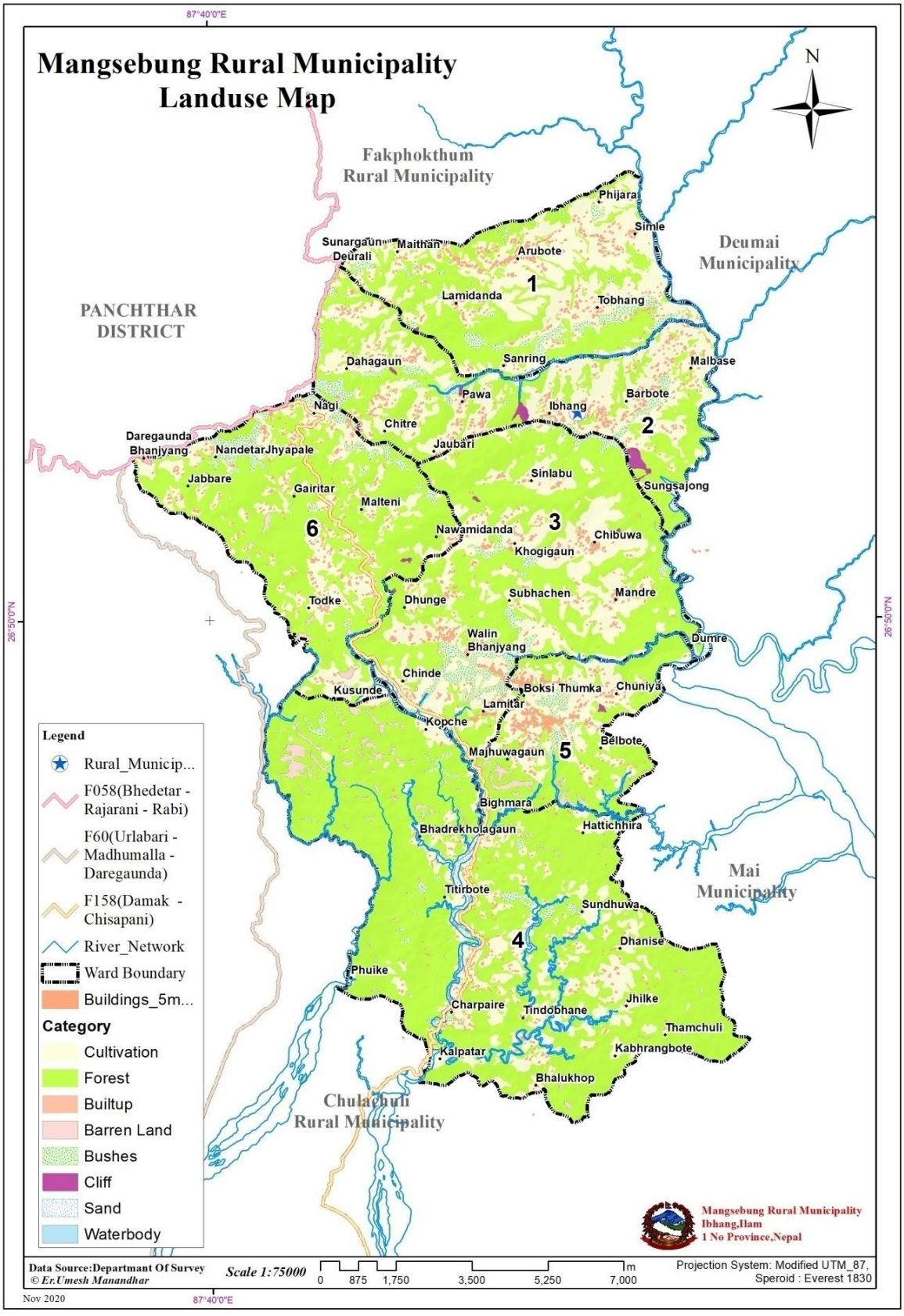
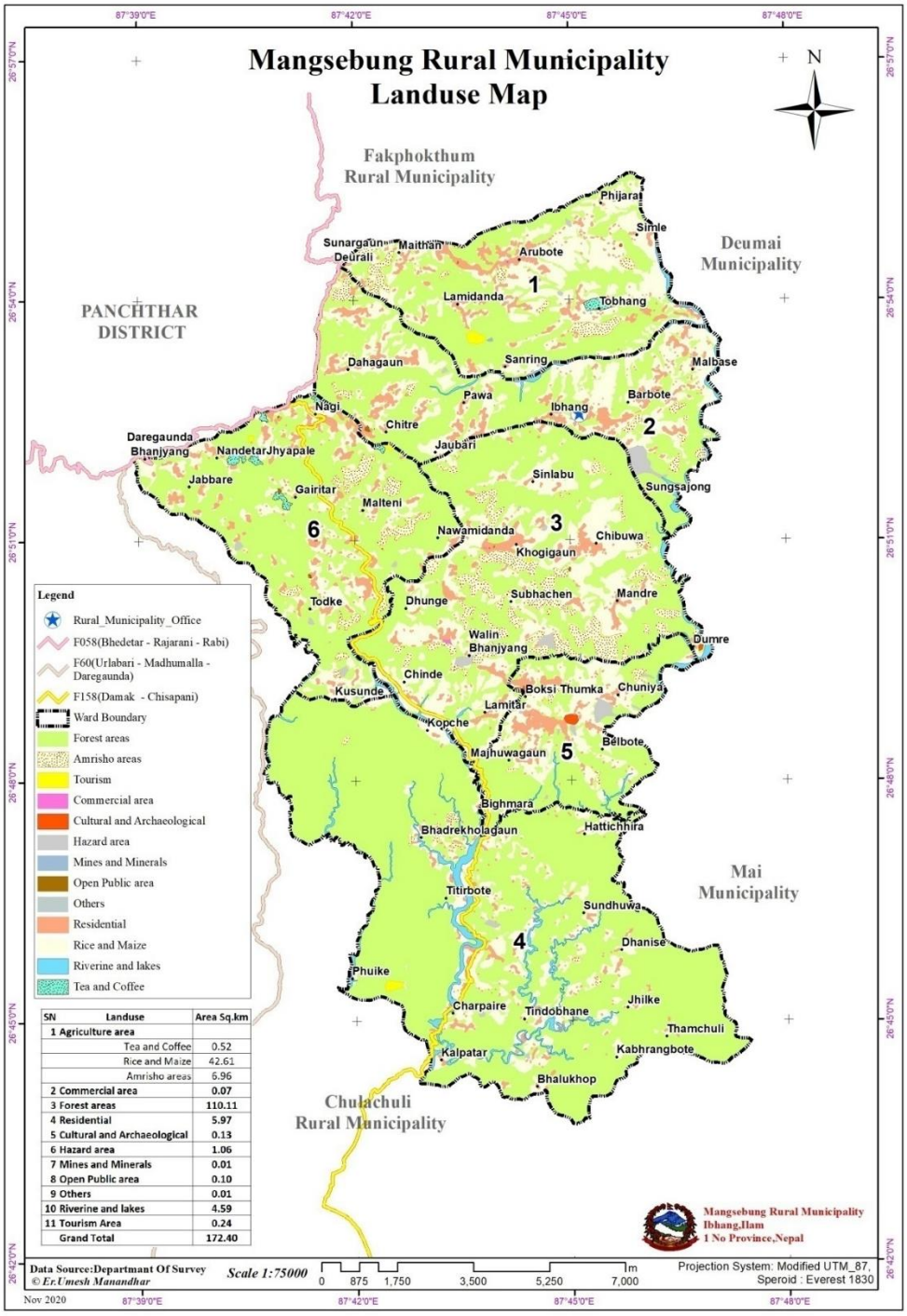


Figure 20: Land cover map of Mangsebung Rural Municipality (2020)

The land use change of Mangsebung Rural Municipality in between 2010 to 2019 shows that there is no dramatic change in all land use types. During 10 years, built-up area has been increased by 115 % (Table 13). On the other hand, the decrease of river bed/sand area and barren land was observed within 10 years. There is no remarkable change in main land cover types, i.e., cultivation and forest. In contrast to the other local levels of the country, land cover change in Mangsebung Rural Municipality is negligible. Such slow changes might be due to slow urbanization of the municipality. Ward wise summary of present land use is presented in Table 14.



SN	Landuse	Area Sq.km
1	Agriculture area	
	Tea and Coffee	0.52
	Rice and Maize	42.61
	Amrisho areas	6.96
2	Commercial area	0.07
3	Forest areas	110.11
4	Residential	5.97
5	Cultural and Archaeological	0.13
6	Hazard area	1.06
7	Mines and Minerals	0.01
8	Open Public area	0.10
9	Others	0.01
10	Riverine and lakes	4.59
11	Tourism Area	0.24
	Grand Total	172.40

Table 21: Detail land use map of Mangsebung Rural Municipality

Table 13: Changes in land use area between 2010 and 2020

Land use categories	Land use change (km^2)		Total change
	2010	2020	
Builtup	1.39	3	-115.8
Bush	8.10	8.13	-0.4
Cultivation	55.96	55.91	0.1
Forest	101.10	102.38	-1.3
Barren land	1.85	1	45.9
Sand	3.22	1.1	65.8
Water body	0.38	0.48	-26.3
Cliff	0.42	0.42	0.0
Grand Total	**172.42**	**172.42**	

Table 14: Ward-wise land present land use statistics

SN	Landuse	Ward No/Area Sq.km						
		1	2	3	4	5	6	Total
1	Agriculture area							
	Tea and Coffee	0.16					0.36	0.52
	Rice and Maize	8.13	8.13	10.38	6.48	3.91	5.59	42.61
	Amrisho areas	0.97	0.61	3.84	0.28	0.17	1.08	6.96
2	Commercial area	0.03	0.00	0.03		0.00	0.01	0.07
3	Forest areas	10.63	11.49	17.85	45.50	7.22	17.42	110.11
4	Residential	1.12	1.40	1.14	0.53	0.66	1.12	5.97
5	Cultural and Archaeological	0.01		0.02		0.09	0.01	0.13
6	Hazard area	0.04	0.33	0.25	0.08	0.25	0.11	1.06
7	Mines and Minerals	0.01						0.01
8	Open Public area	0.02	0.02	0.02		0.01	0.02	0.10
9	Others						0.01	0.01
10	Riverine and lakes	0.37	0.71	0.60	2.43	0.39	0.11	4.60
11	Tourism Area	0.10	0.00	0.01	0.09	0.00	0.04	0.24
	Grand Total	21.58	22.69	34.15	55.39	12.72	25.88	172.40

