Introduction

Scope of Study:

Our growing human family with its impact on the environment has become an issue of global importance. Nowadays sustainable development, pollution and ecological disasters are uttered in the same breath whereas the root cause of suffering of the entire humanity remains unattended. Of late, environmental pollution is defined as unfavourable change to our surroundings by human activity bringing adverse effect on the biosphere. Anthropogenic assault has gone to such a level that it is influencing the terrestrial processes, atmospheric behaviour and radiation changes. Excessive use of natural resources through development and industrial progress are failing to keep a balance between the interactive forces that exist on the earth. The term “balance” is not equality but an optimal, beneficial and appreciable proportionality between the components.

“Urbanisation and environmental degradation” had been chosen at this juncture to highlight the areas of infringement where symbiotic relation between “man and environment” has been endangered by human activities arising out of excessive desire for uncontrolled exploitation of natural resources. As a case study, the hilly terrains of Darjiling Police Station area have been chosen where urbanisation process has caused serious changes in landscape, air and water quality and health. Urbanisation here accentuated natural calamities like soil erosion, landslide and loss of bio-diversity. Inappropriate disposal and reclamation has become highly detrimental with severe far-reaching effects. Thus urbanisation is a major issue of the day and the question of survival of habitations in the region needs immediate attention. Since the time of British occupation around the early nineteenth century, the physico-cultural set up of this premier hill settlement has been getting seriously disturbed. Extensive deforestation as a result of tea plantation and settlement has led to unplanned constructional work, inadequate drainage and unscientific usage of land. Moreover the rapid growth of population since Independence has been responsible for more and more
environmental changes. In the present case it is a unique manifestation where urbanisation has brought alarming changes in demography and created enormous problems in basic amenities for living namely lack of potable water, sanitation, waste disposal and housing, over and above damaging the natural beauty and landscape of the region. Thus the pressure exerted on the environment is immense and ecological imbalance is inevitable.

In view of the above dismal environmental setting and rapid decadence of once prosperous tea industry, Darjiling town once famous for scenic beauty and surrounding is gradually losing its charm as a tourist centre. The present study seeks to explore remedial measures to arrest the decay and restore its pristine glory.

Historical Review:

The history of the district presents a late stage transformation of extension of British rule in the hills. History testifies to the presence of this Shangri-la since the early years of the 19th Century, when it was a part of Sikkim, then a sovereign country, and assailed frequently by war with the Gurkhas of Nepal. In 1780, the Gurkhas marched into Sikkim and annexed the Teral, advancing to the Tista river and settling up an unwritten conflict which they had not bargained for. They had trodden on the toes of the East India Company, and the Gurkha war of 1815-16 first brought the East India Company into direct interaction with this region. The Raja (King) of Sikkim who had been driven out of his dominions by the Gurkhas was reinstated and in 1817 a treaty was signed at Titaliya under which the whole of the country between Mechi and Tista, a tract extending over 4000 sq miles, was restored to the Raja. The Company under this treaty guaranteed his (Raja’s) sovereignty, and assumed the position of paramount power in the state between Nepal and Bhutan. Ten years later, the dispute broke out afresh. Two Officers of the East India Company namely Captain Lloyd and General Grant were deputed in 1828 to deal with the disputes relating to the Gurkhas and the Raja. In course of visiting a Gurkha station in February 1829, the military officers had set into Darjiling for the first time. The Generals were impressed by the ambience and strategic location of Darjiling between Nepal and Bhutan for trade, commerce, and
administration. They sought Lord William Bentinck's directive who was then the Governor General. Lord Bentinck immediately consented and directed the officers to negotiate with the Raja of Sikkim and the deed of grant was executed on 1st February 1835. The area granted was from the south of the Great Rangit river, east of the Balasun, Kahall, and little Rangit river and west of Rungno and Mahanadi rivers comprising 138 sq. miles and known as "Darjiling". It was taken over by the East India Company and the Raja was allocated an allowance of Rs. 3000/- per annum as compensation since 1841, which was raised later. The area then consisted of 20 mud houses around the Mahakal Observatory with a population of around 100 individuals and had a practically uninhabited forest cover. The scenario changed within a few years with the arrival of Dr. Campbell as Superintendent of the region (1839), who was supposed to look into both internal and external matters of the region. His dedication and welfare work brought the population to nearly 10,000 within 10 years. (1849). He took the initiative to build a road through Pankhabari that became the main artery of transport. Simultaneously, he built a bazaar, hospital, sanatorium, jail etc. Experimental cultivation of tea and coffee also started during his tenure. Almost the entire region excepting the mentioned area still remained uninhabitable and under thick forest cover. Steady progress in Darjiling made erstwhile rulers jealous. In 1849, Sir Joseph Hooker and Dr Campbell with permission from the Raja of Sikkim crossed the frontier and were imprisoned by the authority of Raja's Dewan. A military expedition was dispatched to rescue the prisoners and avenge the insult. The yearly allowance granted to the Raja was stopped, and the Sikkim Terral annexed with the portion of the Sikkim Hills. The new territory about 640 sq miles was placed under the Superintendent of Darjiling. The new treaty opened Sikkim to trade and removed all restrictions on travellers and merchants. The treaty put an end to the sufferings of the residents of Darjiling but the uneasy peace was badly interrupted by the incursion of the Bhutanese into the district. Once again a large force was sent in the winter of 1864 and ultimately the whole of the Dooars was captured.

