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CEMAT Consultants – Nepal

*28/7/2013/Birgunj*  
*6885*  
*25 June 2013*

## Birgunj Sub-Metropolitan City & Urbanization Final Report

### Secondary Towns Integrated Urban Environmental Improvement Project (STIUEIP), Birgunj, Nepal

May 2013



#### Birgunj Sub-Metropolitan City Sub Project



Project Name:	Secondary Towns Integrated Urban Environmental Improvement Project (STIUEIP)
Project Number:	5060023
Report for:	Birgunj Sub Metropolitan City, Nepal

#### PREPARATION, REVIEW AND AUTHORISATION

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#### ISSUE REGISTER

Distribution List	Date Issued	Number of Copies
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# **Secondary Towns Integrated Urban Environmental Improvement Project (STIUEIP)**

**For: Birgunj Sub Metropolitan City, Nepal**  
**MAY 2013**

## ACRONYMS

AAS	Accrual Accounting System
ADB	Asian Development Bank
AIEC	Average Incremental Economic cost
AIFC	Average Incremental Financial cost
BDA	Building Design Authority
BSMC	Birgunj Sub Metropolitan City
BP	Business Plan
CDTA	Capacity Development Technical Assistance
CEO	Chief Executive Officer
CFMIP	Comprehensive Financial Management Improvement Plan
DALY(s)	Disability Adjusted Life Years
DSC	Design Supervision Consultant
DSR	Debt Service Ratio
EA	Economic Analysis
EIRR	Economic Internal Rate of Return
FA	Financial Analysis
FIRR	Financial Internal Rate of Return
FMAP	Financial Management and Accounts Training Package
FMIS	Financial Management Information System
FMS	Financial Management System
FNCCI	Federation of Nepalese Chamber of Commerce
FOP	Financial and Operating Plan
FriPAD	Friends for Peace Building and Development
FY	Fiscal Year
GDP	Gross Domestic Product
GoN	Government of Nepal
GNI	Gross National Income
HALT	House and Land Tax
HH	Household
IPT	Integrated Property Tax
LBFAR	Local Bodies Financial Administration and Regulations
MIS	Management Information System
MoLD	Ministry of Local Development
NGO	Non-Governmental Organization
OBA	Output-Based Aid

O & M	Operation and Maintenance
PCO	Project Coordination Office
PIU	Project Implementation Unit
Pop <sup>n</sup>	Population
PPP	Public Private Partnership
PPTA	Project Preparatory Technical Assistance
RAC	Revenue Advisory Committee
RBF	Results Based Financing
SCF	Standard Conversion Factor
SFR	Self-Financing Ratio
STIUEIP	Secondary Towns Integrated Urban Environmental Improvement Project
TDF	Town Development Fund
ToR	Terms of Reference
UNDP	United Nations Development Program
VAT	Value Added Tax
WUSC	Water Users and Sanitation Committee
VSL	Value of Statistical Life
WHO	World Health Organization
YLD	Years Lived with Disability
YLL	Years of Life Lost
3R	Reduce, Recycle and Reuse

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# 1 INTRODUCTION

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Birgunj city was established around 118 years ago. It is believed that the Prime Minister Shree Bir Samsher at that time established this city. As such the city got its name as Birgunj.

Birgunj Sub-Metropolitan City is situated in the Narayani zone and the district of Parsa in the central development region of Nepal. It is one of the businesses, economic and industrial zone of central region, covering an area of 23.37 km<sup>2</sup>. The city lies at 27°02'30" to 26°57'45" North and 84°55'00" to 84°52'15" East. The eastern part of the city is bordered by another district – Bara whereas the southern and south western part by Bihar State of India.

The Pathlaiya to Birgunj corridor is one of the most important manufacturing centres in Nepal constituting many industries including among others steel, plywood, rice mills, sugar mill, agricultural equipment, tanning etc. Birgunj is one of the major gateway towns to India and more than 50% of total foreign trade is carried out via this town.

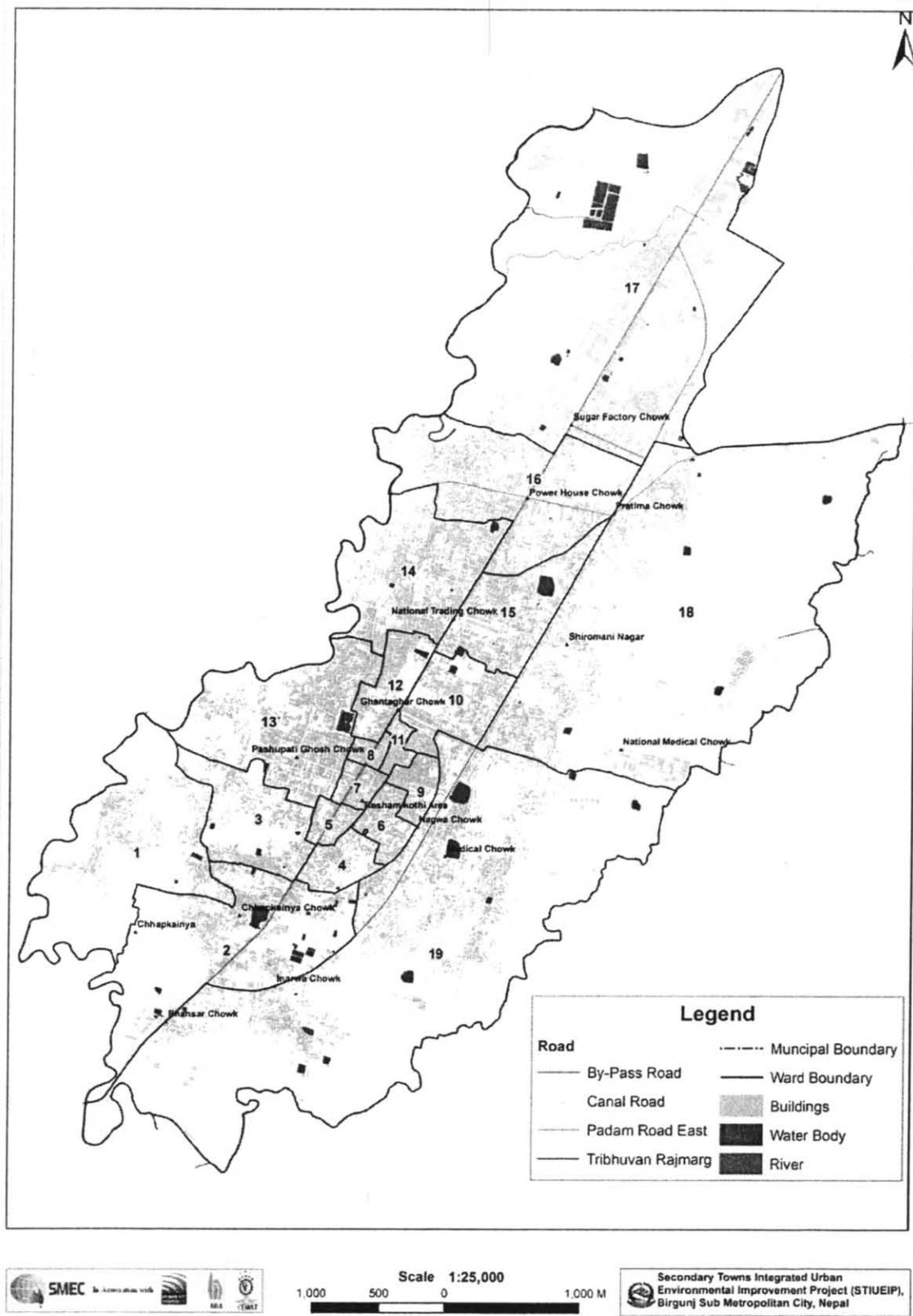
Birgunj Sub-metropolitan City is the leading business centre of the central Tarai region of Nepal. By virtue of its proximity to the Indo-Nepal border, it functions as an outlet for Nepalese exports and an inlet for imports. The town can be termed as a primary gateway town as it has developed in site of considerable transport significance as the break-of-bulk point in the Tarai region along the Indo-Nepal boarder. The city borders India, Sirsiya dry port and Bishrampur VDC in the south, the Sirsiya River, Ramgadh VDC in the west, Parwanipur and Bahundangi VDC in the north, Parsauni, Itahari VDC and the Singaha River in the east.

Birgunj sub-metropolitan has a total area of 2,337 ha, divided into 19 wards with their areas in a range of 5.61 ha (Ward No. 8) to 507.79 ha (Ward No. 19). Ward locations are shown in Figure no. 1. The city has an elongated shape with a maximum north-south length of 8 km and east-west width of 4 km. The altitude ranges from about 78m in the south near the border area to 87m in the north.

The topography exhibits a gradual slope of about 1:900 from north to south-east resembling Tarai plain (northward extension of Indo-Gangetic plain). The altitude ranges from about 78m in the south near border area to 87m in the north. However there is high micro-topographical variation. Two major rivers are features of Birgunj, namely, the Sirsiya River to the west and the Singaha River to the east. In addition to these two rivers there is Gandak Canal in the north. The land is fertile soil with mix of clay, silt and sand.



Figure 1 - 1 : Ward Locations in Birgunj



## 2 POPULATION

### 2.1 Population Growth Trend

According to the census of 2001, the population of Birgunj Sub-Metropolitan City was 112,484 with growth rate of 5.04 % but according to census of 2011, the population of 19 all wards is 135,906 and annual growth rate is 1.91%.

The population of Birgunj municipality in different census years is given in Table No. 2-1 along with annual growth rates. As per the Department of Census, the population Birgunj in various decadal years is as follows:

**Table 2 - 1 : Population Growth Trend**

S. No.	Year	Population	Annual Growth Rate %
1.	1971	12,999	
2.	1981	43,642	
3.	1991	68,764	4.65
4.	2001	112,484	5.04
5.	2011	135,904	1.91

Source: Census and BSMC town profile

The structure of population in 2001 and 2011 and household sizes have been shown in table no. 2-2 and table no. 2-3. The tables show the male and female population are more or less same. The average household is 5.62 in 2011.

**Table 2 - 2 : Ward Wise Characteristics of the year 2001**

Ward no	Area in Ha	House hold	Male	Female	Total	Household Size
1	146.46	985	3333	3004	6337	6.43
2	149.30	1008	3552	3142	6694	6.64
3	57.15	983	3039	2471	5510	5.61
4	18.92	497	1382	1155	2537	5.1
5	9.48	370	1006	934	1940	5.24
6	15.63	1064	2976	2477	5453	5.13
7	9.92	360	1254	1113	2367	6.58
8	5.61	257	940	781	1721	6.7
9	13.43	810	2434	2052	4486	5.54
10	42.91	1175	3365	2768	6133	5.22
11	6.63	375	1023	890	1913	5.1

Ward no	Area in Ha	House hold	Male	Female	Total	Household Size
12	26.41	685	1889	1468	3357	4.9
13	109.26	2393	7218	5812	13030	5.45
14	95.60	2031	5852	4795	10647	5.24
15	56.77	1440	4201	3531	7732	5.37
16	129.22	1362	3763	3070	6833	5.02
17	454.33	1162	4047	3637	7684	6.61
18	482.20	1004	3133	2699	5832	5.81
19	507.79	1939	6549	5729	12278	6.33
<b>Total</b>	<b>2337.02</b>	<b>19910</b>	<b>60956</b>	<b>51528</b>	<b>112484</b>	<b>5.65</b>

Source: National Population Census (Central Bureau of Statistics) 2001

**Table 2 - 3 : Ward wise Characteristics of the year 2011**

Ward no	Area in Ha	House hold	Male	Female	Total	Household Size
1	146.46	1,210	4,211	3,794	8,005	6.62
2	149.3	1,377	4,767	4,245	9,012	6.54
3	57.15	1,358	3,873	3,210	7,083	5.22
4	18.92	427	1,170	1,127	2,297	5.38
5	9.48	312	908	899	1,807	5.79
6	15.63	603	1,912	1,773	3,685	6.11
7	9.92	239	875	773	1,648	6.9
8	5.61	171	567	548	1,115	6.52
9	13.43	858	2,429	2,168	4,597	5.36
10	42.91	1,235	3,467	3,068	6,535	5.29
11	6.63	286	871	785	1,656	5.79
12	26.41	621	1,727	1,575	3,302	5.32
13	109.26	2,934	8,237	6,483	14,720	5.02
14	95.6	2,466	6,605	5,767	12,372	5.02
15	56.77	1,560	4,456	4,037	8,493	5.44
16	129.22	2,011	5,977	4,926	10,903	5.42
17	454.33	1,206	4,362	4,188	8,550	7.09
18	482.2	1,699	5,114	4,426	9,540	5.62
19	507.79	3,591	11,052	9,532	20,584	5.73
<b>Total</b>	<b>2337.02</b>	<b>24164</b>	<b>72580</b>	<b>63324</b>	<b>135904</b>	<b>5.62</b>

Source: National Population Census (Central Bureau of Statistics) 2011

**Table 2 - 4 : The population growth trend of BSMC with respect to national and regional context**

Description	Population growth trend	
Year	91-2001	2001-2011
National annual growth rate	2.25%	1.35%
National urban population	14.2%	17.7%
Urban population growth rate	6.65%	3.4%
BSMC growth rate	5.04%	1.91%

The ward wise annual growth rates have been calculated to know the growth trend of each ward for the population projection and given in Table no 2-5. Study of table shows the annual growth rates have decreased in most of the wards especially in the core area wards.