6. Land resource use

6.1 Agriculture

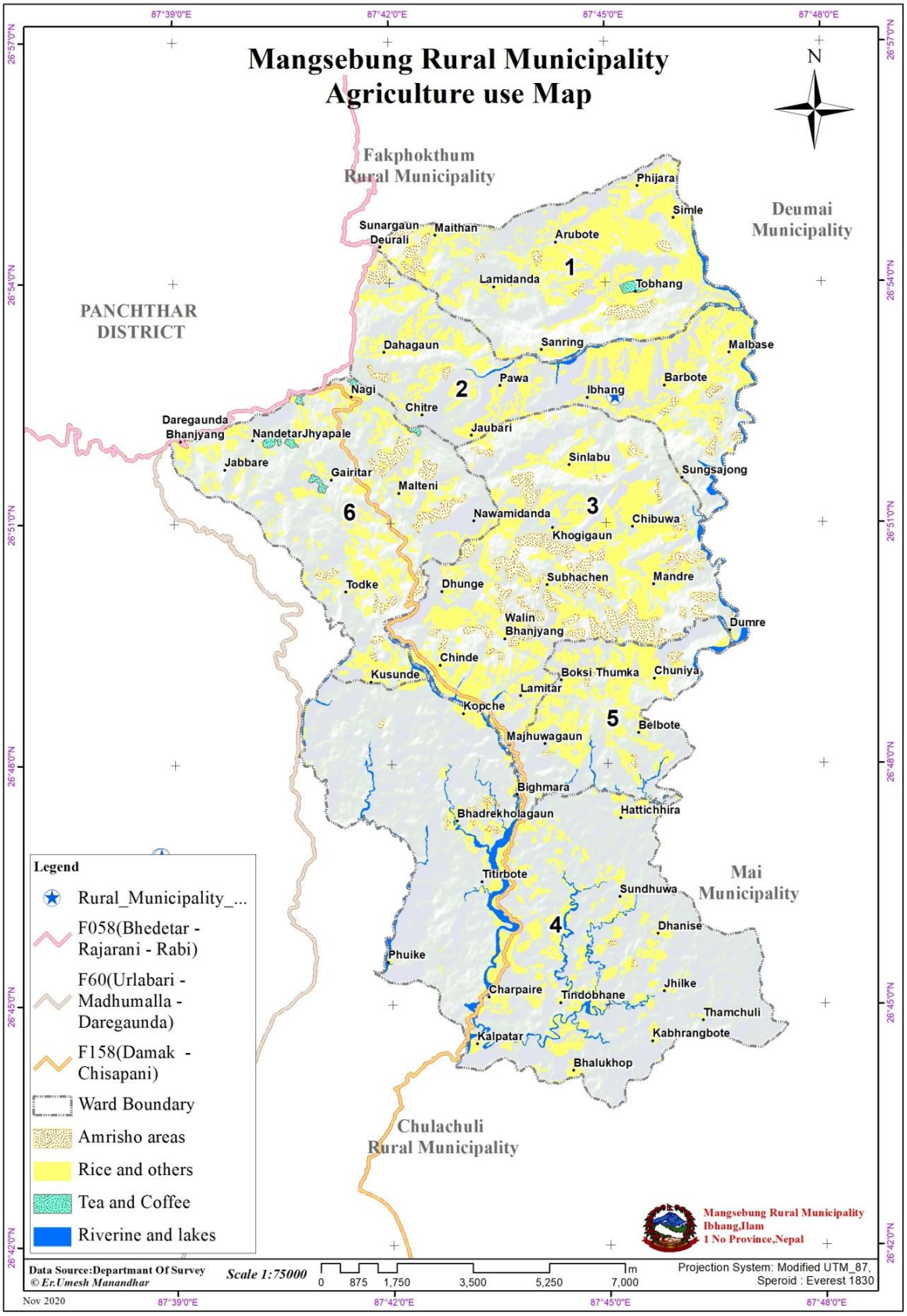


Figure 22: Crop Pattern of Mangsebung rural municipality

The agriculture/cropping pattern of the municipality varies according to agricultural land types, irrigation and precipitation. The agriculture practice of Mangsebung Rural Municipality in terms of crop pattern shows farming of tea, coffee, ginger, alaichi, amrisho, bamboo, beekeeping, rice, corn, fruit, vegetables, potatoes, lemon and millet. The cultivation practice in the municipality can be considered as hilly cultivation on the basis of the altitudinal variation. Analysis of cropping pattern shows that maize-rice is the dominant one followed by maize-millet as shown in the Figure 22. Amrisho farming is dominant in most of the wards (1, 2, 3 and 6) which is cultivated in large area of around 7 sq. km. Tea and coffee farming are practiced mainly in ward 1 and 6. Due to the whole area lies in hilly terrain; terrace farming is widely practiced throughout the municipality. Amrisho is dominant in northern area of the ward. Other crops like coffee and tea are also cultivated in this area

6.2 Commercial areas

In Mangsebung Rural Municipality, economic area are categorized as agro-farm, animal farm, bank and finance, bee keeping, dairy, grinding mill, industrial, market, poultry farm, saw mill and tea factory. The following map shows the major economic areas in Mangsebung Rural Municipality.

6.3 Forest

The municipality has temperate (2000-3000m), sub-tropical (1000-2000m) and tropical (<1000m) climatic vegetation. Temperate, Sub-tropical and tropical vegetation is dominant forest type in the rural municipality (Figure 23).

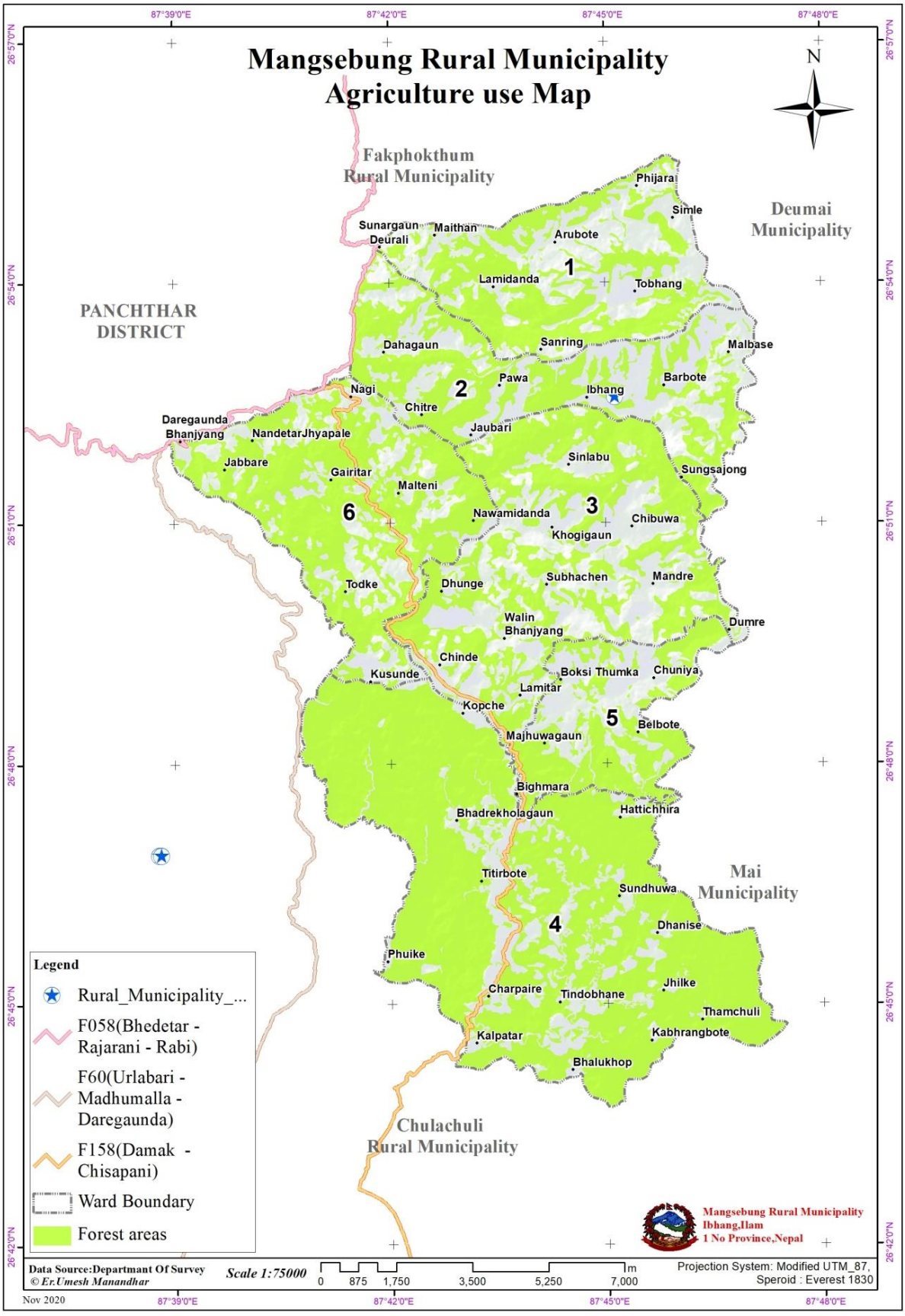


Figure 23: Forest area (climatic vegetation) map of Mangsebung Rural Municipality

6.4 Public areas

In Mangsebung Rural Municipality, public use areas like educational, government office, health service, institutional, recreation facility, security service and utility are found. Public land used by School, College, Hostel, Well, Parks, Airport, Road, Stadium, Picnic spot, and other public service activities are categorized in this class. Public service is further classified on the basis of their functional use into Educational, Government office, Security Services, Transportation Infrastructure, Health Service, Recreational facility, Institution and other.

6.5 Mines and minerals

In terms of mines and minerals found in the Mangsebung Rural Municipality, constructional materials and minerals are generally found. The minerals are found in ward number 1 and 5 of the municipality whereas the construction materials are excavated from ward 5. The following map shows mines and minerals area in MangsebungRural Municipality.

6.6 Cultural and archealogical

The cultural and archealogical areas in the muncipality is covered by church, fort, gumba and other religious sites. These are institutions or establishments related to religious, culture and history.

6.7 Riverine and Lake Area

Mangsebung Rural Municipality consists of different river networks across the wards. Ratuwa khola is the major rivers flowing through the center of the rural municipality. Besides, Mawa khola in the west and Kankai Mai Khola in the east are the main drainage System in the rural municipality. Similarly, Dol Pokhari (Evang), Mangmalung Pokhari (Mangmaalung) and Hiunkhola Pokhari (Banjho) are the main ponds reported in this rural municipality.

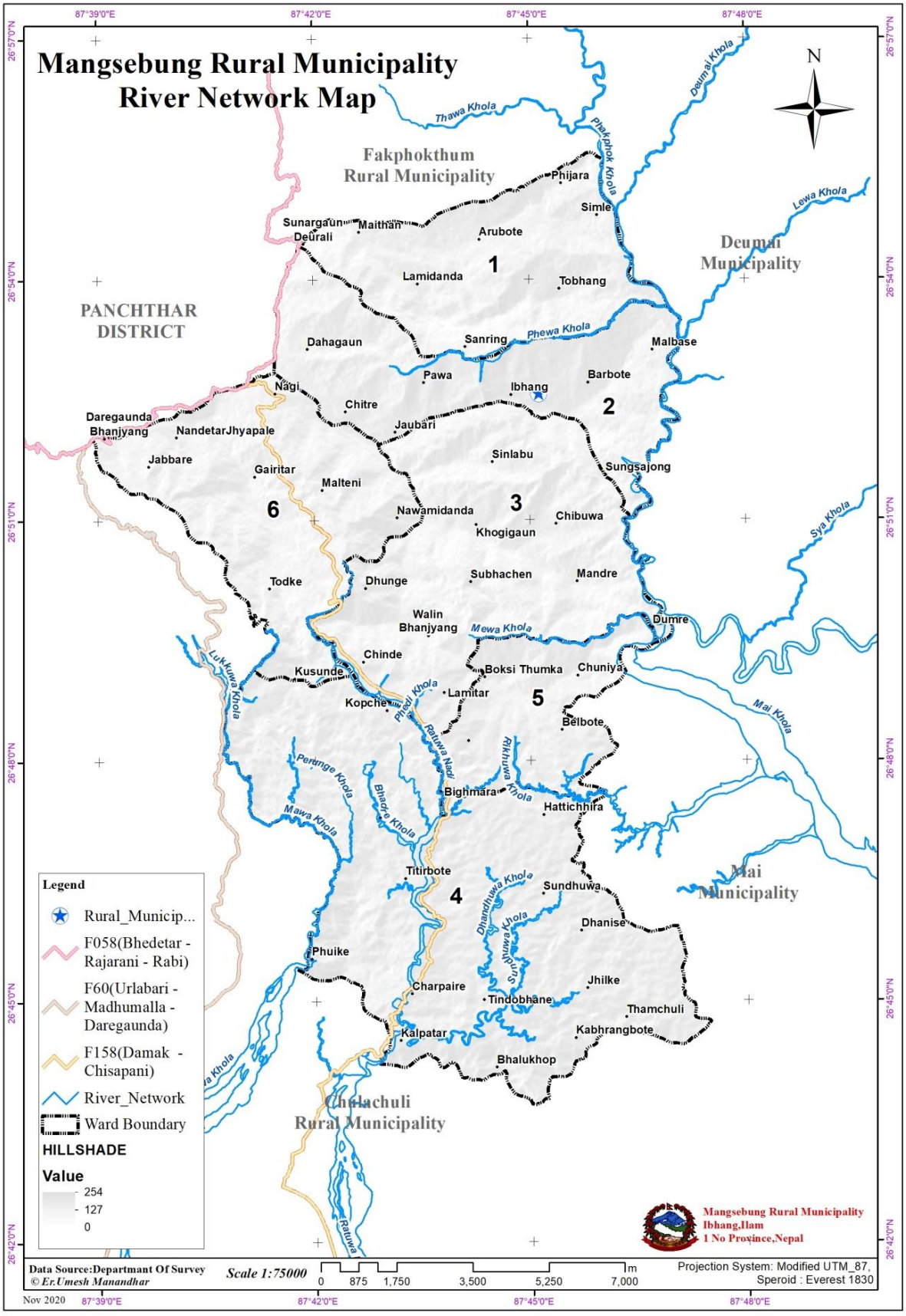


Figure 245: Water bodies map of Mangsebung Rural Municipality

7. Land system, soil and land capability

7.1 Land system and soil

Land systems constitute the terrestrial component of the Earth system and encompass all natural geo-physical and ecological processes together with human activities related to land use. Land system mapping considers geomorphology (evolution of landform and their temporal changes), hydrological and fluvial process, ecology (ecological function and their stage), economics (development potentiality) and social (human dimension of using it). Precise data of Land system is crucial for land use planning and environmental management. Land system mapping assemblages several ecological entities and local geomorphological variations which are closely associated with soil properties including depth, physical and chemical properties, profile development, moisture relationships and erodibility (Wright, 1993).

