



RURAL POVERTY ANALYSIS AND MAPPING IN NEPAL

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PREFACE

Measuring the level of rural poverty and identifying poverty-stricken areas are the common problems in developing countries of Asia due to nonavailability of right kind of data and information. It is also further limited because of inappropriate and cumbersome techniques. This is very much true in Nepal, where GOs and NGOs face similar difficulties in addressing rural poverty issues. Through this research study, an attempt is made to offer some answers in support of simplified techniques and demonstration of application using socioeconomic data of Kaski district, presented by Village Development Committee, the smallest administrative unit of Nepal.

In the research an attempt is made to assess the poverty situation based on selected indicators supported by the available database in Nepal. It uses a simplified technique for standardizing the indicators and computing composite indices to explain the poverty levels at the VDC level. The results obtained through analysis are used for generating various maps to illustrate spatial distribution and to correlate with poverty at the micro level. The study has given the answers for prioritizing poverty-stricken areas for undertaking appropriate development strategies. Finally, few strategies are recommended for combating poverty in Nepal.

The book contains seven chapters and appendices. The introduction chapter covers conceptual framework, research questions and objectives. Chapter two presents a review of poverty measuring methods and techniques as practiced by the developing countries. This chapter gives the idea how poverty-stricken areas (backward areas) are identified and the types of indicators used for poverty analysis in few selected developing countries. Chapter three presents the methodology applied in this research to carry out poverty analysis and mapping in Nepal. Chapter four and five present data and information system, and rural development planning process with a focus on one district in Nepal. Chapter six presents the analysis and the results by maps. Chapter seven provides the conclusion and recommendations. Finally, the appendices present a group of indicators, directly or indirectly reflecting poverty, in few selected countries, and computation of

CONTENTS

Preface	i
Contents	iii
List of Tables	vi
List of Figures	vii
Abbreviations	ix
Glossary	xi
 Chapter One	 INTRODUCTION
Background	1
Objectives of the Study	3
Limitations of Study	4
Conceptual Framework	4
 Chapter Two	 METHODS AND TECHNIQUES OF POVERTY ASSESSMENT
Developing Country Experiences	9
Cambodia	9
Ecuador	11
Lao PDR	14
Thailand	15
Vietnam	17
Nepal	18
Similarities and Differences of Indicators	21
Poverty and Indicators	21
 Chapter Three	 STUDY METHODOLOGY
Study Area Profile	26
Data and Information	31
Poverty Analysis	31
Based on Income	33
Based on the Indicators Related to Poverty	33

APPENDICES

1. Poverty Indicators of Cambodia	93
2. Focal Site Indicators of Lao PDR	97
3. NRD-2C and BMN Database of Thailand	100
4. Poverty Indicators of Vietnam	104
5. Indicators of District Development of Nepal (ICIMOD)	106
6. Computation of Composite Indices	109

INDEX	123
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LIST OF FIGURES

Figure No	Title	Page
Figure 1	Aggregate Indicators of Rural Poverty	5
Figure 2	Causes and Consequences of Rural Poverty	6
Figure 3	Indicators for Rural Poverty	7
Figure 4	Operational Steps Followed for Poverty Mapping	27
Figure 5	Land Distribution	28
Figure 6	Location Map of the Study Area	29
Figure 7	Kaski District Map	30
Figure 8	Network for Data and Information	39
Figure 9	District Map with VDC Boundary	60
Figure 10	Composite Index map of 24 Indicators	60
Figure 11	Average Annual Per Capita Income Map	61
Figure 12	Poverty Index Map	61
Figure 13	Composite Index Map of Natural Resources Sector	62
Figure 14	Composite Index Map of Social Sector	62
Figure 15	Composite Index Map of Infrastructure and Institution Sector	63
Figure 16	Composite Index Map of Women Empowerment Sector	63
Figure 17	Composite Index Map of Aggregate Development Sector	64
Figure 18	Employment in Secondary and Tertiary Sector	64
Figure 19	Percentage of Female Workers in Nonagricultural Occupation	65
Figure 20	Average Household Farm Size	65
Figure 21	Percentage of Household with Food Deficiency	66
Figure 22	Livestock Number per Household	66
Figure 23	Percentage of Thatched Roof Houses	67
Figure 24	Overall Literacy	67
Figure 25	Percentage of Female Illiteracy	68
Figure 26	Percentage of Girls in Primary School	68
Figure 27	Percentage of Lower Caste Population	69
Figure 28	Percentage of Population Having Access to Safe Drinking Water	69

ABBREVIATIONS

ADS	Aggregated Development Sector
AIT	Asian Institute of Technology
APROSC	Agriculture Project Services Center
BMN	Basic Minimum Needs
BSI	Basic Services Indicators
CBS	Central Bureau of Statistics
CDO	Chief District Officer
DDC	District Development Committee
Dev.	Development
DFID	Department for International Development
GIS	Geographic Information System
GO	Government Organization
GSO	General Statistical Office
HDI	Human Development Index
HH	Household
HRD	Human Resource Development
ICIMOD	International Center for Mountain Development
IFAD	International Fund for Agriculture Development
IIS	Infrastructure and Institution Sector
INGO	International nongovernmental Organization
IRDP	Integrated Rural Development Program
JICA	Japan International Cooperation Agency
JMA	John Mellor Associates, Inc.
Km	Kilometer
Km ²	Square Kilometer
LDO	Local Development Officer
LGP	Local Governance Project
LRMP	Land Resource Mapping Project
LSMS	Living Standard Measurement Survey
m	Meter
NA	Not Available
NPC	National Planning Commission
NR	Nepali Rupees
NRD-2C	National Rural Development Database
NRDP	National Rural Development Program

GLOSSARY

Deprivation: Deprived households are those, which are poor, physically weak, isolated, vulnerable and powerless. All these factors are inter-related. They enforce each other in producing and maintaining deprivation. This situation is called deprivation trap (Chamber, 1993).

District: For administrative purpose, Nepal is divided into five development regions and 75 districts. Average size of the district is 1962.41 km².

Headcount Index or Poverty Incidence: This measure represents the percentage of population, which has an annual per capita consumption level below the poverty line. It interprets how many people are poor in the country, but it is indifferent as to whether poor have consumption level just below the poverty line or whether they lie far below the poverty line (World Bank, 1999)

Poverty: People are considered poor, when they cannot secure a minimum standard of well-being and when their choices and opportunities for a tolerable life are denied or severely restricted (UNDP, 1997).

Poverty Gap: It reflects the distance between the consumption level of the poor and the poverty line; the greater the distance the higher will be the Poverty Gap (World Bank, 1999)

Poverty Line: It is an indicator for reflecting the order of magnitude, its spatial distribution and trends to serve as a rough and ready reckoner for allocation of resources (Hiten, 1990). Within the poverty line there are varying degree and depths of degradation. For example destitute, the very poor, the very poor and the poor in terms of their annual incomes (IRDP-India, 1990). There are two poverty lines: Absolute Poverty Line and Relative Poverty Line.

Poverty Map: Poverty maps provide information about spatial distribution of inequality and poverty within a district/country.

Chapter One

INTRODUCTION

BACKGROUND

Poverty eradication is the major goal of both developed and developing countries of the world. At present 1.2 billion people are living on less than \$1 a day, and 2.8 billion on less than \$2 a day. Similarly, 968 million people are without access to improved water resources, 2.4 billion people without access to basic sanitation (World Bank, 1998). 854 million adults are illiterate. The women development situation is still worrisome where their number exceeds half of the given population. 325 million children are out of school at the primary and secondary level. Malnourishment and mortality incidence of children below five are also discouraging (World Bank, 2000).

The intensity of South Asian poverty is more worrisome. Forty percent of world population lives on less than \$1 a day and 83 percent population lives on less than \$2 a day. The Human Development Index (HDI) value computed in 1999 by the UNDP is 0.564 for South Asia, in comparison to 0.716 of the world HDI value.

In case of Nepal, the poverty severity is alarming. The HDI developed by the UNDP in 2001 is 0.480 and places the country in the 129th position in the descending order of development. Based on analysis of the Nepal Living Standard Survey (NLSS) 1996, the Ninth National Plan (1997-2002) mentions that the size of population living below poverty line is 42 percent, where the population of poor is 24.9 percent and population of ultra poor is 17.1 percent. The percentage of poor population is highest in the mountain, which is 56 percent in comparison to 41 percent in the hills and 42 percent in the Terai. The situation in the rural area is more severe, where the poverty incidence is 44 percent in comparison to 23 percent in the urban areas. Similarly the Ninth National Plan mentions that social indicators such as access to health, education, and safe drinking water, etc. are significantly lower in rural areas.

For poverty eradication in the global level, the world's leaders were gathered at the United Nation General Assembly in the beginning

identified and documented. Data analysis process for poverty alleviation program is neither fast nor clear at the local level.

With this background, an attempt is made here to study and assess the available database for poverty analysis and to apply some simple technique to categorize VDCs for rural development planning. The following issues were attempted to explore at the district level.

1. Is the DDC database adequate to assess and compare the poverty and development situation at the VDC level?
2. What are the indicators used to categorize VDCs for poverty alleviation program?
3. Do these indicators capture the heterogeneity in terms of biophysical and socio-economic factors responsible for poverty?
4. What is the relation between the level of poverty and selected development indicators?
5. How effective is the poverty-mapping concept to exhibit poverty heterogeneity at the VDC level?

OBJECTIVES OF THE STUDY

The objectives of the study are set on the basis of the questions raised above. Therefore, the broad objective of the study is to develop a database and information system to support rural poverty analysis and planning in Nepal.

Specific Objectives:

1. To review the sources of data and information, types of data and their availability at the VDC level within the district,
2. To gain views and feedback from the local planners about the adequacy and quality of the database, and identify the problems, needs and constraints associated with the existing database,
3. To establish a spatial database by VDC and identify gaps, if any, to streamline for rural development planning,

1. Economic factors,
2. Social factors,
3. Institutional and infrastructure factors,
4. Deprivation,
5. Women empowerment, and
6. Natural resources endowment.

These factors are demonstrated schematically in Figure 1. They are interrelated to each other. Similar to this relation, Chamber (1990) has called the poverty trap. When one sector in the circle is affected, the other sector is also influenced.

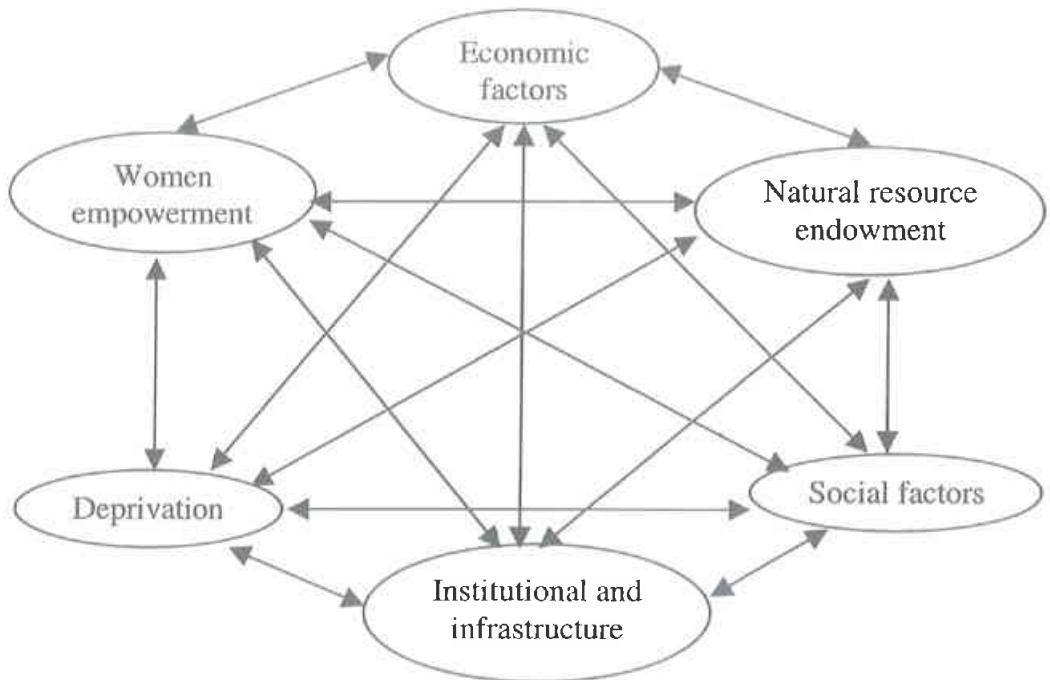
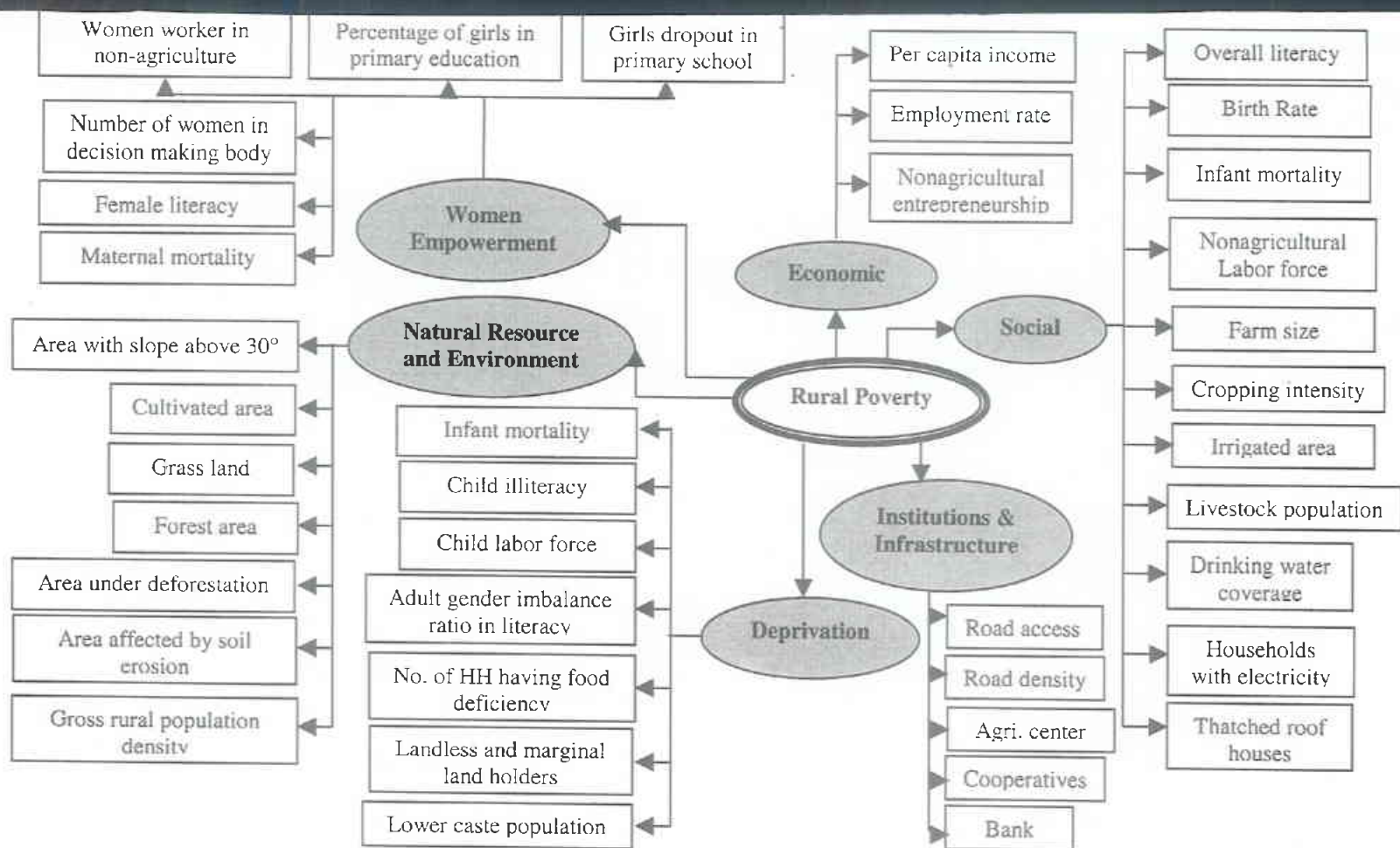


Figure 1. Aggregate indicators of rural poverty

Note: Modified on the basis of the works of Chamber (1990) and Dixon (1990).

These broad factors are regrouped into causes of poverty existing in



Formulated on the basis of database of Cambodia, Lao PDR, Thailand, and works of the World Bank (2000), the UNDP (2000) on development indicators and works of ICIMOD (1997) and Routrav (1997) on development indicators of Nepal

Figure 3. Indicators of rural poverty.

Chapter Two

POVERTY ASSESSMENT METHODS AND TECHNIQUES

Poverty assessment methods and techniques applied in developing countries - Cambodia, Laos, Thailand, Vietnam, Ecuador and Nepal are described in this chapter. The review of the poverty assessment methods and techniques in these countries reveals that the poverty measurement at present is commonly done in two ways.

- 1) It is measured in economic terms such as Poverty Incidence, Poverty Depth (Poverty Gap) and Poverty Severity (Squared Poverty Gap) based on income or level of consumption, and
- 2) Spatial units are assessed on the basis of a set of development indicators directly or indirectly related to poverty. According to the performances of the indicators the spatial units are categorized as poor and non-poor.

