CHAPTER 1

INTRODUCTION

The extent to which humans have altered terrestrial ecosystem is truly remarkable as well as ecologically tragic. In the last 300 years, 12 percent of the global land surface area has been brought under permanent cultivation, half of the world's supply of fresh water is now appropriated by humans, carbon dioxide concentration have risen by nearly a third and at least 20 percent of world's forest and woodlands have disappeared. The degree to which humans have reshaped global landscape is largely responsible for decline in atmospheric, marine and aquatic ecosystem as well.

In an ever accelerating process, humans have reshaped totally the terrestrial surface of the earth. In doing so, humanity has scripted a scenario of global environmental with impacts that promise to be at least as severe as global climate change. Moreover, a global trend toward urbanization promises to "become one of the biggest consumers of land. Historically we lost forest to cropland, now we are losing crop land to urban areas" - predicts Ramakutty*.

Land is a fundamental factor of production and though much of the course of human history, it has been tightly coupled to economic growth. As a result control over land and its use is often an object of intense human interaction. Human activities that make use of, and hence change or maintain attributes of land cover are considered to be proximate source of change. They range from the initial conversion of natural forest into cropland to on going grassland movement (for example determining the intensity of grazing and fire frequency).

*Ramakutty Navin , *Changes in Forest Scenario,*University of Wisconsin,Medison,Australia.

Such actions arise as a consequences of a wide array of social objectives, including the need for food, fiber, living space and recreation, these therefore cannot be understood independent of the underlying driving forces that motivate and constrain production and consumption.

The forces such as population density and level of economic and social development affect the demands that will be placed on the land , while technology influences the intensity of exploitation that is possible and still others such as agricultural pricing policies shape land use decision makers.

Human induced changes in land cover are as ancient as human kind itself. The society's demand for physical resources and the expansion of its technological, managerial and institutional capacity to produce, move and consume such resources have long altered land vegetation and surface features. This is particularly since the middle of this century however land-cover changes has become truly global in scale and is now occurring at rates that are unprecedented (Turner, 1990)*.The human uses of land have affected most of ice free surface of the earth, with consequent impacts on the very process that sustain the interacting system of the geosphere – biosphere.

While most land cover changes are undertaken at the spatial scale of a field like coastal region of Kutch district - which is a field study, other changes are important as though discrete, these have attained global significance due to high frequency.

*Turner,B.L ,Moss,R.H&Skole,D.L,(ed),*Relating Land-use &Global Land Cover Change:A proposal* ,Joint publication of International Geosphere Biosphere Program and the Human Dimension of Global Environment Change program,Stockholm Royal Swedish Academy of Sciences.

CONCEPT OF LAND COVER AND LAND USE

Land cover refers to the attributes of a part of the earth's land surface and immediate subsurface including biota, soil, topography, surface, and groundwater and human structure. It describes the physical state of the land surface, as in cropland, mountains or forest. The term `land cover' originally referred to the kind and state of vegetation (such as forest or grass cover) but has now broadened to include human structures such as building or pavement and other aspects of natural environment such as soil type, bio-diversity, surface and ground water. A vast array of physical characteristics like climate, physiography, soil biota and the varieties of past and present human utilization combine to

make every parcel of land on the nation's surface unique in the cover it possesses and the usage opportunities that it offers.

Land cover can be classified according to numerous criteria depending on the scientific purpose of the classification. Examples of some broad categories of land cover include boreal forest, tropical savanna, temperate grasslands, croplands, wetlands and settlements.

Land use refers to the purposes for which humans exploit the land cover. The common land use includes agriculture, grazing, mineral extraction and recreation. Land use is the way in which and the purpose for which human beings employ the land and its resources e.g. for mining, farming or lumbering. In this study, the term 'Land Use' is used in reference to the industrial usage of land.

CHANGES IN LAND COVER AND LAND USE

Land cover is affected by natural events including climate variation, flooding, vegetation succession and fire - all of which can be affected in character and magnitude by human activities. Land cover today is altered principally by direct human use: by agriculture and livestock raising, forest harvesting and management and construction. There are also incidental impacts from other human activities such as forest damaged by acid rainfall from fossil fuel combustion and crops near cities damaged by tropospheric ozone resulting from atmospheric exhaust. The changes in land cover by land use do not necessarily imply a degradation of the land. Indeed it might be presumed that any change produced due to human use is an improvement until demonstrated otherwise, because we have gone through the trouble of making the change. And indeed, this has been the dominant attitude around the world through time. There are of course many reasons why it might be otherwise. The damage may be done with the best of intention when the harm inflicted is too subtle to be perceived by the land user. It may also be done when the losses produced by a change in land use spill over the boundaries of the parcel involved, while the gains accrue to the land user. Economists refer to harmful effects of this sort as negative externalities, to mean secondary or unexpected consequences that may reduce the net value of production of an activity or displace some of its costs upon other parties.

