A STUDY ON

POPULATION PREASSURES INDEX

2016

Government of Nepal

Ministry of Population and Environment

Population and Environment Management Division

Singha Durbar, Kathmandu

This report was prepared by Ageing Nepal for Ministry of Population and Environment (MoPE) with experts input from Mr. Bhumidatta Poudel and Ms. Rewa Dahal, population specialists. Editors involved in finalization of this report included Dr. Dhanendraveer Shakya from Tribhuvan University, Mr. Krishna M. Gautam from Ageing Nepal and Mr. Arun Gautam from the Population and Environment Management Division of MoPE. The accuracy or authenticity of the data presented and interpretation are from different published and unpublished sources. The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Population and environment management Division of, MoPE.

Reports and viewpoints on population pressure index related matters from readers who wish to contribute to the publication are most welcome. The Population Division reserves the right to edit.

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FOREWORD

MoPE presents this scholarly report produced by Population and Environment Management Division of this ministry.This report forms a part of the policy and development work of the ministry.

Nepal's population reached 26,494,504 on 2011 with the slowest population growth rate at 1.35 per annum since 1961. Population increase over time by district or regions gives a real distribution of population but it is of limited value in understanding the pressure of population. The conventional analysis of population is through the framework of density or simple man-land ratio. The densities are widely used in different resources, i.e. forest, water, soil or land, etc. Within the context of international conference on Population and Development (ICPD), Beijing Conference and Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs), Nepal has attempted to integrate population dynamics into development planning process. Some progressive steps forward have been made in recent years in reducing Total Fertility Rate (TFR), Maternal and Infant Mortality Rates (MMR and IMR), increasing the life expectancy and the educational status of the general public.

This study has been prepared mainly from the population pressure on different sources of resources issue relation with ending MDG in 2015 and starting of Sustainable Development Goals (SDG) from 2016. Some major pressure highlighted included forest, water, soil or land etc. On behalf of the Ministry, I would like to thank Ageing Nepal team for their efforts and contributions. It is my hope that this report will be a valuable resource for ministry of population and environment, readers and will stimulate further research into the vibrant area of population and development.

I would like to express sincere thanks to Joint Secretary Mr. Narayan Raj Timilsina and his team and other MoPE officials for their efforts in bringing out this publication.

Dr. Bishwa Nath Oli
Secretary
Ministry of Population and Environment
July, 2016

ACKNOWLEDGEMENTS

In 15 June 2016, Nepal's population reached 28.7 million with the growth rate of 1.3 percent per annum while the world's population reached 7.37 billion on 15 June, 2015. High pressure on resources, rapid urbanization and migration, uneven spatial distribution of population, population and its impact on environment, imbalance between population growth and economic development, persistent lack of awareness are some of the emerging concerns addressed by this report.

This report focuses on population pressure on different resources. Ageing Nepal prepared the report for MoPE, so that it could be widely disseminated and used by relevant stakeholders as important reference for policy making, planning and designing interventions. The ministry believes that the report will also be useful as a knowledge base to understand the emerging population pressure issues and for integration of these issues in the formulation of sectoral policies and plans of the government of Nepal as guided by the Population Perspective Plan (PPP), 2010-2031 and National Population Policy 2015.

I would like express my sincere appreciation of the efforts put in by expert group involved in timely production of this much needed report on population pressure index on different resource of importance. Similarly I would like to record my appreciation for the lead role played by Mr. Arun Gautam, Under Secretary, Ministry of Population and Environment, for his able leadership and guidance in bringing out this report on time.

Mr. Narayan Raj Timilsina
Joint Secretary
Population Division
Ministry of Population and Environment

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CHAPTER I: INTRODUCTION

1.1 Background of the Study

Nepal measures about 800 kilometers (497 miles) along its Himalayan axis by 150 to 250 kilometers (93 to 155 miles) across. Nepal has an area of 147,181 square kilometers (56,827 sq. miles). Nepal is landlocked by India on three sides and China's Tibet Autonomous Region to the north. West Bengal's narrow Siliguri Corridor or Chicken's Neck separate Nepal and Bangladesh. To the east are India and Bhutan. Nepal depends on India for goods transport facilities and access to the sea, even for most goods imported from China.

The total population of Nepal, as of 22 June 2011, was 26.5 million with a decadal increase of 14.4 percent from 2001. The population a decade age, or in 2001, was 23.2 million. The average annual growth rate of the population from 2001 to 2011 was 1.35 percent, a sharp decline from the 2.25 percent of the previous decade 1991-2001. The number of households stands at 5.4 million in 2011. Households with 1 to 4 members are highest in the census 2011, whereas 5 person households were highest in the 2001 census. Female-headed households have increased by 11 percentage points from 14.87 percent in 2001 to 25.73 percent in 2011.

Population increase over time by district or regions gives a real distribution of population but it is of limited value in understanding the pressure of population. The conventional analysis of population is through the framework of density or simple man-land ratio. The densities are widely used in different resources i.e. forest, water, soil or land, etc.

Forest

Forest is one of the important natural resources. Different types of forests are found in different regions of Nepal. It occupies about 37 percent of the total land of Nepal. Forest is the source of all wood-based industries. Industries like paper, furniture and timber are based on the forest. Forests are rich in herbs. The herbs have medicinal values. Many medicines are made from these herbs. Timber and herbs are valuable natural resources. The value of timber and herbs is very high in the world market.

There are many kinds of animals in the forests of Nepal. Forests provide food and shelter for these animals. Animals and birds add to the natural beauty of the country. People from many countries come to Nepal to see these beautiful birds and exotic wildlife. Many types of fruit and grasses grow in forests. People depend on them for their living and also to rear their livestock.

Forests support agriculture. It also causes rainfall. It keeps the soil tight. So, forests help control soil erosion, landslides and floods. Nepal government is trying to preserve forests. It has established many National Parks and Wildlife Reserves.

Green forest is the wealth of Nepal. Forest is the free gift of nature to human beings. Forest is a very important resource of Nepal. Forest provides wood, fuel, herbs, etc. We get raw materials for fuel; and raw materials for furniture, matches and paper from the forest. It influences climates, causes rain, stops flood, soil erosion and landslide. Forest is the habitat of wild animals. Tourists come to see wild animals and thus we can earn foreign currencies. Forest regulates the temperature of the surrounding areas. It is pleasant to live near forest. Villagers graze their cattle in the forests and they also get fodders for their cattle. We should preserve our forest and use it wisely.

Water

Water is the most important natural resource of Nepal. Nepal is rich in water resource. Nature has been very kind to us by providing us with unlimited supply of water. Nepal is the second richest in the water resources in the world after Brazil.

Nepal is a landlocked country. So Nepal does not have access to the sea or oceans. But there are lots of rivers that flow from the Himalayas. When snow melts in the Himalayas, the glacier and rivers are formed. The rivers flow through the mountain regions to the Tarai. The main rivers of Nepal are Mechi, Koshi, Narayani, Gandaki, Karnali and Mahakali. These rivers have several tributaries. In addition to these Kankai, Bagmati, Trishuli, Marsyangdi, Seti, Rapti, Bheri and also important rivers of Nepal.

Lakes are also important sources of water. There are many lakes in Nepal. Rara lake is the largest. It is located in Mugu district. The second largest lake is the Phewa. It is in Pokhara, Kaski. Begnas and Rupa lakes are also in Pokhara. Lakes are usually large areas of water surrounded by land.

Phoksundo is the deepest lake of Nepal. It is located in Dolpa district. Tilicho is located at the highest altitude. It is in Manang district. Some famous lakes are Gosain Kunda (in Rasuwa district) and Satyawati (in Palpa district). Rivers and lakes together with other streams, ponds and underground water form water resources. These are important sources for the development of Nepal.

Water is used for many purposes. It is used for drinking and washing. It is used for irrigation. Irrigation is the lifeline for agriculture. Hydro-electricity is produced from fast flowing rivers. Many hydro-power stations have been built in Nepal to tap rivers for generating electricity. The major hydro-electricity projects are:

- Kaligandaki (144 MW)
- Marsyangdi (75 MW)
- Kulekhani I (60 MW)
- Bhote Koshi (36 MW)
- Khimti (60 MW), and
- Kulekhani (32 MW).

Land/soil

Land is the other natural resource of Nepal. In Nepal most people depend on land. They do farming and earn their living from land. Land includes soil and minerals. The cultivable land in Nepal is about 17 percent. About 38 percent of the land is rocky and covered with snow.

Soil is an important factor for agriculture. It is not possible for people and animals to live on earth without soil. The land in Tarai is very fertile. It is good for agriculture. So, the productivity of Tarai is very high. The Tarai region is the storehouse of food grains. It is called the green belt of Nepal. There are many hills and mountains in Nepal. The surface

is rugged and sloppy in the hills. When rainfall is heavy, the top soil of the hills is washed away then it causes landslides. So, the trees should be planted and conserved to protect soil in the hills. Plants are the only means to hold the soil tightly and to stop erosion.

A variety of soils are available in Nepal. Nepal is an agricultural country. There is a great importance of soil here. Alluvial soil is found in abundance, which is very good for growing paddy, wheat, jute, oilseed, tobacco and sugarcane. Sandy and stony soil is found in inner Tarai and Chure range. Soil is good for growing groundnut, coconut, palm, oilseeds, maize, potatoes, etc. Reddish grey soil is found in the hills of Mahabharat. This type of soil is good for potato, fruits, soybean, tea and maize. Lacutrine soil is found in the valley. Its colour is black. It is good for the growth of green vegetables and food crops. In the Himalayan region the soil is not suitable for food and cash crops. The soil has less fertility so only buckwheat, barley, maize and potato can be grown.

Minerals

Minerals like slate, stone, rock, coal, iron, copper, limestone, magnesite, mica and natural gas are natural resources. The marbles are made of rocks. Limestone is used in cement industries. Hetauda and Udaypur cement factories are the examples of such industries.