In practice, it is observed that first type of analysis is applied to identify and compare poverty level at the national level, whereas the second type is applied in identifying poorer areas to design poverty alleviation program especially for the rural areas.

The first type of measurement is supported by the financial organizations such as the World Bank, whereas the second type of analysis is supported by the UNDP. Examples for the second type are the Seila Program of Cambodia, Focal Site Strategy in Lao PDR and Participatory District Development Program (PDDP) in Nepal. In these programs, supports are provided at the district level to establish database system for development planning.

DEVELOPING COUNTRY EXPERIENCES

Cambodia

Royal Government of Cambodia (RGC) has implemented Seila Program in 1996. The Seila program is an initiative to strengthen local

Before making final decision for resource allocation, Provincial Rural Development Committee (PRDC) considers other factors also such as the funding that commune is getting, the local contributions that commune is raising and the special attention, if any, that a commune is needing.

The database has covered most of the aspects of development of a commune. It also comprises the indicators directly or indirectly related to poverty. From these indicators rural poverty can be exhibited at the commune level. In the analysis, sectoral composite index can be computed which further can be mapped at commune level for visual communication. The map facilitates for rural development planning at the grassroots level. The indicators such as 1) funding that commune is getting, 2) the local contributions that commune is raising, and 3) the special attention, if any, that a commune deserves, are taken into account separately which can mislead the process to make it transparent. These indicators should be incorporated along with other indicators in the database.

Ecuador

Ecuador is a poorer country, where thirty five percent of the total population (three and a half million people) lived in poverty in 1994. Additional one and a half million population were vulnerable to poverty. Sixty percent of the total poor resided in rural areas. There is great heterogeneity across region and sectors in relationship between poverty and social indicators (World Bank, 1999). The World Bank has mentioned two methods of poverty measurement in the Ecuador Poverty Report.

Consumption Based Poverty Analysis

The report claims that consumption based Poverty Assessment over income, is more reliable for a number of reasons. First, consumption of a household tends to fluctuate much less during the course of a month or even a year than income. The income of the poor is often quite volatile in the urban centers, as the poor frequently depend on daily wage jobs from the informal sectors. In the rural sector, income from agriculture fluctuates with prices and harvest

Poverty line was obtained by determining the average proportion of total consumption, which was spent on nonfood items by those members of the population, who were in principle just able to meet their calorie needs, if they were to devote their total expenditure to the purchase of food items. The poverty line was then calculated by scaling up the national level food poverty line by that empirically estimated proportion.

Three most frequently used poverty indicators have been used: first, the incidence or headcount ratio, second, the depth of poverty (or poverty gap), and third, the severity of poverty. After determining the poverty line the poverty incidence, the poverty depth and the poverty severity were found out.

This technique is being used in developing countries through the World Bank support. It covers few representative households and therefore these data are not available for the development planning at the grassroots level. Also, in the developing countries collection, storing and updating of such data and information for all the households are difficult.

Basic Service Indicators and Poverty

The Statistical Institute of Ecuador (INEC) generated a number of maps for Basic Services Indicators (BSI) applying the census data of 1990. These maps have been used as general poverty maps to identify geographical pockets of poverty. Separate maps were prepared for urban and rural areas.

The INEC involved seven service-related indicators; each was assigned a certain number of points according to its availability and type of supply. The followings are the indicators with subjective weight.

1. Water supply: Public net (250), Water truck (50), Well (25), Others (0).
2. Sewerage: Public net (150), Septic tank (50), Other tanks (25), None (0).
3. Electricity: Available (100), Not available (0).
4. Tel. Service: Yes (200), No (0).
5. Garbage disposal: Collected (75), Others (0).

3. Promotion of settled agriculture to replace slash and burn cultivation in villages,
4. Participation, and
5. Security.

NRDP of the Lao PDR mentions that Provincial Rural Development Committees (PRDC) have used these criteria to select the focal sites in their provinces. In the list of indicators few are not measurable in quantitative term and few separate indicators are mixed in single indicator. Therefore the mathematical calculation of the indicators for composite indices or sectoral indices is complicated.

Thailand

Thailand's National Rural Development Program uses two databases for rural development (NRD-2C and Basic Minimum Needs BMN presented in Annex 3) to identify the areas, which are in need of special attention in order to overcome problem of rural poverty. NRD-2C aims to guide the planner at different levels of planning while BMN aims to get the population involved in examining their own living condition (NRD-2C database and Srisang, 1986). NRD-2C database has 31 indicators, which are covered in six problem groups, namely

1. Infrastructure (4 indicators),
2. Promotion, income and employment (9 indicators),
3. Public health (6 indicators),
4. Water resources (3 indicators),
5. Knowledge, education and culture (6 indicators), and
6. Natural resources and environment (3 indicators).

Level of development is distinguished into three categories, namely poor, fair, and good assigned with 1, 2 and 3 scores respectively for analysis. Villages are categorized from the following criteria

1. (Backward): If more than ten among thirtyone indicators are marked by 1, the village condition is backward. It means the problems are concentrated in that particular area to a degree

technique can further be enhanced by composite index computation for sectoral indicators and mapping.

Vietnam

Minot Nicholas (2000) conducted a study in Vietnam aiming to develop a method to generate a geographically disaggregated estimates of poverty by combining Vietnam Living Standard Survey (VLSS) and Agriculture Census data. The VLSS has used a stratified random sample of 4,800 household including 3,840 rural households and 960 urban households, and collected information on household members, housing, fertility, assets, employment, agriculture production, income and expenditure. Minot used these data to estimate the relationship between poverty and twentyfive indicators (including household characteristics and regional dummy variables shown in Annex 4) with regression analysis using probit regression model.

General Statistical Office (GSO) conducted an Agriculture Census in 1994 covering 11.5 million rural households (including non-agriculture households) and collected data and information on household members, housing, land use, animal ownership and assets. The indicator values were computed for the districts and substituted in the same regression analysis model whose unknown parameters were determined from the VLSS data. Poverty indices were generated for each district. The results were presented in the form of poverty maps at the district level using geographic information system.

From his study, Minot concluded that highly disaggregated maps of the incidence of poverty could be generated by combining household survey data and census data. The approach requires two databases with an overlapping set of household variables. Second, household characteristics are individually, fairly weak predictors of rural poverty. Third, household characteristics are much more accurate in predicting rural poverty when combined using probit Regression Analysis. Fourth, the district level poverty maps suggest that rural poverty in Vietnam is strongly associated with distance from cities and coast. Fifth, to maximize the usefulness of census data for poverty analysis, a census should include a wide range of questions on household characteristics that are correlated with income and it should

Consumption Based Poverty Analysis

Central Bureau of Statistics has accomplished the Nepal Living Standard Measurement Survey (NLSMS) during 1995 and 1996. Based on this survey, poverty assessment was conducted for Nepal. First poverty assessment was done in 1991 from Multipurpose Household Budget Survey of 1984-85.

For computation of caloric consumption per household, the population was grouped into men, women, infants, children and adolescents. The group was further categorized based on the workload into sedentary, moderate and heavy, as the caloric requirements vary for different groups. The caloric requirement per capita from this method came out to be 2124 kcal per day. This is taken as nutrition poverty line.

Thirtyseven food items generally consumed by Nepalese households were identified. The NLSMS took information on these food items and on other various nonspecific food items and their consumption in different groups through sample survey. These consumption figures were converted to caloric consumption using caloric consumption table. From this computation it is found out that average food caloric consumption per person per day is 1736 kcal. This figure is somewhat lower than the recommended intake of 2137 kcal per person per day. After finalization of the food basket in quantity terms, it was multiplied by average price prevailing in the Rural Eastern and the Central Terai and found out the cost of the food basket. The calculated amount came out to be NR 2637 per person per annum.

Food expenditure is a sub-set of total expenditure. So even if some persons could afford to buy the food basket, they should still be considered a poor if they were unable to purchase essential non-food items. To take this point into account, expenditure on non-food items and expenditure on house was added for total poverty line. The final poverty line was calculated to be NR 4404 per person per annum in real price. Further, the Poverty Incidence, Poverty Gap and Poverty Severity were computed using Foster-Greer-Thorbeck class of poverty measures.

Similarities and Differences of Indicators

From the review of database of Lao PDR, Cambodia, Thailand, Vietnam, Ecuador, and also of the World Bank and other literatures, it is found out that there are similarities in indicators of different development sectors such as agriculture, infrastructure, institution, health and education. But there are few country specific indicators also. For example Lao PDR has focussed in slash and burn (shifting) cultivation, which is being practiced in the rural areas. Likewise security is another factor that has been emphasized in Lao PDR's focal site criteria. Cambodia's Seila program has focused on seasonal migration, and performances of and number of community-based organizations. Thailand's National Rural Development (NRD-2C) database has included land ownership and land certificate problem. Development indicators of ICIMOD are in line with the theme of the Ninth National Plan of Nepal.

Poverty and Indicators

Based on the conceptual framework presented in the previous chapter, the broad groups with specific indicators are explained below to understand the interrelationships and linkages with poverty.

Economic Factors

Three indicators have been taken in this category: 1) average annual per capita income, 2) employment percentage, and 3) percentage of people involved in nonfarm activities. Income consists of agriculture income and nonagricultural income of a household. Nepal Human Development Report (NHDR) prepared in 1998 mentions that income is directly related to the low level of literacy, malnutrition, and ill health. Low-income households have low level of consumption. Employment and entrepreneur lead to the use of the existing stock of capability and to the enhancement of capabilities.

Socio-economic Factors

Those indicators, which are causes and consequences of poverty

population, 5) landless and marginal landholders, and 6) number of households having food sufficiency less than nine months.

Analysis of 1991 census data shows that eleven Terai origin groups namely Chamar, Dhanuk, Dhusadh, Kewat, Kurmi, Kushwha, Mallah, Mushar, Muslim, Tharu and Yadav are disadvantaged groups. Similarly, Pahadi origin (people of the mountain) groups are Damai, Kami, Sarki and Tamang are educationally disadvantaged. These groups have shown high level of fertility and low level of participation in the white-collar activities (Chettri, 1996). These groups are distributed all over the country. So the higher the number of these groups in VDCs the higher is the poverty.

Women Empowerment

In general, women are discriminated in Nepal. This situation is the worst in households where food, clothes and money are scarce. This is true and reflected in case of the female children also. They are malnourished and have limited access to education and health care. Women have to work more hours per day than that of their male counterparts. NHDR (1998) mentions that the overall capability attainments in human development in Nepal will be reduced by one-sixth if disparity in men and women capability attainment is taken into account.

Therefore, to assess the status of women and female children, six indicators related to education, health care, occupation and their involvement in administrative decision making body, are included in this group. It includes two indicators related to female children: 1) percentage to girls in primary education, and 2) percentage of girls drop out in primary school. There are other four indicators also related to women: 3) maternal mortality, 4) percentage of females in nonagricultural activities, 5) percentage of female illiterates, and 6) percentage of female in decision making body.

Natural Resources and Environment

Land distribution, quality of land and supporting arrangement e.g. forestland for fodder and fuel wood and litter, grassland for grazing for livestock, constitute elements of agrarian structure.

the people, but their presence increases the economic activities. In the other hand, these institutions are established where the population threshold permits. Therefore, presence of the higher number of service centers symbolizes prosperous areas.

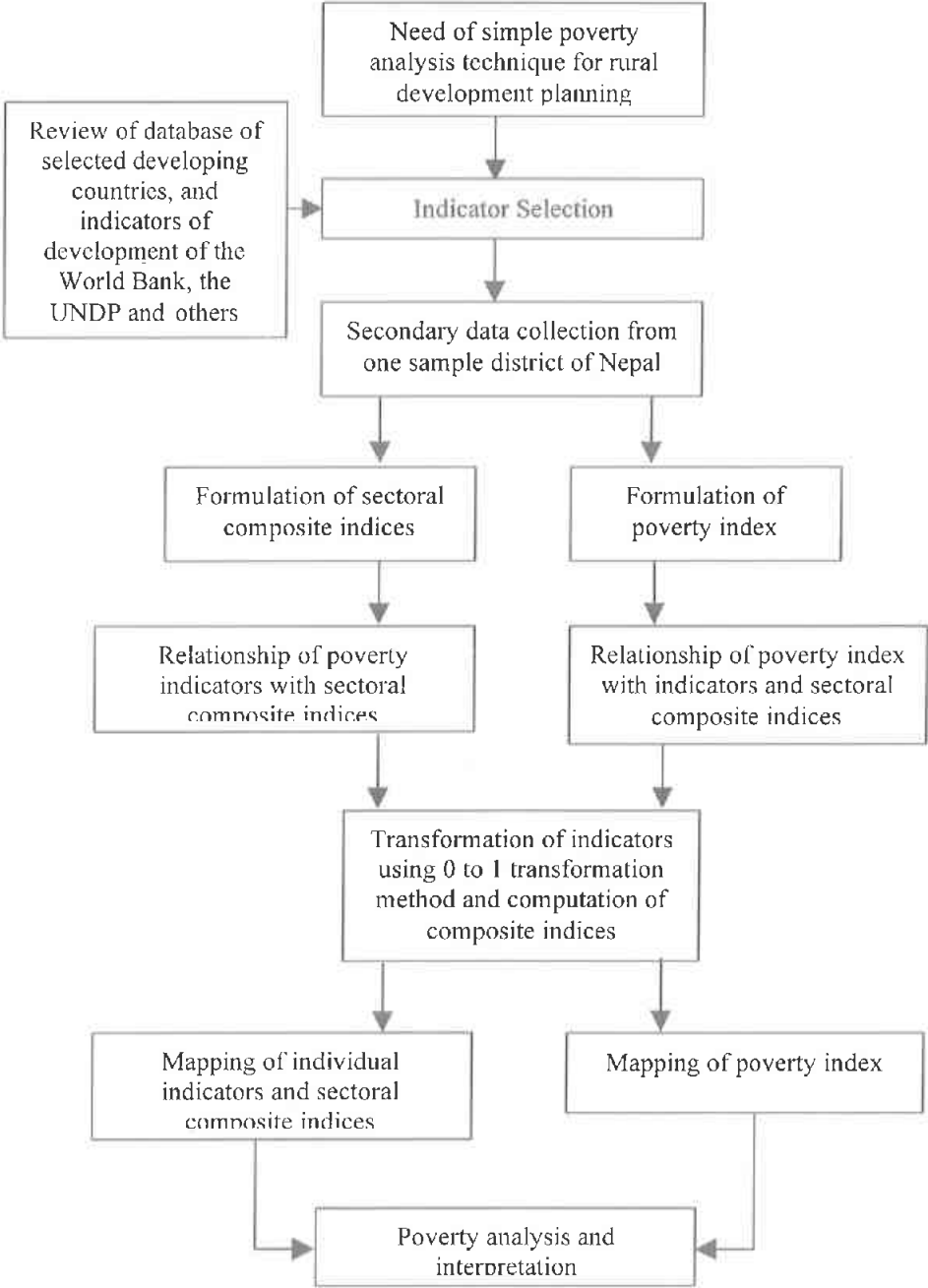


Figure 4. Operational steps followed for the poverty mapping.

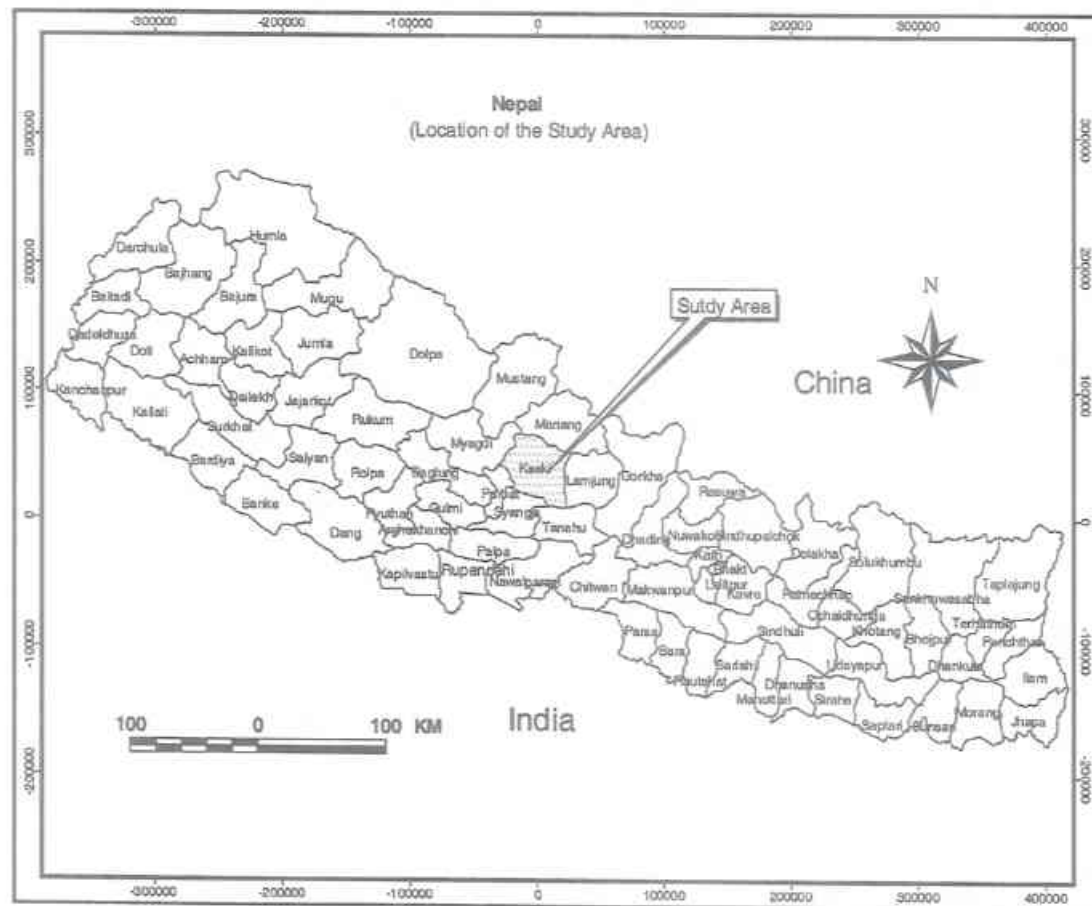


Figure 6. Location map of the study area.

occupation and only 3.5 percent women in the decision making body.