**Table 2 - 5 : Annual Growth Rate of the year 2001 and 2011**

Ward No	Popu 1991	Popu 2001	Popu 2011	Growth 91-01 %	Growth 01-11 %
1	2198	6337	8,005	11.17	2.36%
2	3930	6694	9,012	5.47	3.02%
3	3300	5510	7,083	5.26	2.54%
4	2365	2537	2,297	0.70	-0.99%
5	1882	1940	1,807	0.30	-0.71%
6	3865	5453	3,685	3.5	-3.56%
7	2344	2367	1,648	0.1	-3.49%
8	1709	1721	1,115	0.07	-4.25%
9	3208	4486	4,597	3.41	0.24%
10	3697	6163	6,535	5.19	0.59%
11	2098	1913	1,656	-0.92	-1.43%
12	2525	3357	3,302	2.89	-0.17%
13	6790	13030	14,720	6.74	1.23%
14	6360	10647	12,372	5.29	1.51%
15	4999	7732	8,493	4.46	0.94%
16	3414	6833	10,903	7.19	4.78%
17	4976	7684	8,550	4.44	1.07%
18	3224	5832	9,540	6.11	5.04%
19	6121	12278	20,584	7.21	5.30%
<b>Total</b>	<b>69005</b>	<b>112484</b>	<b>135904</b>	<b>5.09</b>	<b>1.91%</b>

In 2001, negative growth rate was only in ward 11 but in 2011 negative growth rates occurred in ward 4, 5, 6, 7, 8, 11 and 12 (all core ward).

### **3 REVIEW OF DEVELOPMENT PLANS IN DIFFERENT PERIODS**

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A number of planning documents have been prepared for the development of Birgunj city, such as Structure Plan and Integrated Action Plan. The latest development plan is the Periodic Plan of Birgunj Sub-Metropolitan City.

#### **3.1 Structure Plan 1987**

In 1987 the Management Support for Town Panchayat (MSTP) prepared the structure plan of Birgunj Town Panchayat. The major output of this report is the Structure Plan (mainly land use plan) along with the need of the Infrastructure Assessment of Birgunj Municipality. Population projection of Birgunj had been done with growth rate of 5.5 % for the period 1987 – 2002.

The Structure Plan had prepared the land use plan along with the lands required for the future population in 2002 in different wards based on urban density.

As per 1987 Structure plan 1987, the built up area was 519 ha out of which about 70% of built up area was residential and residential cum commercial area and 40 ha (almost 8 %) of industrial area, located specially in northern part. The plan has made number of recommendations which are still valid.

#### **3.2 Integrated Action Plan 1998**

In 1998 (2054 B.S.) the integrated action plan of Birgunj sub-municipality was prepared by the DHUD, udle and BSMC to develop the municipality in integrated way in the field of physical, financial and institutional sector. Number of problem and issues were identified by conducting ward level and town level meetings. The major outputs are the physical and environmental development plan and multi-sector investment plans. Roads, drains, sanitations were identified as top priority projects. The development plan has identified ward no 17, 18 and 19 as suitable for urban expansion along with ward no. 2, 3 and 16 which is valid in the present context since ward 14 and 15 has limited vacant land and ward 1 is environmentally sensitive.

One of the major recommendations is to enforce building and planning by-laws which contains land use policy, building construction regulation and right of way of different roads. This by-law is still valid but it has to be revised in the present situation.

## 4 MUNICIPAL INFRASTRUCTURE

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### 4.1 Transportation

Birgunj is quite accessible. It is linked with different places via the Tribhuvan Rajpath and East-West Highway. There are 115 km of black topped road, 83 km gravelled and 82 km earthen roads and a number of trails within the municipality. Overall roads in Birgunj are in a poor condition. Simara Airport is located about 22 km to the north of the city. There are more than 5,200 Riksha, 313 Tempu and 456 Tanga in Birgunj providing transportation services. There are about 12 locations with major traffic congestion in the city centre.

### 4.2 Water Supply

The main source of drinking water in Birgunj is the deep tube well ground water. At present there are four pumping stations operated by Nepal Water Supply Corporation that supply 8 million liters of water to the sub-metropolitan city. Nearly 6,067 households have piped water supply facility, 1,210 households have drinking water facility from public shallow tube wells and 7,819 households have drinking water facility from shallow tube wells. The water quality from deep tube wells is reported to be safe for drinking water but from shallow tube wells is usually contaminated by surface water and seepage of wastewater.

### 4.3 Storm Water Drain

According to Municipality Profile (2007), there are approximately 4.7 km main storm water drains and 40.5km secondary storm water drains in Birgunj. Open drains have been constructed in all the wards except in the areas from Ghantaghar to the hospital and Aadarsnagar areas where drains are covered.

The main drains referred as MD1 run in a general direction from the north to the southwest in the core area to the west of Main Road in Birgunj. Most secondary drains in the core area to the west connect MD1. The drainage networks in areas to the east of Main Road in Birgunj have inadequate hydraulic capacity to drain surface runoff effectively during monsoon seasons and they end up swamp areas without drainage outfalls.

Most open drains in Birgunj do not function properly due to the lack of maintenance as well as their miss usage by the local people as waste dump sites. These drains are fully filled with debris and wastes all the time and overgrown weeds are covered entire cross sections in most earthen sections.

### 4.4 Sewerage

There are neither public centralized sewerage network systems for sewage collection nor sewage treatment plants for sewage disposal in Birgunj. The open drains have been used for waste water collection and disposal. The on-site sanitation with septic tank and soak pits has been adopted for the sewage disposal from settlements. About 51% households have modern toilets, additional 22% households have ordinary toilets but 25% households do not have any toilets.

Though most of the houses have septic tanks, but very few have soak pits. As such, the septic tank effluents from most houses are directly discharged into the open road-side storm water drains. The municipality does not have facilities for the collection and disposal of septic tank



solids. Generally the private operators provide these kinds of services and they have been found to dispose the solids in the road-side drains or on the vacant land.

As reported in the Birgunj Initial Environment Assessment, the town is seriously short of public toilets. Based on a copy of the Birgunj Facilities map, there are only seven public toilets in the city (five was reported in PPTA Final Report Vol. 2). Most of the residents living in settlements belong to slum and squatter areas without toilet facilities have to sort to defecating either in the open fields or in open drains. Most of the existing public toilets have not been maintained after their constructions.

#### **4.5 Solid Waste Management**

Solid waste is collected by Birgunj municipality. It provides waste collection and sweeping services. The containers/bins are placed at different strategic locations which are used by households, institutions and the commercial sector in the town. There is no organized door-to-door collection system in Birgunj. Majority (78%) of the households dispose their wastes to public places and only 10.5% households use fixed places or containers. Wastes are transported using tractors and open trailers. In the absence of a permanent sanitary dumping site, about 45 tons of garbage a day are being dumped haphazardly along river banks, ponds, by-pass road and open spaces. Nearby areas of those places are prone to serious health hazard. Though a sanitary landfill site was proposed in Ward No. 16, but because of strong opposition from local residents it could not be materialized for this purpose

## 5 URBAN DENSITY

The study of urban density from the census period of 1991, 2001 and 2011 (ward wise detailed unpublished) shows that the urban density of Birgunj sub-metropolitan has changed from 29.5 0 pph (2001) to 58.15 pph (2011). The urban density is calculated by dividing the total population by the ward area.

The ward wise structure of population and gross urban density of the year 1991, 2001 and 2011 has been shown in Table no. 5-1 and an urban density map of 2011 (Figure no. 5-1) has been prepared.

**Table 5 - 1 : Urban density for the year 1991, 2001 and 2011**

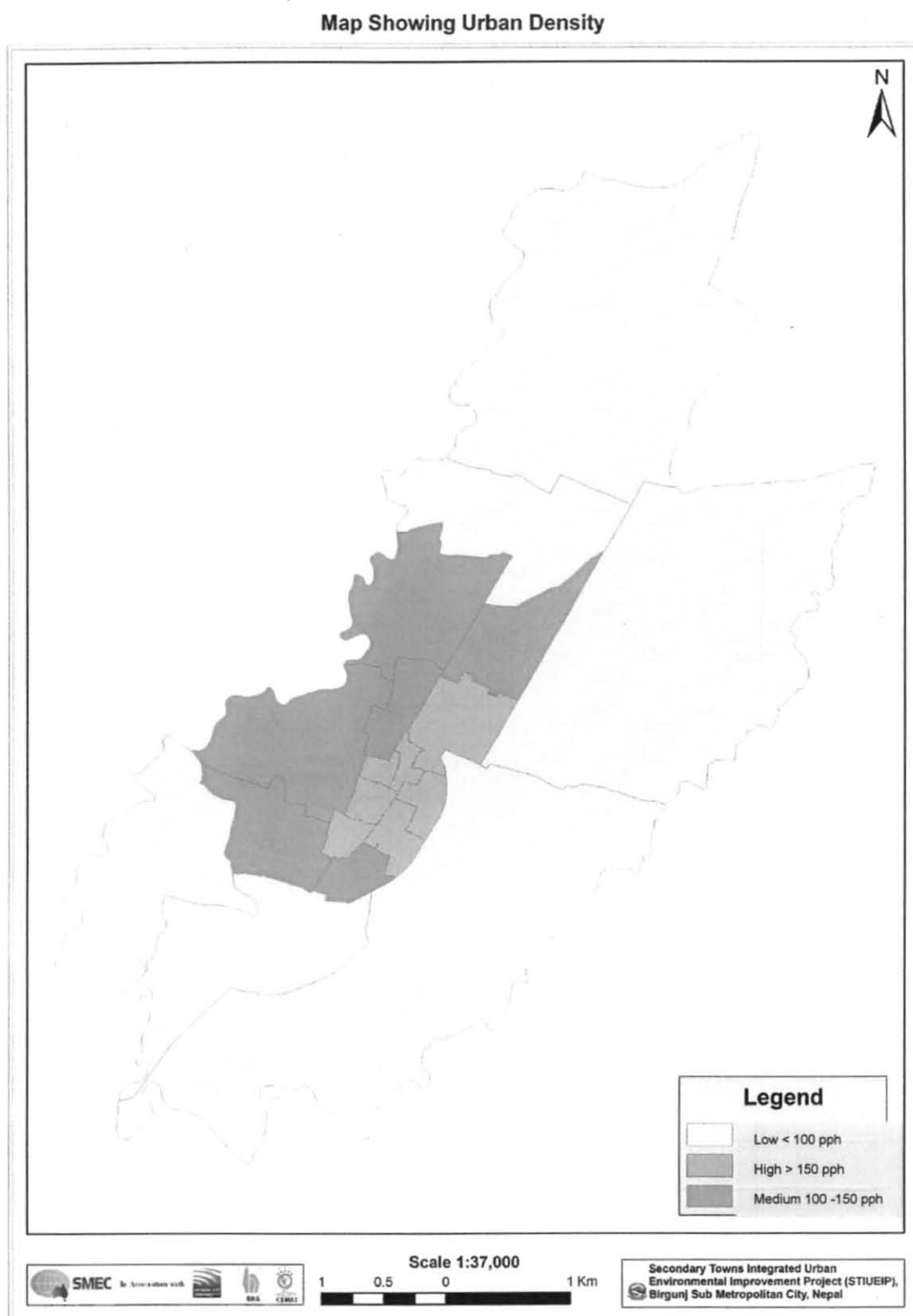
Ward No.	Area in Ha	Population 1991	Density Pph	Population 2001	Density Pph	Population 2011	Density pph
1	146.46	2198	15.0	6337	43.3	8,005	54.7
2	149.30	3930	26.3	6694	44.8	9,012	60.4
3	57.15	3300	57.7	5510	96.4	7,083	123.9
4	18.92	2365	125.0	2537	134.1	2,297	121.4
5	9.48	1882	198.5	1940	204.6	1,807	190.6
6	15.63	3865	247.3	5453	348.9	3,685	235.8
7	9.92	2344	236.3	2367	238.6	1,648	166.1
8	5.61	1709	304.6	1721	306.8	1,115	198.8
9	13.43	3208	238.9	4486	334.0	4,597	342.3
10	42.91	3697	86.2	6133	142.9	6,535	152.3
11	6.63	2098	316.4	1913	288.5	1,656	249.8
12	26.41	2525	95.6	3357	127.1	3,302	125.0
13	109.26	6790	62.1	13030	119.3	14,720	134.7
14	95.60	6360	66.5	10647	111.4	12,372	129.4
15	56.77	4999	88.1	7732	136.2	8,493	149.6
16	129.22	3414	26.4	6833	52.9	10,903	84.4
17	454.33	4976	11.0	7684	16.9	8,550	18.8
18	482.20	3224	6.7	5832	12.1	9,540	19.8
19	507.79	6121	12.1	12278	24.2	20,584	40.5
<b>Total</b>	<b>2337.02</b>	<b>69005</b>	<b>29.5</b>	<b>112484</b>	<b>48.1</b>	<b>135904</b>	<b>58.15</b>