Nepal is quite rich in mineral resources. Mineral deposits such as gold, mica, limestone, and iron ore, copper are found in different parts of Nepal. Because of financial constraint and lack of technical and skilled manpower, progress in the field of mining is negligible. If we utilize the mineral resources of Nepal properly, we can earn foreign currencies and people will get job opportunities also. The areas where minerals are found are as follows:

- Copper: Buddha Khola (Bandipur), Gyari (Gorkha), Arghauli (Chisapani), Taplejung, Ilam, Baitadi, etc.
- Iron: Ramechhap, Labdhi Khola, Pyuthan, Bhainse, Kulekhani, Bhutkhola, Phulchoki, Ghatkhola, etc.
- Mica: Bhojpur, Chainpur, Lamjung, Dhankuta, Nuwakot, Sindhuligadhi, etc.
- Limestone: Chobhar (Kathmandu), Bhainse (Makawanpur), Udaypur.

1.2 Objective of the Study

The overall objective of the study is to analyze the population pressure index from different resources of Nepal. Following are the specific objectives:

- Analyze the population situation based on the latest census,
- To identify the population pressure in different resources of Nepal,
- To analyze the population pressure in water of Nepal,
- To describe the population pressure in cultivated land of Nepal,
- To present the population pressure in forest of Nepal,
- To analyze the population pressure in minerals of Nepal,
- To describe the school enrollment of Nepal,
- To present the active population of Nepal,
- To analyze the economic situation of Nepal,
- Develop population pressure index and identify area of population pressure.

1.3 Methodology of the Study

The study of population relationship involves several conceptual and methodological issues. Beginning with the question of what constitute resources and the inclusion of human as resource, several issues emerge in this connection. However, in this study population is considered as one variable and attempt is made to present its relation with land resources in the given period of time. The availability of data in the compatible scale further deepens the complexity. Therefore the methodology discussed in this section is more of conceptual nature based on available data.

One of the aims of this study is to develop a viable methodology in order to analyze population situation in the country in relation to productive resources. Nepal being an agricultural country its main productive resources is the cultivated land. Thus, this analysis takes into account of cropped area of the district while discussing population situation at the given scale. The methodology adopted in this study is guided by two interrelated concepts. These include man-land ratio, and index of population pressure.

The man-land ratio expresses the population situation with respect to land. There are several forms of densities such as arithmetic (crude) density, physiological density, agricultural density, and many others.

Population pressure index (PPI) in this study is expressed as follows:

$$I = \frac{P - P_1}{A}$$

where,

I = Index of Population pressure per hectare of spatial unit

P = Actual rural population in the spatial unit i.e., district

A = Total amount of rural land of each spatial unit (district)

P_1 = Estimated number of rural inhabitants in the spatial unit capable of being supported by the developed land resources.

The estimation of P_1 is difficult and involves a complex process. The following equation is used for this estimation.

$$P_1 = \frac{x}{K}$$

Where,

X = Gross product of outputs in calorie from the basic crops production in the spatial unit, i.e. district

K = Average per capita calorie requirement per person per day.

The study have based on the secondary data. It is a desk review, some mathematical method have been used. This model is a modified version of the one used in study in India[1]. An earlier study attempted to apply this model in Nepal. Given the problem of data availability and accuracy at the district level, some modifications have been made to suit the purpose of the present study. Instead of cash conversion to primary products at the district level, this study uses the calorie values of all basic crops to come up with gross product of district level output needed for the index.

[1] P. Sen Gupta, 1970, Population and Resources in India, in Zelinsky, W. et al. (eds.). New York: Oxford University Press.

1.4 Limitation of the Study

PPI is a valuable concept but it has several limitations. It is related to the primary production within a given area unit. At the current state of data available at the required scale and the accuracy of the available data it was not possible to include production from other sector of economy. Districts are primary areal units (scale) utilized for analysis in this study and they are considered as micro-regions. This areal unit is chosen because districts are the lowest level administrative units in the country in which data related to primary products are reported. There are 75 districts in the country and analysis at this level is expected to provide a clear micro- level picture of population pressure.

For comprehensive understanding of population pressure situation, districts are viable units. For policy interventions and epically from the point of view of regional development an aggregation at the meso-regional level is preferred to districts or ecological regions. Therefore, apart from district level analysis, an attempt has been made to present population pressure situation by eco-development regions. Although sixteen (fifteen plus one) eco-development regions are taken onto account in this aspect. Eco-development regions are ambulation of ecological zones (e.g. Mountain, Hill and Tarai) and development regions are e.g. Eastern, Central, Western, Mid-western and Far-western), i.e. 3 x 5. Kathmandu Valley (Kathmandu, Lalitpur and Bhaktapur districts) is considered as separate region due to its distinctive features.

The PPI relates population of a given spatial unit with the production (from primary sector) on the same spatial unit. It relates existing population with what is produced or what can be produced at the current level of production and technology. It show whether a spatial unit is under population or over populated at a given time. The distributional aspects of the produce soon as whether there is unrestricted export or sale of the produce from the spatial unit and whether, such an export or distribution system was desirable or not, is policy issues. Therefore, such issues are beyond the scope of PPI study. It is up to the policy makers to decide on the kind of programs and actions are to be developed and implemented if population pressure has to be put within a reasonable limit. The PPI values provide basis for policy intervention.

The present PPI study is primarily limited to central requirements of the individual in the region or distracts and central arability in the respective. Cereal arability is based on calculation on the calorie values of six basic crops produced in the spatial unit i.e. district or eco-development region. These basic crops include paddy, wheat, maize, millet, barley and potato. Further, requirement should aim to capture total (100%) requirements of the individual and consider outputs from other sectors of economy.

PPI value can also be derived from calculations in which all primary product outputs (X) are converted into cash values and a constant income per capita from primary sector activities (K') is used. This would have been desirable and the study term carefully explored the possibilities of developing PPI based on prices of commodities used in the present Exercise. Information on national average prices of selected commodities was available from the Marketing Development Directorate of the Department of Agricultural, Ministry of Agriculture and Cooperatives. Market prices of the selected commodities for Kathmandu and few Tarai and Hill market centers was available but while it was considered too limited this limited information would be difficult to calculate reasonable constant income per capita based on the total production from the primary sector of the country (k') i.e. a must for PPI calculation. Consumer price index using 1995/96 as base year was available at Nepal Rastra Bank. However, it was noted that the actual prices of commodities for the base year was not available in consumer price index.

The calculation of PPI from prices of commodities is meaningful only when market prices of crops and other outputs are available at the spatial unit for which other data on primary products are available for analysis. This was not possible in this study. For meaningful PPI market prices of basic crops at the district level were not available for all districts. Wherever it was available (from limit urban centers) was considered too limited to apply for the case of 75 districts. Inter-district spatial variation are too wide too apply same price for districts located even in the same development region. The terrain conditions are so diverse that market prices vary within a short distance. More importantly, unless market prices of each outputs or commodities included in PPI are available at the district level, the analysis based on cash conversion of produce at the district level turns into a futile exercise and a misrepresentation of really.

CHAPTER II: POPULATION SITUATION

Record of total population is available since 1911 but the numbers available until 1952/54 are considered unreliable. The census taken during 18952/54 is considered as the first scientific census. Census operation was done in two phases. It recorded a total of 8.26 million people living in the country. Since then census operation have been done on a decennial basis.

2.1 Population Growth, 1952/54-2011

By 2011 Nepal's population reached 26.5 million and growth rate between 2001 and 2011 was 1.35 percent per annum. There was a population increase of 1.2 million between 1952/54- 1961. During this period the population increased by 1.65 percent per annum. The population growth was consistent over two percent per annum over the successive decades with highest rate of increase between 1971 and 1981. The average annual growth rate of the population from 2001 to 2011 was 1.35 percent, a sharp decline from the 2.25 percent of the previous decade 1991-2001 (Table 1).

Table 1: Total population and growth rate, Nepal, 1952/54-2011

Census year	Population	Growth rate
1952/54	8,256,625	-
1961	9,412,996	1.65
1971	11,555,983	2.07
1981	15,022,839	2.66
1991	18,491,097	2.08
2001	23,151,423	2.25
2011	26,494,504	1.35

Source: Central Bureau of Statistics, 2003, 2012.

The uneven distribution is quite apparent that Nepal's population concentration is greater in the southern and eastern parts of the country. The regional pattern is quite evident with Kathmandu Valley and the Tarai as areas of higher concentration of population (Table 2).

The overall sex ratio in the country was 94.2 in 2011. Tarai has higher sex ratio compared with the Hill and Mountain. Likewise in terms of development region, central region (including Kathmandu Valley) has the highest sex ratio while western region has the lowest. Of the 15 eco-development region Western Mountain shows the highest sex ratio and the Western Hill has the lowest. In general, the Eco-development regions of Tarai demonstrate higher sex ratios and those of the Hill (except Kathmandu Valley) demonstrate the lowest sex ratio.

The average household size in the country is 4.9 persons in 2011. Hill has the lowest household size and the Tarai has the highest. Similarly, Far-western development region has the highest household size and Western development region has the lowest. Household size in the Eastern development region is lower than the national average where as Mid-western and Far-western regions show the opposite.

Table 2: Population, sex ratio, household and household size by ecological development region, Nepal, 2011

Region	Population		Sex ratio	Household		Household size
	Number	%		Number	%	
Nepal	**26,494,504**	**100.0**	**94.16**	**5,427,302**	**100.0**	**4.88**
Mountain	**1,781,792**	**6.7**	**93.84**	**364,120**	**6.7**	**4.89**
Eastern	392,089	1.5	91.16	84,918	1.6	4.62
Central	517,655	2.0	91.14	122,154	2.3	4.24
Western	19,990	0.1	116.44	4,834	0.1	4.14
Mid-western	388,713	1.5	101.52	68,902	1.3	5.64
Far-western	463,345	1.7	92.15	83,312	1.5	5.56
Hill	**8,876,984**	**33.5**	**87.16**	**1,919,653**	**35.4**	**4.62**
Eastern	1,601,347	6.0	89.55	346,571	6.4	4.62
Central	1,914,790	7.2	91.66	401,404	7.4	4.77
Western	2,811,135	10.6	81.27	677,498	12.5	4.15
Mid-western	1,687,497	6.4	90.19	332,153	6.1	5.08
Far-western	862,215	3.3	87.03	162,027	3.0	5.32
Tarai	**13,318,705**	**50.3**	**96.66**	**2,528,752**	**46.6**	**5.27**
Eastern	3,818,119	14.4	93.70	800,016	14.7	4.77
Central	4,707,517	17.8	101.66	825,710	15.2	5.70
Western	2,095,640	7.9	95.09	384,030	7.1	5.46
Mid-western	1,470,472	5.6	93.46	294,364	5.4	5.00
Far-western	1,226,957	4.6	93.99	224,632	4.1	5.46
Kathmandu Valley	**2,517,023**	**9.5**	**107.84**	**614,777**	**11.3**	**4.09**

Source: Central Bureau of Statistics, 2012.