The DDC is the body of people's representatives and responsible for overall planning, monitoring and evaluation of development activities undergoing in the district. It has set an objective to develop the district as a focal point of tourism development, health and education center and to make itself sufficient in agriculture in next twenty years. The district follows participatory planning approach under which plans are prepared at the VDC, the lowest planning unit, and send to Ilaka (a group of VDCs) for prioritization and then to the DDC for final approval for implementation and budget allocation.

DATA AND INFORMATION

Both primary and secondary data collection methods are applied. Qualitative information regarding the quality of data in the DDC, its use and adequacy for planning and its updating are collected through primary data collection method. A series of discussions were held with key functionaries, officials, and planners at different levels (VDC chairperson, heads of the district line agencies and planners. The secondary data was collected from the DDC and the National Planning Commission (NPC). Types of data used for the study and their sources are given in the Table 1.

POVERTY ANALYSIS

Poverty analysis is done using average annual per capita income criteria and also using indicators related to poverty. The relationships among the indicators and with sectoral indices formulated from the indicators are tested. The indicators and the sectoral composite indices are exhibited in map at the VDC level.

Based on Income

Poverty Incidence, Poverty Gap and Squared Poverty Gap (SPG) are computed from the Foster-Greer-Thorbecke (FGT) class of poverty measures. Based on Incidence of Poverty, Poverty Gap and Squared Poverty Gap, VDCs are divided into four categories such as Very poor, Poor, Fair and Good.

Based on the indicators related to poverty

There are two categories of indicators based on their relationship with poverty. First category of indicators is directly proportional to the well-being i.e. opposite to poverty. Average annual per capita income is an example for this category. When the average annual income of a VDC is higher, the status of the well-being of the VDC is better or poverty is lower. The second category of indicators is inversely proportional to the well-being. Number of households having thatched roof is an example for this category. When the number of households having thatched roof is higher in the VDC, the status of well-being is lower or the poverty is higher.

Scoring and Composite Index Computation

Zero to one scoring transformation method as used by the UN to compute Human Development Index (HDI) and by ICIMOD to compute District Development (1997) has been used to standardize the indicator and then to compute the composite indices. There are various methods to standardize the order of indicators and compute composite index. However, this method is found comparatively easy because of the following reasons.

1. All indicator values are changed to 0 to 1.
2. Intermediate values are computed with respect to the maximum and minimum value. Therefore, the values can be computed with respect to the desired maximum and minimum value.

In the case where indicator is inversely proportional to the well being,

Transformed Value (TV)

$$TV = \frac{\text{Difference between a choosen value of one indictor and maximum value of the same indicator}}{\text{Range of that indicator}}$$

$$= \frac{\text{Max. value of one indicator} - \text{Choosen value of same indicator}}{\text{Max. value of the indicator} - \text{Min. value of the same indicator}}$$

$$= \frac{X_{i(\max)} - X_{ij}}{X_{i(\max)} - X_{i(\min)}}$$

Equation 2

Here also, for a particular indicator denominator is fixed. Only variable is the X_{ij} and when X_{ij} takes the maximum value of the indicator, numerator becomes $\{X_{i(\max)} - X_{i(\max)}\}$ which is 0. Thus, the maximum value becomes zero. When X_{ij} takes the minimum value, the numerator and denominator becomes same and hence quotient becomes 1. Thus, the minimum indicator value changes to 1 and maximum indicator value becomes zero. Other values are also changed in the same way reversing their original order.

Composite Index

For the purpose of poverty analysis, an attempt has been made to identify some meaningful indicators covering different sectors, such as economic sector, development level, natural resources sector, social sector, infrastructure and institution sector and women empowerment sector, those have direct and indirect relationship with poverty. Composite indices for these group indicators have been computed to understand the development situation and compare with the perspective of poverty. The composite index is computed by using the formula as explained below,

$$C_{ij} = \sum_{i=1}^n TV_i / n$$

Equation 3

Chapter Four

DATA AND INFORMATION SYSTEM OF NEPAL

The need for a good database and information system at different levels (VDC, DDC and national) is crucial to support planning activities focussing on rural poverty analysis. The review attempted in this chapter is based on the information provided by the VDC personnel the DDC personnel, head of the district sectoral line agencies and planners of national level planning institutions.

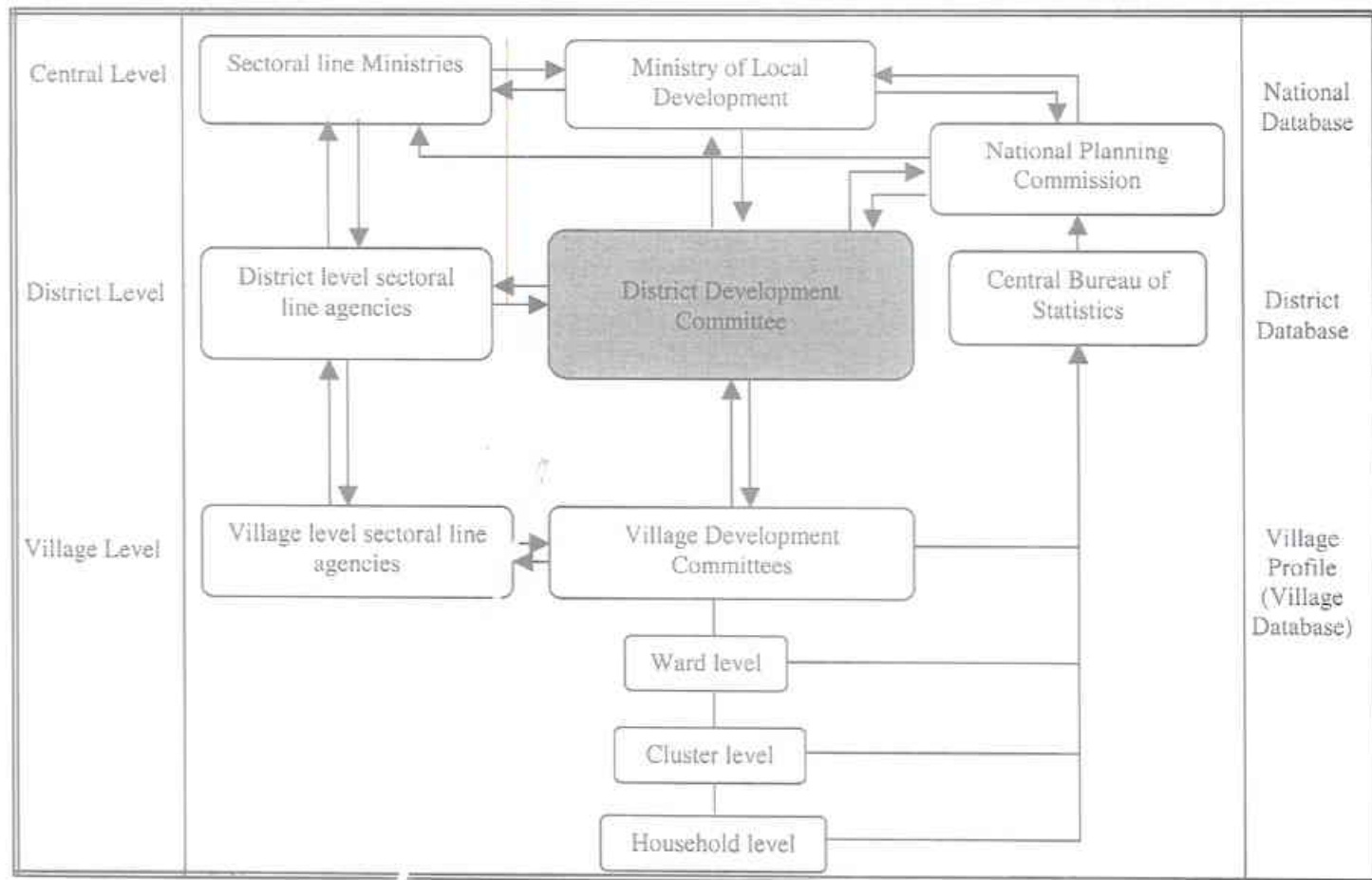
DATA AND INFORMATION FOR PLANNING IN NEPAL

Data and information are used interchangeably, but there is marked distinction between them. The data is the language, mathematical and other symbol surrogates agreed upon to represent people, object, events and concepts. Indeed, it is the set of raw facts that can be processed for use. In the other hand the information is the data placed into a meaningful context for the user (Burch, et al, 1983).

There is a need of strong data and information base for the successful planning and development operations at different levels. The decision making at appropriate time and place as a planning exercise depends on what kind of data and information are available. The use of computers and different softwares has been increasing in the developing countries in different levels for planning.

There are various institutions functioning at different levels to collect data and information in Nepal. Assuming the DDC as a center, other institutions are fitted in the information system and shown in Figure 8. There are three hierarchical levels of information system in Nepal - the village level, the district level, and the national level. The village level is the lowest level and supposed to collect and store data and information and send them to district for further processing. The village level agencies comprise of the VDC and village level sectoral line agencies.

The district level agencies are comprised of the DDC, district level sectoral line agencies, district level CBS and regional level NPC.



Modified from the work of Routray (1990) and Dias et al, (1990)
Figure 8. Network for data and information.

District Officer (CDO) in every district. The VDC secretary collects the information in consultation with the VDC. The voter list contains information about individuals regarding the district, village, ward number, cluster, house number, household chief and age.

District Line Agencies

The district sectoral line agencies are both planning and implementing bodies. They are principal sources of respective sectoral data and information in the district level.

District Development Committee

Under the Local Self Governance Act, DDC is responsible for overall planning of the district. The type and nature of data, and level of their availability in Kaski DDC are given in Table 3.

Data and information are collected and managed in three levels namely, household, settlement and VDC. The data at the settlement

Table 3. Types of data and level of availability at the district level

Aspect	Nature of Data	Level of Availability
Demographic	Household, Population by age, sex and caste.	DDC and VDC level
Social	Landholding size by sex, Food sufficiency by months, Livestock population, Irrigated land, Agriculture technology used, Types of cooking fuel used.	DDC and VDC level
Physical Facility	Household distance from different natural resources, Electricity type and coverage, Drinking water coverage with different sources, Telephone, Service centers, etc.	DDC and VDC level
Economic	Population by major occupation, Migration and reasons, Household by debt, size, Income per household by occupation.	DDC and VDC level
Health	Disease types and affected household, Malnutrition.	DDC and VDC level
GIS Map	District map with VDC boundary, Service centers in cluster level, Road network,	DDC, VDC and cluster level

Note: Modified from the information of Kaski DDC Information Unit (2000).

Road map is available in digital form in the DDC, but it is not disaggregated at the VDC level. Similarly, distance of the VDC from road head or from city center or airport is also not available in the district.

Accuracy of the DDC Database

Existing DDC database is based on sample survey of 30 percent households from each constituting clusters of the VDC. These data and information are used by the DDC for planning, researchers for academic purpose and the NPC for the projection of required indicators at the national level. Therefore, we also consider that the set of data available at the DDC is accurate and valid for this research.

Problems Associated with the DDC Database

In the DDC different sets of data are found, which are prepared by the PDDP, the DDC and other sectoral line agencies. These data do not match with each other. Similarly, database of the DDC and the database of the CBS are also nonmatching on common themes. Vertical data integration is weak in the district. It is learnt that the data collected by the CBS is not taken into consideration by the DDC and vice versa. Practically no database exists in the VDC.

The DDC provides data to the users with certain amount of fees. The amount collected this way is not enough to improve the service facility in the DDC, but it restricts the data use. The GIS unit of the NPC also charges high amount of fees for the data and does not provide few sets of data due to its own limitation. Also, the district level database is rarely updated to support for planning, monitoring and evaluation activities.

α = An exponential having value 0 for the Head Count Index, 1 for Poverty Gap and 2 for Squared Poverty Gap.

When α is 0, 1, and 2, P_α is P_0 , P_1 and P_2 , which denotes Poverty Incidence, Poverty Gap and Squared Poverty Gap respectively.

Poverty line (Z) is taken as NR 4404.00 (NPC, 1998), population (n) as total population of a VDC and X_i as the average annual per capita income. Computed values of Poverty Incidence, Poverty Gap and Squared Poverty Gap are given in Table 4.

Poverty line is the minimum requirement for survival. People consume all their income and do not make any saving at the income equal to poverty line or below. Therefore, it is considered that the average annual per capita income below poverty line is equal to the expenditure and is used in the formula for X_i .

The formula is applicable to those income values, which is less than poverty line. As the income exceeds poverty line, the value of $(1 - X_i/Z)$ becomes negative. SPG is computed for those income also which is greater than the poverty line as the value gives an idea of the intensity of poverty or how significant is the income with respect to the poverty line. From the Table 4 following observation are made.

- Average annual income of VDCs is NR 5815.00,
- Annual average per capita income of fifteen VDCs is below poverty line,
- Average annual income of rest of the 28 VDCs are higher than the poverty line,
- Among fifteen VDCs below poverty line, ten have SPG values greater than 0, which means that the income levels of these VDCs are significantly below the poverty line. The remaining five VDCs of the poor group and other four VDCs with higher income groups have 0 value of SPG. This shows that the income of these nine VDCs do not differ much from the poverty line. In other words, the VDCs with 0 value of SPG are more vulnerable to poverty and can fall within poverty line or rise above poverty line if there is slight change in the income sources.

On the basis of these findings, 43 VDCs are grouped into the following four categories.

- | | |
|---------------------------------|--|
| 1. Very Poor
(NR 729 – 4040) | Those VDCs, whose income is less than poverty line and whose value of Squared Poverty Gap is more than 0. Ten VDCs fall in this group. |
| 2. Poor
(NR 4040 – 4699) | Those VDCs, whose income slightly varies from poverty line up or down and the Squared Poverty Gap is 0. Nine VDCs fall in this category. |
| 3. Fair
(NR 4699 – 6864) | Those VDCs, whose average annual per capita income is higher than the poverty line and falls around the average income of the VDCs that is NR 5815.00. Thirteen VDCs fall in this group. |
| 4. Good
(NRs. 6864 – 12655) | Those VDCs, whose average annual income is much higher than the average income of the VDCs. Eleven VDCs are coming in this group. |

POVERTY ANALYSIS BASED ON INDICATORS

Given the situation of availability of data, 24 indicators are taken for the study. They are of two types; the first types are directly related to social well-being or inversely related to poverty, denoted here by X, and the second types are inversely related to social well-being, and directly linked to poverty denoted by Y.

List of Indicators

List of Indicators directly proportional to the social well-being

1. Annual average per capita income (X_1),
2. Percentage of population employed in the secondary and tertiary sectors (X_2),
3. Percentage of female workers in nonagricultural occupation (X_3),
4. Household farm size in hectare (X_4),
5. Livestock per farm household (X_6),
6. Overall literacy rate (X_8),

requires more resources and highly skilled manpower, which is difficult for countries like Nepal. Therefore, an attempt is made to propose an alternative method of composite index analysis with poverty index, a proxy of poverty measure. The constituting indicators are as below.

1. Household farm size in hectare (X_4),
2. Percentage of households with food deficiency from 3 to 9 months (Y_5),
3. Percentage of thatched roof houses (Y_7), and
4. Percentage of Lower caste population (Y_{11}).

Rural economy is based on agriculture and its allied activities, therefore the farm size has important role to play with the rural poverty. The farm size is always not adequate to reflect the poverty situation in the mountain area, therefore when it is seen combined with the food sufficiency exhibit poverty picture more precisely. Similarly, the higher number of non-thatched roof houses reflect the better saving of households to purchase roofing materials and replace the locally available straw. Chhetri's study (1996) shows that the lower caste population is poorer in Nepal, therefore the lower number of the lower caste population exhibits the better situation of the VDC. Therefore these four indicators, directly reflecting poverty, which at the same time easy to measure are chosen to exhibit poverty situation of a VDC. The poverty index value is presented by CI_1 . The computation of the index is done in such a way that the lower the value, the lower is the poverty or the higher the value the higher is the poverty.

Sectoral Indices

The indicators, excluding average annual per capita income and four indicators of poverty index, are grouped into five sectors without repetition. X and Y has same meaning as mentioned in the list of indicators above. Here, the computation is made in such a way that the higher the value of index the better is the situation.

Natural Resources Sector (NRS)

In this group, five indicators related to natural resource are taken.

this sector.

1. Percentage of female workers in nonagricultural occupation (X_3),
2. Percentage of female illiteracy (Y_9), and
3. Percentage of girls in primary education (X_{10}).

The composite index of this sector is presented by CI_5 .

