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RESEARCH ARTICLE

Impact of Civilized Intervention on the Eco-fitness of Kurseong Municipality, West Bengal, India.

Rabin Das,
Research Scholar of Vidyasagar University, Midnapore, West Bengal and Assistant Professor of Bajkul Milani Mahavidyalaya,West Bengal, India

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Corresponding Author

Rabin Das

Abstract

The high altitude mountain ecosystems are very breakable and susceptible to any kind of changes introduced by human being. The critical balance of such ecosystem has largely been offset by the land use / land cover changes for development purposes. The natural processes are accelerated out of proportion by strong anthropogenic modifications of landscape through clearance of forest for agriculture, settlement, pasturing, mining and quarrying, water resource capturing, road construction etc. to invite hazardous events which have dramatic impact on human property and lives (Das, Chatterjee and Roy, 2011). Thus humans have been instrumental for significant increase in the frequency and magnitude of these hazardous events. An evaluation of civilized intervention on the natural landscape is needed for the mountainous sustainability of an urban landscape, particularly in those urban areas where large volume of population throng together for livelihood. The Kurseong Town occupies the east facing cliff like slope of Senchal- Mahaldiram ridge of the Darjeeling Himalayas that rises steeply from Rinchengtong Khola River Valley (a tributary of the Balason River) from an altitude of 800m, in the east, to an altitude of 2200m to the west. The present study enlightens the echelon of human impacts in causing physical hazards like landslide, soil erosion and social hazards like water scarcity, building congestion, traffic congestion, road accident etc. This study is based on household survey and Global Positioning System aided survey. Dumpy level survey has been carried out for drawing topographic profiles. Satellite images (Wikimapia and LISS-III) have been used to detect the changes in land use pattern. Finally, GIS is used for data analyses and preparation of maps.

Introduction

The role of human being in creating and modifying landform is a theme of great importance (Goudie, 1993). The range of human impact on both forms and processes is considerable, especially in case of fragile environment. The present study has been conducted in one of such sensitive mountain terrains of the Darjeeling Himalayas. Kurseong is a Sub-Divisional town in the Darjeeling district of West Bengal (fig. 1). It lies between $26^{o}51´40´´$ to $26^{o}53´35´´$ North latitudes and $88^{o}15´25´´$ to $88^{o}17´45´´$ East longitudes along the left valley side slope of Balason River and adjoining spur of the Senchal –Mahaldiram range. It is one of the oldest urban centres and was originated way back in 1835 when the British Government of India took this town on lease from Sikkim kingship. Kurseong Municipality came as a separate administrative unit in 1878. It began to develop as a resort town and became centre of attraction after the construction of Siliguri – Darjeeling Road (1880) and laying of narrow-gauge railway line.Along with extension of transport facilities and its connectivity with the plains, economic potentiality began to

sprawl and multifaceted commercial activities like tea gardening, trade and tourism began to flourish which lured a mass of population towards it. Migrants from the neighbouring districts, states and countries converged upon this hilly urban centre causing population to grow. According to the Census of India, Kurseong town had a population of 40,019 in 2001 but in only six years, the number increased to 61,416. This dramatic change in population has great impact on natural environment. The study area is surrounded by steep slopes of mountain spurs and therefore, aerial expansion of the urban centre has been restricted which results in very high concentration of population within limited space. This has created undesirable impacts on offered environment. Construction of high rise buildings along highly vulnerable mountain slopes has led to the problem of slope instability while indiscriminate forest felling adds fuel in offsetting the harmony among environmental systems. Being located in a mountain setting, the nature of problems in Kurseong is different from the general problems of an urban area on plains.

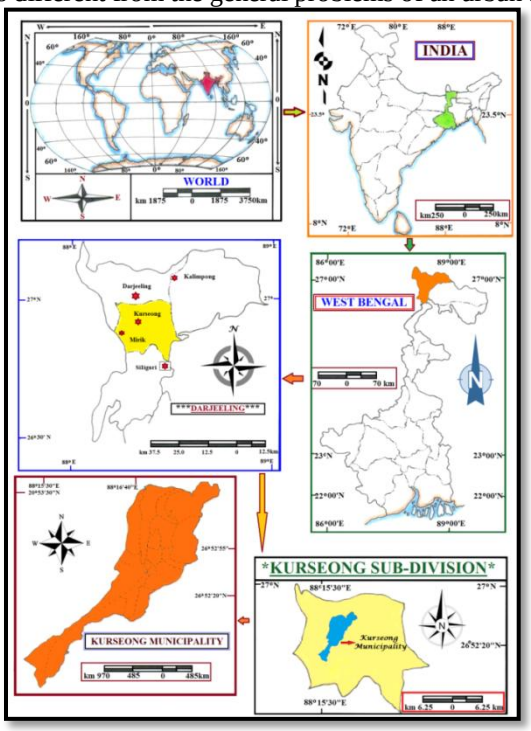

Figure-1:-Location Map of the Study Area

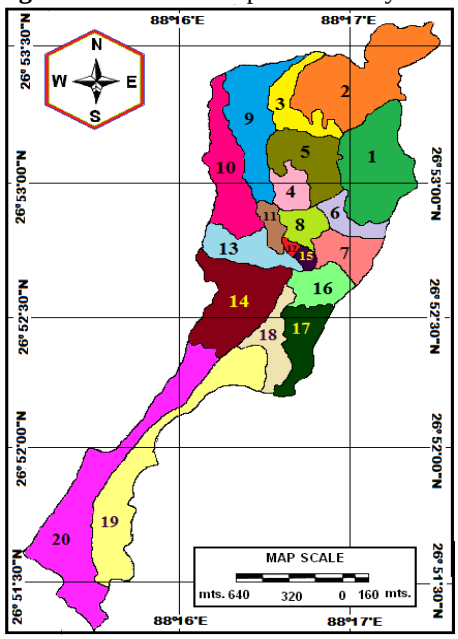

Figure-2:- Administrative Map of the Study Area

Methodology

This study of interest is based on intensive field survey, extensive literature reviews, and broad quantitative analysis following deductive methodology of investigation. Primary data have been collected through field survey (instrumental survey, road survey, conversations, interview and door to door survey). Secondary data have been collected from different books, journals, published and unpublished reports of official sources from government and non-government sides. Remote sensing data have also been used to support and justify the field observations. SOI topographic sheet (78B/9) and satellite imageries are used to analyze the land use pattern of the study area. Finally, GIS techniques have been used for preparing diagrams and maps.

Basic Objectives:-

- To enlighten the comprehensive Physical and Anthropogenic set up of the study area;
- To analyze the increasing intensity of illegal uses of land on this urban landscape;
- To show the nature, degree and types of land transformation and their bearing on the fragile natural systems
- To provide the Green View Proposals for Eco-technological Development of this Hilly Urban Dreamland.

Scenario of Physical Landscape:-

Kurseong is the excellent human signature on the great natural beauty of Darjeeling-Sikkim Himalayan Sector. Beautiful reflectance of man-nature relationship shows the well-existence of this hill city. 'The Land of White Orchids' depending on its physical set up e. g., spur like relief, higher sloppy exhibition with huge number of natural streams/jhoras, green proud of natural forest cover, etc. shows a particular socio-economic framework like tourism, tea plantation and timbering. So, in case of Kurseong municipal flourishment, the physical introduction is very significant to direct and drive the overall development.

☛Climate

Of the four Sub-Divisions of Darjeeling District it is said that Kurseong records the maximum rainfall touching almost 500 cm. annually. Maximum temperature in the summer raises up to 25° C and the lowest temperature in the winter comes down to 5° C to 10° C. However, the climate throughout the year is more congenial than that of Darjeeling, Kalimpong and Siliguri Sub-Divisions. It has a very moderate climate.