2.2 Density of Population

By 2011 Nepal's average population density has reached 180 persons per sq. km. of land area. Density of population increased from north to south. The number of people living per sq. km. of land in the Hill districts is more than five times higher than those in Mountain districts. Likewise, average density of population in Tarai districts is more than

double that of the hill districts (Table 3). But when the Mountain and Tarai districts are compared, population density is more than eleven times higher in the Tarai than in the mountains. Kathmandu valley is an exception where 2,800 people live in an area of one sq. km. of land area in 2011.

Table 3: Land area and population density, Nepal, 2011

Region	Area (in sq. km.)	Population density (per sq. km.)
Nepal	**147,181**	**180.0**
Ecological zone		
Mountain	51,817	34.4
Hill	61,345	185.7
Tarai	34,019	391.5
Kathmandu Valley	899	2,799.8
Development region		
Eastern	28,456	204.2
Central	27,410	352.3
Western	29,398	167.6
Mid-western	42,378	83.7
Far-western	19,539	130.6

Source: Central Bureau of Statistics, 2013.

Regional variation in the density of population is also apparent by development regions. In general, average density decreases from east to west. However, the variation is not as vast as that of the ecological zones. Mid-western region has the lowest density whereas Central region demonstrates the highest. The low density is largely a reflection of terrain characteristics, proportion of area under cultivation and number of urban centers in each of these ecological zones and development regions.

Districts with high densities are located in the Tarai and those with low densities in the Mountains and the Hill (Kathmandu Valley an exception). Table 4 shows the relative population density of eco-development regions. Eco-development regions of the Tarai have higher densities than those of the Hill and the Mountain. Of all the eco- development

regions, Eastern Tarai has the highest density i.e. 525 persons per sq. km. of land area. The western Mountain has density as low as 3.4 persons per sq. km.

With an increase in population of the country the number of people living per unit of area i.e. sq. km. has increase over the years. The increase has been rapid in recent decades. According to population census 1952/54 there was 56 persons per sq. km. This number increased to 64 persons in 1961. By 2011 the average density has reached to 180 persons per sq. km. More importantly the decennial increase in density has most rapid between 1991 and 2001.

The five last censuses suggest successive increase in density by zones, regions and districts. Change in density is evident over time and over spatial units. In both cases change in density has been most prominent in the Tarai than other ecological region (Table 4). When 1971 is taken as the base year, north-south changes in densities are more prominent that change in the east-west directions. Of all the eco-development regions, change in density is higher in Far-western Tarai.

Table 4: Population density, Nepal, 1971-2011

Region	Population density (persons per sq. km. area)					% Change 1971-2011
	1971	1981	1991	2001	2011	
Nepal	**78.5**	**102.1**	**125.6**	**157.3**	**180.0**	**129.3**
Mountain	**22.0**	**25.1**	**27.9**	**32.6**	**34.4**	**56.5**
Eastern	29.2	32.4	34.4	38.5	37.6	28.8
Central	56.4	65.8	75.0	88.4	82.5	46.3
Western	5.9	3.4	3.4	4.2	3.4	-41.9
Mid-western	9.7	11.4	12.2	14.5	18.2	87.7
Far-western	30.1	36.4	42.0	50.2	58.4	94.0
Hill	**90.2**	**105.8**	**121.0**	**142.4**	**146.9**	**62.8**
Eastern	102.9	116.9	133.0	152.9	149.0	44.8
Central	102.9	123.1	144.3	174.0	175.6	70.6
Western	99.2	117.4	132.2	152.5	153.5	54.7

Mid-western	64.6	76.0	89.0	107.4	123.1	90.6
Far-western	77.2	89.4	99.2	118.2	127.5	65.3
Tarai	**127.8**	**192.7**	**253.6**	**329.6**	**391.5**	**206.5**
Eastern	190.9	290.7	365.7	453.9	525.3	175.2
Central	189.8	256.0	325.2	421.7	504.7	165.9
Western	113.1	182.1	252.9	333.3	398.4	252.1
Mid-western	54.0	91.7	127.1	168.2	201.0	272.0
Far-western	40.8	88.1	139.5	205.3	253.2	520.5
Kathmandu Valley	**688.4**	**852.4**	**1,229.6**	**1,829.9**	**2,799.8**	**306.7**

Source: Central Bureau of Statistics, 1975, 1995, 2003, 2012.

CHAPTER III: POPULATION IN THE CONTEXT OF BASIC SERVICES

3.1 Road Accessibility

Accessibility is an important indicator of development. It plays an important role in the movement of people, goods and ideas. Using data from the 2014 Road Network Data, Department of Road, Ministry of Physical Infrastructure and Transport (MoPIT), accessibility situation of districts has been discussed. Two indicators namely road length per 100 sq. km. of total land in the district and population influenced per km. of road length in the district are used for accessibility status.

Of the total road length in the country, the Mountain has 11.9 percent. The Hill with its share of 54.2 percent (including Kathmandu Valley) ranks highest. Tarai has 33.9 percent of the total road length. Data on road length includes a total length of black topped, graveled and earthen road in the districts. The influence area by road or road length per 100 sq. km. of total land area suggests Kathmandu Valley by far ranks highest while districts in Mid-western Mountain have less road access (Table 5). In terms of population influenced per 100 km. road length also, Kathmandu Valley ranks highest and Western Mountain lowest. Central and Eastern Tarai also stand out as having relatively higher values. This means accessibility is better there compared with other districts in the country.

Table 5: Road influence by region, Nepal, 2014

Region	Total road length (in km.)	Percentage	Population influenced per 100 km. road length	Road density (km./100 sq.km. area)
Nepal	**12,494**	**100.0**	**21.3**	**8.5**
Mountain	**1,485**	**11.9**	**12.1**	**2.9**
Eastern	284	2.3	13.9	2.7
Central	421	3.4	12.4	6.7
Western	237	1.9	0.9	4.1

Mid-western	286	2.3	13.8	1.3
Far-western	258	2.1	18.1	3.2
Hill	**6,300**	**50.4**	**14.2**	**10.4**
Eastern	1,360	10.9	11.9	12.7
Central	1,254	10.0	15.4	11.5
Western	1,650	13.2	17.2	9.0
Mid-western	1,355	10.8	12.6	9.9
Far-western	681	5.5	12.7	10.1
Tarai	**4,236**	**33.9**	**31.5**	**12.5**
Eastern	995	8.0	38.3	13.7
Central	1,196	9.6	39.7	12.8
Western	774	6.2	27.0	14.7
Mid-western	804	6.4	18.4	11.0
Far-western	467	3.7	26.0	9.6
Kathmandu Valley	**473**	**3.8**	**53.1**	**52.6**

Source: Road Network Data, Department of Road, Ministry of Physical Infrastructure and Transport (MoPIT), 2014.

Road length per 100 sq. km. of area (influence by road) is 8.5 km. in 2011. Influence area by road decreases from south to north i.e. from the Tarai to the Mountain. Roads exist in all Tarai and Hill districts but Dolpa district of Mountain is deprived of roads. Kathmandu Valley districts demonstrate better situation. Of the 16 eco-development regions (including Kathmandu Valley), Kathmandu Valley has the highest value of road length per 100 sq. km. of area (52.6 km). Western, Eastern and Central Tarai and Eastern Hill are other regions with relatively better values (Table 5). Eco-development regions of the Mountain demonstrate poor situation in general. Inequality among districts in the population influenced by road length and road density is noticeable.

The road density clearly reflects the impact of terrain condition. Tarai having relatively smooth terrain condition, the road length is higher there. But the population influenced per 100 km. road length is not that much higher because of districts having large population sizes there.

3.2 Social Services

3.2.1 School Enrolment

The school enrolment rate of both sexes (percent of school age children aged 5 to 16 years attending primary and secondary schools) in Nepal is 87.9 percent. This means only 88 percent of school age children are enrolled at school. The school enrolment rates (gross) differ by region. Table 6 presents the total number of school age population and the number of school going children.

Table 6: School enrolment rate (both sexes) by region, Nepal, 2011

Region	School age population	School going children	Gross enrolment rate
Nepal	**7,978,900**	**7,014,067**	**87.91**
Mountain	**567,056**	**611,814**	**107.89**
Eastern	122,233	155,072	126.87
Central	155,760	152,136	97.67
Western	3,914	3,120	79.71
Mid-western	126,151	134,484	106.61
Far-western	158,998	167,002	105.03
Hill	**2,774,596**	**2,726,133**	**98.25**
Eastern	488,121	463,896	95.04
Central	588,389	552,544	93.91
Western	832,260	781,297	93.88
Mid-western	573,124	629,727	109.88
Far-western	292,702	298,669	102.04
Tarai	**4,086,096**	**3,189,687**	**78.06**
Eastern	1,103,975	726,175	65.78
Central	1,492,018	1,221,927	81.90
Western	640,463	499,056	77.92
Mid-western	459,632	400,058	87.04
Far-western	390,008	342,471	87.81
Kathmandu Valley	**551,152**	**486,433**	**88.26**

Source: Central Bureau of Statistics, 2012, 2014.

In terms of gross enrolment rate for both sexes Tarai has the lowest rate (78.1%) against the highest rate of Mountain (107.9%) and Hill (98.3%). Taplejung ranks the first and Manang is at the bottom among the 75 districts. Taplejung (140%) and Saptari (68%) are the top and the bottom respectively in Eastern development region. Similarly, Lalitpur (107%) and Dhanusha (72%) are the two extremes in Central development region. Baglung and Lamjung (102% each) and Manang (62%) in Western development region, Jajarkot (138%) and Dang (83%) in Mid-western development region and Baitadi (111%) and Kanchanpur (85%) are the two extremes in Far-western development region.