Aggregate Development Index (ADI)

In this group, fifteen indicators are taken. These indicators reflect development of a particular VDC. The lower level of development is the reflection of the higher level of poverty.

1. Percentage of population employed in the secondary and tertiary sectors (X_2),
2. Percentage of female workers in nonagricultural occupation (X_3),
3. Livestock per farm household (X_6),
4. Percentage of overall literacy (X_8),
5. Percentage of female illiteracy (Y_9),
6. Percentage of girls in primary education (X_{10}),
7. Percentage of population having drinking water facility (X_{12}),
8. Percentage of irrigated area (X_{13}),
9. Percentage of households with electricity (X_{14}),
10. Road access time in hours from VDC center to roadhead (Y_{15}),
11. Road density (all types of motorable roads) (X_{16}),
12. Banking unit per 1000 people (X_{17}),
13. Cooperatives per 1000 people (X_{18}),
14. Agriculture service centers per 1000 people (X_{19}), and
15. Rural population density (X_{24}).

The composite index value of aggregate development is presented by CI_6 .

Data are standardized using 0 to 1 scoring transformation method. All values of the indicators are changed to 0 to 1, irrespective of their units. The indicators (X), directly proportional to social well-

Y_i are the transformed value of the indicators. Then the composite index value for the each group is explained by the following equations.

$$PI = (CI_1) = \{(Y_4) + (X_5) + (X_7) + (X_{11})\} / 4 \quad \text{Equation 5}$$

$$NRS = (CI_2) = (Y_{20} + X_{21} + X_{22} + X_{23} + X_{24}) / 5 \quad \text{Equation 6}$$

$$SS = (CI_3) = (X_2 + X_8 + X_{12} + X_{14}) / 4 \quad \text{Equation 7}$$

$$IIS = (CI_4) = (X_{13} + Y_{15} + X_{16} + X_{17} + X_{18} + X_{19}) / 6 \quad \text{Equation 8}$$

$$WES = (CI_5) = (X_3 + Y_9 + X_{10}) / 3 \quad \text{Equation 9}$$

$$ADS = (CI_6) = (X_2 + X_3 + X_6 + X_8 + Y_9 + X_{10} + X_{12} + X_{13} + X_{14} + Y_{15} + X_{16} + X_{17} + X_{18} + X_{19} + X_{24}) / 15 \quad \text{Equation 10}$$

Composite indices are unitless having numerical value between 0 to 1 where 1 signifies the best situation of a VDC and 0 does the worst. Only the poverty index is computed in such a way that the higher value reflects the poorer situation and lowest value reflects the best situation.

Correlation Analysis

Using the statistical program, correlation coefficients are computed to understand and observe the relationship between selected individual indicators and composite indices.

Correlation of Income with Composite Indices

Correlation coefficients are computed for income with all group indicators. The result shows that the income has significantly negative relation with the poverty index. It has very weak correlation with aggregate development index and women empowerment index. The correlation of income with natural resources index and infrastructure and institution index is also found to be negative.

This is an anomalous character of the income. It can be an exceptional case. The reason behind it can be due to better tourism business in the district, opportunity to people of this district in jobs in

Table 6. Intercorrelation between of poverty and sectoral indices

	PI	NRS	SS	IIS	WEI
PI	1.000	-.130	-.088	-.063	-.019
NRS	-.130	1.000	.424**	.640**	.224
SS	-.088	.424**	1.000	.238	.552**
IIS	-.063	.640**	.238	1.000	-.013
WEI	-.019	.224	.552**	-.013	1.000

** Correlation is significant at the 0.01 level (2-tailed).

Correlation of Road Distance and Road Density with Sectoral Indices

Correlation coefficients are computed between sectoral indices with road distance and road density (Table 7). Distance in hours from VDC center to roadhead shows negative correlation with all sectoral indices. This means that when the road distance increases the sectoral development indices decrease. The VDCs far from the roadhead are poorer in all aspects. The road distance has less correlation coefficient with poverty index and also it is not significant, whereas it is significantly correlated with other indicators.

Similarly, the road density has significant correlation with natural resource sector index. The index value is somewhat higher in the case of women empowerment index. This shows that the higher the road density, the better is the natural resource endowment and women empowerment status. The road density has negative correlation with

Table 7. Correlation analysis of road distance, road density, CI₁, CI₂, CI₃ and CI₅

	Average per capita income per annum	PI	NRS	SSI	WEI
Road head distance in hour from VDC center	.268	.074	-.516**	-.290	-.218
Road density (total motor-able road length in Km per Km ²)	.120	.019	.343*	.089	.265

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

road distance, which means that the VDCs having greater distance from the roadhead have less road density.

Poverty Mapping

With the help of GIS, ArcvView, sets of maps are generated to illustrate the status of individual indicators and composite indices of sectoral development by VDC. Performances of indicators/indices are divided into four groups using equal interval method. The VDCs falling in each group are categorized as very poor, poor, fair and good according to very low, low, medium and high performance of each individual indicators or sectoral indices separately. Maps 9 to 32 present the spatial picture of individual indicators. Maps 11 to 16 present the spatial picture of composite development by sectors. Map 10 presents the overall composite picture of the 24 indicators.

In the maps, the VDCs with high intensity lines show good condition and the VDCs with dots show very poor situation. Other two are in between and higher the density of lines the better is the situation.

From the overall composite map of 24 indicators, it is found that four VDCs (with composite index value 0.580 to 0.662) are in the good category, 11 VDCs (with composite index value 0.498 to 0.580) in the fair category, 18 VDCs (with composite index value 0.416 to 0.498) in the poor category and 10 (with composite index value 0.335 to 0.416) are in the v. poor category (Table 9). The VDCs closer to the district center are in good or fair category. The VDCs in the eastern part and northwest part of the district are falling in the very poor category. Greater portions of the VDCs, under very poor category, have area greater than 30 degree slope. The VDCs around Lekhnath municipality - Kalika, Arba, Majhthana, Hansapur, Thumki and Siddha are in Very poor category. VDCs far from urban area and northern side such as Parche, Machhapuchre, Ghandruk, Dangsing and Bhadaure, and other three VDCs of the eastern side of the district are also falling in the very poor category.

From the natural resource sector map, it is seen that the VDCs in the northern part of the district are falling in the very poor or poor category. Hemja and Lamachaur closer to the district center and adjoining to Pokhara sub-metropolitan city are the best for natural resource sector. These two VDCs are in the top list of better VDCs in other indicators also.

In social sector map, VDCs of the eastern part are in very poor category. The VDCs situated in the western, northwestern and far from

Spatial Analysis of Sectoral Results Based on Composite Indices

Poverty index and natural resources index are compared separately with other sets of composite indices for their matching with each other in Table 11 and 12.

It is seen from the Table 10 prepared from Table 11 and 12 that there is perfect match between the VDCs in poverty index with 11 VDCs in aggregate development index. Similarly, 20 VDCs in poverty index are matching with VDCs in the nearest category and 12 VDCs are matching in the exceptional cases. Relation of PI with natural resources sector is better, where exceptional cases are only 5 in comparison to 16 in social, 14 in infrastructure and institution, and 12 in women empowerment sector indices. Natural resources sector is more or less matching with all other sector. The exceptional cases are fewer in all cases.

Table 10. Matching of poverty and natural resources sector Indices Vis-à-vis
Other sectoral indicators

	PI	NRS	SS	IIS	WES	ADS
PI						
- Perfect matching		17	14	12	11	11
- Matching with nearest (one step up and down) category		21	13	17	20	20
- Exception		5	16	14	12	12
NRS						
- Perfect matching	17		12	15	11	18
- Matching with nearest (one step up and down) Category	21		22	25	18	21
- Exception	5		9	3	14	5

Source: Table 11 and 12

- Note:
- 1) Perfect matching - VDCs of one category (good, fair, poor and very poor) of chosen sectoral index is matching with VDC of the same category in other indices
 - 2) Matching with nearest category - VDCs of one category of chosen sectoral index is matching with VDC of the one step up or down category in other indices.
 - 3) Exception - Not falling in any category mentioned above.

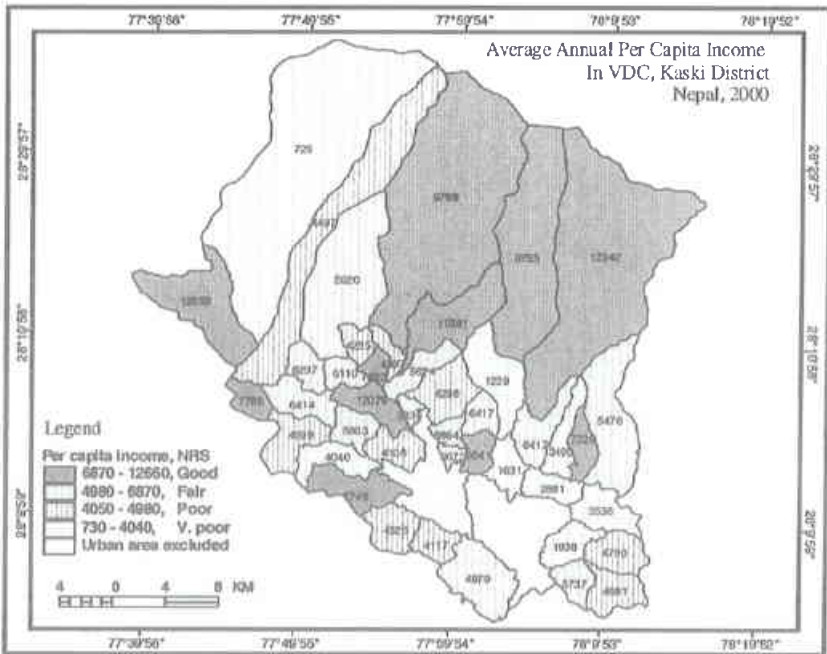


Figure 11. Average annual per capita income.

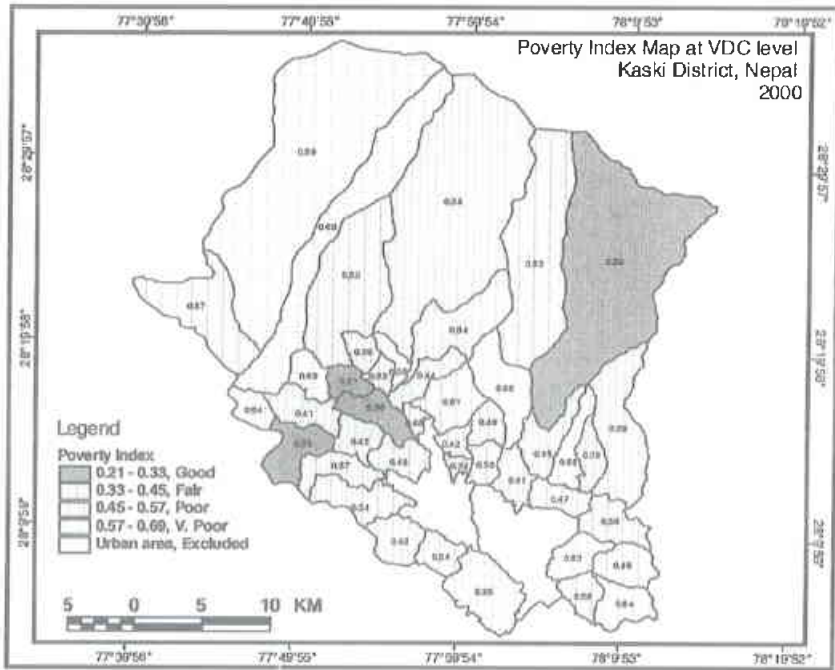


Figure 12. Poverty index map.

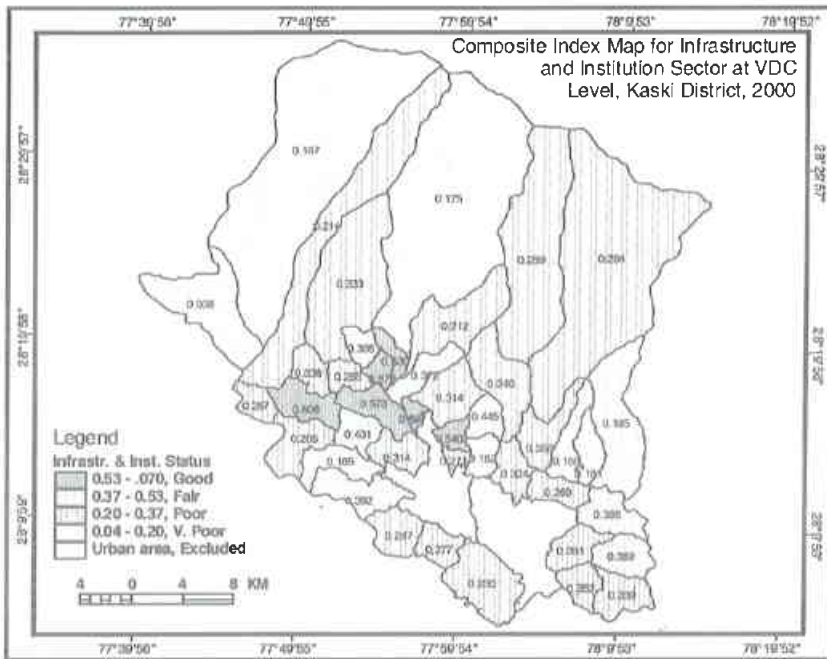


Figure 15. Composite index map infrastructure and institutional sector.

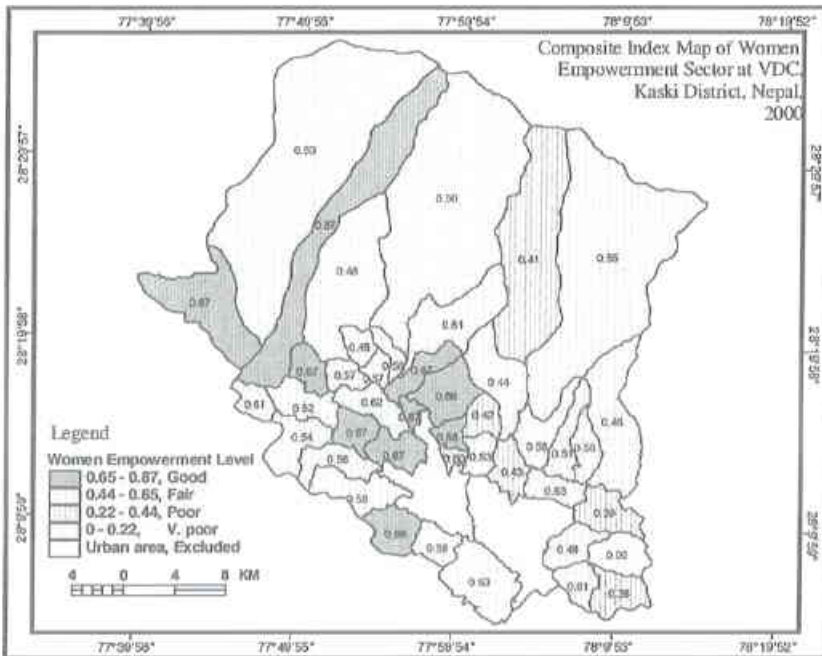


Figure 16. Composite index map of women empowerment.

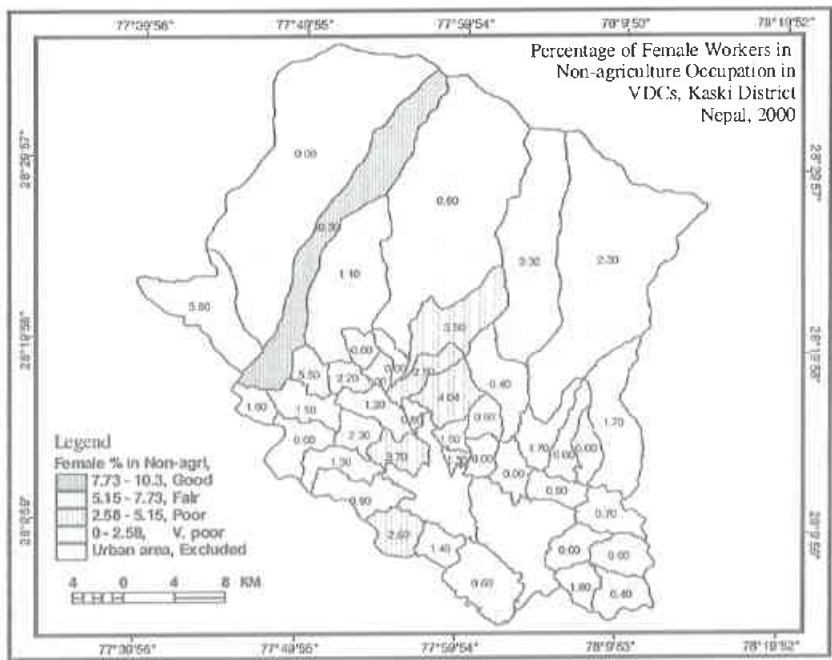


Figure 19. Percentage of female worker in nonagricultural occupation.