The year 1866 may be taken as marking an epoch in the history of Darjiling. Peace was established within its borders and the era witnessed the march of progress and civilization. Between 1839 and 1842, Lord Napier of Magdala, had
been engaged in laying out the station of Darjiling and in making a road through
the virgin forest of the Terai. This road is the present Pankhabari road. As it was
both too narrow and steep for wheeled traffic, it was necessary to develop
frontier trade with a new road. This initiated the beginning of the construction of
Darjiling Cart Road, which was started in 1861 and completed by 1866. The area
presents an intriguing picture of how colonisation and conversion of the forest into
cultivated land and tea gardens was rapid with the increase in population.

The Area of Study:

The present study was taken up to understand the various human induced
processes and their role in environmental degradation of this extremely sensitive
region. The study is based on Darjiling P.S covering an area of 104.6 sq km
including 32 wards of Darjiling town, Hill Cart Road and twenty tea estates
located approximately within 27° N to 27° 08’ N latitudes and 88° 13’ E to 88° 21’E
longitudes (Fig 0.1 & 1.2).

Objective of the Study:

On 1st February 1835, when the East India company first acquired the nucleus of
the Darjiling district from the Raja of Sikkim by a deed of grant, it was almost
entirely under forest and practically uninhabited consisting of a few hundred
people. The most important factor, which led to the rapid population growth, was
the tea industry. With the growth of the tea gardens, communication with the
plains became easier. With further construction of the Hill Cart Road and Darjiling
Himalayan Railways, more labourers poured in from different states for
employment. The phenomenal success of tea plantation, Introduction of tourism
in Darjiling town, ushered in more and more immigrants from neighbouring states
and countries and thereby increasing the population of Darjiling P.S from 63,171 in
1951 to 163,779 in 2001. With the growth of population, there was a desperate
attempt to acquire land as much as possible and gradually the forest cover was
encroached upon. During the British period, the forests on the upper part of the
hills were spared from commercial usage because they could foresee the

Urbanisation and Resultant Environmental Degradation In Darjiling P.S of West Bengal
LOCATION MAP OF STUDY AREA

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<th>JLNo</th>
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<td>Singla (North Tukvar) T.E</td>
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<td>3</td>
<td>Rangit Forest</td>
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<td>Badamtam T.E</td>
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<td>Barbatia Khashmahal</td>
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<td>22</td>
<td>Bloomfield T.E</td>
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<td>Darjiling</td>
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<td>25</td>
<td>Alubari T.E</td>
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<td>26</td>
<td>Lebong and Mineral Spring T.E</td>
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<td>27</td>
<td>Pandam T.E</td>
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<td>28</td>
<td>Alubari Busty</td>
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Fig 0.1
possible ecological disaster the denudation of the forest would bring about. After Independence demand for agricultural land, timber and firewood as fuel to supplement the needs of the people resulted in reckless cutting of the forests. Even the upper layers of forests were not spared. Despite implementation of mass afforestation programmes, a big gap remains between felling and replanting. Needless and reckless obliteration of forests, unscientific use of slopes (specially in construction work), coupled with geological, climatic and slope characteristics have changed the local scenario completely. As such, Darjiling town and its surrounding tea gardens now virtually lie on the threshold of an ecological disaster.