Gross enrolment rate for girls shows the similar pattern as that of enrolment rated for both sexes but with little higher values for most of the regions. The national average gross enrolment rate for girls in 2011 is 90.9 percent.

The gross enrolment rates for both sexes and girls by eco-development regions are given in Tables 6 and 7 respectively. Five regions namely Eastern Mountain, Mid-western Hill and Mountain, and Far-western Mountain and Hill have enrolment rates higher than 100 percent for both sexes, the highest being for Eastern Mountain (126.9%). The lowest enrolment rate (65.8%) is at Eastern Tarai showing that this region requires some intervention to raise the school enrolment rate.

Enrolment rates for girls are highest in Eastern Mountain and lowest in Western Tarai. Besides Eastern Mountain, eco-development regions namely Mid-western Hill and Mountain, Far-western Mountain and Hill, and Central Mountain have girl's gross enrolment rates more than 100 percent. On the contrary, Western and Eastern Tarai have enrolment rates (girls) lower than 80 percent (Table 7). All eco-development region of Tarai, except Far-western Tarai have enrolment rates for girls below the national average.

Table 7: School enrolment rate (girls) by region, Nepal, 2011

Region	School age girls	School going girls	Gross enrolment rate
Nepal	**3,932,362**	**3,575,967**	**90.94**
Mountain	**284,444**	**303,527**	**106.71**
Eastern	61,276	69,814	113.93
Central	78,693	79,180	100.62
Western	1,943	1,601	82.40
Mid-western	62,921	68,076	108.19
Far-western	79,611	84,856	106.59
Hill	**1,391,907**	**1,389,138**	**99.80**
Eastern	244,393	238,238	97.48
Central	296,061	282,054	95.27
Western	415,962	392,397	94.33
Mid-western	288,185	323,706	112.33
Far-western	147,306	152,743	103.69
Tarai	**1,996,317**	**1,651,571**	**82.73**
Eastern	543,015	422,703	77.84
Central	721,374	612,994	84.98
Western	313,521	232,631	74.20
Mid-western	227,519	202,509	89.01
Far-western	190,888	180,734	94.68
Kathmandu Valley	**259,694**	**231,731**	**89.23**

Source: Central Bureau of Statistics, 2012, 2014.

Gross enrolment rates are in some cased higher than 100 percent. This happens when children below 5 years and above 16 years attend school. In addition, children of one district may go to the schools located in the other districts. Such students will be counted among the school age children of their districts of birth but they will be counted among the school going children in the districts where they are enrolled in. However, it is likely that the first reason prevailed for respective ecological regions are relatively worse off from socio-economic point of view. Therefore it is very likely that a significant number of school going children of those districts are outside the school as defined earlier. On the

other hand, the high enrolment rates in Mountain (106.7%) may be due to enrolment of students of higher age groups than considered for school going age in the country.

3.2.2 Health Services

Accessibility to health services is another indicator of social development. The availability of health services is not good in rural areas and even worse in mountain and hill areas. There are only 4,275 health facilities (hospitals, primary health care centers, health posts and sub-health post) and serves about 6,198 persons on the average. Private clinics and nursing homes are not included in this data (Table 8).

Table 8: Population per health service facility by region, Nepal, 2014/15

Region	Total health service facility	Population per health service facility
Nepal	**4,275**	**6,198**
Mountain	**578**	**3,083**
Eastern	129	3,039
Central	160	3,235
Western	31	645
Mid-western	138	2,817
Far-western	120	3,861
Hill	**2,037**	**4,358**
Eastern	413	3,877
Central	384	4,986
Western	669	4,202
Mid-western	344	4,906
Far-western	227	3,798
Tarai	**1,478**	**9,011**
Eastern	413	9,245
Central	619	7,605
Western	234	8,956
Mid-western	131	11,225
Far-western	81	15,148
Kathmandu Valley	**182**	**13,830**

Source: Department of Health Services, Ministry of Health (MoH), 2015.

Table 8 shows that average population served by a health facility in Nepal is 6,198. These figures are not the same across the regions. Contrary to expectation the Mountain region has the lowest average population per health service facility, i.e. 3,083 people. This shows that mountain area has a better health services facility than any other region of Nepal. But the reality is quite different. Majority of the mountain people have no access to such facility. The main reason for such low population per health service facility is that all districts in Nepal have a hospital. Besides, there are also some health centers, health posts and sub-health posts in all the districts.

Though a larger number of private clinic and nursing homes are available in Kathmandu Valley such facility are not included in this analysis because of unavailability of authentic data on these facilities. Since the population in Kathmandu Valley and Tarai are large among all other regions, average number of persons served by health service facility appears to be the larger in these regions. Western development region has the lowest figure. The district level figures show that Kathmandu district has the largest population per health service facility (16,455) followed by Kailali (15,514), Kanchanpur (14,556), Jhapa (14,257) and Sunsari (14,139). Similarly, the lowest population per health service facility is observed in Manang (467) followed by Mustang (791), Dolpa (1,529), Humla (1,884) and Mugu (2,126).

Inter-regional inequality in population per health service facility for the 16 eco-development regions is apparent. Far-western Tarai has the largest population (15,148) per health service facility followed by Kathmandu Valley (13,830), Mid-western, Eastern, Western and Central Tarai with 11,225, 9,245, 8,956 and 7,605 respectively. Western Mountain demonstrates smallest number of population per health service facility i.e. 645 (Table 8). This does not necessarily indicate that the Western Mountain is better off in terms of health services facility because the sparsely distributed population in this region makes the facilities very inaccessible as compared to other more densely populated regions.

3.2.3 Drinking Water

Accessibility to safe drinking water is another indicator of socio-economic condition. Safe drinking water is necessary for preventing many contagious diseases. About 83 percent households in Nepal have access to tap or tube well water. In the proportion of households with such drinking water accessibility, Mid-western and Far-western regions are far behind than other three regions (Table 9).

Table 9: Distribution of households with access of drinking water by region, Nepal, 2011

Region	Total household	Household with tap/ tube well	Percentage
Nepal	**5,427,302**	**4,496,344**	**82.8**
Mountain	**364,120**	**278,302**	**76.4**
Eastern	84,918	68,466	80.6
Central	122,154	97,908	80.2
Western	4,834	4,443	91.9
Mid-western	68,902	47,461	68.9
Far-western	83,312	60,024	72.0
Hill	**1,919,653**	**1,464,529**	**76.3**
Eastern	346,571	266,735	77.0
Central	401,404	317,969	79.2
Western	677,498	559,319	82.6
Mid-western	332,153	217,262	65.4
Far-western	162,027	103,244	63.7
Tarai	**2,528,752**	**2,316,459**	**91.6**
Eastern	800,016	760,096	95.0
Central	825,710	748,977	90.7
Western	384,030	358,488	93.3
Mid-western	294,364	235,766	80.1
Far-western	224,632	213,132	94.9
Kathmandu Valley	**614,777**	**437,054**	**71.1**

Source: Central Bureau of Statistics, 2012.

Mountain and Hill regions lag behind Tarai with respect to drinking water services. Only about 76 percent each in Hill and Mountain households have an access to tap/tube well water. The remaining households (24%) have water available from other sources. The situation of Kathmandu Valley is even worse as shown by data with only 71 percent of households having access of tap or tube well water.

At the district level, Dailekh has a worse scenario with respect to tap/tube well drinking water accessibility. Less than 52 percent of the total households of this district have such accessibility followed by Dang (55.2%), Achham (55.6%), Jajarkot (56.1%) and Kalikot (58.0%). Bardiya district seems to have the highest accessibility (97.8%) in this regard, followed by Rupandehi (97.5%), Morang (96.9%), Kanchanpur (96.7%), Sunsari (96.3%), and Bara and Saptari (96.0% each).

Percent of households with tap/tube well water ranges from 64 percent to 95 percent for different eco-development regions. Drinking water coverage is better in Tarai in general. Far-western and Mid-western Hills have the least household coverage in terms of drinking water supply (Table 9). Less than two out of three households have access to such drinking water. Mid-western Mountain with about two-third households having such accessibility follows this region. Apart from Mid-western Mountain, other regions with poor drinking water coverage include Far-western Mountain and Eastern and Central Hills, besides Kathmandu Valley. The regions with better drinking water coverage include Eastern, Far-western, Western and Central Tarai, and Western Mountain.

3.3 Non-farm Activities

3.3.1 Population in Non-farm Activities

The proportion of population engaged in activities other than agriculture also indicates the level of development of the economy. Modernized economies have higher proportion of population being engaged in manufacturing and services sector.

Table 10 presents the economically active population (aged 10 and above) by regions. The table also presents the total number of non-farm population out of the total

economically active population. The 2011 census data have been used for this purpose. However, CBS (2002) does not report the data on non-farm activities. Therefore, the non-farm population for this study is calculated as the difference between total economically active population and the population engaged in agriculture (including forestry and fishery).

Table 10: Distribution of population (10 years of age and above) in non-farm activities by region, Nepal, 2011

Region	Economically active population	Population engaged in non-farm activities	Percentage
Nepal	**9,929,563**	**3,929,086**	**39.6**
Mountain	**775,772**	**156,338**	**20.2**
Eastern	175,646	34,350	19.6
Central	245,955	52,225	21.2
Western	11,079	4,690	42.3
Mid-western	162,736	28,182	17.3
Far-western	180,356	36,891	20.5
Hill	**3,639,461**	**924,667**	**25.4**
Eastern	708,850	136,320	19.2
Central	835,862	214,618	25.7
Western	1,125,011	356,029	31.6
Mid-western	627,985	151,276	24.1
Far-western	341,753	66,424	19.4
Tarai	**4,571,696**	**2,041,867**	**44.7**
Eastern	1,399,784	696,221	49.7
Central	1,443,437	697,605	48.3
Western	761,407	304,155	39.9
Mid-western	534,541	202,486	37.9
Far-western	432,527	141,400	32.7
Kathmandu Valley	**942,634**	**806,214**	**85.5**

Source: Central Bureau of Statistics, 2013.