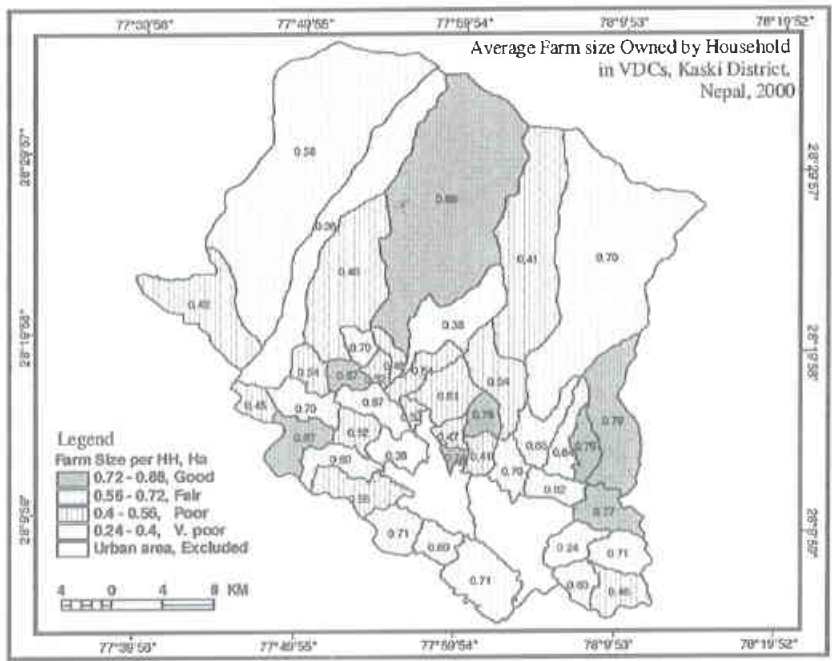


Figure 20. Average household farm size in ha.

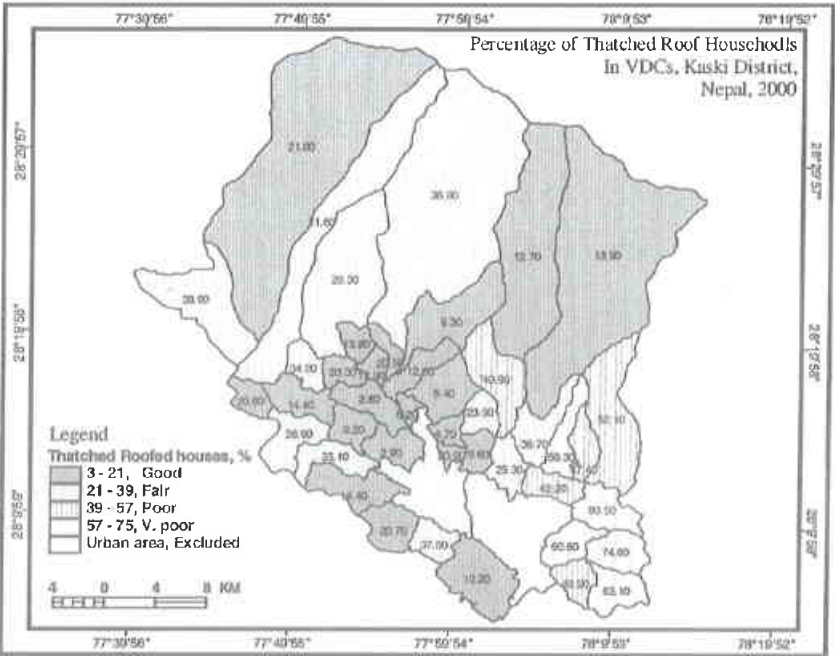


Figure 23. Percentage of thatched roof houses.

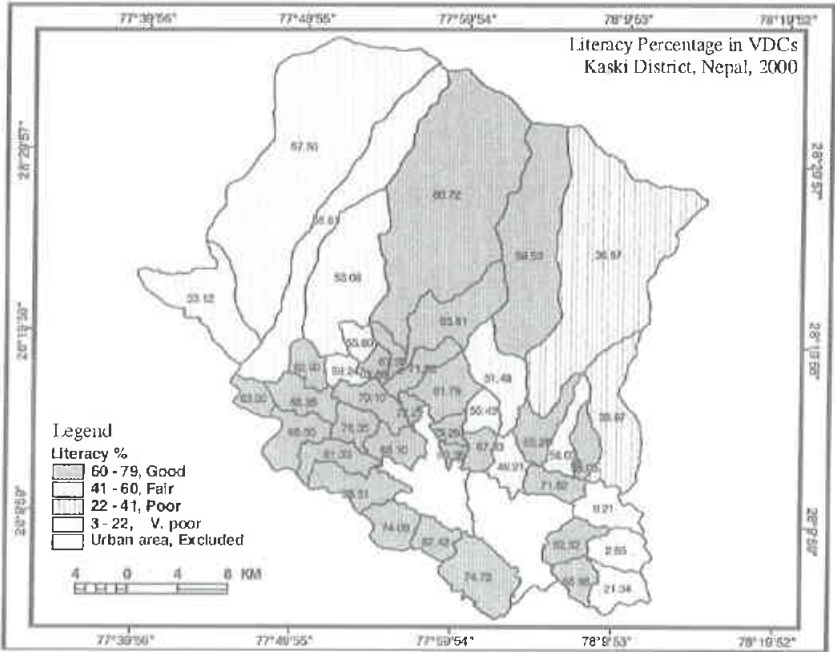


Figure 24. Percentage of overall literacy.

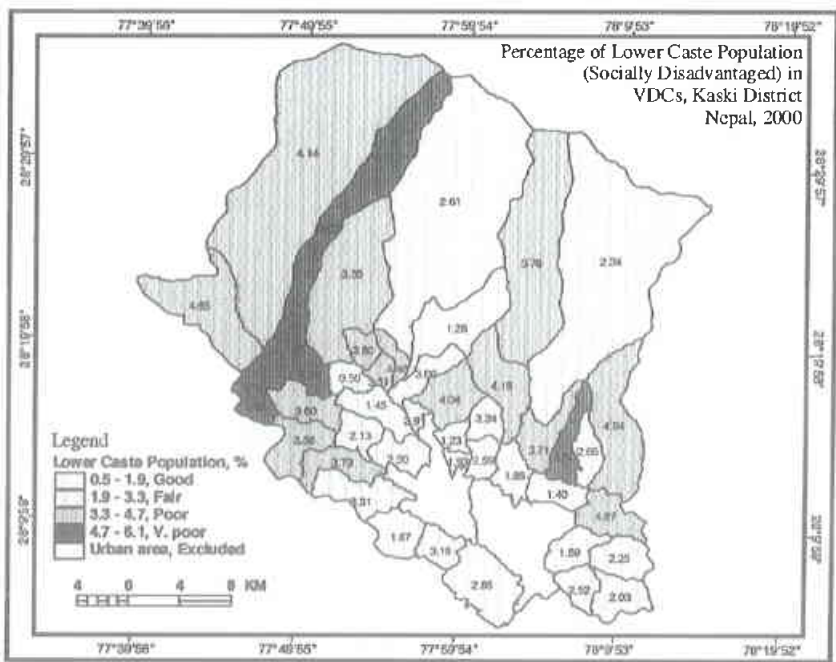


Figure 27. Percentage of lower caste population.

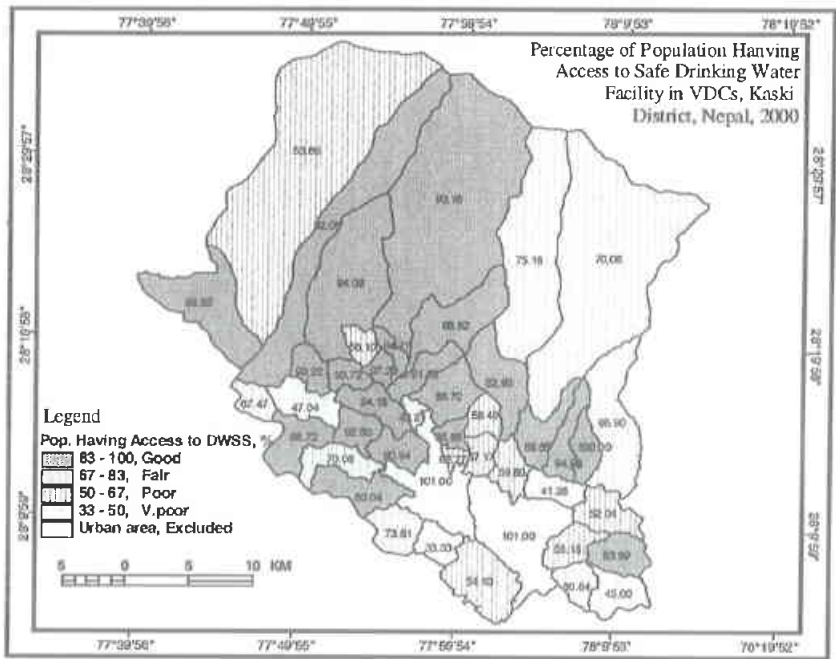


Figure 28. Population having access to safe drinking water.

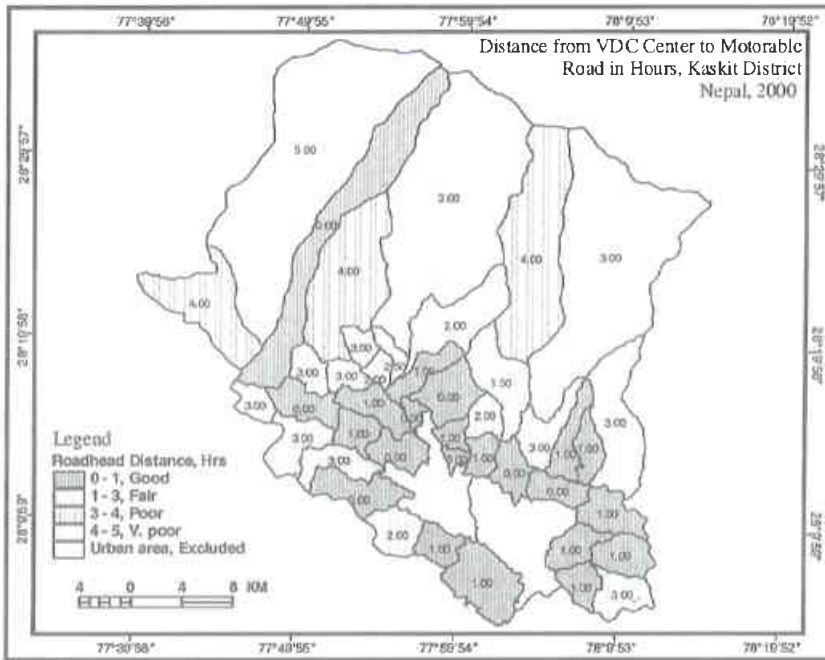


Figure 31. Distance of roadhead from VDC center.

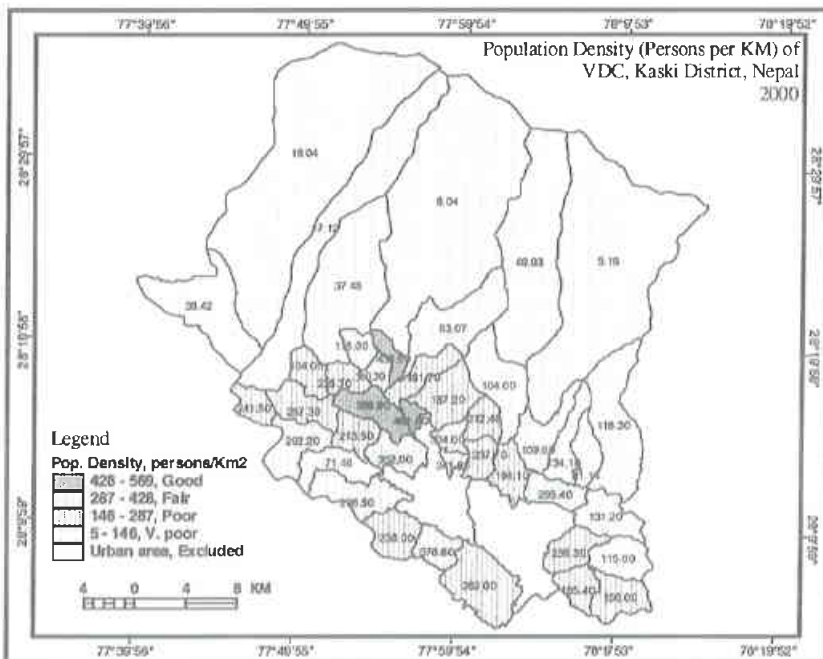


Figure 32. Road density.

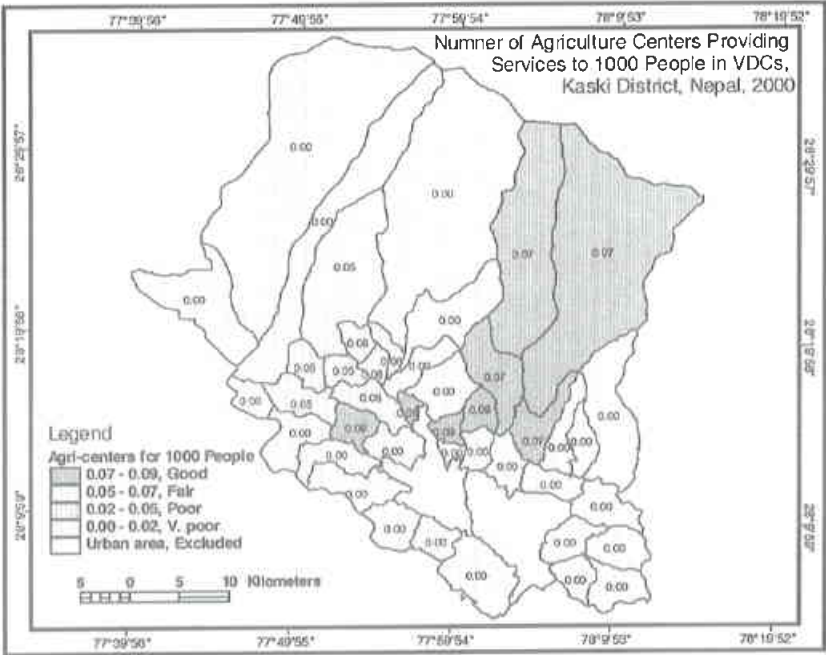


Figure 35. Agriculture centers per 1000 people.

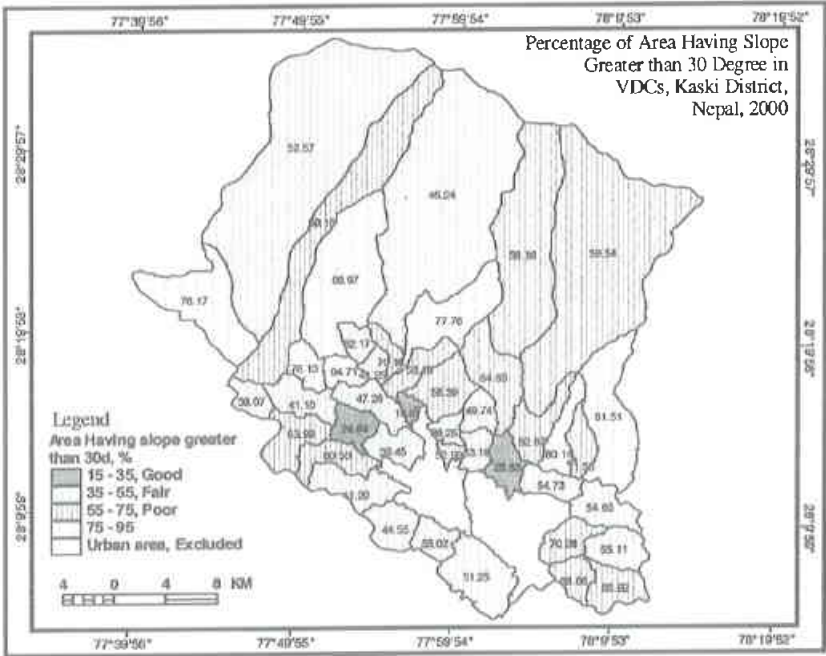


Figure 36. Percentage of area with slope greater than 30 degree.

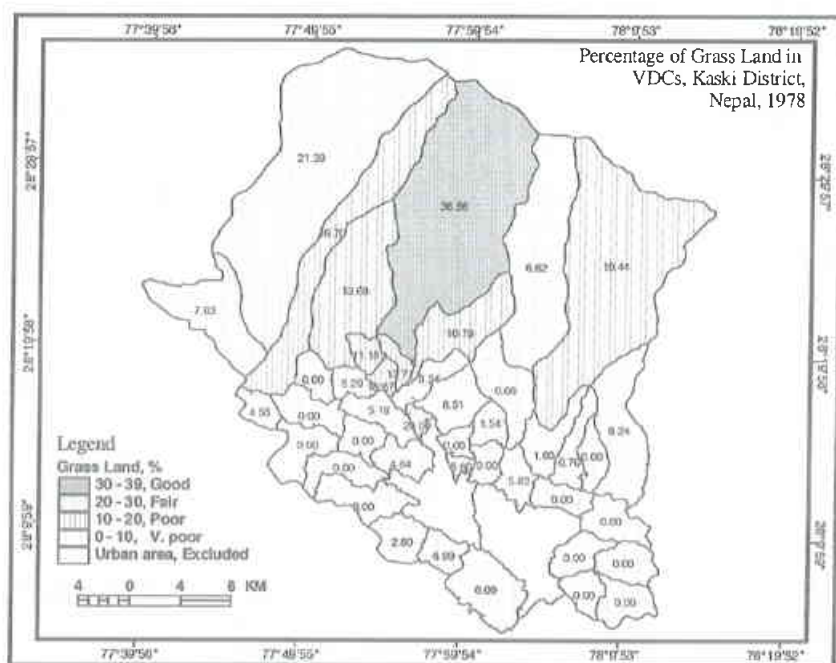


Figure 39. Percentage of grass land.