The Table no. 6 shows that urban densities calculated for the census year 2011 have increased in ward no 1, 2, 3, 9,10, 13, 14, 15, 16, 17,18 and 19 whereas the urban densities decreased in ward no. 4, 5, 6, 7, 8,11 and 12 compared with the urban densities of different ward of the year 2001. The decrease in urban densities in ward 4, 5, 7, 8, 11, 12 is the result of decrease in population due to more commercial activities in these wards.



The urban densities in big wards are less than 20.00 pph in ward no 17, 18, and less than 50.00 pph in ward no. 19. The urban densities in most of the main city area are quite high ranging from 121.4 pph in ward 4 to 342.3 pph in ward no 9. Only few wards such as 1, 2, 16, 17, 18 and 19 have low urban density. Since the current densities are low and lots of vacant lands, more densification is possible in these wards through urban expansion. In case of medium ward 1, 2, 13, 14, 15, 17 more people can be accommodated for certain years but whereas in case of densely populated wards such as 4, 5, 6, 8, 11, 12 where negative growth has taken place, there is less chance of further high densification.

**Figure 5 - 1 : Urban Density Map**



## 6 BUILDING PERMIT

Building construction activities (building permit), plotting of land and land transactions are sources of information to find out the direction of the urban expansion. Normally urban expansion takes place where the infrastructure services (both physical and social) are available and where lands are cheap.

Birgunj Municipality doesn't have elaborated building and planning by-laws. At present the Birgunj Municipality has a simple rule of one meter setback for right of way from the existing road for all roads except in some major roads such as Raj Marga, By-pass road, Second By-pass road, Padam road, By-pass Link road.

The Right of Ways for major roads are 33m for By pass road, 25m for Main road, 28m for Tribhuan Raj Path from Ghanta Ghar onwards right up to Gandak Chowk, 20m for Ghanta Ghar Link Road, 12m for Second By-pass road, 15m for Padma road. In case of Aadarsha Nagar the new building should be constructed in line with the existing building as road widths are already fixed in plan. There is no system of how much should be the road width in the newly opened road.

High rise apartment buildings are coming up in number of places and likewise land plotting activities are also going on different wards, especially in ward 17, 18 and 19. The municipality does not have rule for such activities also. Though the building permit form contains a form showing building height, ground coverage, floor area ratio etc but it does not have rule for the same.

The building permit data are collected from BSMC from 64/65 to 68/69 and are presented in Table no. 6-1.

**Table 6 - 1 : Building Permit Data of Birgunj Sub-Metropolitan for the last 5 years**

S.N.	Ward No.	2064/65	2065/66	2066/67	2067/68	2068/69	Total
1.	Ward No.-1	14	23	15	20	3	75
2.	Ward No.-2	43	29	26	28	11	137
3.	Ward No.-3	30	31	35	33	16	145
4.	Ward No.-4	12	13	24	11	10	70
5.	Ward No.-5	5	3	5	0	2	15
6.	Ward No.-6	25	20	12	10	6	73
7.	Ward No.-7	4	5	8	3	1	21
8.	Ward No.-8	4	5	10	9	3	31
9.	Ward No.-9	18	14	14	17	7	70
10.	Ward No.-10	28	32	19	15	8	102
11.	Ward No.-11	12	14	12	8	2	48
12.	Ward No.-12	23	28	13	16	7	87
13.	Ward No.-13	91	87	74	73	20	345

S.N.	Ward No.	2064/65	2065/66	2066/67	2067/68	2068/69	Total
14.	Ward No.-14	84	85	60	56	21	306
15.	Ward No.-15	47	60	48	40	13	208
16.	Ward No.-16	93	93	54	78	28	346
17.	Ward No.-17	19	21	28	28	7	103
18.	Ward No.-18	73	106	74	81	31	365
19.	Ward No.-19	83	107	90	92	29	401
Total		708	776	621	618	225	<b>2948</b>

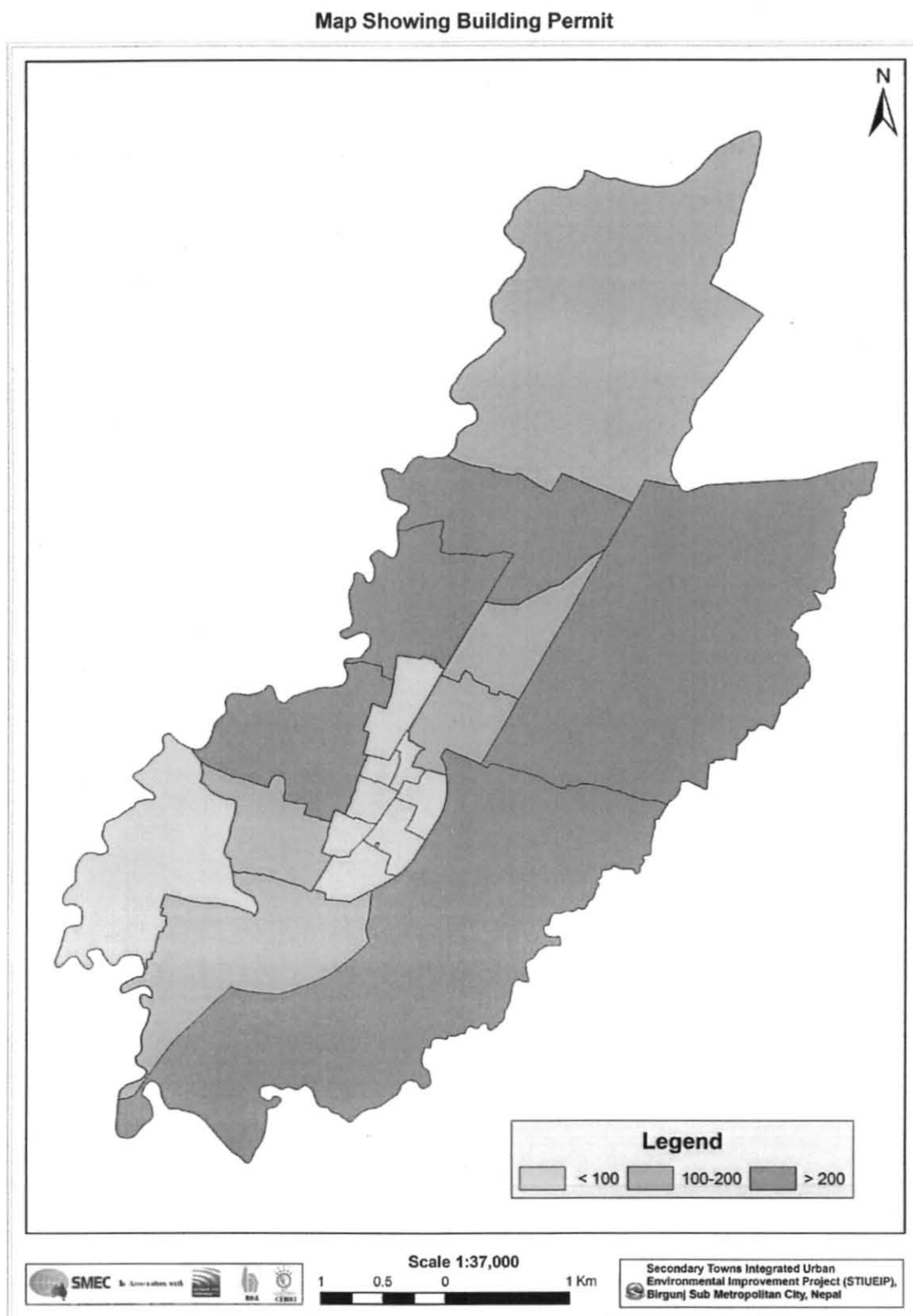
Note: The figure for the year 068/69 is up to 20/9/2068

Source: Birgunj Sub-Metropolitan office

The building permit table reveals that the majority of building constructions in the last five years are taking place in Ward 19, 18, 16 followed by ward 13, 14 and 15. Few buildings are also constructed in Ward 4, 5, 6, 7, 8, 9, 11 and 12 as these wards are small and well developed. The total building construction is around 600 to 700 per year. The analysis of building permit also shows that urban expansion is taking place in the east west direction.

A map (Figure No. 6-1) showing building construction activities in different wards 064/065 to 068/069 have been prepared to know the development trend of Birgunj.