Land use changes may be undertaken because they return a net profit to the land user, while the impacts of negative externalities such as air and water pollution, bio-diversity loss and increased flooding are borne by others.

It is thus concluded that land use and land cover changes matter a lot. Besides affecting the current and future supply of land resources, they are important sources of many other forms of environmental change. They are also interlinked through synergistic connections that can amplify the overall effect. The worldwide trends in land use and land cover changes are an important source of the so called greenhouse gases, whose accumulation in the atmosphere may bring about climate change.

CONCEPT OF ENVIRONMENTAL CHANGES

Land use and land cover play a major role in global environmental changes, as they lead to significant shifts in the earth atmosphere interactions. The resultant global climate change may in turn force changes in land use and land cover, a cyclical process that may culminate in desertification and abandonment of land. The social and economic implications of this process have only recently gained recognition. For all its importance to scientists and policy makers confronting the complexities of global environmental change, the dynamics and driving forces behind land use and land cover change are poorly understood.

Though the global change in land cover, land use, atmospheric concentration of greenhouse gases, loss of bio-diversity and many related processes today are enormous in dimension, this is the result of changes at micro-level i.e. the village, small town and higher order as a result of 'development'. Therefore, the connective action or mitigation strategy should start at that level.

STUDY AREA

This study will focus on the North-western district of Kutch in Gujarat, whose gulf is an ecosystem of national and international importance. So far, this district has remained insulated from the mainland Gujarat in terms of industrialization and overall development. However, recently both the Gujarat Government and Central Government have shown interest in this district and steps are being taken to make this district 'a gateway to north'. This district has a large area of 456 sq. km. In which taluka's touching the coast has been

considered from Lakhpat to Bhachau for precise study but whole district's impacts are considered to get complete picture. Shown in Map No. 1.

OBJECTIVES OF THE STUDY

To assess the effect of human population and their related activities on land use pattern.
To examine the nature of development.
To understand the impact of recent economic activities on environment.
To suggest various measures for planning and critically assess the given alternatives.

HYPOTHESIS

Recent developments have taken place because of its large coastline.
All development is ecologically unviable.

LITERATURE SURVEY

There are limited studies focussing on Kutch district. The existing work, more or less, is based on the geological and geomorphological aspect of the coastline. This research attempt was considerably handicapped in investigation on account of lack of availability of previous literature. There is substantial work on coastal land and mangroves in other parts of the world, but these studies generally follow their own specific approach according to their requirements, and hence have limited relevance to the present study. A few related studies and project reports are discussed as follows.
A related study *Impact of Industrial Development on the Coastal Ecosystem*, 2000 made by Supriya Mehta stresses that unimaginative and over enthusiastic 'developmental efforts' without taking into consideration the natural resources, lead to narrowly planned industrialization, overuse and depletion of natural resources and even destruction of the natural ecosystem, which are actually the life supply systems.

Another project report, *Kutch – Waiting to be explored* discusses Kutch in general and the rich mineral resources, which are yet to be explored.

A dissertation, *Habitat documentation on Mundra* stresses on Mundra Taluka and its adjoining Mandvi area and physio-geographic details.

A Qualitative study on the *Tidal muds of Saurashtra and mainland Gujarat coast* 1985 by Kanchan F. Patel focusses exclusively on tidal muds occurring along the Gujarat coastline.

Another study done on *Kandla port and Harbour* 1961 by Yogendra R. Shukla speaks about Kandla creek and Gulf of Kutch.
A draft report by Gujarat Ecology Commission, *Current Ecological status of Kutch* 1994 stresses on Ecological problems faced by Kutch region like excess run-off, erosion, over-grazing, salinity, water scarcity and decreasing bio-diversity.

Another draft report, *Gujarat State Environmental Action Programme (SEAP) Coastal and Marine Environment* March 2000 by National Environmental Engineering Research Institute (NEERI), Nagpur and National Institute of Ocean Technology (NIO), Chennai concerns the analysis of problems statement based on secondary data pertaining to coastal and marine environment of Gujarat.

Another World Bank aided project by Gujarat Institute of Desert Ecology in April 2000 talked about the physical aspects of Land degradation and its impact on local environment in particular and in general, overall stresses on ecosystem of a whole region.

An *iconological study of Gujarat State*1985 by D M Shringa portrayed Kutch as a land of great antiquity that has reference in the old stone inscriptions, copper plates, and old writing manuscript and thus, it makes an attempt to study the historical and geological background of the region.

One study which supplements this work is *Coastal Marine Ecosystem and Anthropogenic Pressure in the Gulf Of Kutch* 1996 by Saurashtra University. It talks about the danger to the ecosystem of Khauthar island, considered to be richest marine and Scrub land ecosystem and largest mangrove patch as a result of recent efforts to develop the region economically, through construction of a captive jetty.