The situation worsened in the recent decades. With rapid deforestation throughout the last fifty years, the overall climatic condition has changed. There has been a substantial decrease in rainfall as the trees help in natural precipitation. As such the summer and more recently the winter months face severe crisis of water. Moreover as population is on a constant rise, there is severe scarcity of drinking water in the urban area. The indiscriminate cutting of trees led to soil erosion, which again triggered major landslides and landslips in the surrounding areas as the tree roots hold and conserve the soil. The landslides affect all major improvement programmes specially building and maintenance of roads, which are the main arteries to the town and tea gardens. The high man-land ratio has also led to the construction of building on steep slopes in the town. Thus population increase, which is the root cause of environmental change in this area, has changed the socio-economic set up of Darjiling P.S.

Unplanned growth and so-called development has harmed the ecology of the region and as a result a heavy price is awaited. Fortunately need for abatement of such activities has been felt and a thought on restoration of ecological balance is gaining ground. The purpose of my present work is to identify the nature and degree of anthropogenic activities and suggest solutions to arrest further deterioration and improve the quality of life.

Thus the focus of the present study includes collection of data on meteorology, population, land use pattern, waste generation, water supply, deforestation, commercial growth (tea and tourism), life support materials and ambient air and...
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water quality, noise and traffic movement, geomorphic changes and landslides and finally communication system. Many of the areas have representative qualitative data only. Detailed analysis of quantitative data including some statistical application has been done. Qualitative data have been reviewed and logically established.

Analytical results have been put to interpretation, which led to the diagnosis of catastrophic changes in some areas like depletion of forest cover and various environmental threats like landslides, drought and growth of slums in the town area.

Recommendations towards arresting environmental abuse and damages, which would reduce long-term cost of the habitats, have been incorporated. Therefore the present work is a study of environmental changes that have taken place over the century and also a description of the anthropogenic assault on the environment. Keeping the question of survival and sustenance of the human society in view, a few remedial measures have been suggested.

Literature Survey:

The Darjiling Himalaya is a fragile terrestrial system that is too often disturbed by various environmental catastrophes. As such, various research groups, government authorities, renowned geologists, geographers and engineers have intensively studied the region.

One of the first attempts of study in the Darjiling Himalayas was made by J.D. Hooker (1854), during his three long years of travel (1847-1850) in which he traced the regional domal picture of gneisses and observed the overlying sedimentary bedding. Moreover Hooker gave a systematic report of the landslides for the first time, which he came across during his extensive travel.

Geological investigations in Darjiling and adjoining regions were continued in 1874 by F.R. Mallet, who was the first to classify the metamorphic rocks into the Daling series and Darjiling Gneiss. P.N. Bose (1900) investigated the mineral resources of the area; E.J. Garwood (1903) produced the first general map of the area. E. Suess (1885-1909) discussed the Darjiling gneisses and regarded nappism as a solution to many Himalayan puzzles. A major anticlinal structure in the area

Landslides are the most hazardous among all the environmental catastrophies threatening the Darjiling Himalaya. It is also the most widely investigated phenomenon. In order to have a greater idea of the phenomenon, the Government of Bengal appointed a committee to enquire into the causes of slips after the landslips of September 1899 (Griesbach’s Report 1899-1900) apart from the valuable records of Sir Joseph Hooker (1854). H.H. Hayden (1912) visited Darjiling to advise the Bengal government with regard to the protective measures necessary in the Happy valley tea garden. His work was continued by R.C. Burton (1914). A.M.N. Ghosh visited Darjiling as a representative of the relief committee after the landslides of June 1950. According to him half decomposed, unconsolidated regolith resting on steep slopes were mobilised due to heavy rainfall.