☛Relief and Slope Modification

The topography of the study area exhibits a high relative relief of (more than 500 m.) and with steep slope ranging between 150 and 450(fig.-7). Number of cross sections has been drawn on the basis of dumpy level survey with GPS to assess the spatial association of geomorphic units and their relation to landslide sites. The Southern part of the urban area (Ward Nos. 19 & 20) is elongated towards south west along the old Pankha Bari Road. The section is situated over a gradually descending spur that has separated the upper catchment of Rohini from the Balasan basin. The NH 55 along with the heritage narrow gauge railway line approximately follows the 1450 m contour. The regional morphometric setup of this part of Darjeeling Himalayas involves ridge that runs in a north south fashion and flanked in both sides by number of first order basins, each of which is separated from the adjoining basin by a spur that radiates from the aforesaid ridge. All these small rivers like Babu Khola, Paglajhora etc have contributed to the formation of major rivers.

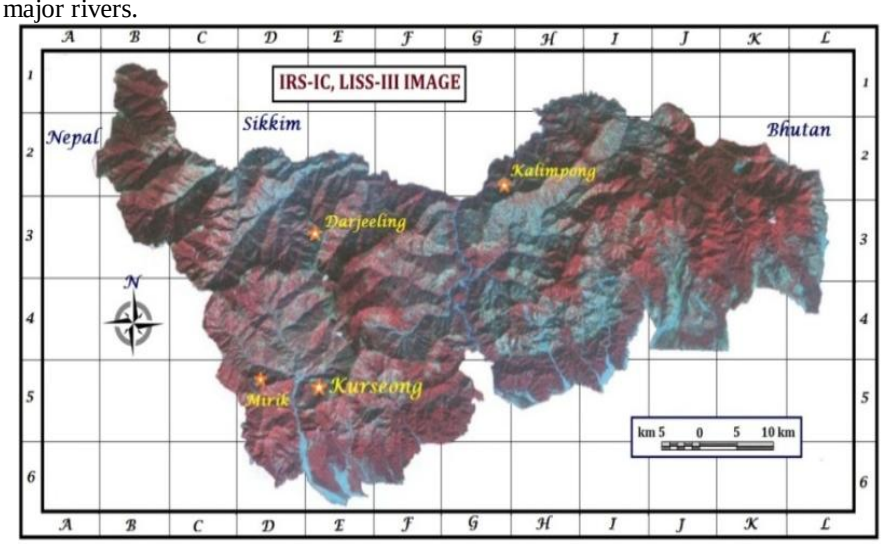

Figure-3:-Location of Kurseong on Darjeeling Himalaya (IRS-IC, LISS-III Image)

☛Changing Vegetation cover due to Civilized Intervention

Kurseong is richly endowed with natural vegetation, the floristic composition of which varies perceptibly with altitude. The upper portion of the hill town has a distinct forest cover of temperate nature. The important species found are Alder, Cryptomenia, Walnut and Poplar. The northern part (Ward no. 1 & 2) is dominated by this kind of vegetation. Other than trees different kinds of herbs, shrubs and Orchids also characterize the natural vegetation of this part. Along with natural vegetation, tea gardens also represent a considerable part of green cover. The Forest Department's data it reveal that there has been a dramatic reduction in vegetal cover during the last few decades. Plantation of tea gardens also results fragmentation of vegetation cover. Urban sprawling in the forms of expansion of- township, residential complexes, tourist complexes, commercial centres, industrial establishments, hotels, restaurants and recreational centers is responsible for such kind of\ de-vegetation in Kurseong (fig.-9). In 1901, about 51.54% of the total land of Darjeeling district was covered by forest. In 1921, it reduced to 49.14%, in 1931 to 45.46%, in 1941 to 45.08% and in 1981 the figure decreased to 38.26%.

Its importance as a growth centre flourished when it was connected toDarjeeling and Siliguri by regular transport in 1864 and 1869 respectively, along the older Military Road and newly constructed Hill Cart Road (Tenzing Norgey Road, NH55). Tenzing Norgey Road connects the hill area to the plains of Bengal via Tindharia, Kurseong, Sonada and Ghoom. The population of this hill town increased due to immigration from neighbouring areas. Britishers also set up many educational institutes of national and international repute which also contributes to attract population. Furthermore, the enchanting beauties of the natural landscape of Kurseong (meaning 'the land of white orchid') have attracted tourists. The places of tourist interest within and around Kurseong town are Bordung Busty, Giddhar Pahar, Rohini, Sittong, Latpacnchar, Dowhill, Durpin Dara, deer park etc. The town has a good market of retailing foreign consumer goods, imported from Nepal, China, Japan, Korea, Hong Kong and other South East Asian countries. All the above factors have long been instrumental for the growth of population in Kurseong town. Urban development has caused population pressure to increase over limited space which in turn has given rise to a number of urban problems like congestion in dwelling places and traffic routes, irrational construction on steep slopes, slope failure, deforestation, shortage of drinking water, unmanaged disposal of waste etc. Exceedingly high growth is observed in the market areas where percentages of Bengali and Nepali population are rapidly rising. Due to shortage of land for construction on hilly ridges, new buildings and roads are being constructed undermining the slopes which are susceptible to landslides.

Major Features of Civilized Intervention and Unplanned Urbanization

☛ Expansion & Intensification of settled area

Kurseong town has a long history of urban growth since 1835. The valley side slopes in and around the town have long been chosen for tea plantation and tea processing which formed the economic bases of this town. From the field data analysis it has been found that the settlements are more concentrated towards the central the market area of Kurseong town (Ward nos. Intensification of settlement Employment opportunity in the urban centre attracts the rural people. Excess population needs land for wards:- 5 1, 2, 9,10,17,18 & 19).Spatial variability in availability of transport facilities and other urban amenities has caused uneven distribution of settlement over the urban space (fig-4). The density of settlement in the central part is 1050 per Sq km. Immigrants in Kurseong has created excessive pressure on land and burgeoning population prefer lands in the fringe areas or in the congested areas which results in expansion of settlement in vulnerable zones. Employment opportunity in the urban centre attracts the rural people. Excess population needs land for settlement causing intensification of settlement in the core areas. Buildings have been constructed without plans violating rules and regulations in many cases. From the settlement density map, it is evident that higher concentration of settlement is found in Ward nos. 1, 2,9,10,17,18,19 and 20, where density is 200 dwelling units per km2. As the distance increases from the heart of the town, density of settlement becomes thinner. Accessibility is a major problem in any mountainous terrain and the poor are unable to afford personal means of transport. Therefore, they concentrate in and around the centre which is one of the major causes of housing congestion in the urban core.

☛Construction of multistoried buildings

House types and pattern of their distribution indicate the economic condition and reflect the social status of the owner. Kurseong town presents an interesting scenario in this regard. From the household survey it is found that most of the housing units are either pucca or semi – pucca. Only 1% of the houses are kuccha (Fig. 5). Owing to scarcity of space, multistoried buildings of concrete structure have been constructed to house a large population within the town. But it may be pointed out that Kurseong is a hill town and concrete construction is environmentally not preferable. Besides this, unscientific utilization of space has also yielded hazardous Results.