Hence, for identification and mapping of land system, inclusion of landform and land units is essential for soil survey and mapping, and for deriving a land capability map. For preparation of land system map of Mangsebung Rural Municipality, the generic and pragmatic approach that was adopted by LRMP with modification was followed for this study. LRMP methodology for preparation of land system map has been characterized as follows:

In the study, 11 land systems were characterized as landform types, which were identified based on the following factors (Table15)

- Pattern and process of landforms,
- Geologic materials,
- Terrain slope
- Limits of arable agricultural land

The information in the soil is derived from the land system map prepared by LRMP (1986).

Table 15: Land system and unit type

SN	Class	Land system	Land unit	Area (ha)	Percentage (%)
1	4a	Active and recent Alluvial plains	sand & gravel bars	209.6	1.2
2	4b	Active and recent Alluvial plains	low terrace	23.56	0.1
3	4c	Active and recent Alluvial plains	higher terrace undulating	170.8	1.0
4	5a	Fans, aprons and ancient river terraces	very gentle slope	109.43	0.6
5	7	Moderately to steeply sloping hilly and mountainous terrain		2149.35	12.5

SN	Class	Land system	Land unit	Area (ha)	Percentage (%)
6	8	Steeply to very steeply sloping hilly and mountainous terrain		5095	29.6
7	9a	Alluvial plains and fans(depositional)	river channel	16.34	0.1
8	9b	Alluvial plains and fans(depositional)	alluvial plains	1.64	0.0
9	10b	Ancient lake and river Terrace called Tars (Erosion)	dissected	564.87	3.3
10	11	Moderately to steeply sloping mountainous terrain		4830.38	28.0
11	12	Steeply to very steeply sloping mountainous terrain		4069.03	23.6
		Total		17240	100.0

Active and recent alluvial plains 4a, 4b and 4c in Chure range and 9a and 9b land unit are in mid land rural municipality. Fans, aprons and ancient river terraces covers 5a and 10b covers about 4 % of total area which is most suitable land for cultivation and other commercial activities. Land system 11 and 12 covers about 28 % and 27 % respectively. Steeply to very steeply sloping mountainous terrain land unit 8 and 12 are not suitable sustainable agriculture of the rural municipality (Figure 25)

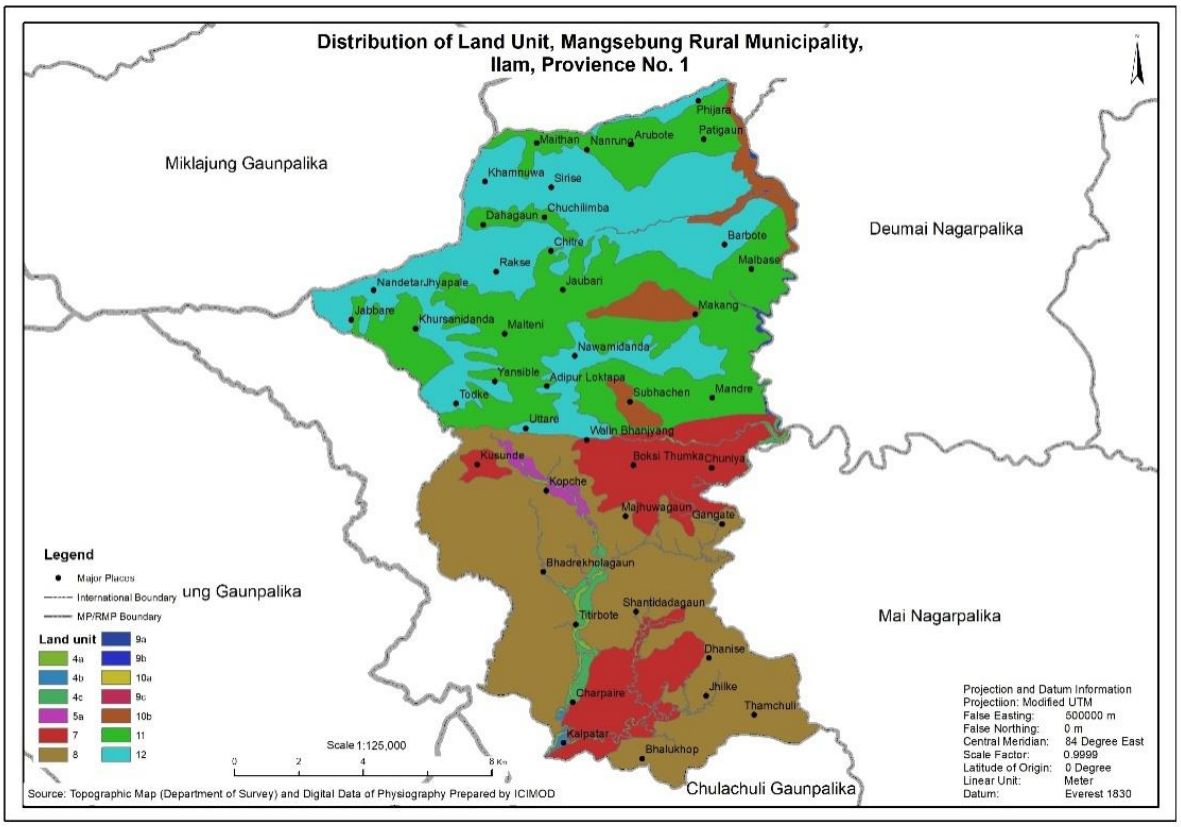


Figure 25. Land unit distribution of Study Gaunpalika

2.2.10 Soil

Inceptisols cover the smallest area in Gaunpalika and are the most important soils. They occur on more stable slopes and show distinct weathering in the subsoil. Soil groups belonging to this order are as follows:

Table 16: Soil groups belonging to this order

Order	Suborder	Great Group	Area (ha)	Percentage
Entisols	Fluvents	Ustifluvents	2220.4	12.9
	Orthents	Ustorthents	7979.78	46.3
Inceptisols	Umbrepts	Haplumbrepts	1058.79	6.1
	Ochrepts	Ustochrepts	5304.51	30.8
		Udochrepts	450.58	2.6
Water body			225.94	1.3
Total			17240	100.0

Source: TSLUMD 2018

In general, only Entisols and Inceptisols were found in this Rural Municipality. Order Entisols was found along with one two-order, two great soil groups and three sub-groups from the soil survey investigation. Entisols is the most extensively available soil found in this Rural Municipality. These types of soils are found in the entire country and covers extensive areas of land.Entisols are recently formed (young) soils. Soil Order Inceptisols are comparatively older and used for cultivation quite for some time. Inceptisols was found in about 39.81% area. It was found along with two sub orders, three great groups and four sub groups.

Fluvents and orethents are two soil sub order and ustifluvents and ustorthents are great soil group of entisols. Ochrepts and umbrepts are the major sub orders found within Inceptisols. Among the great groups of Inceptisol, great soil group of ustochrepts, udochrepts.

7.2 Lands capability

The land capability classes represent the soil properties (soil depth and nutrient) terrain and drainage and erosion characters of the land. There are five land capability class are found which are presented in below table. Land capability class I and II are very suitable for agriculture production. This land class accounts for 5.58 % of the total land. They have no limitation or very low limitation (drainage and soil depth) for crop production. This rural municipality land capability class III and 1V covers about 31 % and 63 % land, which indicates slope and soil depth deficiency. This land capability class III is suitable for cereal crop production such as maize and wheat. Besides this, fruits production and tree plantation is also suitable for agriculture practice. Farmers should be careful about soil erosion. Terrace farming helps to mitigate soil nutrient loss. Class IV land is not suitable for agriculture and settlement due to steep or unstable terrain, thin soil depth, or adverse climatic and terrain condition.

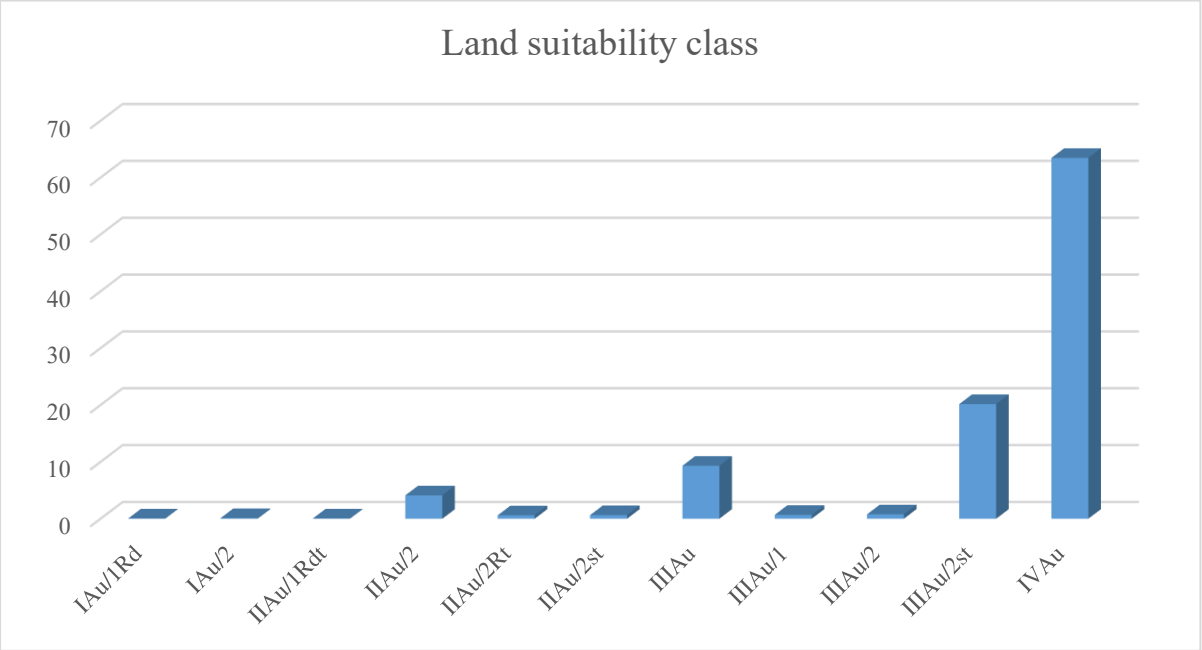


Figure 24: Land capability class

Table 17: Land capability class of Mangsebung Rural Municipality

SN	Land Capability Class	Sum Area	%
1	IAu/1Rd	11.34	0.05
2	IAu/2	28.48	0.12
3	IIAu/1Rdt	12.31	0.05
4	IIAu/2	1010.02	4.12
5	IIAu/2Rt	148.81	0.61
6	IIAu/2st	156.52	0.64
7	IIIAu	2284.88	9.32
8	IIIAu/1	168.57	0.69
9	IIIAu/2	191.76	0.78
10	IIIAu/2st	4944.42	20.17
11	IVAu	15556.66	63.46
Total		24513.76	100.00