About 40 percent of the economically active population in Nepal is engaged in non-farm activities. This means the remaining 60 percent of the total active population is engaged in agriculture related activities. This figure is considered to be relatively high compared to international standard norms. Mountain region (20.2%) has the lowest percentage of active population engaged in norm-farm activities that only about one-fifth of the total active population is engaged in non-agriculture activities. This might have occurred due to limited job opportunity in that region. On the contrary Kathmandu Valley and Tarai region seem to have more opportunity to economically active population to engage in non-farm activities as the percentage engaged in non-farm activities in these regions are found to be about 86 and 45 respectively. At the district level, Kathmandu (90.9%) ranks the first and Khotang (12.9%) is at the bottom of the list among all 75 districts of Nepal.

For eco-development regions, the proportion of population engaged in non-farm activities ranges from 17.3 percent in Mid-western Mountain to as high as 85.5 percent in Kathmandu Valley (Table 10). If Kathmandu Valley is considered as an exception, there are only 3 regions where more than 40 percent of total economically active population aged 10 and above are engaged in non-farm activities, which included Eastern and Central Tarai (49.7% and 48.3% respectively) and Western Mountain (42.3%).

3.3.2 Manufacturing Establishments

There are only 4,076 manufacturing establishments or industries in Nepal. Only two percent of the total active population is engaged in these industries (Table 11). The population employed in this sector is even lower and this might have been because of some people engaged in this sector are unpaid self-employed.

Table 11: Manufacturing establishment and population engaged by region, Nepal, 2011/12

Region	Economically active population	No. of industry	Persons engaged		Persons employed	
			Number	%	Number	%
Nepal	**9,929,563**	**4,076**	**204,360***	**2.06**	**194,989***	**1.96**
Mountain	**775,772**	**47**	**920**	**0.12**	**753**	**0.10**

Eastern	175,646	12	209	0.12	151	0.09
Central	245,955	23	603	0.25	532	0.22
Western	11,079	3	53	0.48	34	0.31
Mid-western	162,736	2	0	0.00	0	0.00
Far-western	180,356	7	55	0.03	36	0.02
Hill	**3,639,461**	**665**	**17,322**	**0.48**	**15,665**	**0.43**
Eastern	708,850	48	2,623	0.37	2,537	0.36
Central	835,862	150	5,403	0.65	4,946	0.59
Western	1,125,011	416	8,674	0.77	7,674	0.68
Mid-western	627,985	46	555	0.09	450	0.07
Far-western	341,753	5	67	0.02	58	0.02
Tarai	**4,571,696**	**2,731**	**146,820**	**3.21**	**140,912**	**3.08**
Eastern	1,399,784	812	47,808	3.42	46,004	3.29
Central	1,443,437	836	48,575	3.37	46,977	3.25
Western	761,407	536	31,890	4.19	30,585	4.02
Mid-western	534,541	328	11,992	2.24	11,188	2.09
Far-western	432,527	219	6,555	1.52	6,158	1.42
Kathmandu Valley	**942,634**	**633**	**39,147**	**4.15**	**37,537**	**3.98**

*Total figures of Nepal do not match with sum of individuals due to unmatched published data.

Source: Central Bureau of Statistics, 2013.

The proportion of total economically active population engaged and employed in industries is lowest in Mountain region (0.12%) and highest in Kathmandu Valley (4.15%) followed by Tarai (3.21%). Not many industries are established in the Mountain because of transportation problem. Even the transportation system is better in the Tarai than in the Hill, many industrial estates of the country lie in Kathmandu Valley. Therefore, the number of industries and people engaged/employed in industries is higher in Kathmandu Valley than in Tarai.

3.4 Energy Situation: Electricity Supply

In the country 67 percent households are served by electricity in 2011. The electricity covers energy generated from hydropower plants, solar and thermal plants. Kathmandu and Bhaktapur rank highest in terms of households covered by energy supply. In each of these two districts 98 percent households have electricity supplies. The coverage is poor in the Mid-western and Far-western regions, especially in the Mountains and the Hills. On the contrary, household coverage in terms of energy supply is relatively good in the districts of Central development region. Many districts in the Eastern Mountain and Hill also have poor energy supply situation. Of the districts, Jajarkot have least coverage of households (4%).

Chapter IV: POPULATION PRESSURE INDEX

4.1 Methodological Clarification

Population Pressure Index (PPI) has been calculated using the method described in the methodological section. The original formulation emphasized its application more on rural areas than in urban areas. In the context of Nepal, it characterized by low level of urbanization. The urban population is not separated from the calculation due to the predominance of municipalities without urban facilities. Apart from this, there are some points that need clarification while interpreting the index.

This index calculation is based primarily on cereal crop production (5 year average) of the districts. This means population pressure in terms of available food crop production. Correspondingly, the constant value used for calculation is also based on cereal requirement in the total daily calorie intake of a person. Unlike earlier studies, which have used cash figures i.e., conversion of all primary products into cash value, this study uses calorie figures i.e., conversion of cereal products into calorie value.

The PPI calculation is based on nutrition requirement of an Individual as reported in the Report of the Commission on Strengthening the Supplies System (2051: 146-148). Accordingly, the stated requirements are 2,344 calories per person per day in the Hill and Mountain and 2,144 calories per day in the Tarai. It is also estimated that 87.3 percent of the total calories should be available from cereals. The calculation of required amount is based on the proportion of cereals needs. Thus, the cereals requirement is estimated at 2046.3 calories for the Hill and 1871.7 calories for Tarai. This method of using calorie available and calorie required is preferred over conversion of crop outputs into cash values to calculate Population Pressure Index. When primary products are converted into cash values at the district levels, the prices of each crop at the same scale is necessary. Otherwise one metric tons of rice in Jumla will have possibility of having same cash values as that in Banke. To avoid this odd, calorie conversion is considered desirable. This way, better regional pictures emerges and variations are clearly established. Moreover, district level data on prices of commodities for each district are not available.

The inclusion of cash crop would be an asset. But whereas there was the problem of fair conversion to cash value at district level, neither the area coverage neither the proportion in the total crop production was large enough to alter the pattern when sugarcane production is excluded. Sugarcane production is mainly concentrated in Tarai, an area with high level of cereal production.

In the mountain region potato is consumed as basic crop. Inclusion of potato production as part of basic crop is desirable. While calculating PPI, 2 scenarios are presented: one based on 5 basic crops namely paddy, wheat, maize, millet and barely and other with inclusion of potato as basic crop.

Furthermore, instead of using total area of district (spatial unit) as in the Sen Gupta model of PPI, in the calculation using five cereal crops only, the total cultivated area of the districts is used as the denominator. Cultivated area is preferred to total area for its relevance to cereal production.

4.2 Cultivated Land

Cultivated land is the main resource for agrarian population. In Nepal data on cultivated land for the country as a whole is available for two time periods: Land Resource Mapping Project (LRMP) 1978/79 and Japan Forest Technology Association (JAFTA) 2000. The land resource situation in both these time period is discussed below.

4.2.1 Cultivated Land (LRMP), 1978/79

In 1978/79, only 18 percent of total area of the country was cultivated land. This proportion is based on air photo data of Land Resource Mapping Project, 1978/79. According to the same source forestland occupied 38 percent of the total area of the country. The proportion of forestland in the Mountain region was 24.4 percent. Similarly, of the total land in the Hill and Tarai, forest occupied 45.5 and 45.7 percent respectively. The proportion of the area under forest cover varies by district.

As an agricultural country where overwhelming majority of population depend on agriculture, cultivated land is the prime resource of the country. The size of rural population that can be supported in a given area depends upon the proportion of the land under cultivation at present and the proportion that could be brought under cultivation in the near future. Several studies in Nepal have noted that the amount of land that can be brought under cultivation in future in Nepal is limited.

While 18 percent of total land in the country is categorized as cultivated land, the proportion differs by ecological regions and by districts. In general, the proportion of cultivated land decreases from south to north. Because of the landform and altitudinal variation, it is quite natural for the Mountain region to have small proportion of land suitable for cultivation. On the contrary, the Tarai region has higher proportion of total land under cultivation. The hill region occupies an intermediate position. Of the total land in the Mountain, cultivated land occupies 4.4 percent. The corresponding proportions in the Hill and the Tarai are 17.2 and 40.0 percent respectively. There is also an east-west variation in the proportion of the land under cultivation. The proportion of cultivated land is higher in the east and it gradually decreases towards west. This applies for all ecological zones.

Jhapa district has the highest proportion of land under cultivation. Of its total land, 68.2 percent is under cultivation. Manang represents the contrary with negligible proportion i.e., 0.3 percent of land under cultivation. Among 75 districts, largest proportion (26.6%) has 20-30 percent land under cultivation and districts with 10-20 percent land under cultivation (25.3%) follow this. Districts with higher proportion of cultivated land are located in the eastern Tarai. Despite hilly terrain, districts in the eastern hills are almost comparable with Mid- and Far-western Tarai in the proportion of cultivated land. Humla, Dolpa, Mustang and Manang are among districts having lowest proportion of land under cultivation.

Table 12 gives the distribution of per capita cultivated land per person using data of population census 2011 and the LRMP, 1978/79 data. At the national level the cultivated land per person for 2011 is 0.100 hectare. When grassland is included as part of cultivated land the figures comes out to be 0.166 hectare. At the household level, the average cultivated land comes out to be 0.795 hectare.

Table 12: Distribution of cultivated land per capita based on LRMP (1978/1979), Nepal, 2011

Region	Cultivated land (ha.) per person	Cultivated land including grass (ha.) per person	Cultivated land (ha.) per household
Nepal	**0.099668**	**0.165996**	**0.795324**
Mountain	0.127511	0.765838	3.341351
Hill	0.092530	0.140429	0.621269
Tarai	0.102049	0.107622	0.563174

Source: New ERA/UNFPA, 2003; Central Bureau of Statistics, 2003, 2012.

Variation by ecological region is obvious. Per capita cultivated land (net) is highest in Mountain. This generalization is further reinforced when grassland is included as part of cultivated area of total land. Hill has lowest per capita land when net cultivated land is taken into consideration. But when grassland is included (i.e. cultivated land plus grassland) Tarai has lowest per capita figure whereas the hill demonstrates the middle position. Area under grassland decreases from north to south or from mountain to plains. As a result, when grassland (pasture) is included as part of agricultural land, Mountain demonstrates highest per capita.