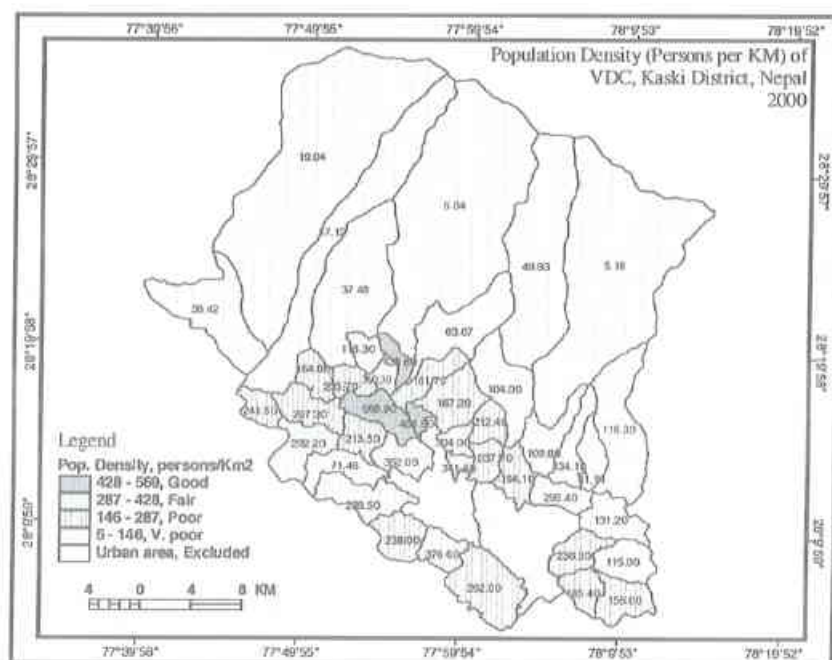


Figure 40. Rural population density.

23	Lamachaur	0.479	Poor	0.641	Good	0.641	Good	0.836	Good	0.670	Good	0.643	Good	0.662	Good
24	Hansapur	0.499	Poor	0.385	Poor	0.179	V.poor	0.463	Fair	0.388	Poor	0.310	V. poor	0.383	V. poor
25	Arbabijaya	0.501	Poor	0.417	Poor	0.442	Poor	0.219	V.poor	0.529	Fair	0.331	V. poor	0.421	Poor
26	Armala	0.507	Poor	0.420	Poor	0.688	Good	0.377	Fair	0.663	Good	0.468	Fair	0.528	Fair
27	Lwangghalel	0.520	Poor	0.333	V.poor	0.455	Poor	0.399	Fair	0.475	Fair	0.367	Poor	0.428	Poor
28	Parche	0.525	Poor	0.291	V.poor	0.414	Poor	0.346	Poor	0.409	Poor	0.331	V. poor	0.387	V. poor
29	Lahachok	0.531	Poor	0.502	Fair	0.594	Good	0.690	Good	0.566	Fair	0.549	Good	0.564	Fair
30	Pumdi Bhumdi	0.536	Poor	0.485	Fair	0.607	Good	0.459	Fair	0.576	Fair	0.480	Fair	0.518	Fair
31	Nirmalpokhari	0.543	Poor	0.481	Fair	0.527	Fair	0.333	Poor	0.591	Fair	0.428	Poor	0.478	Poor
32	Deurali	0.561	Poor	0.378	Poor	0.559	Fair	0.422	Fair	0.610	Fair	0.443	Poor	0.482	Poor
33	Chapakot	0.571	Poor	0.354	V.poor	0.715	Good	0.222	Poor	0.556	Fair	0.392	Poor	0.455	Poor
34	Dangsing	0.574	Poor	0.347	V.poor	0.428	Poor	0.046	V.poor	0.670	Good	0.269	V. poor	0.383	V. poor
35	Ghachok	0.577	V. poor	0.493	Fair	0.568	Fair	0.635	Good	0.561	Fair	0.544	Fair	0.536	Fair
36	Ghandruk	0.594	V. poor	0.266	V.poor	0.268	V.poor	0.200	V.poor	0.533	Fair	0.262	V. poor	0.335	V. poor
37	Lumle	0.604	V. poor	0.289	V.poor	0.541	Fair	0.257	Poor	0.868	Good	0.405	Poor	0.470	Poor
38	Rupakot	0.633	V. poor	0.390	Poor	0.392	V.poor	0.433	Fair	0.478	Fair	0.384	Poor	0.412	V. poor
39	Salyan	0.640	V. poor	0.480	Fair	0.512	Fair	0.321	Poor	0.606	Fair	0.399	Poor	0.456	Poor
40	Siddha	0.640	V. poor	0.395	Poor	0.167	V.poor	0.407	Fair	0.356	Poor	0.273	V. poor	0.337	V. poor
41	Sildujure	0.664	V. poor	0.380	Poor	0.345	V.poor	0.408	Fair	0.436	Fair	0.334	V. poor	0.381	V. poor
42	Saimarang	0.679	V. poor	0.352	V.poor	0.437	Poor	0.199	V.poor	0.510	Fair	0.310	V. poor	0.364	V. poor
43	Dhampus	0.689	V. poor	0.352	V.poor	0.643	Good	0.403	Fair	0.671	Good	0.465	Fair	0.476	Poor

Source: Computed from Transformed Values of the indicators and from mapping.

22	kalika	0.340	Fair	0.412	Poor	0.515	Fair	0.325	Poor	0.595	Fair	0.398	Poor	0.502	Fair
23	Siddha	0.640	V. poor	0.395	Poor	0.167	V. poor	0.407	Fair	0.356	Poor	0.273	V. poor	0.337	V. poor
24	Machhapuchre	0.341	Fair	0.394	Poor	0.414	Poor	0.210	V. poor	0.505	Fair	0.348	V. poor	0.436	Poor
25	Rupakot	0.633	V. poor	0.390	Poor	0.392	V. poor	0.433	Fair	0.478	Fair	0.384	Poor	0.412	V. poor
26	Hansapur	0.499	Poor	0.385	Poor	0.179	V. poor	0.463	Fair	0.388	Poor	0.310	V. poor	0.383	V. poor
27	Sildujure	0.664	V. poor	0.380	Poor	0.345	V. poor	0.408	Fair	0.436	Fair	0.334	V. poor	0.381	V. poor
28	Deurali	0.561	Poor	0.378	Poor	0.559	Fair	0.422	Fair	0.610	Fair	0.443	Poor	0.482	Poor
29	Thumakotdanda	0.451	Fair	0.373	Poor	0.549	Fair	0.428	Fair	0.577	Fair	0.425	Poor	0.495	Fair
30	Thumki	0.457	Poor	0.367	Poor	0.440	Poor	0.467	Fair	0.000	V. poor	0.301	V. poor	0.363	V. poor
31	Sardikhola	0.345	Fair	0.362	Poor	0.583	Fair	0.254	Poor	0.613	Fair	0.381	Poor	0.493	Poor
32	Mijuredanda	0.392	Fair	0.361	Poor	0.393	V. poor	0.222	V. poor	0.465	Fair	0.297	V. poor	0.410	V. poor
33	Chapakot	0.571	Poor	0.354	V. poor	0.715	Good	0.222	Poor	0.556	Fair	0.392	Poor	0.455	Poor
34	Dhampus	0.689	V. poor	0.352	V. poor	0.643	Good	0.403	Fair	0.671	Good	0.465	Fair	0.476	Poor
35	Saimarang	0.679	V. poor	0.352	V. poor	0.437	Poor	0.199	V. poor	0.510	Fair	0.310	V. poor	0.364	V. poor
36	Dangsing	0.574	Poor	0.347	V. poor	0.428	Poor	0.046	V. poor	0.670	Good	0.269	V. poor	0.383	V. poor
37	Lwangghalel	0.520	Poor	0.333	V. poor	0.455	Poor	0.399	Fair	0.475	Fair	0.367	Poor	0.428	Poor
38	Bhachok	0.388	Fair	0.332	V. poor	0.463	Poor	0.217	V. poor	0.556	Fair	0.326	V. poor	0.436	Poor
39	Dhital	0.214	Good	0.314	V. poor	0.486	Poor	0.318	Poor	0.575	Fair	0.384	Poor	0.496	Fair
40	Parche	0.525	Poor	0.291	V. poor	0.414	Poor	0.346	Poor	0.409	Poor	0.331	V. poor	0.387	V. poor
41	Lumle	0.604	V. poor	0.289	V. poor	0.541	Fair	0.257	Poor	0.868	Good	0.405	Poor	0.470	Poor
42	Namarjung	0.302	Good	0.273	V. poor	0.429	Poor	0.353	Poor	0.546	Fair	0.360	Poor	0.460	Poor
43	Ghandruk	0.594	V. poor	0.266	V. poor	0.268	V. poor	0.200	V. poor	0.533	Fair	0.262	V. poor	0.335	V. poor

Source: Computed from the Transformed Value of indicators and mapping.

There are various organizations involved in collecting similar data and information from the VDC. There is neither much coordination among these organizations nor linkages with the VDCs.

In Kaski district only 13 VDCs have village profiles. The higher authorities neither make use of these village profiles in the preparation of database at the higher level nor for the development planning. No agency takes initiatives to systematize and update them.

Data Collection Process

The VDC secretary collects the data and information for the DDC to establish the database from the sample survey of every cluster of a VDC. Similarly, the same VDC secretary collects and updates information for the Election Commission. The CBS also collects data from the VDC taking assistance from the VDC personnel. These collections are repeated and independent of each other. This shows the need for the VDC level database. Therefore it would be practical to expand the VDC activities for data collection, updating, and storage regularly, as required for higher level organizations. The present manpower is not adequate to perform this duty in addition to normal duties and responsibilities.

The DDC Information Unit is becoming capable of managing database in the district. But some improvements are still necessary to enable it to coordinate at different levels, collect data at the VDC level and update on regular basis.

Poverty Measurement

As the research shows, purely economic analysis based on income or consumption cannot reflect the social well-being of the VDCs. The fact behind it is that poverty is multi-faceted and rural people are vulnerable to poverty due to many reasons. Today's non-poor can be tomorrow's poor, if there is slight change in normal situation in and around his/her household.

Income and consumption related data collection, storage and management are costlier for rural development planning. Therefore, an alternative measure to replace income driven analysis is necessary. The

The visual communication is an effective way of observing situation for rural development planning, which is simple and easy to interpret. Therefore, common people with low level of literacy can understand and use it to design rural development funds.

The findings from the statistical analysis and mapping are very close to each other. It is difficult for the local level planners and policy makers to understand the statistical analytical results. Additionally, people believe what they see but not what is proved from mathematical models. Therefore, the visual communication is more effective and extremely important for strengthening participatory planning.

Kaski district is considered relatively an advanced district and possesses data for planning. But all other districts of Nepal are not as strong as Kaski district in this respect. In such case, as shown through this study, it is recommended that following indicators be taken for preliminary assessment of poverty at the VDC level.

1. Rural population density: The higher the population density the better is the social well-being of the VDC, alternatively VDCs having low population density are poorer. Because of threshold criteria for providing development activities, the highly populated areas get more development functions and activities, and in the long run these VDCs become more developed.
2. Distance of VDC from the district center: VDCs closer to the district center are more advanced as they have taken the advantages of the rural urban linkages for advancing the development there. The far off VDCs are poorly developed.
3. Distance of VDC from the road head: VDCs closer to road-head have taken advantages of transportation and communication factors for their development. In other way, it is easy to provide resources to those VDCs, which are closer to road head.
4. Road Density: The VDCs having roads are better off and VDCs having more road length have better access within the VDC and are better off accessing to available facilities. Low level of road density in VDCs characterizes higher poverty.
5. Percentage of land above 30-degree slope: This land is less fertile, prone to high soil erosion and needs terracing for cultivation. Mechanization is not possible, therefore agricultural and soil conservation activities are labor intensive. Higher

be placed at the VDC: one technician, one accountant and one VDC secretary. So that, the VDC secretary can be involved efficiently in the data collection and management works. Thereafter, VDC can manage to collect and update database required for the NPC, the CBS, the DDC or the EC or any other district line agencies. The duplication of economic and human resources as seen in the present process of data collection can be minimized with this arrangement. This helps to empower the VDC in the long run in many ways.

At present it is not possible feasible to provide computer facilities at the VDC level. It increases financial burden to the government. The information collected and updated in the VDC should be submitted to the DDC for compilation and processing taking the advantage of the computer services of the DDC.

Improvement of the DDC Information System

Investment and inputs have gone through the UNDP support to create the database and information system to streamline the activities at the district level. Findings and recommendations if followed carefully, would improve the situation of database management system in the DDC.

The DDC Information unit has already established the basic level databases. Further assistance in instrument supports (digitizing table, computer, vehicles, visual instruments for dissemination of information at different levels) are required to enhance the quality of the database. Arrangements for displaying data, graphics, maps (as demonstrated through this study) etc. should be made at the DDC.

The DDC is trying to raise funds by selling the data to users, which is appreciable. But the fund generated is too less for undertaking such database improvement task. In the contrary, the DDC should provide the data and information to the VDCs and should collect feedback and comments for further improvement of the database.

The DDC has to initiate the process of preparing and updating village level database and has to incorporate the data and information coming from the VDC in its database regularly. Also, the result of the analysis should be shared in the meetings of the district assembly. This process encourages the VDC to collect and update data. This also enhances the awareness of the VDC personnel regarding the

1. Road Access: The Agriculture Perspective Plan of Nepal (1995) has stated the importance of road network for agriculture development. Rural residents are well aware of the importance of road and they give top priority to road construction while prioritizing the development activities at the local level. Therefore road access should be developed in relation to existing and potential market centers. As the VDC centers are the focal points, they must be interlinked with the market centers. Government resources are not adequate to extend the road network in the country for meeting the needs at the VDC level. Therefore, participatory approach is being practiced for cost sharing by various non-government including government organizations. Most of the projects under implementation for poverty reduction address the local level problems but do not give emphasis on rural accessibility explicitly. Government should frame a strong policy to force the project authorities to earmark a part of their budget for road construction in order to maximize road connectivity among the scattered settlements.
2. The study confirms that higher the populations size the better is the development. This explains that the development has gone into larger VDCs. Within VDC, the settlements are very much scattered and also isolated at times due to hilly and mountainous terrain. In order to energize poverty reduction measures, equal emphasis should be given to VDCs irrespective of population size. The smaller VDC must not be ignored while using population threshold criteria in allocating services and production related functions.
3. Areas with slope higher than 30 degree have negative correlation with development indicators. People find extremely difficult to expand resource base in areas beyond 30 degree of slope for earning meaningful livelihood system and as well as improving living standard. Therefore, settlements in such areas should be strictly discouraged. In Thailand the issue of land title to settlers in the areas having slope greater than 35 degree is prohibited. This experience may be exercised in case of Nepal too.

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Appendix One

INDICATORS OF SIELA DATABASE OF CAMBODIA

Royal Government of Cambodia has implemented Seila Program in 1996. The program is an initiative to strengthen the local governance as a key to achieve sustainable poverty alleviation in Cambodia. The following indicators are used to identify the Communes needing immediate attention.

Indicators

I. Village Statistics

1. Total number of families
2. Total number of females
3. Total number of males
4. Girls 0-4 years old (under 5s)
5. Boys 0-4 years old (under 5s)
6. Girls 5-14 years old
7. Boys 5-14 years old
8. Girls attending school, 5-14 years
9. Boys attending school, 5-14 years
10. Male above 65 years old
11. Female above 65 years old
12. Male illiterates over 15 years old
13. Female illiterates over 15 years old
14. Number of female invalids
15. Number of male invalids
16. Number of orphans below 15 years old
17. Number of internally displaced families > 3 years
18. Number of families of returnees < 10 years
19. Number of female-headed households
20. Number of landless families

VI. Transportation

- 44. Number of motorcycles
- 45. Number of tractors/cars
- 46. Number of horse carts and ox carts
- 47. Number of bicycles
- 48. Number of rowing boats
- 49. Number of motor boats
- 50. Distance in (km) to nearest market
- 51. Distance in (km) to nearest year round road (4 wheel motor vehicles)
- 52. Total length of rural roads

VII. Agricultural Resources

- 53. Irrigated rice land (ha)
- 54. Nonirrigated rice land (ha)
- 55. Chamka rice land (ha)
- 56. Other farm land (ha)
- 57. Mined land (ha)
- 58. Total length of functioning irrigation canal in (km)
- 59. Total length of non functioning canals in (km)
- 60. Number of year round irrigation water sources
- 61. Number of irrigation wells
- 62. Number of functioning water gates

VIII. Crop Production

- 63. Number of nonfunctioning water gates
- 64. Total rice yield in last 12 months
- 65. Current farm gate for rice (riel/kg)

IX. Livestock

- 66. Number of nondraught cattle/buffaloes
- 67. Number of draught cattle/buffaloes
- 68. Number of pigs
- 69. Number of active village veterinaries

Appendix Two

FOCAL SITE SELECTION CRITERIA, LAO PDR

Lao PDR has adopted focal site approach to achieve rural development in 1994. Under this program, poorest rural areas, which need urgent attention, are identified using criteria mentioned below for program implementation.