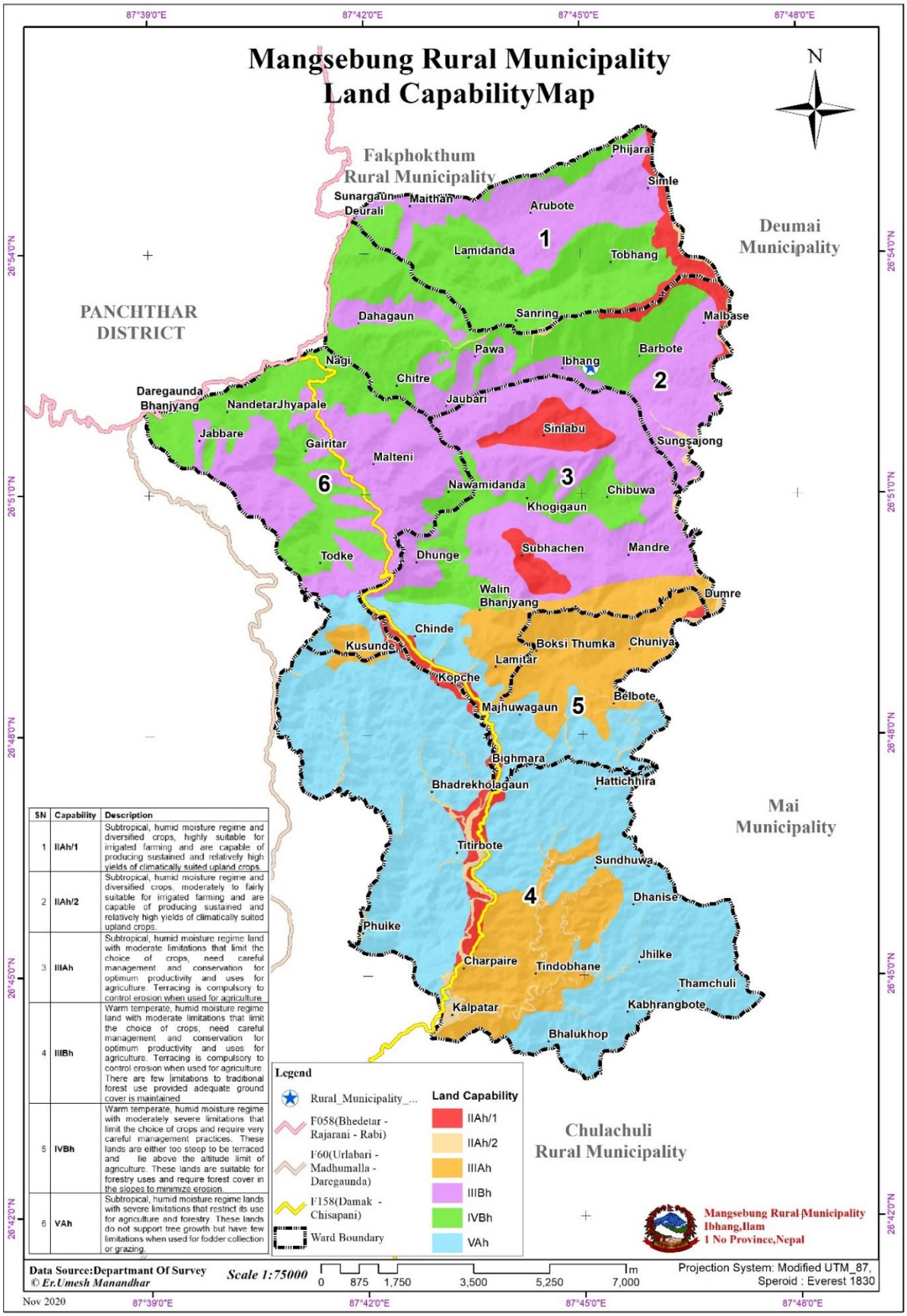


Figure 25: Land capability class map of Mangsebung Rural Municipality.

8. Land use zonation

8.1 Concept and principles

8.1.1 Background

Land use zoning is based on the evaluation of the suitability of sustainable use for a specific purpose. It is the suitability classification and allocation of land for optimum use of land for various uses for sustainable development. The suitability classes are rated from the most suitable to the least. Each suitability class is, therefore, designated a zone with suitability ratings. Based on the suitability of land for various land use classes, land use zones are classified following the ToR into eleven broad categories. The zoning is done for agriculture, forestry, pasture, industry, settlements, wildlife conservation, tourism and recreational, wetland and parks/natural reserves.

The land is a scarce natural resource, which is a backbone of the socio-economic development of the Mangsebung Municipality. Due to steep slopes, and rugged terrain, poor soil condition, and several areas prone to landslide, erosion and flashflood, a large part of the land resources of the municipality has a marginal economic value and impose challenges to development.

For the sustainable development of the rural municipality, this land resources need to be wisely managed through land use zonation and planning, and thus resolve the issues of land resource degradation, shortage of land resources and conflicting issues land use type.

The municipality has undergone population growth and flow of immigrants, and land use change particularly in Bhawar and gentler slopes in the recent decades. It experiences lack of adequate physical infrastructure, scattered small-sized land parcels and haphazard subsistence farming practices resulting in low productivity and food deficit. The flow of immigrants from the hill to the Bhawar region, and urbanization has created unplanned settlements and loss of productive land for agricultural production, and deteriorating resource base. The landlessness, poverty, and prevailing unemployment of economically active age groups have led to encroachment of forest, public land and hazardous areas for squatter farming and settlement.

In addition, fertile agricultural land is being brought under haphazard settlements and plotting. Due to outmigration and absentee population, agricultural land has been left unused and abandoned due to labor shortage. Crop production is not according to the suitability and capability of the land. In many places, human activities with mountainous land is causing various disasters such as landslides and flooding. For these reasons, the municipality may face the problem of food security, unplanned settlements, misuse and sustainable use of land resources, loss of biodiversity and forest, natural disasters, environmental degradation, and other sustainable development challenges in the future.

Realizing the above issues of land use and land management, the Government of Nepal has formulated Land use policy 2015 and has passed the Land use Act 2019. These Policy and Act

have stressed to address the issue of unplanned, illegal, haphazard settlement, food security, disaster risk management, and other land mismanagement issues through well envisioned land use zonation and planning. And has empowered the local government of prepare a land use plan following the guide of land use policy and in close coordination with Ministry of Land Management, Cooperatives and Poverty Alleviation, Nepal.

8.1.2 Land use zoning: Task and Principle

Considering the importance of land use zoning, the following task for land use zonation will be undertaken as per technical guide lines provided by the National Land Use Project, Ministry of Land Reform and Management

- Classification of land into agricultural area, residential area, commercial area, industrial area, public service area and other uses.
- Identifying areas of potential residential, commercial, industrial and public utility keeping balanced environment.
- Classifying agricultural land into comparatively advantageous sub-areas on the basis quality of land, land capability, irrigation facilities to increase productivity.
- Proper conservation of natural resources including forest, shrub, rivers, rivulets and swampy land etc.

The underlying principles of land use zonation as envisioned by the land use policy 2015 are:

- Promote complementary land use, which will help to maintain balance between environment and protect fertile agricultural land to achieve status of food security
- Maintain competitive land use, which will contribute to optimal use of land as per capability and suitability and advantage provided by the location.
- Avoid conflicting land use to promote specialized zone of human activity, which will accrue the maximum benefit from land as well as avoid hazard risk area.
- Controlling and discouraging unauthorized land use
- Controlling the fragmentation of land and haphazard urbanization
- Promote use of specific land parcels, according to land use zonation.
- Address the trends of growth or change and current and future requirement of the country.

Guided by the principles of land use zoning, the flowing broad criteria for land use zonation have been outlined in the Land Use Policy 2015.

- *Capability/suitability based:* Zonation of land use will be done as per opportunities and limitations offered by land capability and suitability based on soil, geology and geomorphology and hazard.
- *Present land use based:* The current land use, if found in accordance to land capability and suitability and is free from disaster risk, will be considered appropriate land use zones.
- *Need based:* The state, for the public welfare, development of infrastructures, and other uses, can alter specified land use zone to other land use zones as per state's requirement.

8.2 Method and Criteria

The land use zoning was evaluated on the basis of some key parameters, which includes land system, soil characteristics, geomorphic features, and land capability through multi-criteria analysis approach. During the analysis, socio-environmental aspects of the study area was also be considered. The product of multi-criteria analysis was overlaid with composite hazard map of the study area to get the final land use zones. Figure 26 shows a general approach and methodological framework for the land use zoning.

A rule based Multi Criteria Evaluation (MCE) methodology was applied for zonation into following broad land use zones: Agricultural area, Residential area, Commercial area, Industrial area, Forest area, Public service area and other categories. Probable subdivisions for each type was done based on the situation analysis and the feedbacks received from the municipality authorities and stakeholders.

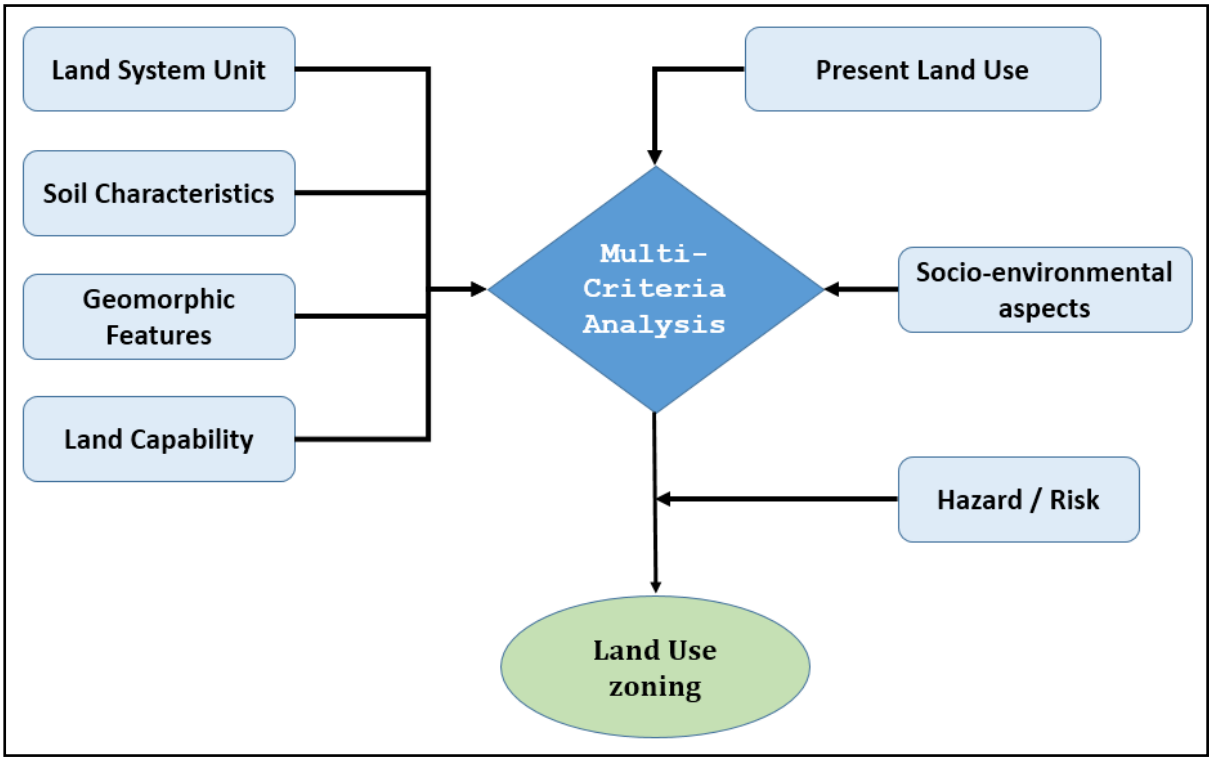


Figure 66: Land Use zoning framework

The input for the multi-criteria analis is several GIS maplayers(so-called criteria) that represent land system unit, soil characteristics, geomorphic features and land capability, hazard zones as physical parameters, and land use, infrastructures and socio-economic and demographic as cultural parameters. These criteria are broadly categorized into two types: The factors and constraints. The factor includes: Land system, land capability/suitability, soil, existing land use distance from the road and settlements. The constraints include, hazard, existing forest and protected areas, existing residential, commercial areas, cultural and archaeological sites.

8.3 Land Use Zones and their Descriptions

According to the Land Use act 2076 BS, there must be following land use zones:

1. Agricultural area,
2. Residential area,
3. Commercial area,
4. Industrial area,
5. Forest area,
6. Public Use,
7. Mines and Minerals,
8. Cultural and Archeological,
9. Riverine and Lake area,
10. Other

But on the basis of requirements, there can be other zones as well.

This study has followed the instruction of the Land Use Act 2076 and categorized the study area on the following zones and sub-zones as shown in Table 18.