Another work *Little Rann Of Kutch - A Biosphere Reserve Proposal* (1996) by Lavkumar Khachar, demonstrates deep concern about the threat to our ecosystem in the light of the de-notification of Narayan Sarovar Sanctuary.

Thus it is found that most of the studies which have been done during the last decade focus on different aspects and fields and no specific attention is made on the coastal region of Kutch district. The present study happens to be the first ever indepth analysis of land use and environmental change and its overall impact of ecosystem of Kutch.

METHODOLOGY

The prime limitation in study of the coastal region of Kutch is non-availability of toposheet, geomorphological data etc., as Kutch is a restricted area. Also, the accessibility to the area is limited.

This work has been considerably handicapped in investigation on account of the lack of availability of previous literature, as well. Though much work has been done on the coastal muds all over the world, the studies followed more or less their own approach and technique. The present work happens to be an indepth analysis of Kutch district as a whole with emphasis on precise land use changes and environmental changes in coastal region of Kutch district, equal stress being given to descriptive and analytical aspects.

The investigation comprised of following four parts:-

Collection and appraisal of all background information.
Field Work
Correlation of Field work and Secondary data.
Analysis of Steps taken by Government in saving this fragile ecosystem.

Collection and appraisal of all background information:

The background information required to be obtained for purpose of the present has been categorized under following heads:

Framework of Kutch district includes its geographical location, physical features etc. and how their location is adding to advantageous development of district.
All available secondary data from different Government organizations.

Field Work:

Field Work will consist of actual visit to the various Creeks, to check their spatial occurrences and morphology of all major mangroves swamps and how development is interfering with the natural ecosystem. Field work will also involve visits to organizations like Gujarat Institute of Desert Ecology Bhuj, Gujarat Ecology Commission, Gujarat State and Development Corporation, Bhuj, District Rural Development Agency, Gujarat Pollution Control Board, Directorate of Economics and Statistics, Gandhinagar, iNDEXTB, Bhuj, District Industrial Commissioner, Bhuj, Kutch Nav Nirman Office, Bhuj, Office of the District Collector, Bhuj, Gujarat State Disaster Management Agency, Bhuj, Conservator of Forest, Bhuj and Kandla Port Trust, and its office, Gandhidham, Mundra Port and office.

Correlation of Field Work and Secondary data:

This is an important aspect to distill the ground truth as the collected data may show different results than ground realities. For example, the data may show mangrove occurrence in large part of coastal area, but field work suggests that recent industrial development along the coast by large industrial houses have destroyed a large patch of mangroves. Quite frequently, the data is not updated as the development occurs.

Analysis of Policies:

It is necessary to take a view of Government policies and suggest various measures to make the policies effective. For instance, a number of Non Profit Organizations (NGOs) and Government Departments are involved, giving recommendations to different industrial sector who are enthusiastically making developmental efforts in the district, but the insatiable greed of human beings has damaged the nature and earth to the point of no return. On its part, the Government is taking steps or keeping watch to stem the destruction of environment, for example, National Environment Engineering Institute (NEERI, Nagpur) has filed a appeal in Supreme Court against Sanghi industry, which has

allegedly neglected 'Environmental Impact Risk Assessment (EIRA). The study tries an estimation of supportive policy implemented by Government to check the degradation of environment.

Organization of Study (Chapterisation)

Introduction-This will be the first chapter which introduces the topic, location of area, concept of land use, Land cover, Land use changes, Land cover changes, Study Area, Aims and Objectives, Literary work done in this field earlier, Methodology and Chapterisation.

The second chapter deals with the study area, general background in terms of physical aspect, Historical background including the origin of its name,, Physical features, Climate and other related aspects which completely profile the district.

The third chapter will discuss the changes which have taken place due to recent development, a description of economic activities, nature of development and the factors behind development concentration. In this chapter, the research problem will be approached from all angles plus environmental changes will be considered which are taking place due to this development and coastal degradation which have occurred to what level.

The fourth chapter will stress on policy initiatives taken by the State as well as local Governments, the policies will be analysed by taking the study area into consideration, extent of their implementation and proposed policies, to be incorporated for future planning.

Another Fifth chapter which is added to give the details of Earthquake, rehabilitation, and the post-quake status of development in general. This chapter is added to give value to work as the quake occurred during my study period and it has had a great impact on the economy of Kutch.

This chapter will be the conclusion. The study will conclude by taking the hypothesis in consideration, whether the same are proved or not and how far objectives of work met and environmental changes have been discussed in details by showing the results of imagery and other concerned details.

Conclusion

A review of land cover and land use indicates that land use is obviously constrained by environmental factors such as soil characteristics, climate, topography and vegetation. But it also reflects the importance of land as a key and finite resource for most human activities including agriculture, industry, forestry energy production, settlement, recreation water catchment and storage. An analysis of the past changes in land use and projecting future land use trajectories requires a thorough understanding of the interaction of the basic human forces that motivate production and consumption.

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