In 1951, S.P. Nautiyal and K.K. Duttc were sent to study landslips on behalf of the G.S.I. In 1956-1666 S. Ray and S.B. Sen Sarma carried out detailed study of the slope pattern around Darjiling. In 1968, Prof L. Starkel carried out extensive survey in the Darjiling hills to investigate the role of catastrophic rainfall of early October in shaping the relief. The observations assembled the data, the amount and intensity of the rainfall and the morphological consequences. The author also mapped these forms in Ambootia tea estate. B. Biswas and G.V. Bhadram later on made a similar study on 1968 flood was presented in the monograph of A. Agarwal and S. Narain. In1972 Japanese geomorphologists T. Nakata published his thesis on the geomorphic evolution of the Darjiling Himalayan mountain front.

Prof S.R. Basu of Calcutta University and Prof S. Sarkar of North Bengal University (1985) carried out detailed investigations on the causes and consequences of landslides along Hill Cart Road and other areas of the Darjiling
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The study included examination of geomorphological processes together with the nature and extent of human interference. The problem of quarry operations and their effects on the environment was taken by S.R. Basu and L. Ghatowar (1988). Since 1984, a Polish team from the Department of Geomorphology and Hydrology in Cracow, Institute of Geography Polish Academy of Sciences has done detailed investigations on the role of extreme and normal rains in the evolution of slopes and river channels. In collaboration with the Polish team, Prof S.R. Basu and his colleagues, Prof S. Sarkar and S. Lama of North Bengal University essentially focussed on the complex relationship between human activity and landslide from parts of the Darjiling Himalaya. Prof M.M. Jana (1995) of North Bengal University and Vimal Khawas (2000) of Centre for Planning and Technology, Ahmedabad also studied the relationship between population growth and environment in the Darjiling hills. Apart from these, different Government agencies surveyed the area from different aspects like economy, culture, sociology, geomorphology etc and published their findings through respective Gazetteers and reports. These are mainly the Census Reports (1951-2001), Imperial Gazetteer (1908), Statistical Abstracts, Economic Reviews, Municipality Souvenir (Darjiling), Labour Gazettes, Working Plans of Forest Divisions in Darjiling, Revenue Reports and Reports of the Tea Committee and Reports on landslides. These are the most important sources of data for evaluating the changing scenario of Darjiling district in general and Darjiling P.S in particular. Unfortunately the Darjiling Municipality failed to offer some of the valuable information pertaining to civic amenities and services due to a fire in 1996 when most of the records were apparently destroyed.

Methodology:

The entire study was conducted in phases by adopting specific and separate methods for each phase-

Pre field Method: This includes collection of primary and secondary data on the respective issues from different Government and non-Government institutions. To have a thorough knowledge of the study area, different libraries like the...
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Field Method: This phase involves the study of different environmental problems through interviews, questionnaire survey and mapping of the town and tea gardens in Darjilling P.S. These include items like soil erosion in the tea gardens and surrounding, deforestation, landslides and landslips, human induced problems like haphazard construction of buildings on steep slopes, water scarcity etc.

Post field Method: This includes analysis and interpretation of different attributes and results obtained during pre field and field studies. Satellite Imageries (IRS_ID LISS III and Pan data), Topographical sheets No 78A/4, and 78A/8 (S01-1929-30 and 1962) have been fruitfully utilised to decipher recent land use, landslide areas and forest cover scenario. While diagnosis of urbanisation problem has been completed during field and post field phases, recommendations including suggestive remedial measures and abatement strategies to ameliorate the quality of life have been exclusively dealt with in this phase. The collected data both primary and secondary were processed, assimilated and analysed with the help of multiple methods such as tabulation, preparation of various types of charts, trend analysis etc. Landslides were mapped with the help of G.P.S and maps were prepared with the help of GIS package such as Map-Info (version 7) and Geomatica (version 9.0). This helped in highlighting the problems and prospects of the study area and suggesting remedial measures so that proper solutions to the problems may be found.