Table 12 uses population data of 2011. But when data from 1981 census is taken into account the cultivated land per capita came out to be 0.29275 hectare (with inclusion of grassland). The per capita for Mountain, Hill and Tarai were 1.04733, 0.22337 and 0.21861 hectare respectively. With exclusion of grassland, average per capita cultivated land was 0.17578 with regional variation of 0.17438, 0.14718 and 0.20729 for Mountain, Hill and Tarai respectively.

Another way of expressing land resource availability is through man-land ratio. Man-land ratio is high is districts located in Central and Western Hills. National average comes out to be 10.5 persons per hectare in 2011. Districts located in Mountain regions have lower ratio in general although the quality of land there may not be comparable with that of the region in Tarai.

4.2.2 Cultivated Land (JAFTA), 2000

Japan Forest Technology Association (JAFTA), 2001 had provided area of agriculture and grass for 75 districts of country. The total agriculture (including grass land) in 2000 was 4,061,631 hectare which consumed 27.6 percent of total area of country. This high proportion is due to inclusion of grassland in same category. It is not possible to separate grassland area from agriculture land in this source. The area under forest is another important indicator of resource availability.

In the Mountain, 10 percent of total area is under cultivation according to this source. The corresponding proportions are 27.2 and 55.2 percent in Hill and Tarai. Variations by eco-development regions in proportion of cultivated land are also evident. The two extremes include Western Mountain with 0.1 percent and Eastern Tarai with 75.6 percent of total area under cultivation. The proportion of cultivated land decreases from east to west and from south to north. The north-south variation is rather distinct than east-west variation. In general districts located in Tarai have higher proportion of cultivated land compared with districts in Hill and Mountain. Generally, districts from Eastern and Central Tarai have more than 50 percent of total land under cultivation. Some districts from Hill namely Tehrathum, Dhankuta, Okhaldhunga and Kathmandu also have more than 50 percent of their land under cultivation. More importantly, by 2000 all Tarai districts have more than 30 percent of their total land under of cultivation. Banke is the only exception.

Cultivated land per person in 2011 is 0.153 hectare for the country as a whole. Among ecological regions Tarai has lowest per capita land i.e., 0.141 hectare. Mountain on the other hand demonstrates highest value, as a result of low population size. Although the per capita land in Hill is higher than Tarai, the difference is rather minimal whereas the difference between Hill and Mountain is far higher than the difference between Hill and Tarai (Table 13).

The distribution of cultivated land per household shows a similar situation. Land per household is lowest in Hill followed by Tarai. Land per household in Mountain is nearly double than in Hill. In the country as a whole, land per household is less than one hectare. This figure is lower than one available from Land Resource Mapping Project. Although

these two sources are not strictly comparable, decrease in amount of land per household is quite logical given rapid increase of population over last two decades.

Table 13: Distribution of cultivated land per capita based on JAFTA (2001), Nepal, 2011

Region	Cultivated land (ha.) per person	Cultivated land (ha.) per household
Nepal	**0.153301**	**0.734497**
Mountain	0.290930	1.269328
Hill	0.146249	0.647024
Tarai	0.140921	0.737422

Source: New ERA/UNFPA, 2003; Central Bureau of Statistics, 2003, 2012.

Table 14 shows the man-land ratio for 2011. By ecological zone, it is highest in Hill and lowest in Mountain. Similarly, it is highest in Central region and lowest in Eastern region. Man-land ratio by eco-development region shows Kathmandu valley with very high ratio in 2011. In exception to Kathmandu Valley, Far-western Hill and Mountain have higher man-land ratios and Eastern Mountain has the lowest man-land ratio.

Kathmandu district has highest man-land ratio of 181.8 persons per hectare and Okhaldhunga has the lowest value of 5.2 persons per hectare. Bhaktapur, Lalitpur, Kaski, and Bajhang are among the districts with high man-land ratios. On the other hand Tehrathum, Ilam, Sankhuwasabha, and Solukhumbu are among the districts with low man-land ratios.

Table 14: Man-land ratio by region, Nepal, 2011

Region	Land holdings (ha.)	Total population	Man-land ratio (P/ha.)
Nepal	**2,525,639**	**26,494,504**	**10.5**
Mountain	213,932	1,781,792	8.3
Hill	986,073	11,394,007	11.6
Tarai	1,325,635	13,318,705	10.0
Eastern	755,178	5,811,555	7.7
Central	716,861	9,656,985	13.5

Western	482,547	4,926,765	10.2
Mid-western	353,624	3,546,682	10.0
Far-western	217,430	2,552,517	11.7

Source: Central Bureau of Statistics, 2013.

4.3 Area and Production of Basic Crops

It is essential to discuss area and production of basic crops before calculating population pressure index. Five cereal crops namely paddy, wheat, maize, millet and barley, and potato have been considered in this study. Table 15 gives the cropped area, production and yield of these crops. The table also gives figures of main cash crops namely sugarcane, oilseeds, tobacco, jute and cotton. This is simply to present the relative importance of cereal crops in total crop production in the respective areal units. The following discussion focuses primarily on issues related to cereal crops. The production figures are five-year averages of 2008/09 to 2012/13. Of all crops, paddy has the largest proportion in area coverage as well as in production. This is followed by maize and wheat in both area coverage and production. Paddy also ranks highest in yield per hectare among cereal crops and wheat comes next in yield per unit and followed by maize, barley and millet.

Table 15: Distribution of cropped area, production and yield for major crops, Nepal

Major crops	Cropped area (ha.)		Production (metric ton)		Yield
	Area	%	Production	%	(mt./ha.)
Food crops	**3,673,027**	**92.2**	**12,341,375**	**77.8**	**3.360**
Paddy	1,486,951	37.3	5,047,047	31.8	3.394
Wheat	754,485	18.9	1,883,143	11.9	2.496
Maize	928,761	23.3	2,283,222	14.4	2.458
Millet	271,183	6.8	304,075	1.9	1.121
Barley	28,112	0.7	34,876	0.2	1.241
Sub-total	3,469,492	87.1	9,552,363	60.2	2.753
Potato	203,535	5.1	2,789,012	17.6	13.703
Cash crops	**311,178**	**7.8**	**3,524,273**	**22.2**	**11.326**
Sugarcane	76,863	1.9	3,315,940	20.9	43.141

Oilseed	224,583	5.6	194,537	1.2	0.866
Tobacco	774	0.0*	1,005	0.0*	1.298
Jute	8,828	0.2	12,659	0.1	1.434
Cotton	130	0.0*	132	0.0*	1.015
Total	3,984,205	100.0	15,865,648	100.0	3.982

*Less than 0.05 percent.

Source: Central Bureau of Statistics, 2013.

There are variations in average productions of all these basic crops. Average paddy production is 62,101 metric ton per district. Similarly, wheat and maize productions are 23,770 and 27,692 metric ton respectively. Average millet production per district is 4,072 metric ton, while barley production is 439 metric ton. The production of cereal crops per district by ecological regions suggests that districts in Tarai have highest production of paddy and wheat, whereas average productions of maize and millet are highest in Hill districts and that of barley in Mountain districts.

Table 16: Average production (in metric ton) of major cereal crops per district in 5-years period by ecological zone, Nepal

Ecological zone	Cereal crops				
	Paddy	Wheat	Maize	Millet	Barley
Nepal	**62,101**	**23,770**	**27,692**	**4,072**	**439**
Mountain	8,568	5,167	12,259	3,665	1,112
Hill	30,981	13,578	37,622	6,068	372
Tarai	165,612	58,141	20,675	505	84

Source: Central Bureau of Statistics, 2013.

The area, production and yield of major crops in Mountain are presented in Table 17. Potato and maize appear first and second major crops in terms of production, whereas in terms of area coverage maize comes first. Potato has highest yield per hectare and millet lowest.

Table 17: Distribution of cropped area, production and yield for major crops, Mountain Nepal

Major crops	Cropped area (ha.)		Production (metric ton)		Yield
	Area	%	Production	%	(mt./ha.)
Food crops	310,436	98.1	992,319	98.0	3.197
Paddy	61,620	19.5	149,565	14.8	2.427
Wheat	52,477	16.6	97,674	9.6	1.861
Maize	90,968	28.7	197,286	19.5	2.169
Millet	53,865	17.0	58,274	5.8	1.082
Barley	14,775	4.7	18,384	1.8	1.244
Sub-total	273,705	86.4	521,183	51.5	1.904
Potato	36,731	11.6	471,136	46.5	12.827
Cash crops	6,172	1.9	20,078	2.0	3.253
Sugarcane	251	0.1	16,570	1.6	66.016
Oilseed	5,914	1.9	3,457	0.3	0.585
Tobacco	7	0.0*	51	0.0*	7.286
Jute	0	0.0	0	0.0	0.000
Cotton	0	0.0	0	0.0	0.000
Total	316,608	100.0	1,012,397	100.0	3.198

*Less than 0.05 percent.

Source: Central Bureau of Statistics, 2013.

The area, production and yield of major crops in Hill are presented in Table 18. Maize and paddy emerge as most dominant crops in both area coverage and production. The production and area coverage of wheat comes next followed by millet and barley.

Table 18: Distribution of cropped area, production and yield for major crops, Hill Nepal

Major crops	Cropped area (ha.)		Production (metric ton)		Yield
	Area	%	Production	%	(mt./ha.)
Food crops	1,661,643	97.0	4,940,975	98.7	2.974
Paddy	409,398	23.9	1,321,941	26.4	3.229
Wheat	270,593	15.8	577,503	11.5	2.134

Maize	676,571	39.5	1,617,911	32.3	2.391
Millet	207,828	12.1	236,209	4.7	1.137
Barley	12,261	0.7	15,151	0.3	1.236
Sub-total	1,576,651	92.1	3,768,715	75.3	2.390
Potato	84,992	5.0	1,172,260	23.4	13.793
Cash crops	50,651	3.0	65,989	1.3	1.303
Sugarcane	975	0.1	20,520	0.4	21.046
Oilseed	49,598	2.9	45,324	0.9	0.914
Tobacco	78	0.0*	145	0.0*	1.859
Jute	0	0.0	0	0	0.000
Cotton	0	0.0	0	0	0.000
Total	1,712,294	100.0	5,006,964	100.0	2.924

*Less than 0.05 percent.