Isolation/Poverty

1. Isolated area far from town, which has not received any aid from any international organization.
2. Area flooded during the rainy season; lacks drinking water, diarrhea, malaria and skin disease occurred during the dry season.
3. Living condition mostly connected directly with nature; they have no market at all.
4. Difficult communication: Village not connected by roads. Roads usable only in the dry season.
5. Poor people living in isolated mountainous areas.
6. Areas where the majority is ethnic people with primitive living conditions.
7. Areas with less opportunity for development, poorer than other areas.
8. Very isolated ethnic areas.
9. Areas bordering neighboring countries.
10. Underdeveloped areas where the people desire development.
11. Close to the border of Thailand or other Lao provinces.
12. Located far away and isolated without roads, electricity, water supply, school, health center.
13. Living conditions are not developed, people still poor and not very healthy due to lack of health services.

Development Potentials

14. Close to national border and suitable for tourism and services.

is possible to provide more facilities for the consolidation of small scattered villages.

Participation

27. Areas, which were former revolutionary bases.
28. Areas where people are active participants in development but who still have more difficulties to overcome.

Security

29. Isolated areas that have many difficulties, areas with a need to ensure security along borders and which have problems with workers illegally travelling to bordering countries.
30. Areas that have more socioeconomic and other difficulties and where there is a need to ensure security.
31. Areas, where there is a need to ensure security and where there is still no safety.
32. Areas situated along what will be main national roads in the future, but there is currently a lack of safety.

16. Mental health
17. Solid waste problems
18. Sanitation at work
19. Participation in health and hygienic activities

Group IV. Water Resources

20. Clean drinking water
21. Water for domestic use
22. Water for agricultural purpose

Group V: Knowledge, Education and Culture

23. Education level
24. Rate of study continuation
25. State educating
26. Education center
27. Information service center
28. Religious, cultural and sport activities

Group VI: Natural Resources and Environment

29. Forest
30. Soil resources
31. Surface water resources

BASIC MINIMUM NEEDS DATABASE INDICATOR (2000)

Section I. Hygiene and Sufficiency of Food

1. Pregnant women receive pre-maternal care, including a complete set of vaccination.
2. Pregnant women receive birth-giving service and post- maternal cares from qualified personnel.
3. Pregnant women have adequate and proper food for consumption so that weight of newborn baby will not be less than 2500 grams.
4. Newborns receive mother's milk

28. Household members have security for them and for their possessions.

Section V. Household Income

29. Household members work and earn on an average, not less than 20,000 (average income per person per year in village) baht per person per year.

Section VI. People Participating in Improving Their Own Living Condition and the Community as a Whole

30. Household members are members of at least one group established in the village or the sub-district.
31. People participate sincerely in democratic election.
32. Household members participate in development activities and maintaining public properties.

Section VII. Spiritual and Moral Development

33. Household members practice religious rites.
34. Household members are not addicted to alcohol.
35. Household members are not addicted to cigarette.
36. Household members participate in local cultural activities.
37. Older and handicapped receive caring from household members or people in the community.

Section VIII. Environmental Conservation

38. Household members participate in conservation activities and natural resources development.
39. Household members participate in environmental protection activities.

30. 1 if household is in the Northern Uplands region, 0 otherwise	X	X
31. 1 if household is in the Red River Delta region, 0 otherwise	X	X
32. 1 if household is in the N. Central Coast, 0 otherwise	X	X
33. 1 if household is in the S. Central Coast, 0 otherwise	X	X
34. 1 if household is in the Central highlands, 0 otherwise	X	X
35. 1 if household is in the Southeast, 0 otherwise	X	X
36. 1 if household is in the Mekong River Delta, 0 otherwise	X	X

Note: * the indicators are designed to fit for the probit regression Model.

X denotes the availability of data under the specified survey.

B. Socioeconomic and Infrastructure Development

Social and health sector

9. Overall literacy rate
10. Infant mortality rate
11. Contraceptive prevalence rate
12. Drinking water coverage
13. Ratio of labor force engaged in non-agriculture to those engaged in agriculture
14. Percentage of farm households reported to have institutional agriculture credit
15. Farm size
16. Livestock per farm household
17. Cropping intensity
18. Percentage of irrigated area

Infrastructure

19. Road density
20. Banks
21. Cooperatives
22. Health institutions
23. Per capita regular budget allocation
24. Per capita development budget allocation
25. Post offices
26. Percentage of forest user households

C. Women's Empowerment

27. Percentage share of females in literacy (10⁺ years)
28. Percentage share of females in nonagricultural occupation
29. Percentage share of elected females at district level
30. Percentage share of females at primary level (female teacher in primary school)
31. Percentage of share of girls enrollment in primary education
32. Percentage of girl dropout at primary level (1-5)

Appendix Six

POVERTY AND COMPOSITE INDEX COMPUTATION

This section describes the computation of Poverty Incidence, Poverty Gap and Squared Poverty Gap using Foster-Greer-Thorbecke formula. It also presents the computation of Transformed Value and composite indices. The Transformed Values and their respective raw data are tabulated along the sectoral indices at the end of this section from Table 13-18.

POVERTY LEVEL BASED ON ANNUAL AVERAGE PER CAPITA INCOME

Poverty Incidence, Poverty Gap and Squared Poverty Gap (SPG) are computed from the Foster-Greer-Thorbecke (FGT) class of poverty measures.

$$P_{\alpha} = \frac{1}{n} \sum (1 - (X_i / Z))^{\alpha}$$

Where

X_i	=	Per capita expenditure for those individuals, who are below the poverty line. It is zero for those having income above poverty line.
Z	=	The poverty line is NR 4404.00 for Nepal (1998)
n	=	Total population of an area under consideration
α	=	Put 0 for computation of Head Count Index, 1 for Poverty Gap and 2 for Squared Poverty Gap separately

Let us take an example of Kalika, Where

Population (n)	= 4470,
Per capita income (X_i)	= Nrs. 3673

1) When $\alpha = 0$, i.e. P_0 is Poverty Incidence,

$$P_0 = \frac{1}{4470} \{ (1 - 3673/4404)^0 + \{ (1 - 3673/4404)^0 + (1 - 3673/4404)^0 + (1 - 3673/4404)^0 + \dots \dots 4470 \text{ times} \} \}$$

Maximum value of annual per capita income = 12655 (Dangsing)

Minimum value of annual per capita income = 729 (Ghandruk)

i) When $X_{ij} = X_{i(\max)}$

$$\begin{aligned} TV &= \frac{X_{ij} - X_{i(\min)}}{X_{i(\max)} - X_{i(\min)}} \\ &= \frac{12655 - 726}{12655 - 726} \\ &= 1 \end{aligned}$$

ii) When $X_{ij} = X_{i(\min)}$

$$\begin{aligned} TV &= \frac{X_{ij} - X_{i(\min)}}{X_{i(\max)} - X_{i(\min)}} \\ &= \frac{726 - 726}{12655 - 726} \\ &= \frac{0}{11929} \\ &= 0 \end{aligned}$$

Similarly other values are transformed to 1 to 0 without changing their original order.

In the case where human well being is inversely proportional to the indicator

Taking an example of percentage of thatched roof houses in VDCs

Maximum value of percentage of thatched roof houses in the VDCs
= 97.1% (Sarangkot)

Minimum value of percentage of thatched roof houses in the VDCs
= 25.4% (Thumki)

i) When $X_{ij} = X_{i(\max)}$

$$\begin{aligned} TV &= \frac{X_{i(\max)} - X_{ij}}{X_{i(\max)} - X_{i(\min)}} \\ &= \frac{97.1 - 97.1}{97.1 - 25.4} \end{aligned}$$

Social sector (CI₃)

1. Employment rate generated from secondary and tertiary sectors (X ₂)	=	0.35
1. Drinking water coverage (X ₁₂)	=	0.43
2. Percentage of household with electricity (X ₁₄)	=	0.48
5. Percentage of thatched roof house (X ₇)	=	0.75

Infrastructure and institution sector (CI₄)

3. Percentage of irrigated area (X ₁₃)	=	0.41
4. Road access time from VDC to road-head (X ₁₅)	=	0.22
1. Road density (X ₁₆)	=	0.22
5. Bank service available per 1000 people (X ₁₇)	=	0.00
6. Cooperatives service available per 1000 people (X ₁₈)	=	0.00
7. Agriculture Centers providing services available to 1000 people (X ₁₉₄)	=	0.00

Women empowerment (CI₅)

1. Percentage of female workers in non agricultural occupation (X ₃)	=	0.13
2. Percentage of females in Literacy (10 ⁺ years) (X ₉)	=	0.77
3. Percentage of girls in primary education (X ₁₀)	=	0.89

Aggregated development Index (CI₆)

1. Employment rate generated from secondary and tertiary sectors (X ₂)	=	0.35
2. Percentage of female workers in non agricultural occupation (X ₃)	=	0.13
3. Livestock (large and small ruminants) per farm household (X ₆)	=	0.16
4. Overall literacy rate (X ₈)	=	0.79
5. Percentage of females in Literacy (10 ⁺ years) (X ₉)	=	0.77
6. Percentage of girls in primary education (X ₁₀)	=	0.89
7. Drinking water coverage (X ₁₂)	=	0.43

$$= (0.13+0.77+0.89) / 3$$

$$= 0.597$$

$$\text{ADS} = (\text{CI}_6) = (X_2 + X_3 + X_6 + X_8 + Y_9 + X_{10} + X_{12} + X_{13} + X_{14} + Y_{15} + X_{16} + X_{17} + X_{18} + X_{19} + X_{24}) / 15 \quad \text{Equation 10}$$

$$= (0.35 + 0.13 + 0.16 + 0.79 + 0.77 + 0.89 + 0.43 + 0.41 + 0.48 + 1.00 + 0.22 + 0.00 + 0.00 + 0.00 + 0.34) / 15$$

$$= 0.398$$

NATURAL RESOURCE SECTOR INDEX

Table 14. Raw data of Indicators, corresponding TVs and composite index

S.no	VDC	Y ₂₀		X ₂₁		X ₂₂		X ₂₃		X ₂₄		CI ₂
		%	TV	%	TV	%	TV	%	TV	per/Km2	TV	
1	Arbabijaya	53.16	0.52	52.63	0.65	42.11	0.50	0.00	0.00	237.7	0.41	0.417
2	Armala	58.39	0.45	44.83	0.55	46.67	0.59	8.51	0.22	167.2	0.29	0.420
3	Bhachok	71.55	0.29	55.17	0.69	44.83	0.55	0.00	0.00	81.14	0.13	0.332
4	Bhadauretamagi	63.99	0.38	30.57	0.37	69.43	0.99	0.00	0.00	292.2	0.51	0.451
5	Bhalam	38.28	0.70	64.84	0.81	35.16	0.38	0.00	0.00	304	0.53	0.485
6	Bharatpokhari	51.25	0.54	43.44	0.53	50.16	0.65	6.09	0.16	262	0.46	0.468
7	Chapakot	60.50	0.43	51.72	0.64	46.71	0.59	0.00	0.00	71.46	0.12	0.354
8	Dangsing	76.17	0.23	25.55	0.30	66.82	0.95	7.63	0.20	36.42	0.06	0.347
9	Deurali	68.66	0.33	53.92	0.67	46.08	0.57	0.00	0.00	185.4	0.32	0.378
10	Dhampus	76.13	0.23	53.15	0.66	46.85	0.59	0.00	0.00	164	0.28	0.352
11	Dhikurpokhari	41.10	0.67	59.51	0.74	40.49	0.47	0.00	0.00	267.3	0.47	0.470
12	Dhitai	94.71	0.00	75.88	0.95	18.24	0.08	5.29	0.14	235.7	0.41	0.314
13	Ghachok	70.16	0.31	43.55	0.54	41.94	0.50	13.71	0.36	438.6	0.77	0.493
14	Ghandruk	52.57	0.53	6.02	0.05	23.45	0.17	21.39	0.55	19.04	0.02	0.266
15	Hansapur	54.65	0.50	57.56	0.72	40.99	0.48	0.00	0.00	131.2	0.22	0.385
16	Hemja	47.26	0.59	47.87	0.59	43.90	0.54	5.18	0.13	568.9	1.00	0.571
17	Kahu	24.64	0.88	79.71	1.00	20.29	0.11	0.00	0.00	341.6	0.60	0.517
18	kalika	52.99	0.52	54.48	0.68	35.45	0.38	5.60	0.15	194.1	0.34	0.412
19	Kaskikot	25.83	0.86	75.42	0.94	18.75	0.08	5.83	0.15	213.5	0.37	0.482
20	Kristinachnechau	44.55	0.63	60.44	0.75	36.76	0.41	2.80	0.07	238	0.41	0.454
21	Lahachok	48.25	0.58	69.30	0.87	14.04	0.00	16.67	0.43	360.3	0.63	0.502
22	Lamachaur	14.67	1.00	62.67	0.78	17.33	0.06	20.00	0.52	481.6	0.85	0.641
23	Lumle	59.16	0.44	10.81	0.12	37.96	0.43	16.70	0.43	17.12	0.02	0.289
24	Lwangghalel	88.97	0.07	16.20	0.18	69.57	1.00	13.68	0.35	37.48	0.06	0.333
25	Machhapuchre	46.24	0.61	1.80	0.00	34.22	0.36	38.56	1.00	6.04	0.00	0.394
26	Majthama	54.73	0.50	61.73	0.77	36.63	0.41	0.00	0.00	295.4	0.51	0.438
27	Mauja	49.74	0.56	68.21	0.85	30.26	0.29	1.54	0.04	212.4	0.37	0.422
28	Mijuredanda	81.51	0.16	24.52	0.29	69.25	0.99	6.24	0.16	116.3	0.20	0.361
29	Namajung	59.54	0.44	4.09	0.03	48.91	0.63	10.44	0.27	5.16	0.00	0.273
30	Nirmalpokhari	55.02	0.50	63.32	0.79	29.69	0.28	6.99	0.18	376.6	0.66	0.481
31	Parche	58.16	0.46	9.34	0.10	50.21	0.65	6.62	0.17	49.93	0.08	0.291
32	Pumdi Bhumdi	41.20	0.67	50.69	0.63	48.15	0.61	0.00	0.00	296.5	0.52	0.485
33	Puranchaur	56.18	0.48	32.21	0.39	58.05	0.79	8.24	0.21	161.7	0.28	0.430
34	Rivan	52.17	0.53	52.17	0.65	36.65	0.41	11.18	0.29	116.3	0.20	0.414
35	Rupakot	70.28	0.31	48.25	0.60	49.65	0.64	0.00	0.00	236.3	0.41	0.390
36	Saimarang	80.14	0.18	34.49	0.42	64.81	0.91	0.70	0.02	134.1	0.23	0.352
37	Salyan	38.07	0.71	55.11	0.68	40.34	0.47	4.55	0.12	241.5	0.42	0.480
38	Sarangkot	39.45	0.69	62.28	0.78	32.87	0.34	4.84	0.13	352	0.62	0.509
39	Sardikhola	77.76	0.21	18.60	0.22	69.81	1.00	10.78	0.28	63.07	0.10	0.362
40	Siddha	55.92	0.48	39.34	0.48	55.45	0.74	0.00	0.00	156	0.27	0.395
41	Sildujure	64.69	0.38	33.66	0.41	65.68	0.93	0.66	0.02	104	0.18	0.380
42	Thumakotdanda	62.67	0.40	48.80	0.60	49.33	0.63	1.60	0.04	109.6	0.19	0.373
43	Thumki	55.11	0.49	52.63	0.65	41.49	0.49	0.00	0.00	115	0.19	0.367

Source: Raw Data and Computation.