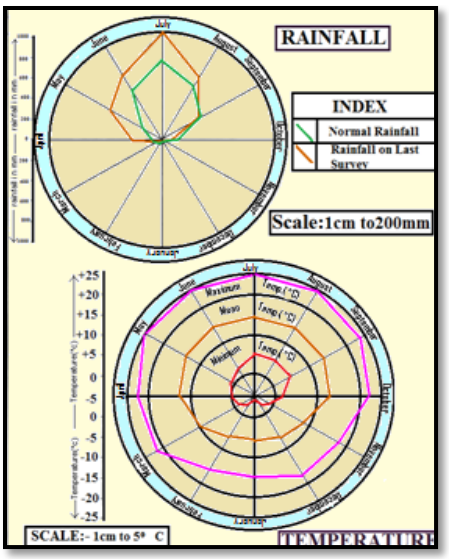

Figure-4:-Climatic Feature

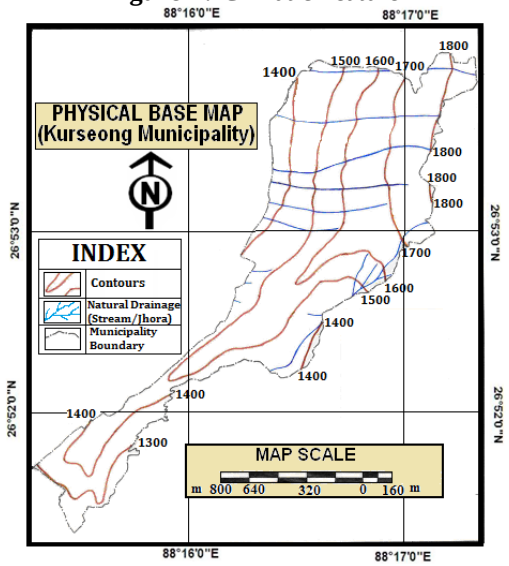

Figure-5:-Physical Base Map

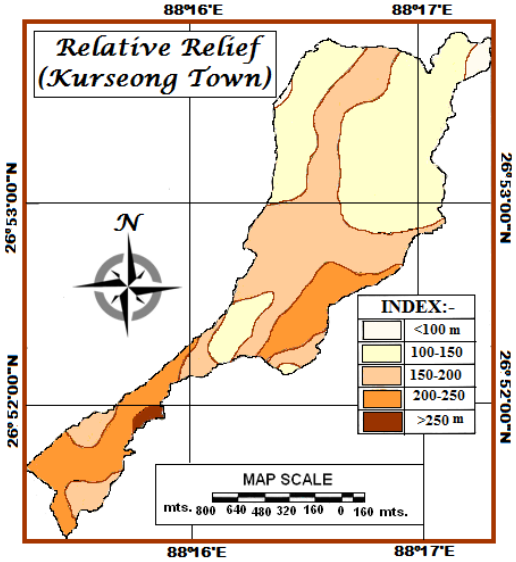

Figure-6:-Relative Relief Map

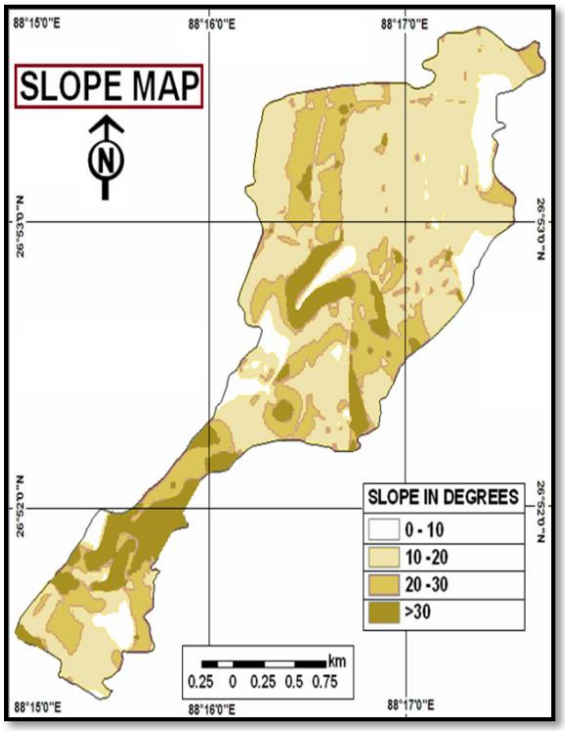

Figure-7:-Slope Map

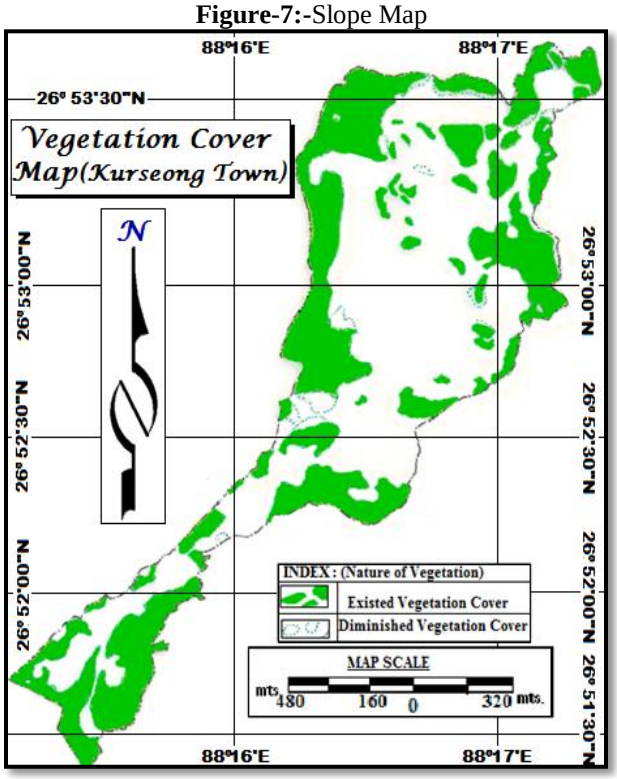

Figure-8:- Vegetation Cover Map

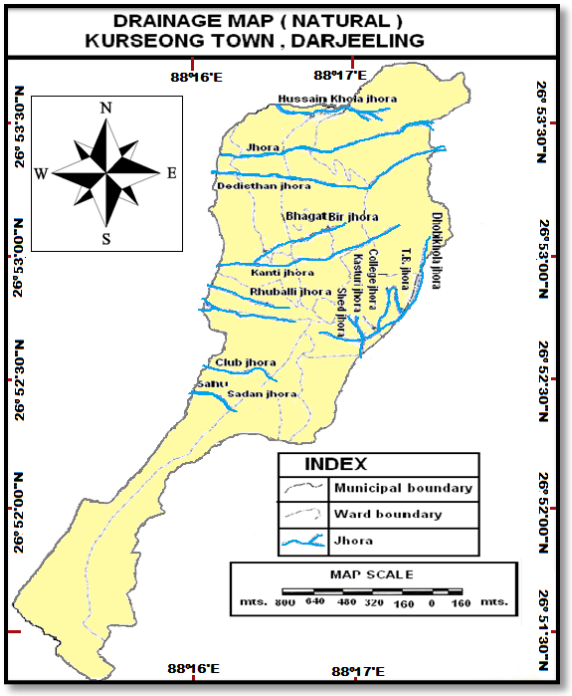

Figure-9:- Drainage Network (Natural)