**Figure 6 - 1 : Building Permit Map**



## 7 URBANIZATION IN BIRGUNJ

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Birgunj Sub-Metropolitan City is Nepal's principal trade centre. The city has experienced rapid growth especially in the past decade, due to migration to the city from peripheral districts and VDCs for security reasons, or other reasons such as for a better livelihood. There is consequently environmental deterioration resulting from inadequate sanitation and drainage, and mounting traffic congestion mainly in the main road leading to poor air quality in the city. The individual institutional efforts of both the sub-metropolis and sectorial agencies in addressing these issues, has remained uncoordinated and grossly inadequate. Most of the fertile agricultural fields are rapidly converting into residential and commercial areas. The eastern part of the sub-metropolis which lies in the flood-prone area of the Singaha River is also being changed to residential and commercial areas due to pressure of an increase in the population in the sub-metropolitan city. Most buildings are being constructed in Wards 18 and 19. The infrastructural facilities such as roads, sewer and storm-water drains and water supply, need to be developed to match the current rate of other development, which remains a major future concern

## 8 DEVELOPMENT TREND OF BIRGUNJ

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### 8.1 Land Use

Land use involves the manner in which land is being utilised for various activities such as residential, commercial, industrial, institutional etc. The land use pattern is the resultant of various activities associated with physical, socioeconomic and environmental aspects

Urbanization causes change in the land use pattern like converting agriculture area into residential area or non built up area to built up area and hence changes in catchment hydrology turning pervious area into impervious area. This means reduction in catchment storages as water ways are channelized and piped. The effects of urbanization on run off (hence on sewer and surface drain)

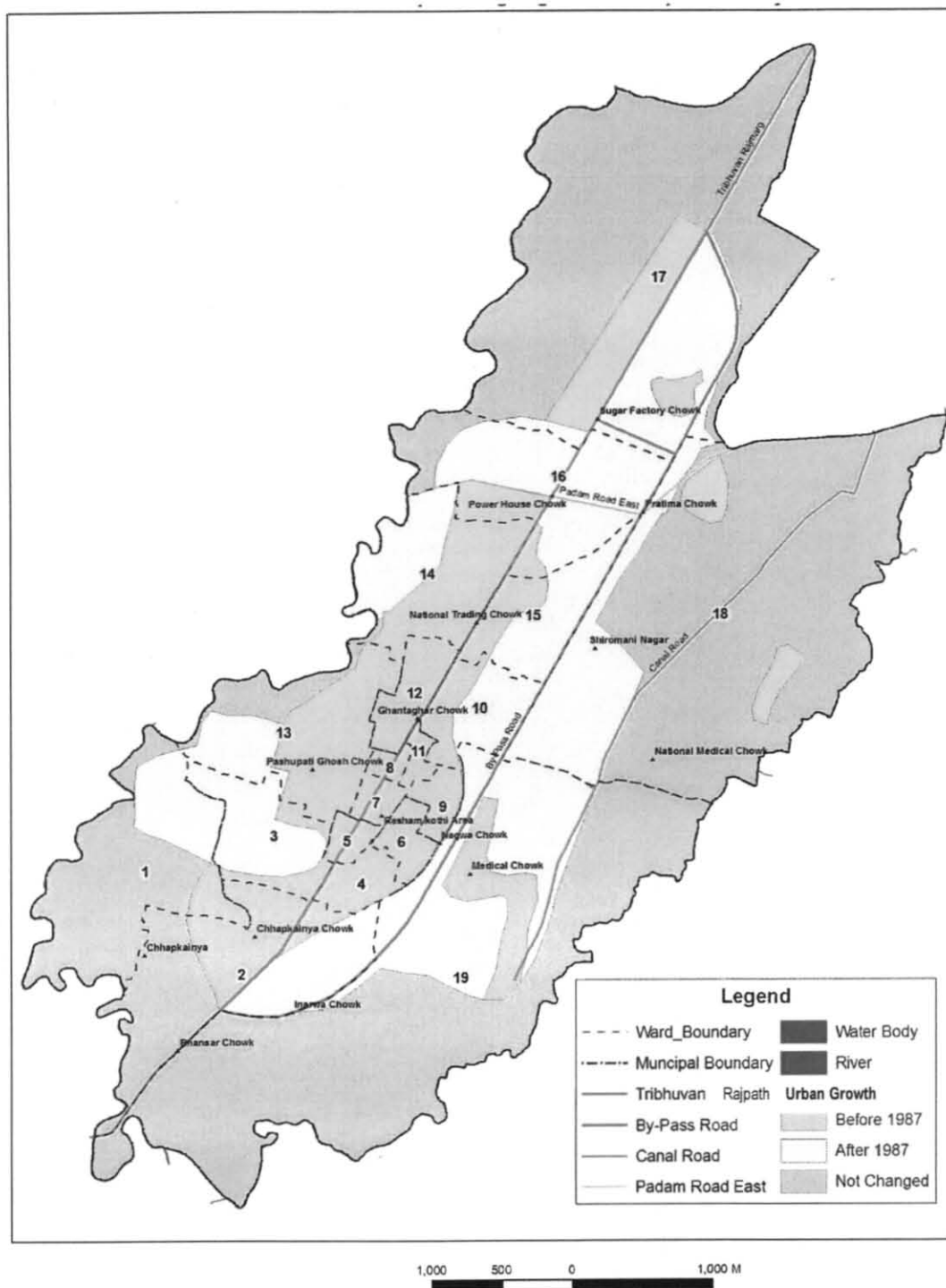
Increase in peak discharges and run off volume

Decrease in time concentration

Increase in frequency and severity of flooding

More and more urbanization means more and more buildings, paved roads, parking. These built up areas increase considerably the run off volumes. The land use planning is one of the key elements of development plan of every municipality. The development of city should be guided by its Land Use Plan. Quite a number of Land Use Plan had been prepared for the development of Birgunj Municipality in different periods. Study of land use maps prepared during different period show how the growth of Birgunj city took place converting the agriculture land into urban area. An urban growth trend map (Figure no. 8-1) showing the growth of Birgunj from 1987 to 2012 have been prepared to how the urban development took place.

**Figure 8 - 1 : Urban Growth Trend Map of Birgunj Sub Metropolitan City**



In Association with



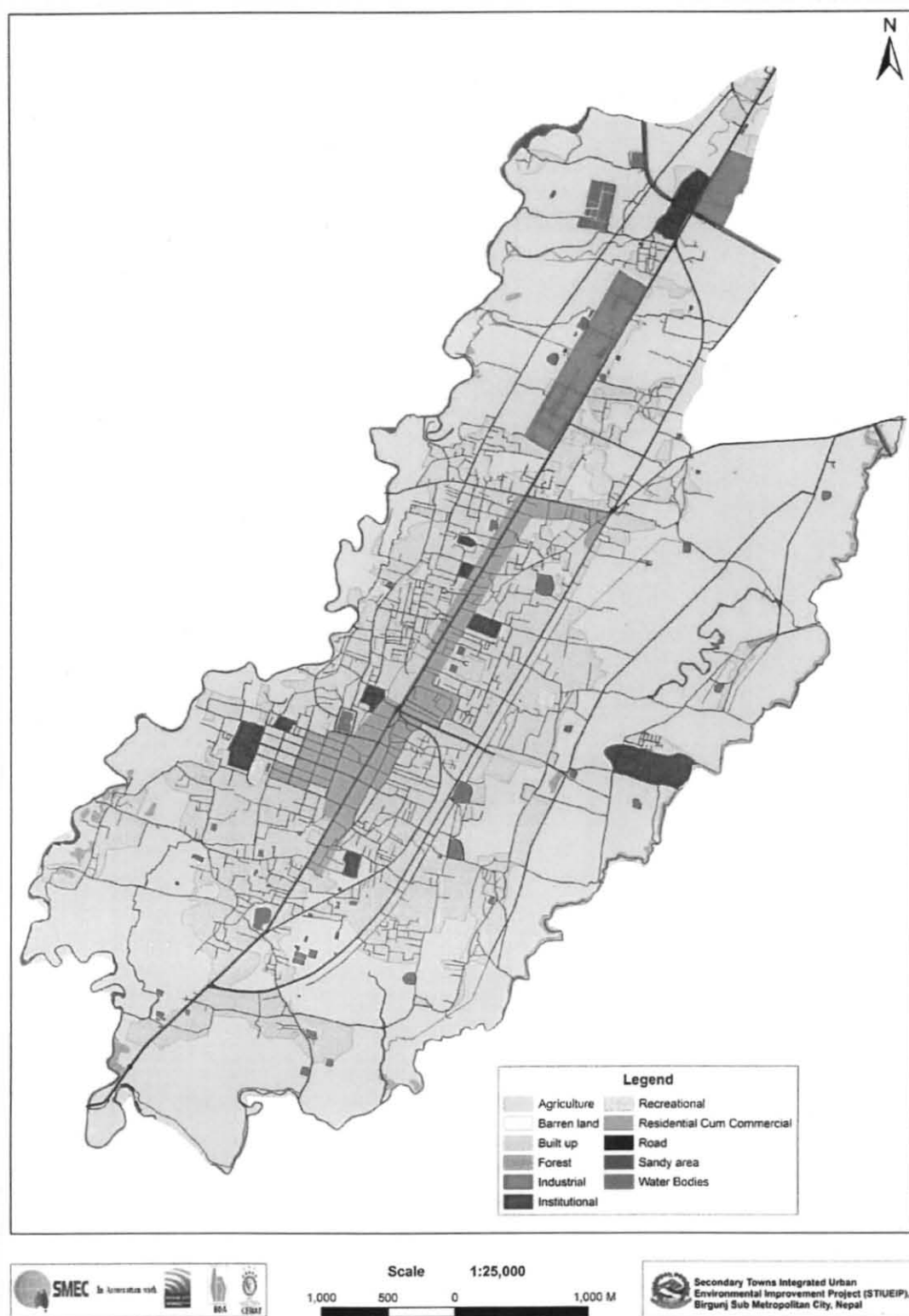


## 8.2 Existing Updated Land Use Plan

The existing land use (Figure No. 8-2) map shows the built-up area of Birgunj and distribution of different land uses. The total area of Birgunj Sum-metropolitan city is 2,337.02 ha. In addition to residential and residential-commercial areas there are many isolated villages within the municipality. Birgunj contains a large amount of institutional and industrial institutions. The agricultural area still dominates the total area of municipality.

<b>Class</b>	<b>Area Hec</b>
Agriculture	1282.42
Barren land	5.72
Residential	688.81
Forest	23.32
Industrial	47.25
Institutional	39.63
Recreational	9.31
Residential cum Commercial	97.52
Road	71.13
Sandy area	5.27
Water Bodies	66.64
<b>Total</b>	<b>2337.02</b>

Figure 8 - 2 : Existing Land Use Map of Birgunj Sub Metropolitan City



## 9 PERIODIC PLAN OF BSMC

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### 9.1 Development Concepts of Birgunj

Every municipality is required to prepare Periodic Plan as per Local Self Government Act 2054. The basic objective of preparing the Periodic Plan is to guide the development of the municipality in a planned way in every sector. The major outputs were: Vision; Sectoral Development Plans; Multi-Sector Investment Plan; Physical Development Plan (Land Use Plan); Resources Maps; and Building By-laws.

The Birgunj Municipality has prepared its Periodic Plan to guide the development of Birgunj in the planned way in different sectors and defined its VISION "Birgunj as Main Gate to Nepal, Clean, Prosperous and Progressive is our Identity". To achieve its fore mentioned vision, a number of programs are put forward in the periodic plan and has adopted the following objectives and strategy for physical and environmental development of Birgunj Sub-metropolitan City.

- Development of Birgunj as per land use
- Development of Sewerage and drains
- Proper management of solid waste
- Public awareness building on environmental issues
- Adopt approaches that reduces in waste reduction
- Ensure that raw sewerage gets into drains after it passes through septic tanks
- Protection of rivers banks
- Reduce municipal investment in solid waste and encourage private sector