INFRASTRUCTURE AND INSTITUTION SECTOR INDEX

Table 16. Raw data of Indicators, corresponding TVs and composite index

S.no	VDC	(X ₁₃)		(Y ₁₅)		(X ₁₆)		(X ₁₇)		(X ₁₈)		(X ₁₉)		CL
		%	TV	Hrs	TV	Km/ KM2	TV	per 1000	TV	per 1000	TV	per 1000	TV	
1	Arbabijaya	5.98	0.04	1	0.80	0.67	0.25	0	0.00	0	0.00	0	0.00	0.18
2	Armala	63.49	0.52	0	1.00	0.11	0.04	0	0.00	0.5	0.32	0	0.00	0.31
3	Bhachok	35.44	0.29	1	0.80	0	0.00	0	0.00	0	0.00	0	0.00	0.18
4	Bhadauretamagi	18.57	0.14	3	0.40	0.92	0.35	0.05	0.33	0	0.00	0	0.00	0.20
5	Bhalem	61.86	0.51	1	0.80	0.31	0.12	0.09	0.60	0.33	0.21	0.09	1.00	0.54
6	Bharatpokhari	52.83	0.43	1	0.80	0.04	0.02	0	0.00	0.21	0.13	0	0.00	0.23
7	Chapakot	46.06	0.38	3	0.40	0	0.00	0.05	0.33	0	0.00	0	0.00	0.18
8	Dangsing	4.88	0.03	4	0.20	0	0.00	0	0.00	0	0.00	0	0.00	0.04
9	Deurali	38.43	0.31	1	0.80	0	0.00	0.15	1.00	0	0.00	0	0.00	0.35
10	Dhampus	46.17	0.38	3	0.40	0.35	0.13	0.05	0.33	0.34	0.22	0.05	0.56	0.34
11	Dhikurpokhari	55.51	0.46	0	1.00	2.63	1.00	0.05	0.33	0.48	0.31	0.05	0.56	0.61
12	Dhital	23.69	0.19	3	0.40	0.3	0.11	0.05	0.33	0	0.00	0.05	0.56	0.27
13	Ghuchok	64.51	0.53	2.5	0.50	0.99	0.38	0.13	0.87	0.37	0.24	0.06	0.67	0.53
14	Ghandruk	120	1.00	5	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.17
15	Hansapur	77.9	0.64	1	0.80	0.16	0.06	0	0.00	1.27	0.81	0	0.00	0.39
16	Hemja	64.56	0.53	1	0.80	0.83	0.32	0.13	0.87	0.4	0.25	0.06	0.67	0.57
17	Kahu	8.27	0.06	1	0.80	0.34	0.13	0.09	0.60	0	0.00	0.09	1.00	0.43
18	Kalika	49.58	0.41	0	1.00	0.58	0.22	0	0.00	0	0.00	0	0.00	0.27
19	Kaskikot	47.56	0.39	0	1.00	0	0.00	0.05	0.33	0.35	0.22	0	0.00	0.32
20	Kristinachnechau	42.19	0.34	2	0.60	0.37	0.14	0.06	0.40	0	0.00	0	0.00	0.25
21	Lalachiok	85.71	0.71	2	0.60	1.19	0.45	0.13	0.87	0.24	0.15	0.06	0.67	0.57
22	Lamachaur	65.99	0.54	0	1.00	0.1	0.04	0.09	0.60	1.57	1.00	0.09	1.00	0.70
23	Lumle	1.49	0.00	0	1.00	0.75	0.29	0	0.00	0	0.00	0	0.00	0.21
24	Lwangghalel	108.5	0.90	4	0.20	0.01	0.00	0.05	0.33	0	0.00	0.05	0.56	0.33
25	Machhapuchre	77.34	0.64	3	0.40	0.02	0.01	0	0.00	0	0.00	0	0.00	0.17
26	Majhhatna	52.77	0.43	0	1.00	0.33	0.13	0	0.00	0	0.00	0	0.00	0.26
27	Mauja	56.98	0.47	2	0.60	0	0.00	0.09	0.60	0	0.00	0.09	1.00	0.44
28	Mijuredanda	85.47	0.71	3	0.40	0	0.00	0	0.00	0	0.00	0	0.00	0.18
29	Namarjung	70.97	0.59	3	0.40	0	0.00	0	0.00	0	0.00	0.07	0.78	0.29
30	Nirmalpokhari	46.63	0.38	1	0.80	0.22	0.08	0.06	0.40	0	0.00	0	0.00	0.28
31	Parche	90.81	0.75	4	0.20	0	0.00	0	0.00	0	0.00	0.07	0.78	0.29
32	Purndi Bhumdi	40.84	0.33	0	1.00	0	0.00	0.06	0.40	0.88	0.56	0	0.00	0.38
33	Puranchaur	85.68	0.71	1	0.80	0.27	0.10	0	0.00	0.97	0.62	0	0.00	0.37
34	Rivan	49.43	0.40	3	0.40	0.13	0.05	0.13	0.87	0	0.00	0.06	0.67	0.40
35	Rupakot	36.95	0.30	1	0.80	0.17	0.06	0.15	1.00	0	0.00	0	0.00	0.36
36	Saimurang	24.48	0.19	1	0.80	0	0.00	0	0.00	0	0.00	0	0.00	0.17
37	Salyan	14.75	0.11	3	0.40	2.45	0.93	0	0.00	0.25	0.16	0	0.00	0.27
38	Sarangkot	41.05	0.33	0	1.00	0.29	0.11	0.05	0.33	0.17	0.11	0	0.00	0.31
39	Sardikhola	75.53	0.62	2	0.60	0.12	0.05	0	0.00	0	0.00	0	0.00	0.21
40	Siddha	76.55	0.63	3	0.40	0	0.00	0.15	1.00	0	0.00	0	0.00	0.34
41	Siduware	68.08	0.56	1.5	0.70	0	0.00	0	0.00	0	0.00	0.07	0.78	0.34
42	Thumakotdanda	94.2	0.78	3	0.40	0.1	0.04	0	0.00	0.22	0.14	0.07	0.78	0.36
43	Thumkei	64.64	0.53	1	0.80	0	0.00	0.15	1.00	0	0.00	0	0.00	0.39

Source: Raw Data and Computation.

AGGREGATE DEVELOPMENT INDEX*

Table 18. Raw data of Indicators, corresponding TVs and composite index

S no	VDC	X ₂		X ₃		X ₆		X ₈		X ₉	
		%	Score	%	Score	No/HH	Score	%	Score	%	Score
1	Arbabijaya	1	0.00	0	0.00	3.52	0.10	67.93	0.85	42.16	0.84
2	Arnala	7.5	0.65	4.04	0.39	3.71	0.11	61.79	0.77	49.78	0.72
3	Bhachok	1	0.00	0	0.00	4.7	0.14	68.05	0.85	41.49	0.85
4	Bhadauretamagi	1	0.00	0	0.00	4	0.12	65.03	0.81	42.98	0.83
5	Bhalam	5.5	0.45	1.6	0.16	3.17	0.09	79.28	1.00	31.34	1.00
6	Bharatpokhari	5	0.40	0.6	0.06	4.93	0.15	74.72	0.94	34.50	0.95
7	Chapakor	7.5	0.65	1.3	0.13	4.24	0.13	61.33	0.77	49.12	0.73
8	Dangsing	2.5	0.15	5.8	0.56	1.56	0.03	53.12	0.66	55.01	0.64
9	Deurali	8	0.70	1.8	0.17	4.67	0.14	65.88	0.83	45.79	0.78
10	Dhampus	6.5	0.55	5.5	0.53	3.29	0.09	62.9	0.79	51.06	0.70
11	Dhikupokhari	2.5	0.15	1.5	0.15	4.02	0.12	68.35	0.86	40.07	0.87
12	Dhital	4	0.30	2.2	0.21	3.44	0.10	59.24	0.74	54.29	0.66
13	Ghachok	1	0.00	0	0.00	7.94	0.26	67.95	0.85	40.99	0.85
14	Ghandruk	1	0.00	0	0.00	7.24	0.23	57.5	0.72	49.06	0.73
15	Hansapur	4	0.30	0.7	0.07	7.3	0.23	9.21	0.09	90.52	0.11
16	Hemja	2	0.10	1.2	0.12	2.72	0.07	70.1	0.88	39.92	0.87
17	Kahu	6	0.50	2.3	0.22	4.63	0.14	76.35	0.96	36.08	0.93
18	Kalika	4.5	0.35	1.3	0.13	5.17	0.16	63.38	0.79	46.69	0.77
19	Kaskikot	2	0.10	0	0.00	3.36	0.09	49.21	0.61	61.61	0.55
20	Kristinachnechau	9	0.80	2.6	0.25	4.32	0.13	74.06	0.93	35.02	0.94
21	Lahachok	6	0.50	1	0.10	2.99	0.08	62.68	0.78	47.52	0.76
22	Lamachaur	7.5	0.65	0.8	0.08	1.91	0.04	72.22	0.91	35.87	0.93
23	Lumle	6.5	0.55	10.3	1.00	0.69	0.00	58.81	0.73	46.12	0.78
24	Lwangghalel	3.5	0.25	1.1	0.11	6.49	0.21	53.06	0.66	58.43	0.59
25	Machhapuchre	1	0.00	0.6	0.06	28.86	1.00	60.72	0.76	51.67	0.69
26	Majthama	3	0.20	0.9	0.09	4.46	0.13	71.52	0.90	37.96	0.90
27	Mauja	6	0.50	0.6	0.06	4	0.12	55.43	0.69	59.57	0.58
28	Mijuredanda	7	0.60	1.7	0.17	5.85	0.18	38.67	0.47	67.78	0.45
29	Namarjung	8.2	0.72	2.3	0.22	8.86	0.29	36.67	0.44	68.25	0.45
30	Nirmalpokhari	7	0.60	1.4	0.14	6.73	0.21	67.42	0.85	43.99	0.81
31	Parche	1	0.00	0.3	0.03	8.25	0.27	59.53	0.74	66.97	0.46
32	Pumdi Bhumdi	6.5	0.55	0.9	0.09	7.52	0.24	68.51	0.86	44.60	0.80
33	Puranchaur	7	0.60	2.8	0.27	3.6	0.10	71.33	0.90	38.07	0.90
34	Rivan	1	0.00	0	0.00	3.04	0.08	55.8	0.69	60.11	0.57
35	Rupakot	5	0.40	0	0.00	6.08	0.19	62.52	0.78	51.57	0.70
36	Saimarang	2	0.10	0	0.00	4.68	0.14	58.03	0.72	51.02	0.70
37	Salyan	8.5	0.75	1.8	0.17	3.27	0.09	63	0.79	47.85	0.75
38	Sarangkot	7	0.60	3.7	0.36	2.68	0.07	65.1	0.81	46.91	0.77
39	Sardikhola	6.5	0.55	3.5	0.34	5.43	0.17	63.81	0.80	50.84	0.71
40	Siddha	3.5	0.25	0.4	0.04	2.38	0.06	21.34	0.24	82.70	0.23
41	Sildujure	1	0.00	0.4	0.04	3.93	0.12	51.48	0.64	61.26	0.55
42	Thumakotdanda	6.5	0.55	1.7	0.17	4.13	0.12	65.29	0.82	46.61	0.77
43	Thumki	11	1.00	0	0.00	7.19	0.23	2.65	0.00	97.87	0.00

* Out of 15 indicators first 5 are given in this table.

Table 18. Raw data of Indicators, corresponding TVs and composite index

S.no	VDC	X ₁₆		X ₁₇		X ₁₈		X ₁₉		X ₂₄		CI ₆
		Km/Km ²	Score	1000	Score	1000	Score	1000	Score	per/Km ²	Score	
1	Arbabijaya	0.67	0.2	0	0.00	0	0.00	0	0.00	237	0.41	0.331
2	Armala	0.11	0.0	0	0.00	0.5	0.32	0	0.00	167	0.29	0.468
3	Bhachok	0	0.0	0	0.00	0	0.00	0	0.00	81.1	0.13	0.326
4	Bhadauretamagi	0.92	0.3	0.05	0.33	0	0.00	0	0.00	292	0.51	0.343
5	Bhalam	0.31	0.1	0.09	0.60	0.33	0.21	0.09	1.00	30	0.53	0.575
6	Bharatpokhari	0.04	0.0	0	0.00	0.21	0.13	0	0.00	26	0.46	0.404
7	Chapakot	0	0.0	0.05	0.33	0	0.00	0	0.00	71.4	0.12	0.392
8	Dangsing	0	0.0	0	0.00	0	0.00	0	0.00	36.4	0.06	0.269
9	Deurali	0	0.0	0.15	1.00	0	0.00	0	0.00	185	0.32	0.443
10	Dhampus	0.35	0.1	0.05	0.33	0.34	0.22	0.05	0.56	16	0.28	0.465
11	Dhikurpokhari	2.63	1.0	0.05	0.33	0.48	0.31	0.05	0.56	267	0.47	0.513
12	Dhital	0.3	0.1	0.05	0.33	0	0.00	0.05	0.56	235	0.41	0.384
13	Ghachok	0.99	0.3	0.13	0.87	0.37	0.24	0.06	0.67	438	0.77	0.544
14	Ghandruk	0	0.0	0	0.00	0	0.00	0	0.00	19.0	0.02	0.262
15	Gansapur	0.16	0.0	0	0.00	1.27	0.81	0	0.00	131	0.22	0.310
16	Hemja	0.83	0.3	0.13	0.87	0.4	0.25	0.06	0.67	568	1.00	0.600
17	Kahu	0.34	0.1	0.09	0.60	0	0.00	0.09	1.00	341	0.60	0.579
18	Kalika	0.58	0.2	0	0.00	0	0.00	0	0.00	194	0.34	0.398
19	Kaskikot	0	0.0	0.05	0.33	0.35	0.22	0	0.00	213	0.37	0.353
20	Kristinachnechau	0.37	0.1	0.06	0.40	0	0.00	0	0.00	23	0.41	0.440
21	Lahachok	1.19	0.4	0.13	0.87	0.24	0.15	0.06	0.67	360	0.63	0.549
22	Lamachaur	0.1	0.0	0.09	0.60	1.57	1.00	0.09	1.00	481	0.85	0.643
23	Lumle	0.75	0.2	0	0.00	0	0.00	0	0.00	17.1	0.02	0.405
24	Lwanghalel	0.01	0.0	0.05	0.33	0	0.00	0.05	0.56	37.4	0.06	0.367
25	Machhapuchhre	0.02	0.0	0	0.00	0	0.00	0	0.00	6.0	0.00	0.348
26	Majthamna	0.33	0.1	0	0.00	0	0.00	0	0.00	295	0.51	0.353
27	Mauja	0	0.0	0.09	0.60	0	0.00	0.09	1.00	212	0.37	0.407
28	Mijuredanda	0	0.0	0	0.00	0	0.00	0	0.00	116	0.20	0.297
29	Namarjung	0	0.0	0	0.00	0	0.00	0.07	0.78	5.1	0.00	0.360
30	Nirmalpokhari	0.22	0.0	0.06	0.40	0	0.00	0	0.00	376	0.66	0.428
31	Parche	0	0.0	0	0.00	0	0.00	0.07	0.78	49.9	0.08	0.331
32	Pumdi Bhundi	0	0.0	0.06	0.40	0.88	0.56	0	0.00	296	0.52	0.480
33	Puranchaur	0.27	0.1	0	0.00	0.97	0.62	0	0.00	161	0.28	0.466
34	Rivan	0.13	0.0	0.13	0.87	0	0.00	0.06	0.67	116	0.20	0.337
35	Rupakot	0.17	0.0	0.15	1.00	0	0.00	0	0.00	236	0.41	0.384
36	Saimarang	0	0.0	0	0.00	0	0.00	0	0.00	134	0.23	0.310
37	Salyan	2.45	0.9	0	0.00	0.25	0.16	0	0.00	241	0.42	0.399
38	Sarangkot	0.29	0.1	0.05	0.33	0.17	0.11	0	0.00	35	0.62	0.495
39	Sardikhola	0.12	0.0	0	0.00	0	0.00	0	0.00	63.0	0.10	0.381
40	Siddha	0	0.0	0.15	1.00	0	0.00	0	0.00	15	0.27	0.273
41	Sildujure	0	0.0	0	0.00	0	0.00	0.07	0.78	10	0.18	0.334
42	Thumakotdanda	0.1	0.0	0	0.00	0.22	0.14	0.07	0.78	109	0.19	0.425
43	Thumki	0	0.0	0.15	1.00	0	0.00	0	0.00	11	0.19	0.301

* Last 5 indicators and the composite index value are given in this table.

- Khet*, 22
Kurmi, 23
Kushwha, 23
- Lanjow, 4
 Lao PDR, 14, 101
 Less than \$1 a day, 1
 Less than \$2 a day, 1
 Limitation of the Study, 4
 Literacy rate, 7, 47
 Livestock, 7, 48
 Living Standard Measurement
 Survey, 12, 17, 19, 38
 Lower caste, 23, 48
 LRMP, 24, 40
- Mallah*, 23
 Map Analysis, 36
 Mapping, 4, 7, 36, 44, 81
 Migration, 21, 100
 Millenium declaration, 2
 Minot Nicholas, 17
 Moderate, 16
 Monetary indicators, 4
 Monitoring, 90
 Mortality, 7, 23, 42, 81
 Multipurpose Household Budget
 Survey, 19
 Municipalities, 28
Mushar, 23
Muslim, 23
- National highway, 26
 Natural resource endowment, 5, 7, 49
 NHDR, 21, 22
 Ninth National Plan, 1, 18, 87
 Nonfood items, 12, 19
 NPC, 38, 40
 NRD-2C, 15, 16, 104
- Objectives, 3
- Pakho*, 22
 Participatory approach, 2
- Participatory District Development
 Program, 43
 Population density, 7, 48
 Post Office, 48
 Poverty, xi, 14, 20, 110
 Poverty alleviation program, 3, 87
 Poverty Depth, 9
 Poverty Gap, 9, 19, 33, 44, 113
 Poverty heterogeneity, 4
 Poverty incidence, 9, 19, 33, 44, 113
 Poverty Index, 48, 54, 76
 Poverty line, 13, 19, 44, 113
 Poverty Severity, 9, 19, 33, 44, 113
 Poverty trap, 5
 Poverty mapping, xi, 3
 Poverty stricken area, 3, 85
 Powerlessness, 4
 Probit model, 17, 109
 Progressive, 16
- Recommendation, 85
 Road density, 7, 48
 Routray, 7, 38, 40
 Rural poverty, 4, 7
- Sarki*, 23
 Secondary data, 32, 38
 Sectoral Indices, 49,
 Sectoral line agencies, 38, 41
 Sedentary, 19
 SFDP, 18
 Sharma, 18, 22
 Slash and burn cultivation, 15, 102
 Social factors, 4
 Social Sector, 50
 Socio-economic Factors, 4
 Squared Poverty Gap, 9, 19, 33, 44,
 113
 Strategy, 87
 Subjective weight, 13, 34
 Sustainable rural development
 approach, 2
- Tamang*, 23
 Thatched roof, 7, 48