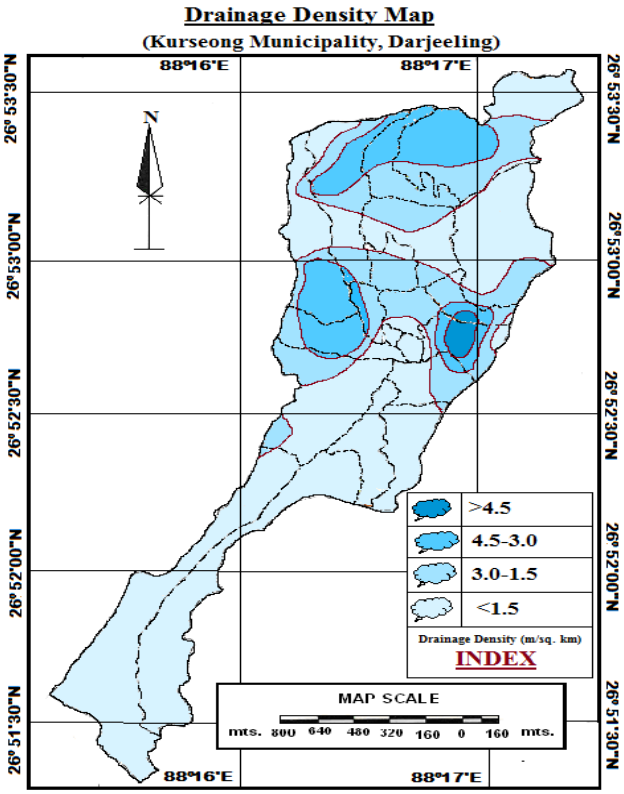

Figure-10:-Natural Drainage of Kurseong Town

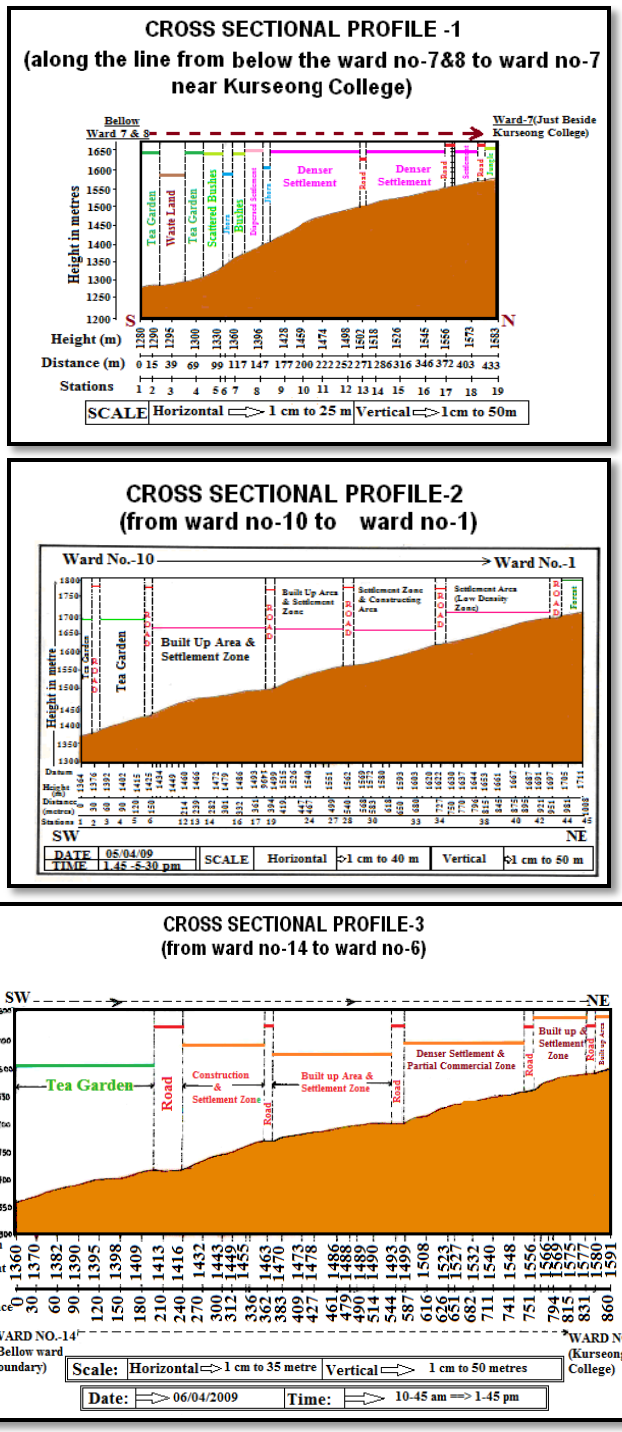

Figure-11, 12 & 13:-Land use Patterns along with topographical profile

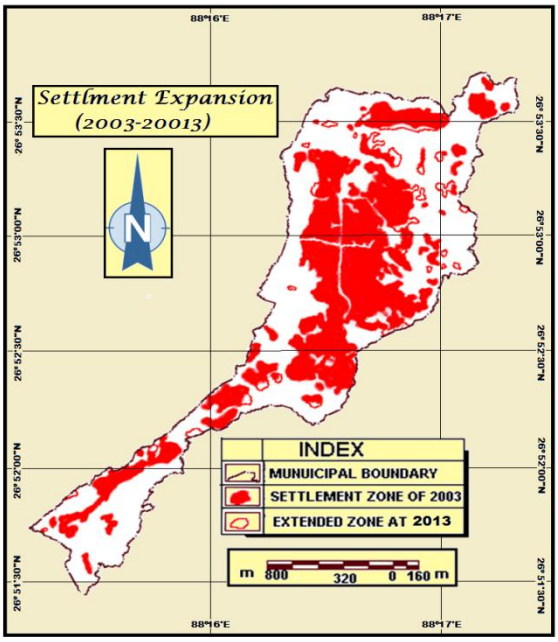

Figure-14: - Settlement Expansion Map

Table-1:-Land use Categories

Land use category	Percentage of Developed Area		
	Small	Medium	Large
Residential	50-55	48-52	45-50
Commercial	2-3	2-3	4-5
Industrial	3-4	4-5	5-7
Public & Semi-public	8-10	8-10	12-15
Recreational	15-18	15-18	16-20
Transport & Communication	5-6	5-6	6-8
Ecological	8-10	8-10	8-10

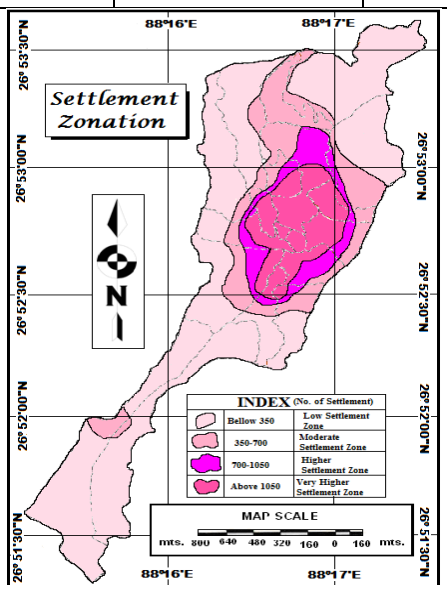

Figure-15:-Settlement Map

Man-made drains

Man made drains and sewerages are very important urban features. Density of manmade drains (Fig. - 6) is highest along the central tracts. In Ward nos. 6,7,11,12 13 and 15 the density is more than 9km/ km2 where as lower density is found in Ward nos. 1,2, 3, 4,8, 14, 17,19 and20. Very low density is observed in the parts of Ward nos. 1,2,10, 19 and 20. From the field observation it can be said that marginal parts of the fringe wards are having least drainage density.

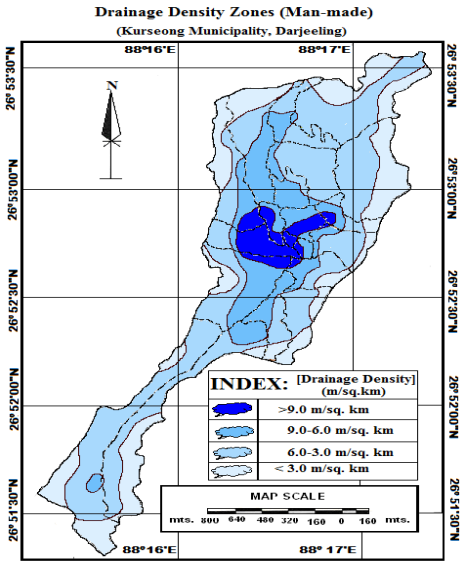

Figure-16:-Man-made Drainage System

☛Waste disposal

A major problem faced by the people of Kurseong town is disposal of wastes. There is no proper disposal site with advanced management technology in the municipal area. Volume of waste generated daily is 6 MT. and these wastes are directly thrown to the jhoras without grading and treatment. These are mainly responsible for blockage of Jhora. The road side dustbins are not adequate to hold domestic and municipal garbage. Very limited number of dustbins in the marginal wards is also a problem. Along with solid waste problem, sewerage system is also poor in the study area.