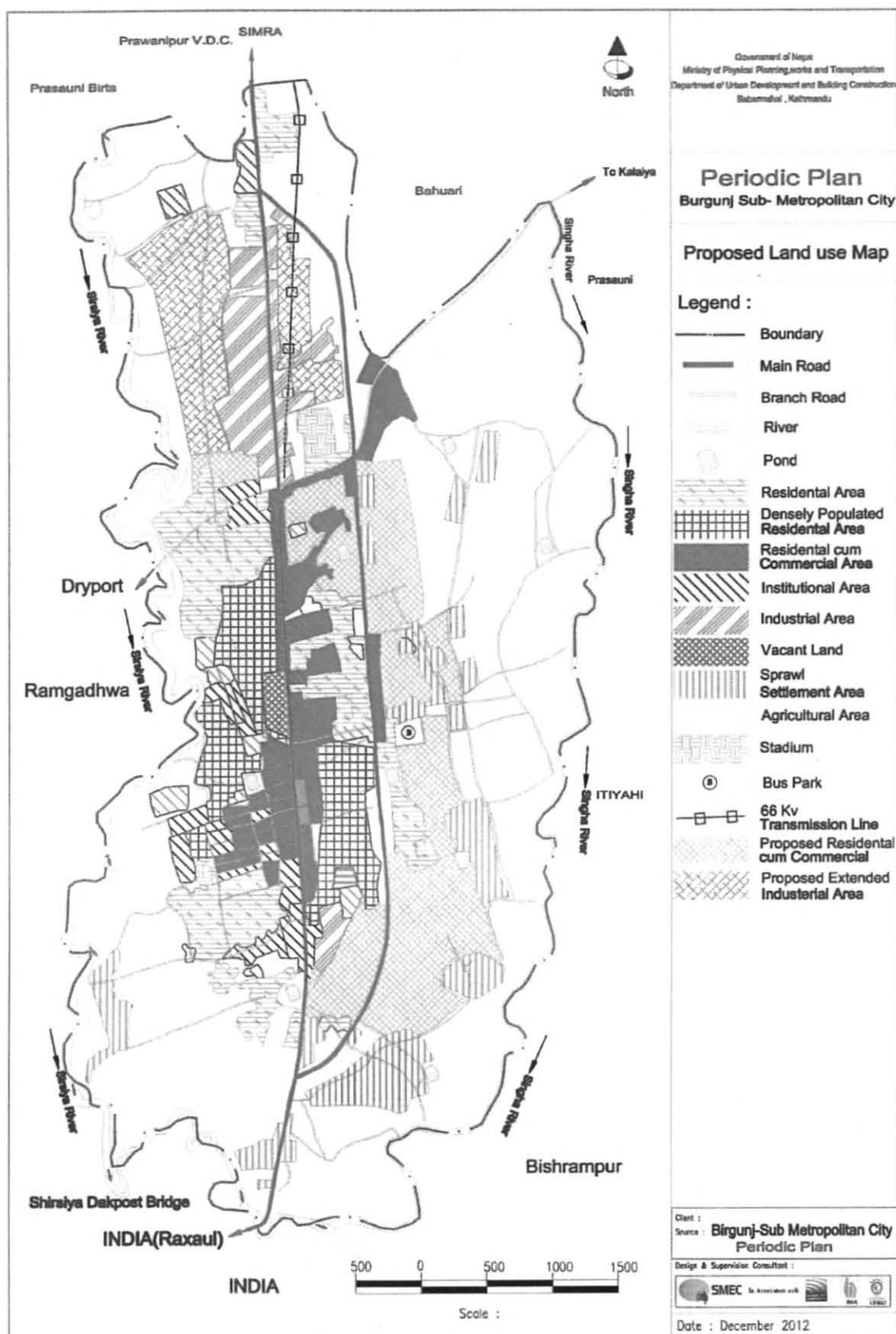
### 9.2 Proposed Land Use Plan

During the preparation of Periodic Plan, a new Land Use Plan (Figure No. 8-2) has been prepared to guide the future development of Birgunj based on current predominant land use. Besides the existing land use, new areas have been designated for different purposes as follows:

- The industrial area has been extended in the east west side of current industrial area.
- Further new residential and commercial development have been proposed in between the eastside of Bypass Road and canal road in Ward No. 18 and 19.

There is not much change between the existing and proposed land use except the above mentioned two points. Also it is doubtful that that the proposed Land Use Map will be implementable unless the municipality passes the land use strategy. At present the municipality does not have any land use policy while giving building permit. The proposed Land Use Map prepared by the Ribs Consultant is shown in Figure No. 8-2.

Figure 9 - 1 : Proposed Land Use Map in Periodic Plan



## 10 WARD ANALYSIS AND FINDINGS

A detailed study of wards has been carried out to analyze the different wards with respect to land use, urban density, growth rate and current development trend.

Ward No. 1 – This ward is still rural in nature and lies south-west part of BSMC. Proposed land use has designated this ward agriculture area. Building permit data shows low building construction activities and it has growth rate 2.36 % in 2011. Currently it has urban density of 54.7 pph and expected urban density is 95.7pph in year 2035. The Solid Waste Treatment Plant lies in this ward. There is a great scope of fast urbanization in future because of road improvement program of current ADB project. Timely planning intervention is required to stop the haphazard growth of city so that there is no problem of drainage due to urbanization.

Ward No. 2 – This ward lies next to Ward No. 1 in the southern part adjoining the Indian border having main road, rail road and by-pass road passing from this ward. It has a high growth rate of 5.47 % and 3.02% in 2001 and 2011. Since vacant lands are still available and close to commercial area, it has great potential for urban expansion especially in between By-pass road and railway road. The expected urban density in 2035 is 123.3 pph and projected population is 18,404 which was 9,012 in 2011. The increased in population have to be adjusted in southern part of Chhapkanya area and in the vacant land available in between By-pass road and Railway road.

Ward No. 3 – This ward lies in west of ward no. 5 and south of ward no. 13. Most of the developments are taking place after 1987 and it is dominated by sprawl development. The current density is 123.9 pph but the expected density is 226.3 pph. The expected population has to be adjusted through densification of sprawl development area and in the vacant land. The whole ward is dominated by residential houses.

Ward No. 4, 5, 6, 7, 8, 9, 11 and 12 – These seven wards are the old wards having developed before 1987 and occupies most of the commercial areas of Birgunj. Major part of drainage project area lies in these wards. Almost all wards have area of less than 30 ha with ward 8 being the smallest having the area of 5.61ha. The urban density ranges from 121.4 pph in ward 4 to maximum 342.3 pph in ward 9. The annual growth rates in the year 2001 were positive in all wards except in ward 11. The reason could be more out migration of people from this area to neighboring wards for residential purpose, since most of the building has been used for commercial activities. The building construction activities are quite low, with maximum 87 in ward 12 and minimum 15 in ward 5 in the last 5 years. Ward 12 contents a big open space of 6.58 ha which is proposed for City Park.

Ward No. 10 – This ward constitutes of residential cum commercial area along with institutional area. Most of the areas have been filled with vacant land left only in institutional area. The annual growth rate was 5.19 % in 2001 but reduced to 0.59 % in 2011.

Ward No. 13 – This is the most dynamic ward of BSMC and Birgunj's most attractive planned area which is known as Aadarsha Nagar. Also it is one of the worst affected drainage problem area of Birgunj. Building permit is quite significant and sprawl development is taking in the west of Aadarsha Nagar and will continue in future because of near to commercial area and availability of road access. The current density is 134.7 pph which is expected to be 180.7 pph in 2035.

Ward No. 14 – This is one of the attractive wards for building construction because of nearness to already developed area. Current development of trend is sprawl and taking place in western part beyond the road between Ranighat Chowk and Shreepur Chowk. The current density is 129.4 pph with population of 12372 which will have a density of 185.4 pph in 2035 with the population of 17727. The increment in population has to be accommodated in vacant land available as well as in sprawl development area in the western part of ward. Most of the ward area is dominated by residential purpose.



Ward No.15 – This ward is bounded by Murli road in the north, Main Road in the west and By-Pass road in the east. The existing land use pattern shows the residential cum commercial activities along the Main Road and By-pass road and Daak road. The whole ward has been proposed as residential cum commercial use in the proposed land use plan. Huge junk of land is occupied by the National Trading. The road National Link Road connects the Main Road and the By-pass road in west-east direction. The ward is almost filled with built up area. The annual growth of ward has already reduced from 4.46 % in 2001 to 0.96 % in 2011. The expected urban density is 187.1 pph in 2035 which is 149.6 pph in 2011.

Ward No 16 – This ward consists the two major east-west link roads Padma road and By-pass Link Road. The ward is growing fast because of Padma Road, its link with Birgunj Dry Port and way to Kalaiya, and adjoining to Sugar Factory. The building permit and annual growth rate (7.19 % in 2001 and 4.78 % in 2011) are also quite high. The expected density in 2035 is 258.8 pph which was just 84.400 pph. Since the growth rate is high, the projected population in 2035 is 33,438 which was 10,903 in 2011, an increment of 22,535 (206.6%). It will be difficult to accommodate so much in the remaining land of ward 16. The whole ward has sprawl development. The extra population has to be diverted in nearby wards. The proposed land use plan has designated this as residential in the west of Main Road and residential cum commercial between Main Road and By-Pass Road.

Ward No. 17 – This ward has an area of 454.33 ha. This ward has low building construction activities and low annual growth rate. Numbers of land plotting activities are going on in this ward along Canal Road, in spite of the fact that the land is designated as industrial area in the proposed land use map.

Ward No. 18 and 19 – These two big wards having the area of 482.11 ha and 507.79 ha respectively; occupy 42.05% of total municipality area which is 2,337.02 ha. Study of ward wise land use pattern reveals the total built up area in these two wards calculated from GIS is 363.75 ha approximately and vacant agriculture land as 626.24 ha. Out of the total built up area, 78.61% area is sprawl development. At present ward 18 and 19 have maximum building permit approval and maximum urbanization is taking place in these wards. Ward no. 18 and 19 are the major future urbanization area of Birgunj-Sub Metropolitan City. The urban densities are very low in these wards. Timely planning intervention in these wards is very important.

An effort has been made to present an overview of all wards concerning ward wise area, population, urban density and the annual growth rate dividing all wards into four different categories as big, medium, small and very small wards based on area. The overall view of the wards are shown below.

#### Big Ward area between 450 to 510 ha

Ward No.	Area in ha	Popn. 2001	Urban Density pph	Growth Rate % 2001	Popn. 2011	Urban Density pph	Growth Rate % 2011	Assumed Growth Rate %	Popn. 2035	Urban Density in 2035	Remarks
17	454.33	7684	16.9	4.44	8550	18.8	1.07	1.07	11038	24.3	Big ward. Land is available and low density, building permit is high in ward 18 and 19
18	482.2	5832	12.1	6.11	9540	19.8	5.04	5.04	31051	64.4	
19	507.79	12278	24.2	7.21	20584	40.5	5.30	5.30	71091	140.4	
Total	1444.32	25794	17.86		38674	26.78			113180 (42.05%)	78.36	

### Medium Ward area between 100 to 200 ha

Ward No.	Area in ha	Popn. 2001	Urban Density pph	Growth Rate % 2001	Popn. 2011	Urban Density pph	Growth Rate % 2011	Assumed Growth Rate %	Popn. 2035	Urban Density in 2035	Remarks
16	129.22	6833	52.9	7.19	10903	84.4	4.78	4.78	33438	258.8	Vacants land available wards are close to comercial area urban expansion possible
1	146.46	6337	43.3	11.17	8005	54.7	2.36	2.36	14013	95.7	
13	109.26	13030	119.3	6.74	14720	134.7	1.23	1.23	19739	180.7	
2	149.3	6694	44.8	5.47	9012	60.4	3.02	3.02	18404	123.3	
Total	534.24	32894	61.57		42640	79.48			85594 (31.80%)	160.22	

### Small Ward area between 25 to 100 ha

Ward No.	Area in ha	Popn. 2001	Urban Density pph	Growth Rate % 2001	Popn. 2011	Urban Density pph	Growth Rate % 2011	Assumed Growth Rate %	Popn. 2035	Urban Density in 2035	Remarks
15	56.77	7732	136.2	4.46	8493	149.6	0.94	0.94	10631	187.3	Land is available for further urban expansion
14	95.6	10647	111.4	5.29	12372	129.4	1.51	1.51	17727	185.4	
3	57.15	5510	96.4	5.26	7083	123.9	2.54	2.54	12932	226.3	
10	42.91	6133	142.9	5.19	6535	152.3	0.59	0.59	7527	175.4	
Total	209.52	23889	114.02		27948	133.39			48817 (18.14%)	232.99	

### Very small Ward area less than 25 ha

Ward No.	Area in ha	Popn. 2001	Urban Density pph	Growth Rate % 2001	Popn. 2011	Urban Density pph	Growth Rate % 2011	Assumed Growth Rate %	Popn. 2035	Urban Density in 2035	Remarks
4	18.92	2537	134.1	0.70	2297	121.4	-0.99	0.0	2527	139.6	Congested. All ready densified. Less land available for expansion.
5	9.48	1940	204.6	0.30	1807	190.6	-0.71	0.0	1988	209.7	
6	15.63	5453	348.9	3.50	3685	235.8	-3.84	0.0	3685	235.8	
7	9.92	2367	238.9	0.10	1648	166.1	-3.56	0.0	1813	182.8	
8	5.61	1721	306.8	0.07	1115	198.8	-4.25	0.0	1227	218.7	
9	13.43	4486	334.0	3.41	4597	342.3	0.24	0.24	4869	362.5	
11	6.63	1913	288.5	-0.92	1656	249.8	-1.43	0.0	1822	274.8	
12	26.41	3357	127.1	2.89	3302	125.0	-0.17	0.0	3632	137.5	
Total	106.03	23774	224.21		20107	189.63			21563 (8.01%)	203.36	

## 11 WARD WISE LAND USE ANALYSIS

A ward wise land use map (Figure No. 14-1) is being prepared to carry out the study of the land use distribution in different wards and to find out how much land is available for future urban development. Areas occupied by different land uses have been calculated with the help of GIS and shown in Table No. 11-1.