Source: Central Bureau of Statistics, 2013.

The area, production and yield of major crops in Tarai are presented in Table 19. Paddy by far is the most dominant crop in both area coverage and production. Wheat emerges as second major crop in both area coverage and production. The share of barley and millet in total area coverage and production are very small.

Table 19: Distribution of cropped area, production and yield for major crops, Tarai Nepal

Major crops	Cropped area (ha.)		Production (metric ton)		Yield
	Area	%	Production	%	(mt./ha.)
Food crops	1,700,948	87.4	6,408,081	65.2	3.767
Paddy	1,015,933	52.2	3,575,541	36.4	3.519
Wheat	431,415	22.2	1,207,966	12.3	2.800
Maize	161,222	8.3	468,025	4.8	2.903
Millet	9,490	0.5	9,592	0.1	1.011
Barley	1,076	0.1	1,341	0.0*	1.246
Sub-total	1,619,136	83.2	5,262,465	53.5	3.250
Potato	81,812	4.2	1,145,616	11.7	14.003
Cash crops	245,397	12.6	3,425,415	34.8	13.959
Sugarcane	75,637	3.9	3,278,850	33.3	43.350
Oilseed	169,071	8.7	145,756	1.5	0.862
Tobacco	689	0.0*	809	0.0*	1.174
Jute	0	0.0	0	0.0	0.000
Cotton	0	0.0	0	0.0	0.000
Total	1,946,345	100.0	9,833,496	100.0	5.052

*Less than 0.05 percent.

Source: Central Bureau of Statistics, 2013.

The production of major cereal crops varies not only by ecological zones but also by districts within zones. Paddy is grown in all districts except Manang and Mustang. Paddy and wheat are grown in large quantity in Tarai districts. Jhapa ranks first in production of paddy followed by Rupandehi, Morang and Kapilbastu. Wheat is comparatively more grown in Dhanusha, Rupandehi, Bara, Parsa and Kapilbastu. Similarly, maize is grown in large quantity in Hill districts and Syangja ranks highest in maize production.

Millet is important in Hills and Mountain districts. The production situation of barley shows that it has primary concentration in Mountain districts. Apart from Mountain districts noticeable production of barley is evident in Hill districts also. Of all crops, its share in total cereal production is highest in Hill districts.

Potato is grown in all 75 districts. It is considered more important in the mountain districts although its production is higher in the Hill and Tarai districts. Jhapa, Bara and Kavrepalanchowk are notable for potato production.

4.4 PPI Based on Cereal Crop Production

Based on methodology discussed earlier, the total cereal calorie requirements for 75 are calculated first, then the total cereal output. These two values are then compared for the purpose of calculating PPI. The PPI values are interpreted as neutral, positive and negative. A value of zero indicates a neutral situation. The positive values indicate the area with over population while negative values suggest areas with under population. All three categories are relative. They express the situation of population in the district at the current level of production and technology. In addition, the relative level of over or under population is interpreted in terms of their proximity to zero. Proximity to zero with positive values indicates over population but less critical. The farther the positive values are from zero, the more critical they are in terms of population pressure.

The following discusses PPI based on calories available from five basic crops namely barley, maize, millet, paddy and wheat. The cereal requirements per person per day remain the same in the calculation as with inclusion of potato. With not including potato, the national average value of PPI for 2011 comes out to be 2.9, which shows a negative situation being over populated at the current level of production of cereal crops. The calculation suggests a difference between the actual census count (2011) and the estimated number of inhabitants capable of being supported by the cereal crops produced in the total cropped area at the current level of technology (Pi) in the country. By definition the value is positive which means a negative situation. The Pi is estimated at 19,116,016, while the total population enumerated was 26,494,504 in 2011. The PPI values suggest all 3 ecological zones Mountain, Hill and Tarai showing a negative situation. With exclusion of calories available from potato as part of cereal requirement the location of districts in the categories changes. This change is quite apparent in the Mountain and Hill districts. Fifteen out of 16 Mountain districts show negative situation implying over population. Overall 64 districts fall under negative category. In Mountain, only one district, 4 districts from Hill and 5 districts from Tarai show positive situation

meaning a relative under population. These figures are 8, 15 and 8 respectively when calories from potato are included in the calculation of cereal availability in the district.

Table 20: Distribution of number of districts by PPI value for ecological zones, Nepal, 2014

PPI index	Ecological zones			Total	Remarks
	Mountain	Hill	Tarai		
< -3.0	-	-	1	1	Positive
-3.0 to -2.1	-	1	-	1	
-2.0 to -1.1	1	1	3	5	
-1.0 to -0.1	-	2	1	3	
0	-	-	1	1	Neutral
0.1 to 1.0	1	5	2	8	Negative
1.1 to 2.0	3	8	1	12	
2.1 to 3.0	2	6	3	11	
> 3.0	9	16	8	33	
Total	16	39	20	75	

One district namely Rupandehi from Western Tarai emerged as neutral with its PPI value of 0. The inclusion of potato in cereal calorie changes PPI values of districts as a whole. As a result, overall change is more towards positive but for other districts changes in PPI values may not change their relative standing in region.

4.5 PPI Including Potato Production

When district level production of six crops namely paddy, wheat, maize, millet, barley and potato are taken together, the national average value of PPI for 2011 comes out to be 1.4. This also suggests a negative population situation. The estimated number of inhabitants capable of being supported by basic crops produced in total cropped area of country is 23,051,685 while total population in country was 26,494,504. Of all districts, 31 districts demonstrate positive situation, 44 districts demonstrate negative situation and one district namely Jumla displays neutral situation with PPI value 0. Districts showing positive situation are largely from Hills (15 districts) and more districts showing negative

situation are also from Hills (24 districts). Among the mountain districts, 8 districts with production of potato demonstrate positive situation, 7 negative and one neutral. Likewise, 8 Tarai districts have positive situation and 12 negative.

Majority of Hill districts show over population at current level of basic crops production. Relative status of districts with their PPI value suggests that more districts also in Hills are stressed in terms of resource use than others. Moreover, more districts located in Eastern region show better situation than those located in Far-western, Mid-western and Central.

Table 21: Distribution of number of districts by PPI value (including production of potato) for ecological zones, Nepal, 2014

PPI index	Ecological zones			Total	Remarks
	Mountain	Hill	Tarai		
< -3.0	4	2	2	8	Positive
-3.0 to -2.1	1	2	1	4	
-2.0 to -1.1	-	6	2	8	
-1.0 to -0.1	3	5	3	11	
0	1	-	-	1	Neutral
0.1 to 1.0	-	3	2	5	Negative
1.1 to 2.0	2	5	2	9	
2.1 to 3.0	1	5	2	8	
> 3.0	4	11	6	21	
Total	16	39	20	75	

As noted earlier, for policy intervention and regional development perspective, discussion of PPI values for eco-development region is imperative. With the PPI values including calories available from potato, 7 out of 16 eco-development regions have negative values of various extents. This analysis suggests that 3 eco-development regions of Tarai and 2 each of Hill and Mountain demonstrate under population. Of all regions, Kathmandu has the highest positive values demonstrating over population. Apart from Kathmandu valley other region with higher positive values includes Far-western Mountain, but the difference is very large. Overall, with exceptions of Kathmandu valley and Eastern and Western Mountain (two extreme ends), interregional difference in PPI values is not very wide, if compared with the variation at the district level. While PPI at the national level is 1.4, the range at the eco-development level is from -3.0 (Eastern Mountain) to 3.3 (Far-western Mountain), excluding Kathmandu Valley.

4.6 Identification of Critical Areas

PPI values are helpful in identifying the relative extent of over or under population of the districts that are dominantly rural in character. In this case, the values are based on five year average production of cereal crops in the district. These values are as good as the

quality of data on agricultural production available where fluctuations are common than rare. However, the five year average figures are assumed to overcome the problem of fluctuation. Since PPI values are based on current level of production and technology, they change with the change in technology and subsequent change in production. More importantly, the growth of population is vital in affecting the values of PPI. Thus, population increase in the district with no change in crop production quickly changes the negative PPI values into positive. Likewise, change in production will have similar impact.

Therefore, PPI is relative indicator and for identification of critical areas for policy improvement, these values need to be assessed in association with population growth rate of the district, existing man land ratio and proportion of population dependent on agriculture. As a result, to identify critical areas three additional indicators namely growth rate of population (1981-2011), proportion of population engaged in agriculture (2011) and man-land ratio (2011) were calculated and an average ranking was obtained for these three indicators. Since PPI is sensitive to growth of population it is important to consider population growth rate in connection with the values. For this, growth rate of longer period, i.e. 1981-2011 is considered more meaningful than that between 2001 and 2011.

Districts in the southern parts of the country have higher growth rates than those located in the northern parts. Similarly, the PPI is more meaningful in the agrarian situation; proportion of population engaged in agriculture is also considered important. Thus, this indicator is also considering important to be included in order to indentify critical areas of population pressure. Present man-land ratio reflects availability of cultivated land and it is imperative to bring the changes in the current level of district output. Therefore, districts were rank in terms of these three indicators. Once the average ranking of three indicators was obtained it was added to the ranking obtain from PPI values. After that an average of two set of value was obtained which give the final ranking from good to poor. The low value indicates better situation and the high value indicates the poor. For convenience, 75 districts have been grouped into three with the equal number in each category. The result is presented in Table 22.

Table 22: Classification of districts based on growth rate of population, proportion engaged in agriculture, man-land ratio and PPI index, Nepal

Ecological zone	Classification of district			Total
	Low (good)	Fair	High (poor)	
Mountain	Mugu, Solukhumbu, Sankhuwasabha, Taplejung, Sindhupalchowk, Dolpa	Darchula, Dolakha, Kalikot,	Bajhang, Mustang, Rasuwa, Jumla, Humla, Manang, Bajura	16
Hill	Khotang, Bhojpur, Tehrathum, Okhaldhunga, Syangja, Baglung, Myagdi, Ramechhap, Ilam, Dhankuta, Doti, Gorkha, Arghakhanchi, Panchthar, Nuwakot, Lamjung	Parbat, Salyan, Gulmi, Palpa, Rukum, Surkhet, Dadeldhura, Pyuthan, Rolpa, Dailekh, Jajarkot, Sindhuli, Kavrepalanchowk, Achham	Baitadi, Dhading, Tanahu, Udaypur, Makawanpur, Bhaktapur, Kaski, Lalitpur, Kathmandu	39
Tarai	Bardiya, Kapilbastu, Kanchanpur	Dhanusha, Bara, Parsa, Jhapa, Rupandehi, Banke, Dang, Nawalparasi	Mahottari, Morang, Saptari, Sarlahi, Kailali, Siraha, Sunsari, Rautahat, Chitwan	20
Total	25	25	25	75

The critical districts are distributed generally across western parts Mountain, central parts Hill and eastern parts of Tarai of the country. A large majority is from Hill and Tarai. Given low population size with low rates of growth, several mountain districts fall under good to fair condition.