Table 18: Land use zoning scheme of the study area

Zone No	Zone Type	Subtype	Description
Zone 1	Agricultural Zone	Zone 1A	Cereal crop production area
		Zone 1B	Cash crop area
		Zone 1C	Horticultural area
		Zone 1D	Animal husbandry area
		Zone 1E	Fish farming area
		Zone 1F	Agroforestry area
		Zone 1G	Other Agriculture Area
Zone 2	Residential Zone	Zone 2A	Existing residential zone
		Zone 2B	Potential area for residential zone
Zone 3	Commercial Zone	Zone 3A	Governmental institutions Service areas
		Zone 3B	Business area
Zone 4	Industrial Zone	Zone 4A	Areas under industrial use
		Zone 4B	Potential areas for industrial use
Zone 5	Forest Zone	Zone 5A	Existing forest
		Zone 5B	Potential area for forest including barren lands, wet lands etc.
Zone 6	Public Use Zone	Zone 6A	Areas under roads, railways, bus parks, airport and landfill site etc.
		Zone 6C	Open spaces, picnic spots, playing grounds and stadiums etc.

Zone No	Zone Type	Subtype	Description
		Zone 6E	Public health/education/library, police station, fire station, telephone /electricity areas etc.
		Zone 6F	Grazing land
		Zone 6G	Government Institutional area
		Zone 6H	Open Space/area
Zone 7	Other Zone	Zone 7	Other Area (As per requirement)
Zone 8	Mine and Minerals Zone	Zone 8A	Existing Mine and Minerals Area
		Zone 8B	Potential Mine and Minerals Area
Zone 9	Cultural and Archeological Zone	Zone 9A	Existing Cultural and Archeological Areal
		Zone 9B	Potential Cultural and Archeological Areas
Zone 10	Riverine and Lake Zone	Zone 10A	Existing Riverine and Lack Area
		Zone 10 B	Potential Existing Riverine and Lack Area

The following main objectives of the land use program should be followed as guidelines as far as practical.

- Minimize the ratio amongst the different land use sectors for maintaining the balanced land use from the point of view of population, environment and sustainable development; and classify the land for agriculture, forest, settlement, industrial and commercial areas, water bodies, public use, cultural and archaeological and other.
- Identify and classify the sectors based on geographical characteristics, land capability and soil quality which are comparatively more beneficial for arable land for agricultural crop production and the areas for income generation such as fruits, cash crops and herbs production areas.
- Identify and zoning the land for housing, urbanizing, industrialization and other non-agricultural purposes in the existing municipalities and urban-oriented rural areas as well as to balance the environment and sustain the system by preserving and developing water, forest and living treasure.
- Identify the main settlements which are in the transition zone and develop such areas in a planned and environmentally justifiable way.

Table 19: Present Land use versus Land capability

Land use / Capability class	I	III	IV	V	VI	VII	VIII
Cultivation	Irrigable and suitable for cultivation. Crop suitability information based on soil, temperature, moisture, and drainage information required	Cultivation with terracing and other soil conservation measures	Flood mitigation or forestry flood adapted cultivation	River way	Restoration of riverine vegetation	Agro forestry	Forestry
Forest or shrub	No change in existing forest						
Residential	No change New residential area can be developed avoiding prime agriculture and following other socio-economic, accessibility, proximity, urbanization trend criteria	No change Residential area to be developed avoiding instable slopes, following other socio-economic, accessibility, proximity, urbanization trend criteria	Relocation to safe area or flood mitigation			Risk assessment, relocation that are at risk	Relocation to safe area and Forest restoration and conservation
Commercial and Industrial	New area can be developed avoiding prime agriculture and following other socio-economic, accessibility, proximity, urbanization trend criteria, industries should be located at	Commercial and industrial can be developed on stable slopes and criteria	Not recommended for new areas Strong flood mitigation measures and industrial waste disposal measures for existing industries or relocation			Not recommended Risk assessment and relocation	

Land use / Capability class	I	III	IV	V	VI	VII	VIII
	sites that cause least damage to environment and pollution to human settlements	mentioned above.					
Public Use	Preserved and protected, parks and aesthetic landscape can be developed on stable areas						
Cultural and archaeological features	Preserved and protected						
River and Lake	Wet land needs to be protected from encroachment damage and pollution		River and riverine ecology should be protected, river resources should be extracted based on feasibility without disrupting hydro-ecological balance				
Others	Recommendation only after the land use specified						

8.4 Criteria for land use zoning

A multi-criteria analysis considering the factors of constraint and opportunities were considered for land use zoning. Land use zoning was done by using a two-step approach.

At the first step, the land use zoning was done by considering the inherent capabilities of the land evaluated based on the biophysical characteristics such as topography, soil, climate, natural hazard, and drainage condition. These biophysical features were derived from the land system unit map. Eight land capability classes relevant to agriculture, livestock, and forestry land use with recommendations for terracing, wherever required, soil conservation, and hazard mitigation measure soil were prepared. The existing areas which are very steep, and hazard-prone and other biophysical factors imposing serious limitations or constraint to agriculture or settlement are avoided. In such marginal areas forestry zone has been proposed.

At the second step, the suitable residential, commercial, industrial, cultural and archaeological areas, were identified based on the disaster risk evaluation, road network, and connectivity, and present status and market centers and commercial area indicating potential growth in the future. The envisaged agricultural pocket areas by local government were also considered for land use zoning.

A detailed description of criteria, which include factors of constraints and opportunities, was adapted in classifying land for various land use zones as specified in Table 18.

1. Residential area

a) Keep the existing residential area intact if they are free of risks

b) Risk-free area (avoid all types of risks)

c) Land system: well-drained and locally elevated area

d) Near to existing settlements (periphery of existing settlement), should meet conditions b and c.

e) Near to existing roads within 50 m (Bhawar and Tarai) and 25 meters in Chure Hills from the center of roads including space required for right-of-way, which includesthe district, feeder, and collector road. The narrow green belt along the main road is recommended.

f) Residential and commercial areas along the proposed Madan Bhandari Highway will be developed as per guidelines provided by the Government.

g) Soil type: Avoid the area with high organic matter and prime agricultural importance based on soil survey.

2. Commercial area

a) Fulfill the criteria of the proposed residential area, but may extend beyond 50 m buffer from the road as necessitated by the development of commercial and business activities in future.

b) Keep the existing commercial area as intact

c) Near to existing settlement

d) Local administrative headquarter or potential market/urban center proposed by governmental organizations

e) Close to sites of archeological and cultural heritage or touristic places (wetland/wildlife habitat and others). How the environmental integrity of these sites should be maintained.

f) Far from the forest of high biodiversity

3. Industrial area

a) Keep the existing industrial area as intact, if suitable

b) Near to existing industrial areas, if suitable only (within 500 m from the periphery of the existing industrial area)

c) Near to existing major roads (within 250 m from the center of highway and district road), provided condition is met

d) Far from the forest of high biodiversity

e) Far from existing settlements (more than 500 m from the periphery of large settlements)

f) Flood risk-free area

g) Proposed industrial areas depend upon the type/scale/production/market of the industries. However, they should be built in a risk-free area with low productivity area

4. Forest area

a) Keep the existing forests as intact

b) Extension of existing forests, if possible

c) Riverine forests (adjacent to both banks of major rivers)

d) Land system = landform not suited to residence and agriculture

e) Along major roads on both side after the right of way

f) Public wasteland (unregistered land/abandoned flood plain)

g) High flood risk area

5. **Public utility and open zone**
    a) Keep the existing public sites intact
    b) Near to existing and potential residential areas, commercial areas, industrial areas, if appropriate
    c) Accessible to road networks (touched by roads)
    d) Soil fertility == low or very low, if possible
    e) Risk-free areas (avoid all types of risks)
6. **The cultural and archaeological zone**
    a) Keep the existing cultural, religious, and archaeological sites as intact
7. **Riverine and Lake zone**
    a) Keep the existing rivers and water bodies as defined and described by the National Land Use Act 2019 AD.
8. **Excavation zone**
    a) Keep existing areas of excavation, if environmentally suitable and defined by the National Land Use Act 2019 AD and other relevant Policies.
    b) Appropriate areas delineated by experts' study
9. **Agricultural area**
    a) Keep existing agricultural pocket areas such as vegetable farming, rice field, wheat field, fruit, etc.
    b) Soil fertility == high or moderate
    c) Remaining land use from other land categories
    d) Well-drained productive land
    e) Avoid severe flood-prone areas
    f) Areas with the high potentiality for irrigation
10. **Others**
    a) Fishery:
        - Keep existing fish farming sites
        - Land system == areas with adequate water availability
        - Other local depression areas, where ponds can be developed
    b) Poultry Farming (currently no mappable)
        - Keep existing poultry farming sites as intact, if appropriate
        - Far from residential areas
        - Accessible to road networks
        - Risk-free areas

c) Livestock farming

- Keep existing poultry farming sites as intact, if appropriate
- Risk-free areas
- Preferably at the periphery of existing or proposed residential/commercial area

8.5 Proposed land use zonation vis-à-vis present land use

Following the criteria mentioned in section 8.4, land use zone has been proposed. Table 20 presents the proposed land use zonation statistics. Of the total area, the proposed forest area occupies 191.87 km2 (78.3%) % of the total area, which is equivalent to the present land use. According to Land Use Act 2019, no land under the existing forest area has been proposed for other use. The forest covers the rugged hilly terrain of the Chure hills and the Middle Mountains of the Mahabharat Range, which is highly prone to erosion and landslides. Hence the current forest should be conserved and the degraded state of the forest needs to be improved. Grazing should be controlled and stall feeding livestock keeping should be promoted. Grazing should be allowed on a few prescribed sites on a rotational basis.

Similarly, the proposed agricultural land accounts for 40.79 ha (16.6%). This implies a loss of up to 145 hectares of present agricultural land. Similarly, a substantial area along the hazard-free 50 m buffer of major roads (in Bhawar and Terai) and 25 m in hills has been proposed for the residential zone, which covers 4.46 km^2 as compared to the current residential area comprising 2.26 km^2. This is a substantial increment considering the current population growth rate of 1.75-2% (CBS 2014) and the rapid urbanization rate of 3.1% (MoUD 2015).

Anticipating future scenarios created by the above trends, about 0.24 km2 of land is allocated to the proposed commercial area. The locations of the proposed commercial areas are described in Table 16. The land allocated for the proposed commercial area is an increase of 0.17 km2 as compared to the current area under the same category, i.e., only 0.07 km2. Proposed cultural and archaeological area, industrial area, mines and mineral sites occupy 0.05, 0.05, and 0.2 respectively, i.e., which does not show an increase in area as against the current state (Table 20).

The rationale is that the available space for the above uses is adequate for the anticipated scenario in the coming 15 years. The available land has partly been used as yet. Only small to medium scale industries are envisaged, in remote and hilly areas. Mostly agro-livestock or forestry-based industries are planned.

However, as warranted by growing urbanization and by unforeseen developments in the future may necessitate increased land demand for industries. In that case, more areas can be allotted for industrial and other use as guided by the criteria mentioned in section 8.4. The proposed public use area is 0.4 km2, which is 0.1 km2 increment compared to the present coverage.

About 1.0 km2 area has been proposed for horticulture (Table 20). Riverine and lake area remains the same as that of the current status. Occasional flood areas and the gully erosion areas on the foothills and on the hill slopes should be brought under protective vegetation cover, with necessary mitigation and erosion control measures.

Issues of land use zonation

There are some inherent issues in implementing land use zonation in Mangsebung rural municipality. Putting land use zoning in place is the central issue of land use planning. Although a comprehensive Land Use Act exists, hardly there exist any instances of implementation of the Act. Because of the lack of solid implementation and monitoring of land use zonation, highly productive agricultural land has become challenging to protect from being grabbed for non-agricultural use. Due to mountainous terrain, the issue of land grabbing for non-agricultural use is not severe in the Municilpality . However, the tendency of forest encroachment for settlement and agriculture needs to be controlled.

A substantial part of the agricultural land and settlement lies in steep and unstable terrain or flood-prone areas. Implementing risk sensitive land use plan by developing forestry on steep cultivated land and risk-prone human settlements is a challenging task unless the alternative opportunity is available for their livelihood, raising the quality of life. Similarly, lack of good governance and employment opportunity, and nexus between political actors and land acquisition actors, contributing to domestic land grabbing in Nepal is a crucial constraint to implementing the land use plan. Overcoming these constraints by effective governance, people participation, and appropriate strategy and policy measures by the local government in coordination and cooperation with a higher tier of government is necessary.