**Table 11 - 1 : Ward wise Land Use Data**

Ward no.	Residential Attached Ha	Residential Compact Ha	Sparse Ha	Institution Ha	Industrial Ha	Agriculture Ha	Other Ha
1	12.35	6.84	6.19			83.86	
2	42.04		50.99			54.63	1.64
3	11.52	1.05	42.75			1.82	
4	0.41	10.78	3.37	2.1			2.24
5		8.84					0.63
6	15.62	0.02					
7	8.64	1.11		0.18			
8	5.6						
9	8.55	3.84					1.04
10	3.35		39.35				
11	6.63						
12	16.93			2.89			6.58
13	31.26	22.59	33.99	7.84		11.15	2.44
14	56.85	4.28	24.79	2.18		4.09	0.42
15		46.99	5.51	4.24			
16	0.01	29.67	79.16			20.39	
17	8.32	0.3	119.59	8.79	47.26	249.35	8.04
18	26.38	8.34	126.77	14.13		306.48	
19	19.35		168.68			319.76	
Total	286.71	144.64	750.38	42.41	47.26	1012.66	12.54

The above Table shows that the core ward 4, 5, 6, 7, 8, 9, 11 and 12 are almost covered by built up area. More sprawl developments are taking place in ward no 16, 17, 18 and 19 in comparison with the other wards. These wards are still dominated by agriculture use and future urban expansion area will take place in these wards by converting more agriculture land in built up area.

It has been seen that from Table No 11-1 that there are no more agriculture land left in wards no 4,5,6,7,8,9,10, and 15. Hence most of the additional population projected in the 2035 are to adjusted in wards 1,2,16,17,18,and 19. How much lands are required for the additional population have been calculated based on projected urban densities of the year 2035 and are



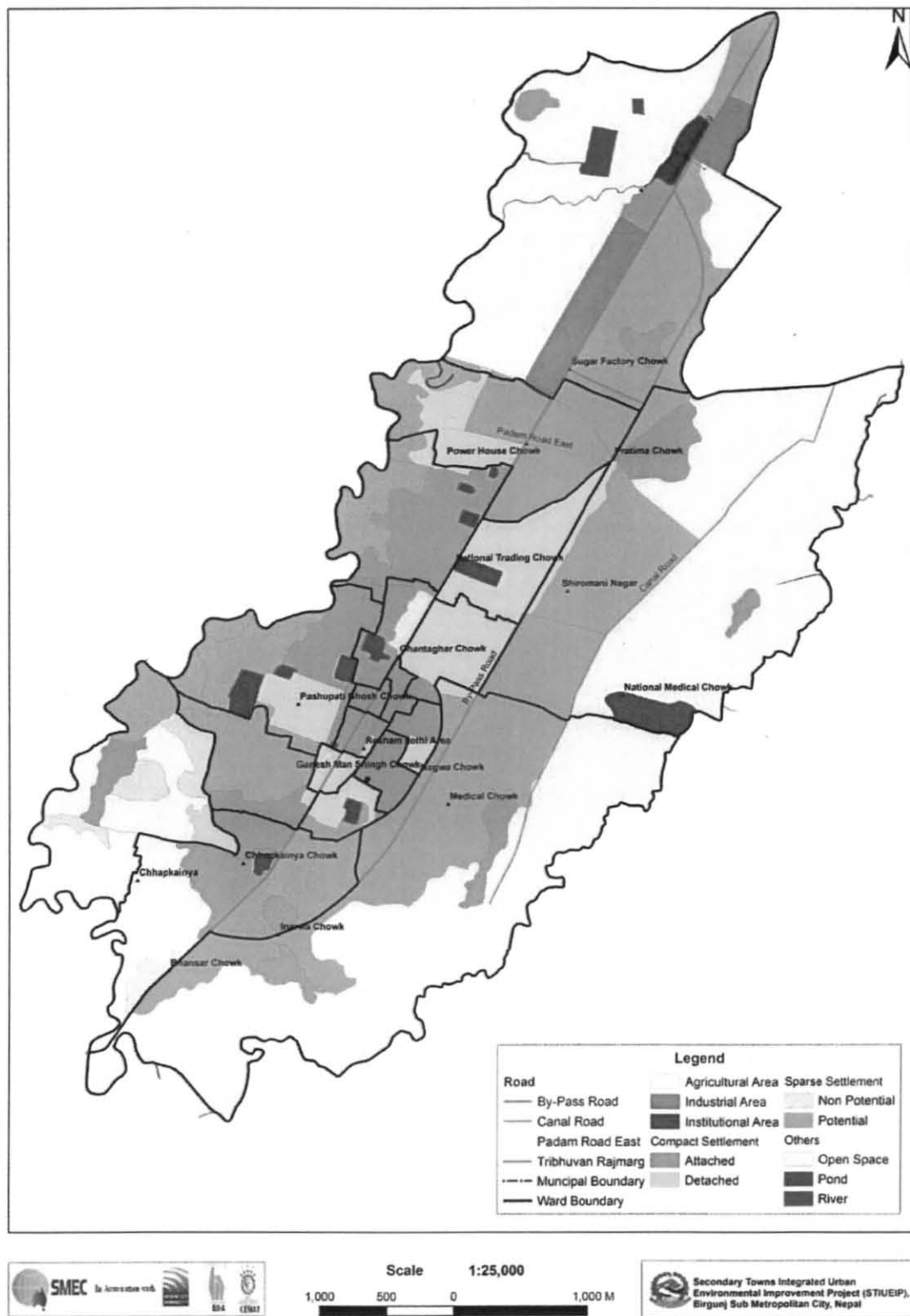
shown in Table No 11-2. The additional lands are available in the sprawl development area and agriculture area.

**Table 11 - 2 : Future Land Requirement**

Ward No.	Area Ha	Population in 2011	Urban Density pph	Sprawl Development area Ha	Agriculture Land Ha	Total Ha	Project ed populati on in 2035	Project ed urban density in 2035 pph	Addition al Populati on to be Accommodated	Addition al Land Require d Ha
1	146.6	8005	54.7	6.19	83.86	90.05	14013	95.7	6008	62.77
2	149.3	9012	60.4	50.95	54.63	105.58	18404	123.3	9392	76.17
16	129.22	10903	84.4	79.16	20.39	99.55	33428	258.8	22535	57.07
17	454.33	8550	18.8	119.59	249.35	368.94	11038	24.3	2488	102.38
18	482.2	9540	19.8	126.77	306.48	437.25	31051	64.4	21511	334.02
19	507.79	20,584	40.5	168.68	318.76	488.44	71091	140.4	50507	359.73

The above Table shows that 551.34 hacters of land of ward no 1,2,16,1,7,18, and 19 available in sprawl development and also agriculture land will converted into built up area by the year 2035. Proper management of these land is to be seriously thought in time to provide effective infrastructure services by doing proper urban planning.

Figure 11 - 1 : Ward Wise Land Use Analysis Map of Birgunj Sub Metropolitan City



## 12 POPULATION PROJECTION

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Central Bureau of Statistics has released the result of the National Population Census 2011 on November 27, 2011. According to the National Population Census 2011, population of Nepal as of the census day (June 22, 2011) stands at 26,494,504. The increment of population during the last decade is recorded as 3,343,081 with an annual average growth rate of 1.35 percent.

Tarai constitutes 50.27 percent (13,318,705) of the total population while Hill and Mountain constitutes 43 percent (11,394,007) and 6.73 percent (1,781,792) respectively. Among the five development regions, Central development region has the highest population (36.45 percent) and far western region records the lowest (9.63 percent).

According to the National Population Census 2001, the population growth rate of Nepal was 2.25 percent per annum. Likewise, the result shows that there are 5,659,984 households living in 4,767,196 dwellings/houses throughout the country which shows the ratio of houses to households 1:1.19.

Furthermore, the result also revealed that the size of the household in Nepal has decreased from 5.44 in 2001 to 4.88 in 2011. The household size is recorded highest (6.44) in Rautahat district and lowest (3.92) in Kaski.

The result shows that the absentee population in Nepal increased to 1,921,494 which are more than double the absentee population in 2001. Apparently, the population of male absentee dominates in the total absentee population. The male absentee population comprises about 87.6 percent.

The percentage of male and female absentee population in the year 2001 was 89 and 11 percent respectively.

The result reveals that the population of male and female in Nepal is 12,849,051 and 13,645,433 respectively.

Accordingly, sex ratio (number of males per 100 females) at the national level has decreased from 99.8 in 2001 to 94.2 in 2011. In abstract number, there are 796,422 more females than males in the country. Sex ratio is highest (127) in Manang district and lowest (76) in Gulmi district

Also, the result reveals the massive increase in the urban population. The urban population (population residing in 58 municipalities) constitutes 17% (4,523,820) of the total population compared to 13.94% (3,227,879).

Population density (average number of population per square kilometer) at the national level is 180 compared to 157 in 2001. The highest population density is found in Kathmandu district (4,416 persons per square km) and lowest (3 person per square km) in Manang district.

The fastest decadal population growth rate is to be found in Kathmandu district (61.23 percent) and least in Manang (-31.80 percent). Altogether 27 districts including Manang, Khotang, Mustang, Terhathum, Bhojpur etc. recorded negative population growth rate during the last decade.

Likewise the rural population of Nepal decreased from 86 percent in 2001 to 83 percent in 2011. The sex ratio in the rural areas, as in the census 2001 is higher (104) than in the urban areas (92).

Among the urban areas, the Kathmandu Metropolitan City constitutes the largest population of 1,006,656 followed by Pokhara and Biratnagar Municipality. Dhulikhel Municipality has the lowest population, 16,406 among the urban areas followed by Dasharathchand, Bhadrapur and Ilam Municipalities.

The result also reveals that Kathmandu district has the largest population of 1,740,977 followed by Morang, Rupandehi, Jhapa and Kailali which has the population of 964,709; 886,706; 810,636 and 770,279 respectively. Manang constitutes the lowest population of 6,527 followed by Mustang, Dolpa, Rasuwa and Humla that has population of 13,799; 36,701; 43,798 and 51,008 respectively.

## 12.1 Population Projection

The population projection depends upon number of factors such as socio-economic activities, political development and availability of infrastructures.

Population projections are based on the assumptions that the past trends will continue in future. In general population projections are treated predetermines and never to termed as final projections. They should be reviewed frequently in order to determine the degree to which it agree with recent demographic change

There are various methods of projecting population (mathematical, economic and component methods). Some are very sophisticated and rigorous while others are simple and less sophisticated.

In case of Birgunj, the projection of the population has been done by the geometric growth method i.e.  $P_n = P_0 (1+r)^n$

The annual ward wise growth rates have been calculated based on the census data of 2001 and 2011 and projected the population in wards with the base year 2015. The reasons for taking the Base Year 2015 are follows:

The design period is up to Dec. 2012.

6 months period may be required for procurement of contract i.e. June 2013.

Project completion period is required one and half year i.e. 2014.

The DSC identified two options for the population projection of BSMC which are as follows:

### **Option 1**

To project the population of municipality on ward wise basis by taking the growth rate of wards based on two decadal years which give different annual growth rate in different wards and the projected population has been shown in Table no. 12-1.