☛Liquid Waste Management

A partial Sewerage System has been developed for Kurseong town in 1918 for servicing 10 public community latrines and a few houses in Bazar area more than 736 Nos. of low cost sanitary latrines were constructed to eliminate the removal of night soil by head load an old and obnoxious practice. A central septic tank has been constructed in Ward No.-14 with the technical assistance of Municipal Engineering Directorate at a cost of Rs. 12 crores. The Central Septic Tank has been commissioned at present but only a few wards of Kurseong town has covered this central septic tank besides that the night soil from almost all the houses are going into the open Jhoras which is causing health hazards.

☛Solid Waste Management

The main problem that has been faced by the people of Kurseong is the disposal of solid wastes. MPL does not have proper disposal site with latest technology. The daily volume of solid wastes is about 6 M.T. but these wastages is directly disposed of into Jhoras (Big Nullaha) without any grading & treatment causing blockage of Jhoras during rainy season and damaging the tea bushes & houses of B.P.L. families due to heavy flow of water in the Jhora. At present the Municipality have about 65 nos. of Conservancy Staff who look after both the liquid waste system & manage to dispose of the solid waste and only two nos. of Tractors to lift these garbage by head load which is not feasible to manage to keep the town clean due to difficult topography of Kurseong.

☛Landslide

Landslide is one of the most important problems of Kurseong having higher probability to appear in more destructive way in future. But the local authority has not yet seriously addressed the issue in any of their planning programmes. Indiscriminate replacement of forest cover by dwelling units or natural drainage and other environmental systems along the steep mountain slopes of Kurseong urban area has aggravated the problem to the hazardous extent. There are at least 20 landslide sites within this municipal area (Fig. 7). The incidences of

landslide mostly occur during monsoon. Observation and enquiries in regard to the landslide events reveal the following important points. Landslide phenomena are particularly associated with high energy mountainous environment having moderate to high relief and subject to period of high rainfall. Complex sets of physical factors are responsible for slope instability e.g. geology (rock type, structure, joint and crack etc.); hydrology (surface runoff, through flow, drainage network etc.); geomorphology (nature of terrain, landform character and association, degree and aspect of slope, intensity of weathering and types of other geomorphological processes involved etc.); climate (intensity and amount of precipitation, temperature etc.) and above all the characteristics of surface materials (texture, porosity, moisture transfer and holding capacity, shear strength etc.).The natural processes of slope failure have largely been magnified by strong anthropogenic modifications of landscape through agriculture, settlement, pasturing, mining, water resource capturing, road construction etc.

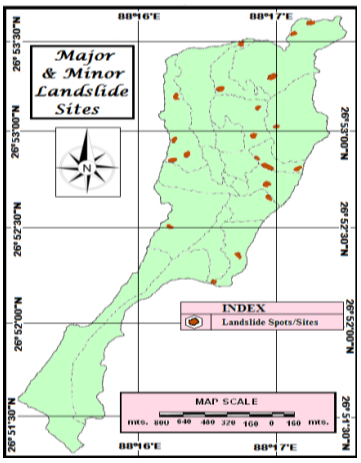

Figure-17:-Major Landslides sites/spots

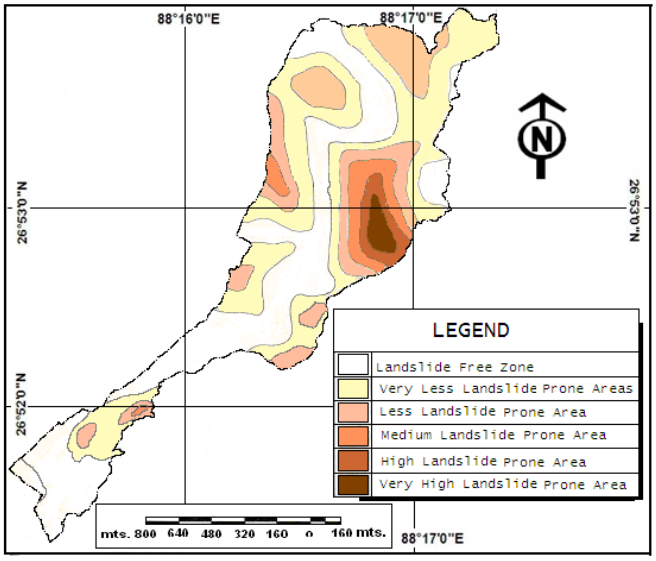

Figure-18:-Landslide prone area

Table-3:-Landslides Measurable Criteria

FACTORS	LANDSLIDE SUCCEPTIBILITY VALUES (LSV)	SUB-CATEGORY	RATING
Slope	**30**	**>40°**	**10**
		30°-40°	**8**
		20°-30°	**6**
		10°-20°	**4**
		0°-10°	**2**

Lithology	**25**	**Quartzite-Phyllite**	**10**
		Schist/Slate	**7**
		Quartzite	**1**
		Granitic Gneiss	**2**
		Sandstone	**5**
Land use	**15**	**Agricultural Land**	**6**
		Forest Cover	**3**
		Barren Land	**2**
		Settlement (Built up Area)	**4**

Relative Relief	**10**	**<10 m**	**0.5**
		100-200 m	**1.5**
		200-300 m	**2.0**
		300-400 m	**2.5**
		>400 m	**3.5**
Drainage Density	**15**	**<2**	**1**
		2-4	**2**
		4-6	**3**
		6-8	**4**
		>8	**5**
Landform	**05**	**Ridge**	**0.25**
		Spur	**3.00**
		Valley	**0.75**
		Terrace	**1.00**
TOTAL	**100**		

Landslide Susceptibility Index (LSI)

=[(% of Landslides/sq. km) x LSV] ÷100

☞Drinking water scarcity

Insufficiency of drinking water is a serious trouble in Kurseong town that culminates in a crisis during the dry months. The situation becomes so worse that people of some localities are compelled even to purchase water. Impervious nature of the country rocks and very high degree of slope are the two important factors that pose restriction to recharging processes. The terrain being composed of gneiss and other equivalent metamorphites of various mineralogical compositions does not allow rainwater percolation to greater depth. As such, surface run off constitutes the major output component of the local hydrology. This portion of the basin thus experiences negative water budget temporarily during lean season. The higher degree of slope is also responsible for ready drainage of rainwater as surface run-off leaving very short period of time for recharging, and whatever amount of water is recharged, a major share of it is drained quickly as through flow. Furthermore, indiscriminate forest felling, concretization of slope surfaces etc. play additive roles to hinder recharging processes. Increase in the use of water for various commercial activities is another major factor leading to water scarcity in the town. Survey reveals that the problem of water scarcity is not equally suffered in all the municipal wards (Fig. 8). In many cases, natural scarcity has been supplemented by municipal water supply that has lessened the degree of suffering. But in general the areas of steeper slope, lower drainage density, and higher concentration of population, the scarcity of water is much higher.