Controlling and discouraging unauthorized land use, maintaining the balance between development and environment, controlling the fragmentation of land and haphazard development of residents and urbanization, and determining allowed land use of specific land parcels, and ensuring this is implemented and monitored are other significant issues of land use zonation and implementation. Similarly, the lack of required expertise and human and capital resources to implement land-use planning in the municipality will be challenging to implant land-use plans. For this, support of provincial and federal governments and community participation is needed.

Table 18: Present and Proposed Land of the study area

Land use and land cover	Present Land use 2021		Proposed Land use	
	Area (km2)	Percent	Area (km2)	Percent
Agriculture	42.24	17.2	40.79	16.6
Forest	193.56	78.9	191.87	78.3
Bushes and grass	4.05	1.7	3.69	1.5

Land use and land cover	Present Land use 2021		Proposed Land use	
	Area (km2)	Percent	Area (km2)	Percent
Residential	2.16	0.9	4.16	1.7
Commercial(Mixed use)	0.07	0.0	0.24	0.1
Industrial	-	-	0.05	0.0
Institutional	-	-	0.70	0.3
Cultural and Archaeological	-	-	0.05	0.0
public use	0.1	0.0	0.40	0.2
Mines and Minerals	0.31	0.1	0.59	0.2
River and lakes	2.65	1.1	2.65	1.1
Total	245.19	100.0	245.19	100.0

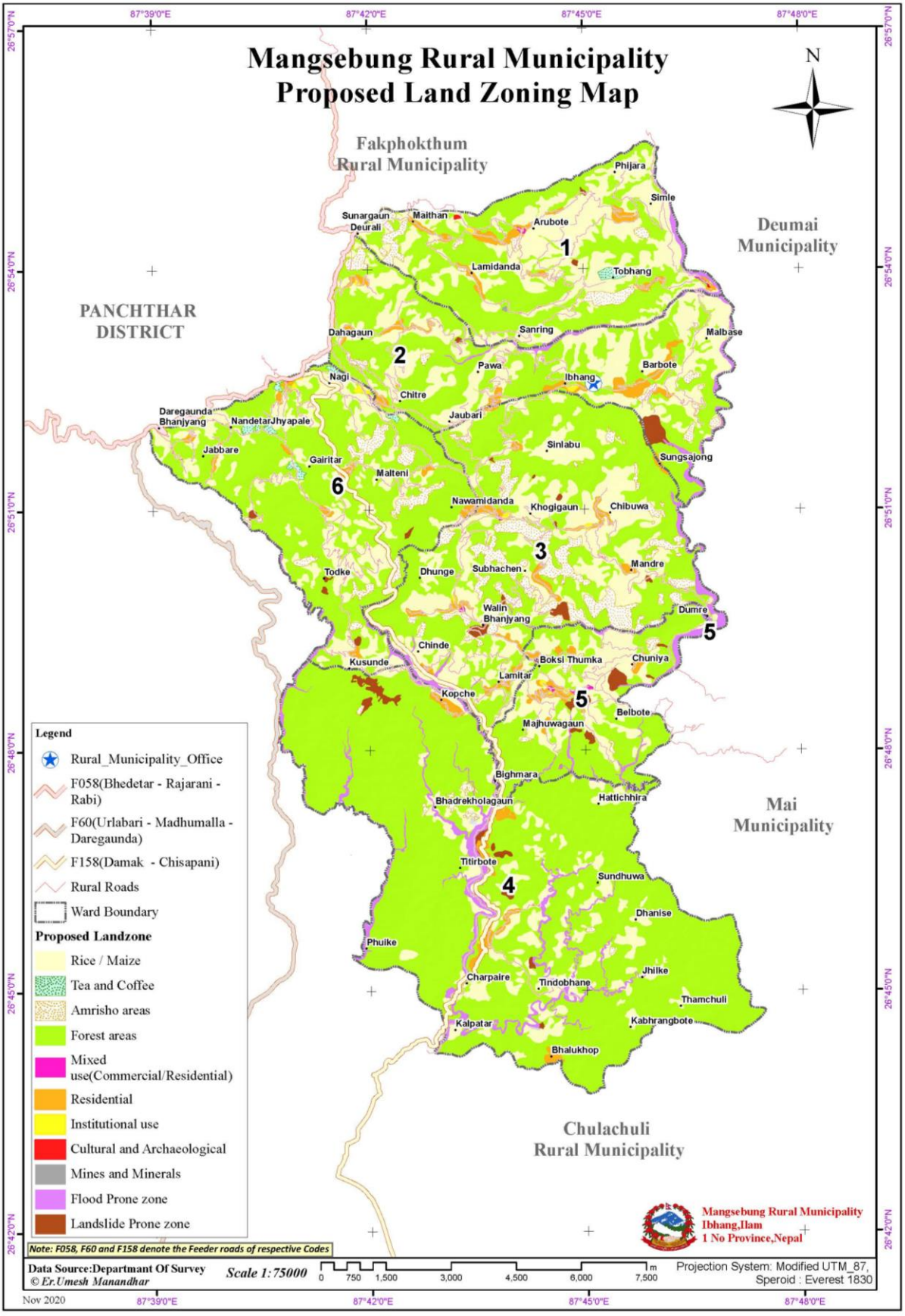


Figure 27: Land use zonation of Mangsebung Rural Municipality.

9. SWOT analysis

SWOT is acronyms of Strength, Weakness, Opportunity, and Threats which is being used as analysis technique for the land use planning of Mangsebung Rural Municipality. The following steps were followed for the analysis of the internal and external factors. In first step we listed the strengths and weaknesses of LUP of the municipality. Secondly, we identified its opportunities and threats as experienced by consulting local people. Strength, weakness, opportunities and threats analysis of each thematic component of land use plan of Mangsebung Rural Municipality were computed jointly through the consultation workshop at municipality and expert judgments (Table 19). SWOT analysis' aim is to maximize strengths and take advantage of opportunities while minimizing weaknesses and avoiding threats.

4.3.1. Strength

4.3.2. Weakness

4.3.3. Opportunities

4.3.4. Threats

Table 19: SWOT analysis of Mangsebung Rural Municipality

Strength	Weakness	Threats	Opportunity
• The Municipality extends from Chure to Mahabharat range. • 190 m to 2061 m above the sea level. Diverse ecological zone • Connected with Damak by Damak-Chisapani sadak. • Adequate surface water resource (ponds and rivers) • Tropical to temperate weather • Diverse fertile agricultural landscape. • Proximity to the huge market area such as Damak, Itahari, Biratnagar and India • Around 64 % of forest cover area • Cultural, religious, natural destinations • Existing tourism related infrastructure	• Prone to landslide (fragile ecology) due to weak Shiwalik and Mahabharat formation • Lack of scientific and sustainable management of Chure regions. • Limited use of agriculture land due to lack of agro entrepreneurship. • Haphazard and scattered settlement • Insufficient and poor infrastructures • Cultivation on marginalized land. • Settlement near disaster risk location • Haphazard road construction • Majority of roads are seasonal so linkage break during rainy season. • Lack of bridges in several locations • Lack of local land use plan and zonation. • Public land and forest encroachment • Lack of motivation/attraction in agriculture entrepreneurship • Soil quality: less depth and less fertile. Laterite soil type; dry soil (south facing) • Lack of sufficient investment for infrastructure • Lack of awareness	• Strong political commitment and community acceptance • Youth migration • Degradation of Chure and Mahabharat regions • Increase in disaster risk • Uncertain climate change scenario • Loss of biodiversity • Impact on human health • Degradation of soil fertility due to excessive use of inorganic fertilizer • Drying of local springs (Chure region-south facing slope) • Loss of local crop varieties • Land abandonment • Constraint in agriculture development • Lack of sufficient investment	• Stable political situation • Enacted condition of Local Government Operation Act 2074 and Nation Land Use Act 2075 • Mandated local government to formulate, implement and evaluate development plan and policy as per need • Implementation of land use planning in the development • Scientific and sustainable development of Chure regions • Scientific management of forestry • Informed community • Development of ecological corridor in the waste land • Attractions for Priority programs of Federal, Provincial and Local government (Land use zoning)

10. Land use planning

10.1 Concept and approach

Land use plans are essentially zoning plans which outline the future location and type (residential, office, retail, industry) of development activity that is to be permitted and not permitted (i.e. green space, parks, etc.) within urban and regional areas over a set horizon period (normally 5, 15 and 30 years). Planning is generally based on land use models, which allow planners to consider future conditions of an urban system under current and alternative policy scenarios. This is particularly useful for simulating changes due to large infrastructure investments and for estimating ecological impacts from land-use patterns.

Through land-use planning, authorities assign different types of allocation to the land plots, according to their particular characteristics. Hazard areas (such as landslides, flood, and earthquake) should ideally be kept free of urban settlements and sensitive infrastructures while reserving them for alternative uses, such as agriculture, open spaces, or recreational activities. Based on the hazard levels, restriction to development and building regulations may be adopted (Copons et al., 2004). In some particular situations, relocation also might be considered. Settlements could be relocated when damage has been extensive or if risk is considered unmanageable (Corominas, 2007). Similarly, some areas owing to their cultural heritage, ecological and environmental values, may be conserved or developed. Such plans directs planners to allocate land for urban built up, residential, commercial and industrial and public utilities and develop a well-managed and planned and disaster resilient land use vis-à-vis ensuring environmental sustainability.

10.2 Vision, mission, goal and objectives

Vision

Land use planning of any municipality is based on the analysis of present situational trends, past historic events and future prospective goals to reach. To the newly formed municipalities like Mangsebung Rural Municipality, setting out the vision of the municipality is itself an important opportunity to direct municipal goals, plans, and program which will direct whole municipal activities towards the focused direction of set vision. It is a way to form a structural guide for the development and provides guidelines for a holistic development of the city.

Through the participatory process of discussion and induction, the planning team carried out vision setting exercise along with objectives.

"सत प्रतिशत जमिनको सदुपयोग माङसेबुङ गाउँपालिकाको दिगो विकासमा उपयोग"

"Optimum use of land for the sustainable development of Mangsebung Rural Municipality"

Mission

"आगामी १५ वर्षमो सत प्रतिशत जमिनलाई उपयोगिताका आधारमा पूर्णत सदुपयोग गरी आर्थिक, पर्यावरणीय र प्राकृतिक सम्बृद्धि हासिल गर्ने"

"Enhancement of livelihood and environment of Mangsebung Rural Municipality within 5 years"

Goal

Mangsebung Rural Municipality has desired to reach its ultimate long-term goal. The long-term goal of the municipality is to use optimum land use for sound and sustainable environmental and economic growth within 5 years by land use planning. The ultimate goals of the municipality are to:

- Achieve a sustainable development of its available resources by using well land use plan.
- Create a vibrant socio-economic growth of the municipality

Objective

A municipality never be prosper in a sustainable manner without proper and implementable land use plan. At the same time, optimum use of the available natural resources along with its conservation is crucial. The specific objectives are to:

- Provide strategic guidance for the future land development (including physical/spatial development) plan of the Municipal area
- Preparation of land use planning according to local need and conditions
- Protection of forest and agriculture zone/area from the encroachment
- Increase forest area on the basis of forest area criteria
- Propose appropriate locations for industrial, commercial, settlement purpose
- Identification of hazard susceptible areas and settlements. Prohibit human activities in disaster prone areas.
- Conservation of watershed areas
- Enhance environmental and physical well-being of human settlement areas
- Conservation of forest for the well-being of biodiversity and minimization of soil erosion
- Promote clear, green and planned urban spaces
- Minimize climate change impact
- Preparation of Risk Sensitive Land Use Plan (RSLUP) with preparedness, and capacitate human resources plans.
- Development of additional physical amenities based on priority of new urban expansion.
- Conservation and sustainable management of natural resources
- Increase economic opportunities through efficient and sustainable use of natural resources.

10.3 Strategies

The long-term vision of any place, though generally bound by time-frame, should be idealistic in nature and it should always guide the strategies, plans and programs towards achieving that state of development. A strategy is about finding the best way for the municipality to meet a development objective. Following strategies will be adopted to achieve the objectives set by Mangsebung Rural municipality.