**Table 12 - 1 : Projection No. 1**

Ward	Popu- lation (2001)	Popu- lation (2011)	Average Growth Rate (2001-2011)	Popu- lation (2015)	Popu- lation (2020)	Popu- lation (2025)	Popu- lation (2030)	Popu- lation (2035)
1	6341	8,005	2.36%	8787	9873	11093	12464	14004
2	6694	9,012	3.02%	10150	11777	13665	15855	18396
3	5510	7,083	2.54%	7831	8879	10067	11414	12941
4	2537	2,297	-0.99%	2207	2100	1998	1901	1809
5	1940	1,807	-0.71%	1756	1695	1636	1579	1524
6	5453	3,685	-3.84%	3150	2589	2128	1749	1438
7	2367	1,648	-3.56%	1426	1190	993	829	692
8	1721	1,115	-4.25%	937	754	607	489	394
9	4486	4,597	0.24%	4642	4699	4757	4815	4874
10	6163	6,535	0.59%	6690	6889	7094	7305	7522
11	1913	1,656	-1.43%	1563	1454	1353	1259	1171
12	3357	3,302	-0.17%	3280	3253	3226	3199	3173
13	13030	14,720	1.23%	15456	16428	17461	18559	19726
14	10647	12,372	1.51%	13138	14162	15266	16456	17739
15	7732	8,493	0.94%	8818	9242	9686	10151	10639
16	6833	10,903	4.78%	13144	16603	20973	26493	33466
17	7684	8,550	1.07%	8923	9412	9928	10473	11047
18	5832	9,540	5.04%	11616	14857	19002	24303	31083
19	12278	20,584	5.30%	25310	32771	42432	54941	71137
<b>Total</b>	<b>112518</b>	<b>135904</b>	<b>1.91%</b>	<b>146567</b>	<b>161080</b>	<b>177030</b>	<b>194559</b>	<b>213824</b>

In option 1, the Table 12-1 shows the following facts:

Growth rates are negatives in ward no. 4, 5, 6, 7, 8, 11 and 12 the maximum negative is in ward no. 8 with -4.25% followed by ward no. 6 with - 3.58%. The wards 1, 2, 3, 10, 9, 13, 14, 15, 16, 17, 18 and 19 have positive growth with maximum growth rate of 5.30 % in ward 19.

The populations in ward no. 4, 5, 6, 7, 8, 11 and 12 in the year 2035 are less than the population in the year 2011 if population projection is carried with the actual growth rate of 2011. Hence effort has been made to find the alternative option.

## **Options 2**

Numbers of meetings were held with PCO and PMSC to discuss the other alternatives identified by DSC for the population projection. The main issue discussed in the meetings is to decide the annual growth rate in negative growth rate wards such as 4, 5, 6, 7, 8, 11, and 12. The meeting decided to take the growth rate for the ward wise population projection as follows:

Project the population with natural growth rates for positive growth rate wards like ward no. 1, 2, 3, 9, 10, 13, 14, 15, 16, 17, 18 and 19.

Project the population with zero growth rate in case of negative rate wards like ward no. 4, 5, 6, 7, 8, 11 and 12 but increase 10% of the total population of the year 2035 in commercially actives wards such as 4, 5, 7, 8, 9, 11 and 12.

The option 2 population projection has been adopted for the design purpose and presented in tabular no. 11 and the urban densities of different wards in different year have been calculated with this projected population and presented in Table no. 12-2.

**Table 12 - 2 : Projection No. 2**

Ward	Popu- lation	Popu- lation	Actual Growth Rate	Assumed Growth Rate	Popu- lation	Popu- lation	Popu- lation	Popu- lation	Popu- lation	Popu- lation
	(2001)	(2011)	(2001- 2011)	(2001-2011)	(2012)	(2015)	(2020)	(2025)	(2030)	(2035)
1	6337	8,005	2.36%	2.36%	8194	8788	9875	11097	12470	14013
2	6694	9,012	3.02%	3.02%	9284	10151	11779	13668	15860	18404
3	5510	7,083	2.54%	2.54%	7263	7831	8877	10063	11408	12932
4	2537	2,297	-0.99%	0.00%	2297	2297	2297	2297	2297	2527
5	1940	1,807	-0.71%	0.00%	1807	1807	1807	1807	1807	1988
6	5453	3,685	-3.56%	0.00%	3685	3685	3685	3685	3685	3685
7	2367	1,648	-3.49%	0.00%	1648	1648	1648	1648	1648	1813
8	1721	1,115	-4.25%	0.00%	1115	1115	1115	1115	1115	1227
9	4486	4,597	0.24%	0.24%	4608	4641	4697	4754	4811	4869
10	6133	6,535	0.59%	0.59%	6574	6691	6891	7097	7309	7527
11	1913	1,656	-1.43%	0.00%	1656	1656	1656	1656	1656	1822
12	3357	3,302	-0.17%	0.00%	3302	3302	3302	3302	3302	3632
13	13030	14,720	1.23%	1.23%	14901	15458	16432	17468	18569	19739
14	10647	12,372	1.51%	1.51%	12559	13136	14158	15260	16447	17727
15	7732	8,493	0.94%	0.94%	8573	8817	9239	9681	10145	10631
16	6833	10,903	4.78%	4.78%	11424	13142	16598	20963	26476	33438
17	7684	8,550	1.07%	1.07%	8641	8922	9410	9924	10466	11038
18	5832	9,540	5.04%	5.04%	10021	11614	14851	18990	24283	31051
19	12278	20,584	5.30%	5.30%	21675	25307	32763	42416	54913	71091
Total	112484	135904	1.91%							
Total of wards					139227	150008	171080	196891	228667	269154

The projected population in different wards reveals the following facts:

Out of the total population of 269,154, population of 113,180 (42.05%) is expected to live in big ward no 17, 18 and 19; population of 85,594 (31.80%) in medium ward no 1, 2, 13 and 16; population of 48,817 (18.16%) in small ward no. 3, 10, 14 and 15 and population of 21,563 (8.01%) in very small ward 4, 5, 6, 7, 8, 9, 11 and 12 which are core wards. Due care should be given in planning of ward no 17, 18 and 19. So that there is no problem in providing infrastructure services.



**Table 12 - 3 : Projected Urban Density**

**Actual and Projected Population and Urban Density of Birgunj Municipality by Wards  
A Time Series Data for the Year 2001 Through 2035**

Ward No.	Area Ha	Year 2001 (A)		Year 2011 (A)		Year 2015 (P)		Year 2020 (P)		Year 2025 (P)		Year 2030 (P)		Year 2035 (P)	
		Popn.	Density	Popn.	Density	Popn.	Density	Popn.	Density	Popn.	Density	Popn.	Density	Popn.	Density
1	146.46	6337	43.3	8,005	54.7	8788	60.0	9875	67.4	11097	75.8	12470	85.1	14013	95.7
2	149.3	6694	44.8	9,012	60.4	10151	68.0	11779	78.9	13668	91.5	15860	106.2	18404	123.3
3	57.15	5510	96.4	7,083	123.9	7831	137.0	8877	155.3	10063	176.1	11408	199.6	12932	226.3
4	18.92	2537	134.1	2,297	121.4	2297	121.4	2297	121.4	2297	121.4	2297	121.4	2527	133.6
5	9.48	1940	204.6	1,807	190.6	1807	190.6	1807	190.6	1807	190.6	1807	190.6	1988	209.7
6	15.63	5453	348.9	3,685	235.8	3685	235.8	3685	235.8	3685	235.8	3685	235.8	3685	235.8
7	9.92	2367	238.6	1,648	166.1	1648	166.1	1648	166.1	1648	166.1	1648	166.1	1813	182.8
8	5.61	1721	306.8	1,115	198.8	1115	198.8	1115	198.8	1115	198.8	1115	198.8	1227	218.7
9	13.43	4486	334.0	4,597	342.3	4641	345.6	4697	349.7	4754	354.0	4811	358.2	4869	362.5
10	42.91	6133	142.9	6,535	152.3	6691	155.9	6891	160.6	7097	165.4	7309	170.3	7527	175.4
11	6.63	1913	288.5	1,656	249.8	1656	249.8	1656	249.8	1656	249.8	1656	249.8	1822	274.8
12	26.41	3357	127.1	3,302	125.0	3302	125.0	3302	125.0	3302	125.0	3302	125.0	3632	137.5
13	109.26	13030	119.3	14,720	134.7	15458	141.5	16432	150.4	17468	159.9	18569	170.0	19739	180.7
14	95.6	10647	111.4	12,372	129.4	13136	137.4	14158	148.1	15260	159.6	16447	172.0	17727	185.4
15	56.77	7732	136.2	8,493	149.6	8817	155.3	9239	162.7	9681	170.5	10145	178.7	10631	187.3
16	129.22	6833	52.9	10,903	84.4	13142	101.7	16598	128.4	20963	162.2	26476	204.9	33438	258.8
17	454.33	7684	16.9	8,550	18.8	8922	19.6	9410	20.7	9924	21.8	10466	23.0	11038	24.3
18	482.2	5832	12.1	9,540	19.8	11614	24.1	14851	30.8	18990	39.4	24283	50.4	31051	64.4
19	507.79	12278	24.2	20,584	40.5	25307	49.8	32763	64.5	42416	83.5	54913	108.1	71091	140.0
<b>Total</b>	<b>2337.02</b>	<b>112484</b>	<b>48.1</b>	<b>135904</b>	<b>59.0</b>	<b>150008</b>	<b>64.2</b>	<b>171080</b>	<b>73.2</b>	<b>196891</b>	<b>84.2</b>	<b>228667</b>	<b>97.8</b>	<b>269154</b>	<b>115.2</b>

Note: (P) = Projected Population and Density [Year 2012 - 2035]

Ward 17, 18 and 19 have still medium urban density, less than 150 pph even in 2035 and enough land for urbanization. Thus these three wards could accommodate more than the projected population even after 2035.

Medium ward 16 and 13 are expected to reach high urban density of 258.8 pph and 180.7 pph where as ward 1 and 2 are expected to reach medium density of 93.00pph and 123.00pph. These two wards can accommodate more people even after 2035 as more lands are still available in these two wards.

Small ward 3,10,14,15 will reach fairly good urban density in 2035 but these wards do not have enough land.

Very small ward 4, 5, 6, 7, 8, 9, 11 and 12 ranging 133.6 pph in ward no 4 to 362.5 pph in ward no 9. Since these wards are very small, increase in density is possible due to more commercial activities, high rise building and property separation among family members.



## 13 CONCLUSIONS & RECOMMENDATIONS

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Birgunj Sub-metropolitan City has experienced rapid urban growth in the last two decades in ward no 13, 14 in the western sector and ward no. 15, 16, 18 and 19, in the eastern sector, especially in between main road and By-pass road. The building permit data show the present development trend is still continuing in this direction. If someone looks at the development trend of the city, one could notice haphazard development of road network system with narrow road width, the effect of which will be in providing the infrastructure services.

The pattern of new residential development is a function of access; distance from established urban areas. Extension of infrastructure services such as water, electricity, drainage and sewerage are dependent on access since these services are provided along road access.

There is opportunity to guide the urban development by predetermining primary infrastructure networks. Public awareness of road networks would automatically influence private sectors decisions about where to invest in land for future urban development.

### 13.1 Current Development Pattern

In case of Birgunj, the present scenario of urban development and possibility of future urban expansion can be looked upon as follows:

The central part of Birgunj, ward no. 4, 5, 6, 7, 8, 9, 11 and 12 are fully developed and concentrated settlement. Only natural growth is possible in these wards.