Table-4:- Total trees removal and Forest Encroachment

Sub-divisional	Total Tree Removal(area in	Forest Encroachment(area in hectares)

Headquarter	hectares)			
Kurseong	2002-2003	494.95	2002	85.69
	2003-2004	1180.65		
	2004-2005	535.50		
Source: D.F.O Darjeeling (Working Plan – 105)				

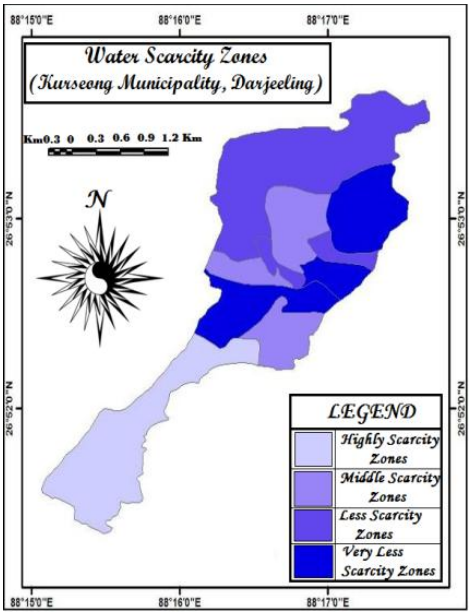

Figure-19:-Water Scarcity Zones

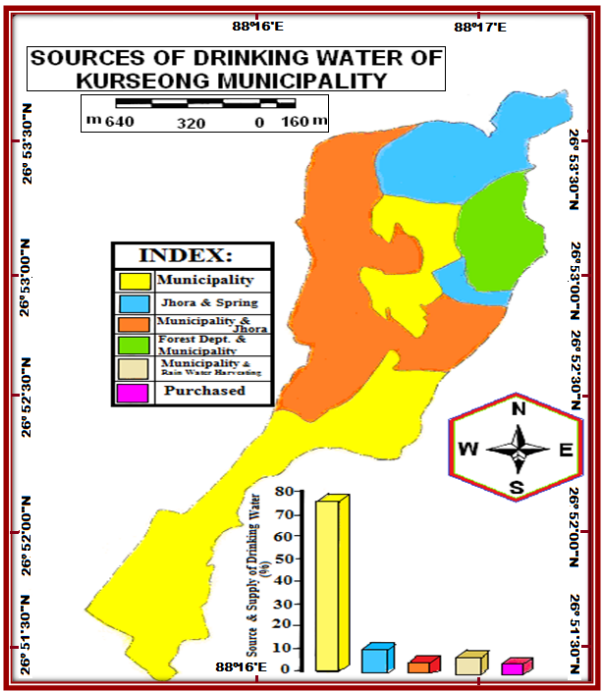

Figure-20:-Sources of Water Supply

Table-5:- Estimation of water resources of Kurseong town (2010-2011)

Months	Rainfall(mm)	Temperature(°C)	Evaporation Loss(mm)	Evaporation Loss as % of rainfall	Run-off(mm)	Run-off as % of rainfall
January	**5.2**	**7.9**	**1.3**	**25.00**	**3.9**	**75.00**
February	**9.0**	**10.95**	**2.0**	**22.22**	**7.0**	**77.77**
March	**17.8**	**12.85**	**3.0**	**16.85**	**14.8**	**83.15**
April	**49.1**	**14.8**	**3.2**	**6.52**	**45.9**	**93.48**
May	**15.6**	**16.65**	**2.7**	**17.31**	**12.9**	**82.69**
June	**1021.2**	**18.65**	**4.4**	**0.43**	**1016.8**	**99.57**
July	**1208.2**	**20.30**	**5.5**	**0.46**	**12202.7**	**99.54**
August	**1280.5**	**19.35**	**4.8**	**0.37**	**1275.7**	**99.63**
September	**536.8**	**18.25**	**2.2**	**0.41**	**534.6**	**99.59**
October	**74.3**	**16.85**	**2.8**	**3.77**	**71.5**	**96.23**
November	**0.0**	**14.50**	**1.5**	**-**	**-1.5**	**-**
December	**0.0**	**11.90**	**2.0**	**-**	**-2.0**	**-**
	$\sum$ **4217.7**	$\sum$ **15.25**	$\sum$ **35.4**	$\sum$ **0.84**	$\sum$ **4182.3**	$\sum$ **99.16**
Source: Darjeeling Tea Research Centre(2010-'11)						

☛Traffic Congestion

Unplanned growth of Kurseong Township in a situation of acute land scarcity, has led to the problem of traffic congestion along most of the major motorable roads. Rapid increase in the number of vehicles, plying between Siliguri and Darjeeling, and expansion of commercial activities in Kurseong and consequent extension of transport both in terms of connectivity and frequency, are responsible for large-scale congestion within Kurseong town(Fig. 10). The major arterial roads have been constructed parallel to the contours across the cliff slope. As such, there is little or no opportunity to expand the roads in their width. Moreover, the buildings and dwelling units have been constructed closely to the roads without leaving any space for road expansion. It has been tried to manage the congestion problem by construction of parallel roads which are still far behind the requirement. The down flow of vehicles towards Siliguri from Darjeeling are diverted along Pankhabari Road to release pressure on NH-55 along which only upward flow to Darjeeling is allowed. Though, this has significantly reduced congestion along NH-55 within the market area, but in other major roads like Dowhill Road, portion of the Hill Cart Road away from the Kurseong Railway Station (towards Siliguri) etc. are still facing serious traffic congestion problem. Siliguri bound vehicle flows from different directions and converge at the central transport node near Railway station and create congestion. It has been found from the flow count survey along the major roads of the town that number of Darjeeling bound vehicles along Hill Cart Road remains considerably high all the day after 9 AM and create congestion. Sometimes the flow comes to a halt during the peak hours. Dowhill Road is another channel of flow that remains busy throughout the day and congestion problems are faced in every now and then. From survey and post field data analyses it has been found that the areas under Ward Nos..-5,6,7,11 are more facilitated by good transport while in Ward Nos.- 1,2,10,19 and 20 road density is moderate and less density is found in Ward nos.-4,8,15,16,17 and 18.So this may be said that more transport facility as well as road density found in the market centre of town while the marginal wards are suffering from lack of transport facility.