- A land use plan to be prepared for the period of 15 years based on long-term development concept and vision, with the direct involvement of municipality's executive body members, subject expert and communities.
- Ensure proper and safe land use (agricultural, industrial, and manufacturing) practices which protect, enhance, and are in harmony with the natural environment.
- Recognize natural resources as primary assets, i.e. positively integrating natural elements in the creation of a human and sustainable environment
- Protect agricultural, forest, and open public areas.
- Implement scientific forest management program to protect and get benefits from forest.
- Implement Chure reform and restoration program with the involvement of local communities.
- Relocation of hazard risk settlement
- Allocation and implementation of industrial, settlement and commercial area.
- Promote integrated settlements for the optimum utilization of limited resources.
- Discourage any form of illegal encroachment on government and public land
- Implement the integrated watershed management for sustainable management of natural resources and enhance the livelihood of municipal people
- Preparation and implementation of building bye-laws.

10.4 Program (Logical Framework Approach: LFA)

A logical framework approach (LFA) comprising Goal, verifiable indicators, sources and means of verification is developed. The contents of the LFA are provided in the Table 20.

Table 20. Logical Framework Approach: LFA

Goal	Objectively verifiable indicators (OVI)	Sources and means of verification (MOV)	Important assumptions and risks
• **Landuse plan prepared & implemented** • **Prepared Risk sensitive Landuse Plan (RSLP)** • **Approved Land zoning** • **Scientific land use plan** • **Scientific zoning of all land use areas** • **Dissemination of land use mapping information in all wards** • **Approved and implementation of landuse zoning** • **Implement watershed conservation and management activities.** • **Preserved of all springs**	• Preparation of land use plan and RSLP & implement it • Landuse policy available • Landuse (Agriculture, built-up area, industrial area, commercial area, forest, public land, and other as specified by GoN) maps • Sanction of landuse by municipal land use council • Easily accessible of land use plan in the municipality • Zoning of the land • Easily accessible of land use plan of rural municipality in all wards • Land use according to the zoning • Reduced in watershed vulnerability. • Increased water availability • Reduced in soil erosion	• Land use maps &policies • Documents available at Rural Municipality office • Field observation • Change in livelihood of locals • DRM plan documents, Disaster Report, Environment Section • Baseline and periodic survey • Positive changes such as employment opportunities, business, flourishment of tourism, human mobility etc. • Baseline survey	• Rural Municipal Government able to formulate the landuse policies and implement • Community participation and acceptance • Key stakeholders, including private sectors and line agencies willing to participate landuse plan • Political stability • Proper use of budget • Availability of necessary human resources and other infrastructure resources. • Availability of technology • No natural disaster • Active participation of stakeholders

Goal	Objectively verifiable indicators (OVI)	Sources and means of verification (MOV)	Important assumptions and risks
• **Flood, Erosion and mass wasting minimized** • **Relocated settlement from disaster prone areas.** • **Minimized in waste and shrub lands** • **Constructed roads under national guidelines.** • **Increase tourism activities.** • **Increase employment and per capita income in municipality** • **Effective Forest management, Agroforestry and horticulture** • **Biodiversity conservation and management** • **High value and native plants integrated for disaster mitigation**	• Treat all landslide having risk to people and major physical infrastructures • Growing forest in the waste and shrub lands • Development of all season road • Develop tourism infrastructure • Increased number of tourist and tourism businesses. • Municipal per capita income is double of national average. • Substantially decreased in municipal unemployment rate. • Sustain existing forest coverage • Increased in forest and biodiversity quality • Area of Argo forestry and horticultures increased • Reduced landslides triggered by haphazard road construction • Increased floral and faunal diversity	• Periodic rural municipal report • Annual rural municipal progress report. • Demographic survey of rural municipality.	• Rural Municipality consistently works with long term Plan • Plan and resource are mobilised with detail planning • Control over land use conversion • Public sector mechanism to assist farmers and entrepreneurs to run/establish agro-business • Availability of necessary infrastructure. • Sufficient market for products. • Forest will be used under CFUG frame. • Good coordination with forest department. • There will be arrangement of resources to facilitate necessary activities

Table 21: Activities and estimated cost

Activities	Implementation duration			Estimated cost (in lakhs)	Budget source			
	Short term (5-years)	Mid-term (10-years)	Long-term (15-years)		Local	Province	National	Private and NGOs, etc
• Periodic update of land use mapping of the municipality		√		15	RM			
• Soil survey and land capability/ suitability mapping	√			15	RM		DoS	
• Detail hazard survey and identify settlement at risk	√			15	RM		PCTMC, DWIDP	
• Integrated settlement and infrastructure development	√	√	√	500	RM	MoLMAC /DUDBC	MoUD/ DUDBC	
• Pre-implementation of landuse planning	√	√	√	10	RM			
• Preparation of building bye- laws	√			5	RM			
• Promote herb and horticulture farming in abandoned and barren land. • Agro-forestry & Horticulture promotion & productivity increasement • Promotion of one ward one product based upon productivity	√	√	√	100	RM	MoLMAC	MoALD	CGUGs/public-private partnership
• Improvement in productivity and promoting commercialization of agriculture	√	√	√	100		MoLMAC		Private sectors

Activities	Implementation duration			Estimated cost (in lakhs)	Budget source			
	Short term (5-years)	Mid-term (10-years)	Long-term (15-years)		Local	Province	National	Private and NGOs, etc
• Formation and capacity building of farmer's group	√	√	√	45	RM			Community
• Promote integration of fragmented land and its proper use through land use policy	√	√	√	50	RM	MoLMAC	MoALD	Public-private-cooperative partnership
• Proper use of public lands by developing: ✓ Greenery and picnic areas ✓ Demonstration site ✓ Market place ✓ Weekly bazaars (Haat Bazaars) ✓ Industrial area ✓ Public open space ✓ Disaster evacuation place ✓ Tourist destination ✓ Nursery compound ✓ Memorial site ✓ Temples, church and Gumbas ✓ Cremation ground, cemetery ✓ Parking lot ✓ Sports ground	√	√	√	2500	RM	MoLMAC	MoALD	Local communities
• Integrated forest and watershed management for the conservation of forest and greenery area.	√	√	√	100	RM	MoLMAC	DoF/ DoSCWM	

Activities	Implementation duration			Estimated cost (in lakhs)	Budget source			
	Short term (5-years)	Mid-term (10-years)	Long-term (15-years)		Local	Province	National	Private and NGOs, etc
• Landslide and flood mitigation	√	√	√	400	RM		PCTMCD/ DWIDP	NGOs/INGOs
• Restoration planning of degraded Chure and Mahabharat area	√			10	RM		PCTMD	
• Soil conservation planning	√			5	RM		DoSCWM	
• Scientific forest management	√	√	√	20	RM		DoF	
• Public utility development	√	√	√	100	RM			

11. Conclusions and recommendations

Conclusion

The present land use mapping of Mangsebung Rural Municipality is prepared based on Land Use Act 2076 and categorized the area in different zones and sub-zones for achieving the long-term vision of the municipality. The study is carried out from remote sensing and GIS along with visual interpretation and extensive field verification. The land use classes have yielded a better accuracy because of the visual interpretation and extensive field verification. The Municipality showed less variability in land use pattern in which highest percentage of land is covered by forest and agricultural lands. Eight land capability classes relevant to agriculture, livestock, and forestry land use with recommendations for terracing, wherever required, soil conservation, and hazard mitigation measure are prepared. The existing areas which are very steep, and hazard-prone are categorized as marginal areas and such lands are proposed for forestry. The suitable residential, commercial, industrial, cultural, and archaeological areas are identified based on the disaster risk evaluation, road network, and connectivity, and present status and market centers and commercial area indicating potential growth in the future.

The land use data and map developed by this study can be used to formulate land use zoning system for controlling land fragmentation, unplanned urbanization, and encroachment of public and government land. It can be achieved through interactions and negotiations between planners, stakeholders and decision-makers at national, regional and local levels. Therefore, these databases could be used in land zoning and for planning, analyzing and decision-making process on the sustainable, equitable and economic use of the land and sustainable land development of the municipality.

The study reflects more investment to be required for setting up the structure and developing according to the plan. The SWOT analysis, makes it obvious that the municipality needs substantial investment in urban infrastructure development. The plan depicts the need of investment in rural networks, transportation, social infrastructures, infrastructures for economic growth, and disaster management. It is expected that the new institutional setup of the municipality will be able to invest in different land use plan of the municipality. However, the municipality might face the challenge to implement the proposed plan due to insufficient financial support. It is expected that the municipality will be able to manage from municipal own income. Further, the shortage in financial resource shall be fulfilled from the respective ministry of the federal and provincial government, multinational agencies, international development partners, and others.

Recommendation

The following recommendation could be made for the future land use plan by the municipality.

- Implement both scientific and traditional knowledge in land use planning.

- Utilization of natural resources for the benefit of the municipality without hampering the environment.
- Commercialization of agriculture for appealing young generation and accelerating economic growth rate.
- Control of land fragmentation and proper use of barren and wasteland.
- Control human activities in disaster-prone and other sensitive areas.
- Regular monitoring and evaluation of land use plan of the municipality if necessary.
- Soil mapping for crop-specific agricultural zoning.
- Establish an urban development mechanism including role and responsibility amongst public and private sectors.
- For key infrastructure development, it is important to start through establishing coordination amongst concerned agencies and conducting a survey or study (feasibility study, detailed design) for its implementation.
- Maintain balanced land use from the point of view of the population, environment, and sustainable development; and classify the land for agriculture, forest, settlement, industrial and commercial areas, water bodies, public use, cultural and archaeological, and others.
- Identify and classify the sectors based on geographical characteristics, land capability, and soil quality which are comparatively more beneficial for arable land for agricultural crop production and the areas for income generation such as fruits, cash crops, and herbs production areas.
- Identify and zoning the land for housing, urbanizing, industrialization, and other non-agricultural purposes in the existing municipalities to balance the environment.
- Identify the main settlements which are in the transition zone and develop such areas in a planned and environmentally justifiable way.

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Annexes

Annex I: Criteria for land use zoning

Following criteria, which include factors and constraint, was adapted in classifying land for various land use zones as specified in the Table 3.1.

Residential area

i. Keep the existing residential area as intact if they are free of risks
ii. Risk free area (avoid all types of risks)
iii. Land system: well drained and locally elevated area of 2c
iv. Near to existing settlements (periphery of existing settlement), should meet condition b and c.
v. Near to existing roads (within 500 m from center of highway and 300 m from feeder road) excluding right of way according to National standard, not necessary meet condition d but should meet b and c.
vi. Soil type: Avoid the area with high organic matter and montomoralite clay (2:1) soil and provided condition a, b, c, d and e are met

Commercial area

i. Fulfill the criteria of proposed residential area
ii. Keep the existing commercial area as intact
iii. Near to existing settlement with area higher than 20 ha
iv. Local administrative headquarter or potential market/urban centre proposed by governmental organizations
v. Close to sites of archeological and culture heritage or touristic places (wetland/wildlife habitat and others)
vi. Far from forest of high biodiversity
vii. Fig. shows the multi-criteria for commercial area zoning.