CHAPTER V: CONCLUSION

Population size of a country or its components parts is determined by the growth process over time and spatial pattern through migration. Both are much evident from Nepal's population trend over the last five decades. Since 1961, population growth rate has been consistently over two percent per annum despite various control measures. The measures have been directed mostly toward fertility control through family planning. Another significant phenomenon has been the spatial mobility of population. Until the 1980's, migration was mostly highland to lowland, rural to rural, through land colonization. This was due to spontaneous migration to frontier land of the Tarai as well as the impetus of resettlement schemes there. Since the last three decades, there has been significant population shift from rural to urban areas. This owes mainly to pauperization of rural areas. Another reason is the liberal but unscientific definition of municipal areas whereby they are designated on the basis of their population size without consideration to the functional of their residents.

The conventional analysis of population is done through the framework of crude density or simple man-land ratio. In Nepal's case, population densities among districts by elevation zones have a consistent pattern, that is, lower the elevation higher the density of population and vice versa. As of census 2011, the Tarai population density is more than 11 times that of the mountain zones. Such density measures are inadequate to express the population situation of area unit in the terms of their resources. The purpose of this study is to assess population pressure both in terms of available services and land resources. However, the focus is on developing Population Pressure Index (PPI) of the administrative districts and eco-development reasons.

5.1 Access to Services

The indicators used for accessing the services are road, education, health, drinking water, non-farm activities and manufacturing establishments. The comparisons are limit at the level of eco-development regions and ecological zones.

Table 23: Access of major services by ecological zones, Nepal

SN	Services	Mountain	Hill	Tarai	Nepal
1	Road length (%)	11.9	54.2	33.9	-
2	Gross school enrolment rate (%)	106.7	98.1	82.7	90.9
3	Health service (population per facility)	3,083	5,135	9,011	6,198
4	Household with tap/tube well water (%)	76.4	75.0	91.6	82.8
5	Population engaged in non-farm activities (%)	20.2	37.8	44.7	39.6
6	Number (%) of industry	47 (1.2)	1,298 (31.8)	2,731 (67.0%)	4,076 (100.0)
7	Population employed in industry (%)	0.10	1.16	3.08	1.96

Road accessibility has a significant effect on movement of goods and range of economic activities. Generally, higher the density of roads, the higher is the level of development of the area. Of the total length in the country, Mountain has only 11.9 percent of total road length of the country. Hill with 54.2 percent roads length is better than Tarai of 33.9 percent. About 91 percent of children aged 5 or 16 years are enrolled in schools. This indicates an encouraging increase in school enrolment rate in recent decades due to a very wide coverage. School enrolment rate is the only indicator that presents a reverse situation among the three ecological zones. In other words, school enrolment rate is progressively higher from high to low land ecological zones. The Mountain zone that lags behind in other service indicators leads with the highest enrolment rate while it is lowest in Tarai. On the average, available health facilities in the country serve 6,198 populations. It is only the Tarai zone that exceeds the national average of population served by health services.

About 83 percent of households in Nepal have access to safe drinking water. Percent of population with such access by elevation zone conform to that of health services. Higher the elevation zone, lower the number of households with access to safe water supply. The Tarai zone exceeds the national average in access to such facility.

The proportion of population engage in non-farm activities indicates a higher level of development. The national average of economically activates population (aged 10 or above) engaged in non-farm activities is about 40 percent. In Tarai, the proportion of economically active population engaged in non-farm activities is 45 percent. This becomes progressively lower at higher elevations. This proportion is slightly more than one-third in Hill and only a fifth in Mountain.

Of the 4,076 manufacturing establishments in the country, that in Mountain zone is only 1.2 percent. Hill zone has 31.8 percent as compared to two-thirds (67.0%) in Tarai. Of the county's total economically active population, less than 2 percent are employed in manufacturing establishments. The share of mountain zone in such employment is only 0.10 percent.

Table 24 provides details of access to services by eco-development regions. Kathmandu Valley and regions of Tarai have advantage over other regions in terms of access to services. However, in terms of population pressure Kathmandu Valley has negative situation. The above assessment of access to basic services reveals the disparity among elevation zones and regions. Such a situation analysis is essential for future programming of service delivery in spatial terms.

Table 24: Access of major services by eco-development regions, Nepal

Region	Road density (influence per 100 sq.km.)	Gross school enrolment rate (%)	Population per health service facility	Household with tap/ tube well water (%)	Non-farm employ-ment (%)	Industry (%)	Employ-ment in industry (%)
Mountain	**2.9**	**107.9**	**3,083**	**76.4**	**20.2**	**1.2**	**0.10**
Eastern	2.7	126.9	3,039	80.6	19.6	0.3	0.09
Central	6.7	97.7	3,235	80.2	21.2	0.6	0.22
Western	4.1	79.7	645	91.9	42.3	0.1	0.31
Mid-western	1.3	106.6	2,817	68.9	17.3	0.0	0.00
Far-	3.2	105.0	3,861	72.0	20.5	0.2	0.02

western							
Hill	**10.4**	**98.3**	**4,358**	**76.3**	**25.4**	**16.3**	**0.43**
Eastern	12.7	95.0	3,877	77.0	19.2	1.2	0.36
Central	11.5	93.9	4,986	79.2	25.7	3.7	0.59
Western	9.0	93.9	4,202	82.6	31.6	10.2	0.68
Mid-western	9.9	109.9	4,906	65.4	24.1	1.1	0.07
Far-western	10.1	102.0	3,798	63.7	19.4	0.1	0.02
Tarai	**12.5**	**78.1**	**9,011**	**91.6**	**44.7**	**67.0**	**3.08**
Eastern	13.7	65.8	9,245	95.0	49.7	19.9	3.29
Central	12.8	81.9	7,605	90.7	48.3	20.5	3.25
Western	14.7	77.9	8,956	93.3	39.9	13.2	4.02
Mid-western	11.0	87.0	11,225	80.1	37.9	8.0	2.09
Far-western	9.6	87.8	15,148	94.9	32.7	5.4	1.42
Kath. Valley	**52.6**	**88.3**	**13,830**	**71.1**	**85.5**	**15.5**	**3.98**

5.2 Population Pressure Index

The primary aim of this study is to develop Population Pressure Index (PPI) by devising a suitable methodology. The Sen Gupta Model of calculation population pressure has been adapted with some modification. To present the PPI situation in the proper context, it analyzes population situation in the context of crude density, cropped land and some measures of basic and social services. The district is chosen as the unit of analysis. The PPI values have calculated based on cereal requirements of the resident population.

PPI values are interpreted as positive, neutral and negative. PPI values suggest that at the current level of technology and production, the country as a whole is already over populated. At the district level, 43 districts are over populated (including potato production) with positive of PPI. Only 31 districts fall under negative category, i.e. under

populated and one has neutral PPI value. At eco-development level, most of districts in Hill region have positive PPI values with Kathmandu Valley being the most stressed.

Table 25: PPI ranking by eco-development regions, Nepal

SN	Region	PPI value	PPI category
1	Kathmandu Valley	87.4	Extremely high
2	Far-western Mountain	3.3	High
3	Far-western Hill	1.9	
4	Eastern Tarai	1.6	
5	Mid-western Mountain	1.6	
6	Western Hill	1.4	Fairly high
7	Central Tarai	1.0	
8	Mid-western Hill	1.0	
9	Central Mountain	0.1	
10	Mid-western Tarai	-0.9	
11	Far-western Tarai	-1.0	
12	Eastern Hill	-1.1	
13	Western Tarai	-1.4	Low
14	Central Hill	-1.7	
15	Western Mountain	-2.8	
16	Eastern Mountain	-3.0	

PPI values are helpful to identify over-or under-population of the district or regions that are mostly rural in character and are dependent upon primary products from land. These values change with the change in technology and level of production and more importantly with change in population size. Considering the dynamics of PPI values, they are combined with composite value of three other indicators: namely, population growth rate, man-land ratio and the proportion of population engaged in non-agriculture in order to identify critical areas of population pressure. The average ranking value of three indicators was added to the ranking obtained from the PPI values. An average of these two sets of values was obtained for final ranking of districts.

For convenience, 75 districts have been grouped into three categories with equal number in each category. The rankings are labeled as good (low value), fair (median value) and poor (high value). The low value indicate relatively better situation and the high values indicate the poor. A large majority of critical districts is from Hills. Given low population size with low rate of growth, a few mountain districts also fall under good to fair condition.

PPI study particularly draws attention to resource relationship and about improving the quality of resources needed for the sustainable livelihood of rural people. Rapid population growth and increasing pressure on natural resources are major challenges in the country. PPI values for the country as a whole and for 75 districts suggests that population-resource (related to primary products) relationship has almost reached a critical stage. This will need comprehensive plan of action to regular growth and improve the production base in general and critical districts or over-populated ones identified in this study.

Two areas of crucial importance for such spatial planning relates to population migration and economic productivity. Existing population policies in Nepal have either ignored or adopted migration as a negative aspect. Thus, there has been no approach on directing internal migration and restricting immigration. Given the impelling trajectory and volume of inter-regional migration in the country, internal migration should be viewed as a spontaneous distribution and should be an essential component of the country's demographic policy. The aspect of economic productivity has to be considered in terms of vertical expansion of production based. This means expansion of economic activities with provision of infrastructure and technology based on the potentials of regional resources of comparative advantage. PPI value of districts aggregated into discrete eco-development regions provides a useful tool for such planning and intervention.

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