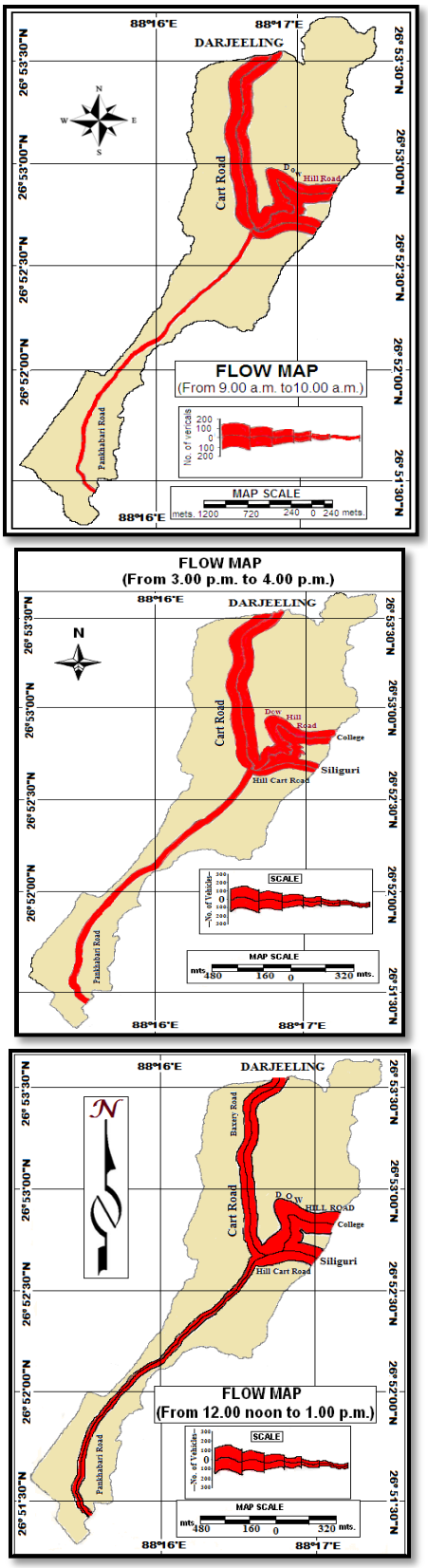

Figure-21,22 & 23:-Traffic Flow at different duration

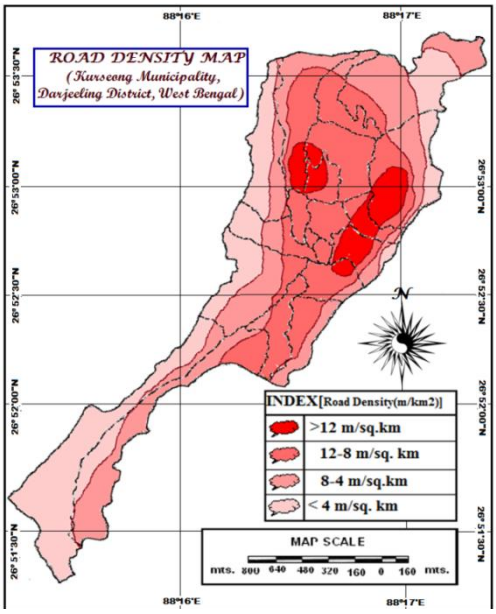

Figure-24:-Road Density Map

☛Population Congestion

Kurseong town has a population of 40,019 according to the census of 2001. Out of this, 20,410 are male and 19,609 are female. There is highest number of population in Ward No-4 (4,043) when the lowest is in Ward No-11 (1,018). More than 2000 population is found in Ward Nos.-2, 4, 5, 7, 8, 9, 13, 14 and 17. Moderate range of population (1500-2000) is present in Ward Nos. - 1, 10 16, 18, 19 and 20. Relatively lower population (1000-1500) exists in Ward Nos.-3, 6, 11, 12 and 15. According to 2001 census, total population of Kurseong town was 40,019 but within only 6 years the number of population reached to 61,416 .

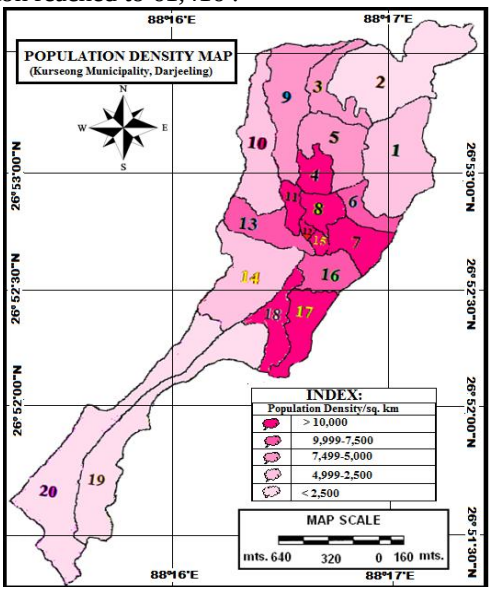

Figure-25:-Population Density Map

Table-6:-Demographic Growth & Population Projection

WARD NO	2001	2006	2011	2016	2021	2025
1	1756	1962	2191	2448	2735	2988
2	2235	2497	2789	3116	3481	3803

3	1236	1381	1543	1723	1925	2103
4	4043	4517	5046	5637	6297	6880
5	2059	2300	2570	2871	3207	3504
6	1328	1484	1657	1851	2068	2260
7	2917	3259	3640	4067	4543	4964
8	2112	2359	2636	2944	3289	3594
9	2698	3014	3367	3761	4202	4591
10	1996	2230	2491	2783	3109	3397
11	1018	1137	1270	1419	1585	1732
12	1226	1370	1530	1709	1909	2086
13	2244	2507	2800	3128	3495	3819
14	2323	2595	2899	3239	3618	3953
15	1136	1269	1418	1584	1769	1933
16	1580	1765	1972	2203	2461	2689
17	2753	3075	3436	3838	4288	4685
18	1988	2221	2481	2772	3096	3383
19	1610	1799	2009	2245	2508	2740
20	1761	1967	2198	2455	2743	2997
Total	40019	44706	49943	55792	62327	68103

Source:-

☛**Building Congestion**

Frequency of houses and buildings used for other purposes (shops, hotels, service centres etc.) have been studies all across the municipal wards using grid method. Maps have been prepared on the basis of data thus colleted. Concentration of houses / buildings has attained maximum value around the market and circular zones (elongated along NH-55) of diminishing house frequency surround that central high-density core. It is interesting to note further that, though the market hub having an area of only 0.75 km2 approximately, has house / building density as high as 1800 units per km2 while the density diminishes dramatically away from NH-55 on its both sides. In the peripheral areas of the municipality house frequency has reduced to values between 100 and 200 units / km2. Accessibility to the market and availability of regular transport facility can be considered as the factors that have played dominant role in choosing dwelling sites. Physically this area is more vulnerable to slope failure. Unregulated and irrational constructions in this area provide impetus to landslide phenomena. Number and frequency of landslide events have gone up during the last few years.

☛**Health Hazards**

Increasing trend of diseases like T.B., Hepatitis, Diarrhoea, liver diseases, heart diseases, Cirrhosis of liver, Anemia, stomach disease etc. has worsened the health scenario of Kurseong town. Inadequate treatment facility, non availability of modern instruments technology and lack of adequate expert medical officers etc are the principal hindrances in extending health services.

☛Feature of AIDS

AIDS has become an alarming threat to the inhabitants of Kurseong town where the incidence of AIDS is increasing at high rate. The disease is mostly prevalent among the transport workers. 83% of AIDS patients are drivers, 9% are helpers (Khalasi) and 2-3% are the students. The youths of 20-45 years age group are the poor victims of this disease. Lack of hospitals, lower number of doctors per head, insufficient hospital beds, lack of medicines, private clinic, nursing home, health centers and specialist doctors, lack of awareness about HIV & AIDS- all these problems are instrumental in recent spread of HIV and AIDS. Following table (Table-2) depicts the prevalence of other communicable and non-communicable diseases in the area.