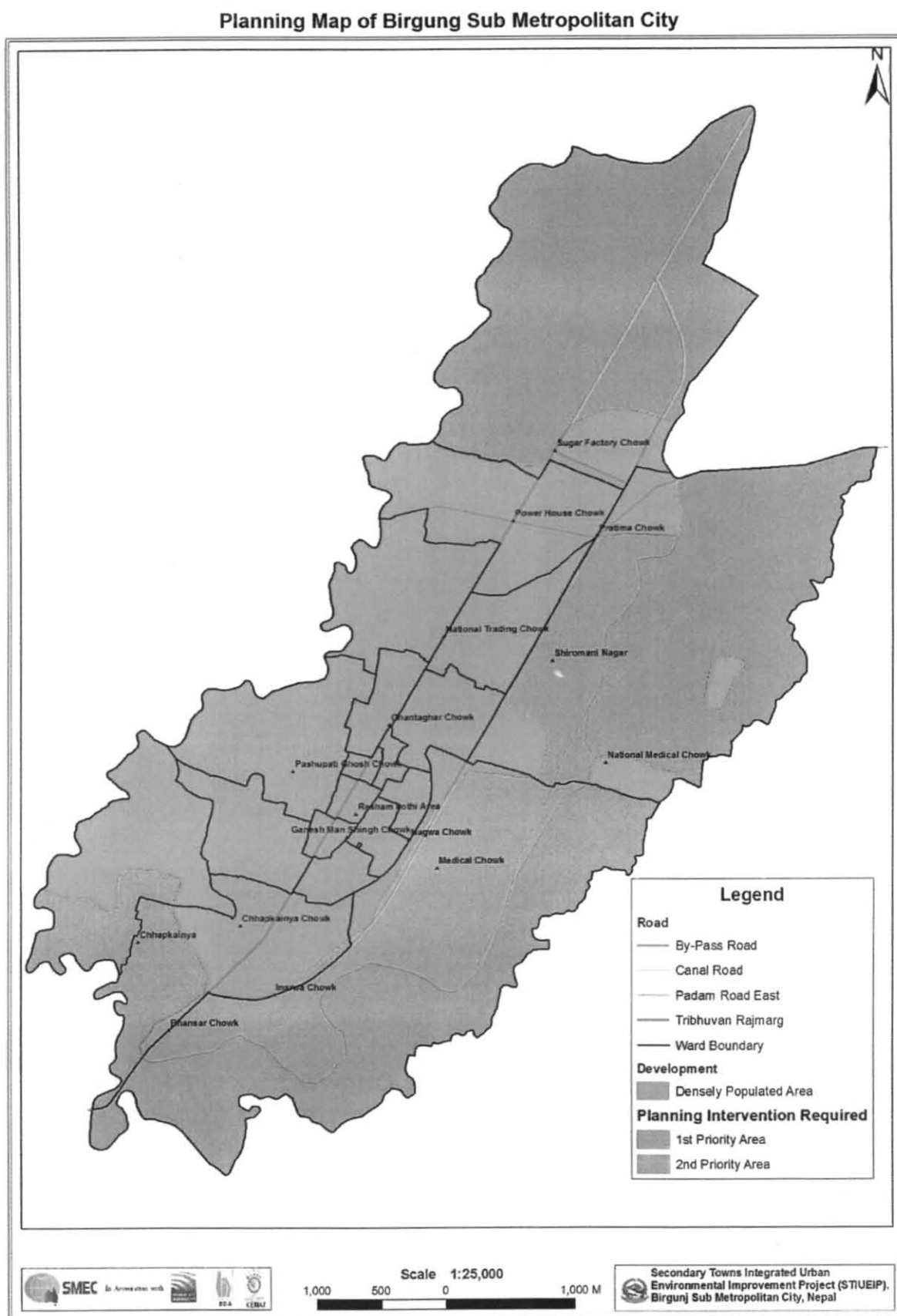
Ward 3 in south, ward 13, 14, 16 in the west are well developed with some vacant lands still available for development and there is limited opportunity for further new development.

Ward 1, 2 in south and ward 17 in north and ward 18, 19 in east are the only wards where there are enough opportunity for further urban expansion. The urban densities are also very low in these wards in compared to the other wards.

### 13.2 Planning Intervention in Ward No. 17, 18 and 19

The current development pattern ( Figure No. 16-1) shows that the area bounded by Padma road in the north, Chhapkaiya in the south, Sirsiya river in the west and second by-pass road in the east is almost fully developed. Planning intervention is required beyond the By-pass road in the east and north south sectors to resolve new settlement issues by doing proper urban planning. Immediate planning intervention is suggested for the area between the By-pass road and Canal road as sprawl development which is already taking place in this area.

Figure 13 - 1 : Planning Map



The majority of agriculture lands are remained only in ward no 17, 18 and 19 for future urban expansion. Hence the new urban expansion should occur in the eastern, northern and south eastern sectors of municipality in the east of the By-pass road and around the canal road. The reasons to encourage the urban expansion in these areas are:

- i) A major surface drain is going to be constructed in the canal road along with proposing it as four lanes road. The upgrading of this road will attract building construction activities as well as land speculation around the canal road, and even beyond the canal road;
- ii) Sprawl development has already taken place in between the By-pass road and canal road e.g. Nagawa Fulbari area, Kavi Shiromani Nagar and Inarwa;
- iii) The building permit data shows maximum building permits are approved in these areas.

Timely planning intervention is required for the planned development of the area so that there is no problem in developing infrastructure services such as proper road network, both sewer line and surface drains, electricity and water supply line. Immediate planning intervention is suggested for the area between the By-pass road and canal road as sprawl development is already taking place in this area.

The two most important tools for planned development are i) land development program and ii) land use strategy. The tool for land development could be either Guided Land Development (GLD) or Land Pooling. Land Pooling is much better than GLD as the plan consists of definite road network pattern with definite plot sizes but it is time consuming, though the Land Pooling is better, it is suggested to use GLD program for land development in the beginning.

The advantage of GLD is that the major networks of roads are already defined and hence it will guide the development activities such as building construction activities, provision of infrastructure services like surface drain, sewer line in planned way. Once the road network plan is prepared, it will be easy to provide the other infrastructure in planned way. The other advantage of introduction of Land Pooling or GLD is that it will decrease infrastructure cost by increasing the urban density.

Hence it is recommended that a GLD land development program be planned and launched in eastern part of Birjung city, in ward no. 18 and 19 and in ward no. 17 in northern part.

Based on road network plan, a drainage master plan should be prepared showing contour value, flow line and right of way in the map.

### **13.3 Alternative Option to GLD Programme: Road Network Plan**

If the GLD could not be planned, designed and implemented immediately due to lack of time and technical man power plan, one more option is to prepare a road network plan consisting of existing roads, roads with dead ends and some additional roads.

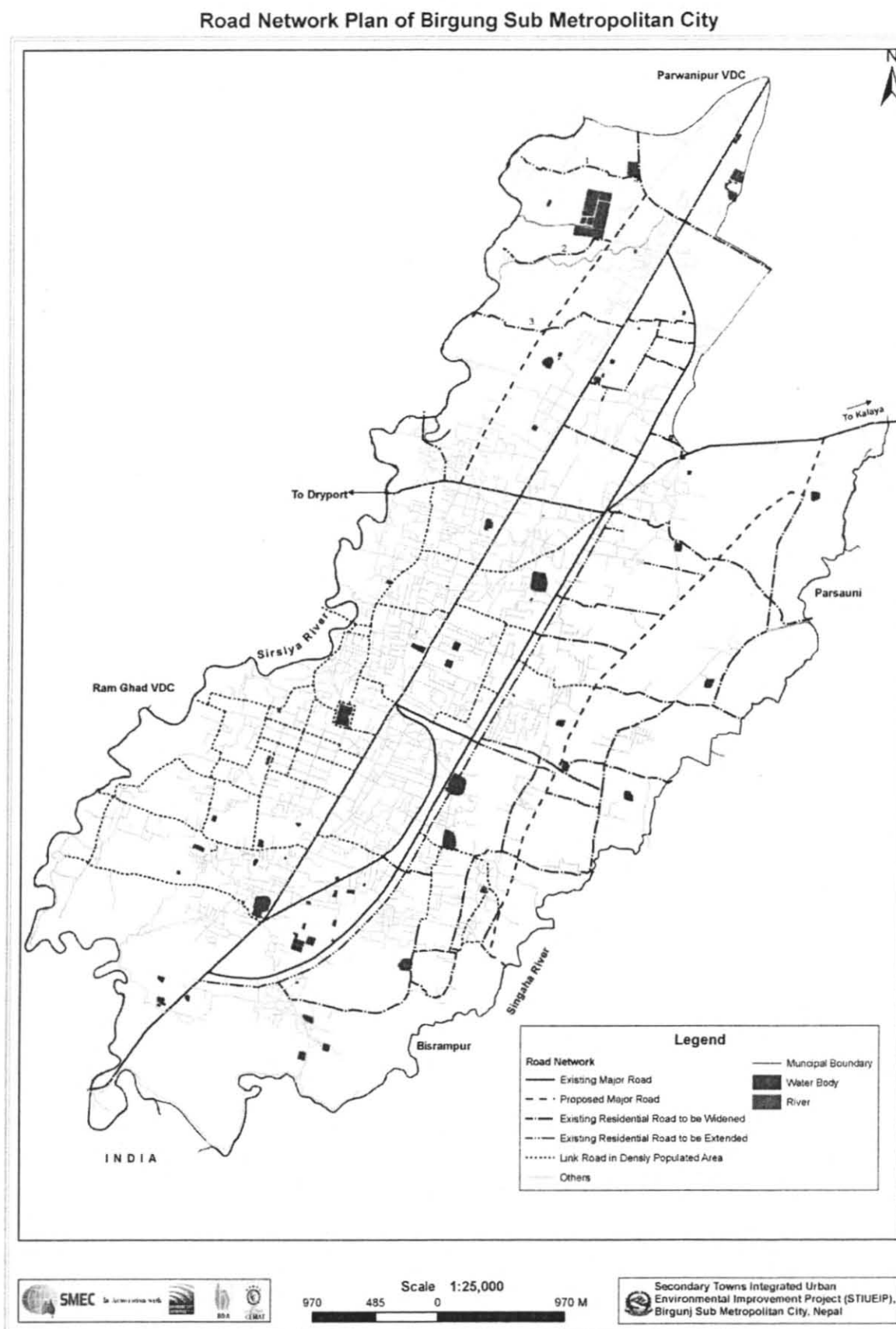
Since the municipality consists of densely populated areas with heavy existing roads and thinly populated areas with few roads, the municipality has been divided into two parts ; one already densely populated wards such as ward no. 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16 with road network already developed and other thinly populated wards such as ward no. 17, 18 and 19 with few roads and dominated by huge agriculture land with high potentiality for future urban expansion.

A preliminary road network plan (Figure No. 16-2) has been prepared for these two areas as follows:

Part one consists existing roads only and effort is being to show north-south and east-west linkage of major roads only for the future traffic management.

Part two consists the following types of roads:

Figure 13 - 2 : Road Network Map



Existing major roads such as Main road, By-pass road, Second By-pass road, Padma road, and Ghantaghar Link road.

Existing road but proposed to play as major road (proposed major road) in future, such canal road in the east and Radhemai road in the west.

Existing residential roads which are very important for north-south and east-west linkages and are required to be widened for thorough traffic.

Existing residential roads left in middle of the field but required to be extended to connect with the other roads.

The basic objectives of the road network for ward no 17, 18 and 19 are i) to show road linkage between north-south and east-west ii) to define road hierarchy iii) to fix the right of ways. Such road network plan could helps in guiding the infrastructure services like drains, electricity, water supply, telephone etc. because these are provided along the roads. It will also help in traffic management of the city. Recommended Right of Ways for different types of roads as shown in Road Network Map can be referred from the Report by Road Engineer.

### **13.4 Building and Planning By-laws**

Birgunj Municipality doesn't have elaborated building and planning by-laws. At present the Birgunj Municipality has a simple rule of one meter setback for right of way from the existing road for all roads except in some major roads such as Tribhuvan Raj Path, By-pass road, Second By-pass road, Padam road, By-pass Link road.

The Integrated Action Plan of 1998 had prepared building and planning by-laws for Birgunj Municipality showing most of the elements of the building and planning by-laws except rule for land development and apartment buildings.

It is strongly recommended to prepare a new building and planning by-laws based on the present situation and by referring the proposed 1998 building and planning by-laws. It will not be unfair to mention that the 1998 building and planning by-laws prepared during the preparation of the Integrated Action Plan is well written and worth to update looking at the present context.

The Bye-laws should have the key elements of Bye-laws of such as height of building, ground coverage, floor area ratio, right of way, set back, minimum road width in newly developed area and rule for land development by private people.

It is worthwhile to mention here that while preparing the Bye-laws the whole municipality should be divided in two parts as mentioned above ; one already highly developed area such as core area and the other is newly developing ward 17, 18 and 19. There should be separate by-laws in these two parts based on ground reality.

A special zoning map should be specially prepared for ward 17, 18, and 19 with separate building and planning By-laws and land use strategy (permissible, non permissible and special requirement) for ward 17, 18 and 19. Some land should set aside sites for sewage disposal and treatment plants as future urbanization is bound take place in these wards.

Numbers of land use plans have been prepared for Birgunj municipality but none of them have been implemented properly due to lack of political commitment and people's right to property. It is also true that a rigid land use plan cannot be implemented because of land belong to people and without giving compensation, nothing can be forced that one should use one's land as per defined land use plan.

Hence land use strategy plan should be conceived for proper utilization of land and planned development. A land use strategy plan helps to a coordinated series of land use development policies and actions.