Industrial area

i. Keep the existing industrial area as intact, if suitable
ii. Near to existing industrial areas, if suitable only (within 500 m from periphery of existing industrial area)
iii. Near to existing major roads (within 250 m from center of highway and district road) provided condition is met
iv. Far from forest of high biodiversity
v. Far from existing settlements (more than 500 m from periphery of large settlements)

vi. Flood risk free area

vii. Proposed industrial areas depend upon type/scale/production/market of the industries. However, they should be built in risk free area with low productivity area

Forest area

i. Keep the existing forests as intact

ii. Extension of existing forests, if possible

iii. Riverine forests (adjacent to both banks of major rivers)

iv. Land system = landform not suited to residence and agriculture

v. Along major roads in both side after the right of way

vi. Public waste land (unregistered land/abandoned flood plain)

vii. High flood risk area

Public utility and open zone

i. Keep the existing public sites as intact

ii. Near to existing and potential residential areas, commercial areas, industrial areas, if appropriate

iii. Accessible to road networks (touched by roads)

iv. Soil fertility =low or very low, if possible

v. Risk free areas (avoid all types of risks)

Cultural and archaeological zone

i. Keep the existing cultural, religious, and archaeological sites as intact

Riverine and Lake zone

i. Keep the existing rivers and water bodies as defined and described by National Land Use Policy 2072

Excavation zone

i. Keep existing areas of excavation, if environmentally suitable and defined by National Land Use Policy 2072 and other relevant Policy

ii. Appropriate areas delineated by experts' study

Agricultural area

i. Keep existing agricultural pocket areas such as vegetable farming, rice field, wheat field, fruit etc.

ii. Soil fertility = high or moderate

iii. Remaining land used from other land categories

iv. Well drained productive land

v. Avoid severe flood prone areas

vi. Areas with high potentiality for irrigation

Others

i. Fishery :

- Keep existing fish farming sites
- Land system == areas with adequate water availability
- Other local depression areas, where ponds can be developed

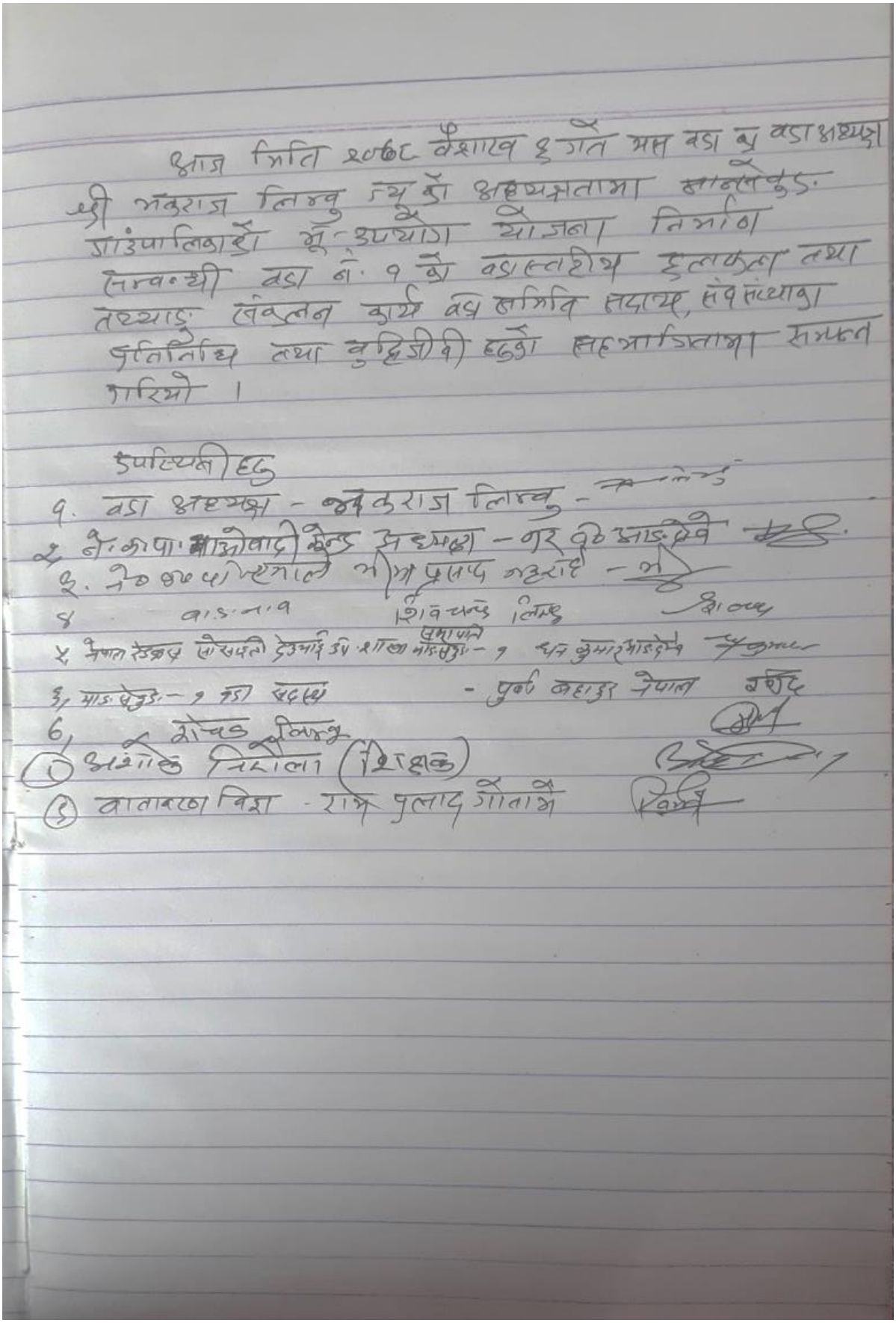
ii. Poultry Farming (currently no mapable)

- Keep existing poultry farming sites as intact, if appropriate
- Far from residential areas
- Accessible to road networks
- Risk free areas

iii. Livestock farming

- Keep existing poultry farming sites as intact, if appropriate
- Risk free areas
- Preferably at the periphery of existing or proposed residential/commercial area

Annex II: Ward level meeting minutes



आज मिति २०८८/०१/०५ गते आइतवारका दिन यस नगरपालिका वडा २ का वडा अध्यक्ष श्री पुष्पराज डाङ्गी ज्यूको अध्यक्षतामा बैठक बसि विभिन्न बुद्धिजीवी, राजनैतिक प्रतिनिधी, समाजसेवी लगायतको उपस्थितमा विभिन्न विषयमा छलफल एवं निर्णयहरु गरियो ।

उपस्थिति :

१. वडा अध्यक्ष श्री पुष्पराज डाङ्गी — [signature]
२. वडा सदस्य श्री कमला पौडेल [signature]
३. वातावरण विज्ञ श्री राम प्रसाद गौतम [signature]
४. समाजसेवी एवं बुद्धिजीवी श्री कृष्ण बहादुर बस्नेत [signature]
५. समाजसेवी श्री राजकुमार पोखरेल [signature]
६. " श्री तीर्थराम खुलाल [signature]
७. " श्री जीवन राई [signature]
८. " श्री चन्द्र कुमार राना [signature]
९. वडा सचिव श्री हेमसागर घिमिरे [signature]
१०. समाजसेवी श्री आशा लिम्बु [signature]
११. " श्री रविता राई [signature]
१२. " श्री मिना खत्री [signature]
१३. " श्री शिशिर लिम्बु [signature]
१४. " श्री डम्बरः डाङ्गी [signature]
१५. शिक्षक श्री युवराज बस्नेत [signature]
१६. श्री प्रमिला विश्वकर्मा [signature]

प्रस्ताव नं. १ : भू-उपयोग योजना निर्माण संबन्धमा ।

उपरोक्त प्रस्ताव नं. १ माथि छलफल गर्दा यस वडामा रहेका एवं संचालित खाद्यान्न तथा नगदेबालीहरुको उत्पादन अवस्था, बजार व्यवस्था, व्यवसायिक फर्म एवं घरेलु उद्योगहरुको संख्याबारे चर्चा गरि यहाँको माटो पुहाउँदो बालीहरुको अध्ययन, सिंचाईको प्रबन्धबारे चर्चा गरियो। साथै यहाँको बाटो, पहिरो, जस्ता जोखिमबारे चर्चा गरियो ।

आज मिति २०७८ बैशाख ७ गते यस वडाको वडाध्यक्ष श्री मैतराज राई ज्यू को अध्यक्षतामा गाउँपालिकाको भू-उपयोग योजना निर्माणको लागि वडास्तरीय छलफल तथा तथ्यांक संकलन कार्य सम्पन्न गरियो ।

उपस्थिती हरु

१. वडाध्यक्ष श्री मैतराज राई
२. " सदस्य श्री संगीता राई
३. " " श्री इन्द्र ब. लिम्बु
४. " " श्री कुमा ब. "
५. " " श्री कला शिवा
६. " सचिव श्री सुलभ दाहाल
७. आमन्त्रित
८. आईतराज सिम्बा
९. कलाहाङ "
१०. वातावरणविद - राम कुमार गौतम

आज मिति २०७८ वैसाख ८ गतेका दिन यस वडा नं. ४ का वडाअध्यक्ष श्री अमृत बहादुर राई ज्यू को अध्यक्षतामा गाउँपालिकाको भू-उपयोग योजना निर्माणको लागि वडास्तरीय छलफल तथा तथ्यांक संकलन कार्य वडा समिति, अन्य प्रतिनिधि हरु तथा बुद्धिजीवि लगायतको उपस्थितीमा सम्पन्न भयो ।

उपस्थिती

१. वडा अध्यक्ष - अमृत बहादुर राई
२. " सदस्य - गोमा देवि वि.क.
(३) " " - सन्त कुमार वि.क.
४. " " - धन प्रसाद राई
(५) " " - विष्णु कुमारी लिम्बु
(६) प्रतिनिधि तथा बुद्धिजिवि - टेक बान लिम्बु
(७) " " " - उत्तर कुमार राई
(८) " " " - सुक बहादुर राई
(९) प्रहरी चौकी नामीटार " प्रहरी जवान रमेश बास्कोटा
(१०) वातावरण विद - राज प्रसाद गोतामे
(११) वडा सचिव - सरिता श्रेष्ठ

२०७८/०१/०८

आज मिति २०७८ वैशाख ०८ गते यस माङसेबुङ गाउँपालिका ५ नं. वडा कार्यालयमा वडा अध्यक्ष श्री नरेन्द्र कुमार राईको अध्यक्षतामा बैठक बसी स्वयं यस वडाका सामाजिक अगुवा तथा बुद्धिजीवी संग संयुक्त बैठक बसि आपस छलफल गरी निर्णय पारित गरीयो ।

उपस्थिती तालिका:

वडा अध्यक्ष - श्री नरेन्द्र कुमार राई
वडा सदस्य - श्री तिलकण लेवहाङ
" " श्री खड्क लिम्बू
" " श्री पवित्रा लिम्बू तुम्बाहाङफे
" " श्री देवी माया वि.क.
" " श्री
वडा सचिव/ कार्यालय कर्मचारी श्री सुनिल स्रेष्ठ
सामाजिक अगुवा/बुद्धिजीवी - श्री देवी कुमार योङहाङ
" " " श्री होम लिङदेन
" " " श्री मन बहादुर लिम्बू
" " " श्री लिङहाङ तुम्बाहाङफे
" " " श्री जितेन सुब्बा
वातावरण विज्ञ श्री राम प्रसाद गौतामे

प्रस्ताव:

१. माङसेबुङ गाउँपालिकाको भू. उपयोग योजना निर्माणका लागि वडा स्तरीय छलफल तथा तथ्याङ्क संकलन सम्बन्धमा

निर्णय: नं. १, प्रस्ताव नं. १ मा छलफल गर्दा यस माङसेबुङ गाउँपालिका भू-उपयोग सम्बन्धि ५ नं. वडाको वडा भित्रका उपयोगी जग्गा जमिन हरुको बारे छलफल गरी यस वडाको उपयोगी भुमिहरुको तथ्याङ्क संकलन गरिएको छ।

आज मिति २०६८/१/६ गते का दिन यस माउसेबुङ गाउपालिका वडा नं. ६ चिसापानी पञ्चमीमा भु-उपयोगी योजना सम्बन्धि छलफल तथा तहमाङ्ग संकलन यस वडाका वडा अध्यक्ष श्री प्रदिप साङपाङ ज्यु को अध्यक्षतामा वडा समितिको, यस वडाका बुद्धिजिवी समाजसेवी, नागरिक समाज लगायतका व्यक्तिहरुको उपस्थितिमा सम्पन्न गरियो।

उपस्थितिहरु

१. वडा अध्यक्ष :- श्री प्रदिप साङपाङ
२. वडा सदस्य :- श्री राम चन्द्र राई
३. — " — :- श्री मनिषा राई
४. — " — :- श्री धन कुमारी वि.क.
५. वडा सचिव :- श्री सिर्जना खड्का
६ शिक्षक श्री भक्त ब. राई (सर्की)
७ बुद्धिजिवि श्री इन्द्रकु० राई
८ नागरिक श्री अनिष राई
९ —"— श्री भनम राई
१० —"— श्री भक्त कुमार राई
११ —"— श्री दिपेन राई
१२ —"— श्री रिपना राई
१३ —"— श्री पदम राई
१४ —"— श्री मनोज कुमार राई
१५ —"— श्री चन्द्रकला राई
१६ —"— श्री सोनिका राई
१७ —"— श्री रमिला राई
१८ —"— श्री प्रतिराम राई
१९ —"— श्री तुल ब. राई
२० —"— श्री धन ब. राई
२१ —"— श्री सुमना राई
२२ —"— नविन राई
२३ —"— अरुन कुमार राई
२४ वातावरण मिल - राम प्रसाद गौतम

Annex III: Some glimpse of ward level meeting