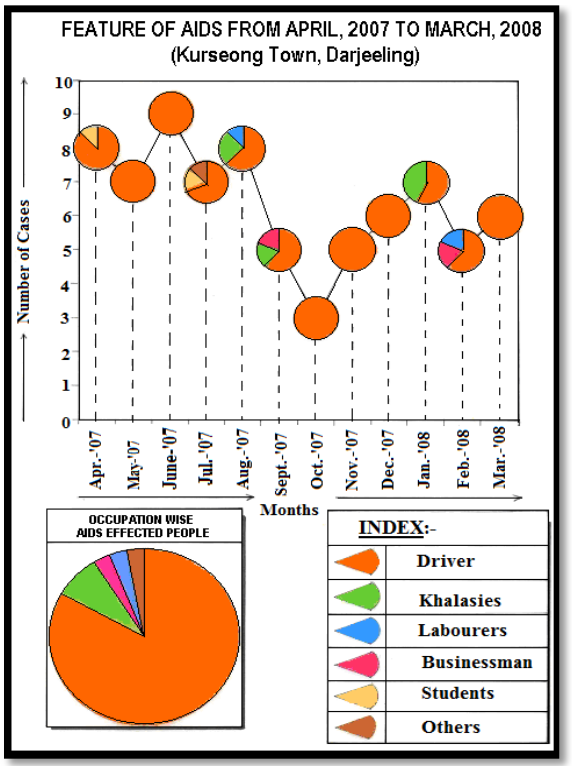

Figure-26:-Feature of Aids

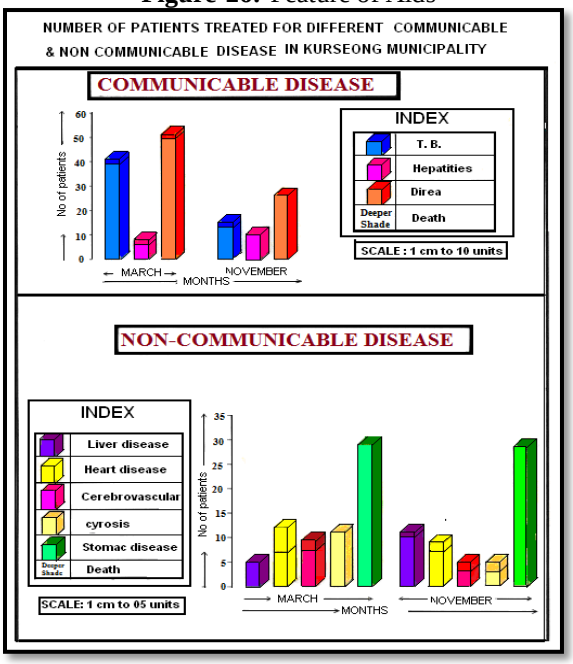

Figure-27:-Major Existed Diseases

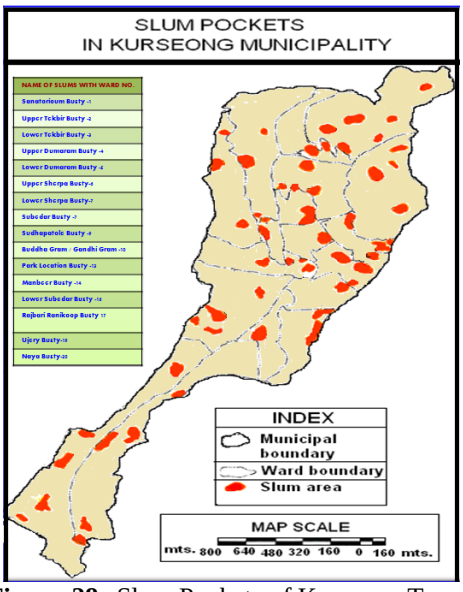

Figure-28:-Slum Pockets of Kurseong Town

Table-8:-Water Supply and Shortage Feature

A	**Total storage facility during the summer months**	**3,05,000 Gal./Per Day**
	Less 5% due to water (loss)	**(-) 15,250 Gal. /Per Day**
	Net available	**2,89,750 Gal./Per Day**
B	**Present Population of Kurseong Town**	**40,172 Nos**
	Add Floating Population Per Day	**(+) 2,000 Nos.**
	Total	**42,172 Nos.**
C	**Average Water supply per day**	**2,89,750 Gal.**
	Population served	**42,000**
	For one unit of population	**6.90 Gallons per day per head**
D	**Present demand per day**	**8,40,000 Gallons (42,000 population @20Gal./per head/ per day)**
E	**Actual supply available Per day during the dry Season.**	**2,89,750 Gallons**
F	**Shortfall during dry Period**	**5,50,250 Gallons**

☞Discussion

The present study assesses the urban sprawling of Kurseong town and its consequences in terms of physical and socio-economic stresses on the urban setting. Boost in population beyond the sustainable limit is the most important alarm that has exposed the urban dwellers to all kinds of vulnerabilities forced. Limited extent for the local economy to burgeon and constraint imposed by unavailability of space to accommodate increasing population are the roots of every hazard knowledgeable in this age-old town. In spite of sufferings of the people from all such problems, no significant long term management strategy has been taken up by the administrative authorities. This has provoked the problems to the serious extent.

☞Following are the major findings of this research –

☞ Population of the town is growing at very high rate, which has apparently attained an alarming level. Population of Kurseong increased from only about 10,000 in 1901 to about 30,000 in 1991. But during the next 7 years Total

population of the urban centre has doubled. In 2007, total population reached 62,000. In spite of fabulous increase in population, the territorial domain of the urban area could not expand as it is surrounded by steep slopes of mountain ridges and spurs leaving the urban area with only possibility to sprawl in the form of narrow strip along the main road. This has led the population density to increase. Currently population density has attained a value as high as 10,000 person /km2 in many of the municipal wards. Increasing population within a limited space has compelled the economically marginalized people to be pushed in environmentally marginalized areas. Thus the ecologically fragile areas have been irrationally occupied that has triggered many environmental hazards, like- landslide, flash flood, scarcity of water etc. Illogically calculated constructions have been built up on unreasonably chosen defenseless sites. Steeper mountain slopes have been haphazardly de-vegetated for constructional purposes; natural drainage lines have been either blocked or abstracted without bearing in mind the local slope; construction of road obliterating local hydro-geological setting etc. have been instrumental in causing physical hazards. As such, the numbers of landslide sties have gone up. Most of them are occurring within the zone of high landslide vulnerability. At this time certain areas within the municipal area have become highly in danger to landslide.

☞ The economy of the town is not competent to absorb its total population. Closure of many tea gardens has posed serious threats to the economic potentiality of the area. More than 45% of the households fail to earn only Rs. 6000/- per month. More than 10% of the total populations are living a miserable life in the slums.

☞ Urban dwellers in Kurseong are maintaining a poor health status. They have been found to suffer from Tuberculosis, hepatitis, Cirrhosis of Liver etc. Number of HIV positive patients (currently 76) exhibits a rising trend.

☞ Tremendous pressure of vehicles on the main and arterial roads within the town and consequent congestion is another problem faced by the local inhabitants.

☞ Population pressure within the municipal area has gone up to such an extent that it has become very difficult for the municipal authority to provide basic services to the urban dwellers. Inefficient drainage and sewerage system, solid waste collection and disposal insufficient supply of drinking water etc. have crippled the urban life.

☞ Strategies to manage landslide problem, fulfill the demand for water, mange the solid waste are to be formulated immediately and to be implemented without further delay.

☞Conclusion

After an in detailed analysis of physical and anthropogenic landscape of Kurseong town, it is understandable that this urban landscape is highly unbalanced and susceptible with time. Management and supervision of urban problem are a technique in which urban potentiality is well preserved and functionalized as well as the urban infrastructure and all of the services will be definite in a encouraging and helpful way along with the diminution and alleviation of urban problems and issues. Some significant strategies may be taken up for the green growth of sustainable Kurseong town.

- The Micro-level Integrated Resources planning and conservation oriented planning of the resources;
- The environmentally sustainable farming techniques
- Integrated Man-Biosphere Programme implementation
- Active involvement of the local people in the urban management process
- Joint forest and Watershed Management;
- Sustainable eco-tourism Industry;
- Large-scale ‘orchid’ culture and floriculture may be developed on a cooperative basis;
- Animal husbandry should largely be extended;
- Extension of mushroom culture and development of mushroom industry;
- The environmental impact assessment has to be done before development planning;
- Transformation of marginal and undeveloped habitats through educational improvement, health care, transport improvement, credit and marketing etc.(Das, Chaterjee and Roy)

☞Future Scope of the Study:-

There are some specific limitations, which should be addressed as a means of improvement for further study. This study has equipped based on intensive literary survey, raw satellite data and field ground truth information used for image processing. Planning is never whole without local people’s opinions incorporated. The study can be considered as the guideline or instruction for ecotourism planning based on mountainous environment including the geology, geomorphology, hydrology and also ecology of this Darjeeling-Sikkim Himalayan Sector. Yet, this research will expose opportunities for further research and investigation, and help decision makers to review what options exist for improving and humanizing Mountainous Urban Environment and Landscape with its tourism facilities over North Hilly Tourism Circuit in West Bengal and how they can better ecotourism planning and green urban developmental planning especially, from a point of reducing the negative impacts from comprehensive development in this region.

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