

DEVELOPMENTAL PROBLEMS OF RURAL SETTLEMENTS IN THE COASTAL AREA OF THE BHAL REGION OF GUJARAT

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ABSTRACT : The main objectives of this paper are to know (a) environmental problems for rural development and (b) to suggest a micro-level planning for the coastal area of the Bhal region in Gujarat.

The Bhal region, being located around the Gulf of Khambhat, is comprised of 275 villages from eight talukas of four districts of Gujarat. As a low lying coastal area, it faces the problems of marine ingress, flood during the monsoon and drought during the summer. Both soil and underground water suffer from salinity, a pH varying from 8.6 on the coast to 7.6 in the interior. Due to natural hazards limiting agriculture to a single harvest during the winter, people cannot sustain themselves on land. This is seen in the decrease in yield and percentage of agricultural land during 1971-1981. In order to survive, rural people have to migrate either seasonally or permanently for jobs in other areas. This has resulted in a decrease in the density of population in coastal areas. Nearly 40% of land has been degraded during 1968-1988 for which no action or planning has been undertaken, and consequently people migrate instead of taking care of their land.

The region has been studied into three units-coastal, sub-coastal and interior area. Land capability has been analysed with the help of physical variables and land use has been suggested on the basis of local eco-system. It has been suggested that in order to bring sustainability to a region, people have to depend on a combination of farm and non-farm activities so as to have full employment within the region. This can only hold rural population to its root and will be able to save both rural origins and urban destinations. Cartographic, tabular and statistical methods have been used with census and remote sensing data from Space Applications Centre.

The focus of this paper is the Bhal coastal region of Gujarat, a region riddled with not only inadequate economic development but also inadequate and degraded local resources to the extent that the village population finds itself unable to sustain on the local resources. To illustrate this the paper is divided into the following two parts.

(a) The first part: To know environmental problems for rural development in the Bhal Region,

(b) The second part: To suggest an integrated micro-level planning based on local eco-system for the region.

The study area covers a backward region of Gujarat, having a fragile eco-system. The Bhal region, located in the hinterland of the Gulf of Khambhat, is a marine-ingressed, flood-affected coastal area (Fig. 1). The Bhal region is an extensive low lying coastal plain, covering a total area of 5292 sq. k.m. with 275 villages from four districts of Gujarat, namely

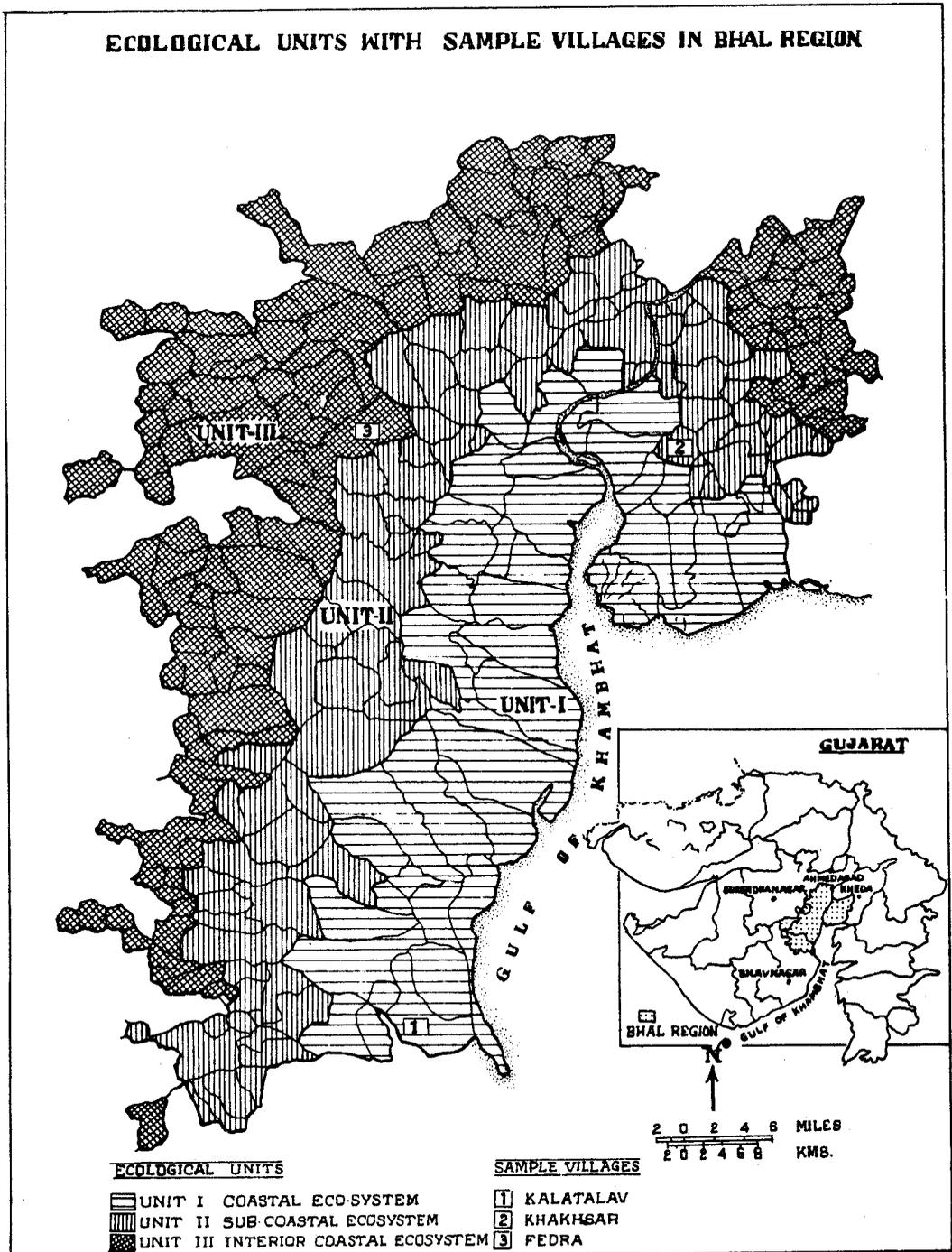


FIGURE - 1

Fig. No. 1

Bhavnagar, Surendranagar, Ahmedabad and Kheda. The region was once a part of the sea and is only 25 metres above sea level, having black, volcanic clayey soil along with riverine and coastal alluvial soil. Saline mudflats and coastal dunes are seen on the south-west, while the north eastern side is relatively better developed agriculturally, with lower soil salinity. The area is drained by non-perennial rivers. In summer, the region faces the problem of drought, having mean annual rainfall varying between 500 to 600 mm, and faces soil salinity due to capillary action. Marine ingressions has also taken place, making the soil further saline, having a pH of 7.6 in the interior area to 8.6 in the coastal area. During the monsoon, the region faces the problem of flood due to clayey soil, high water table and an insignificant surface gradient. Hence winter is the only season when cultivation of wheat, millets, oil-seeds and spices is done, especially in the interior areas of Kheda and Surendranagar districts where salinity of soil and water is less. Irrigation is not suitable due to salinity of ground water. Instead of managing their land resource for non-farm activities, farmers move out to cities seasonally or permanently in search of unskilled work. Many villages in the coastal area have lost population and have a deserted look without any sign of development.

The study area can be divided into three sub-eco-systems-

(a) coastal (b) sub-coastal and (c) interior unit having 48, 88 and 140 villages respectively (Table No. 1). This sub-division has been made on the basis of physical and human variables, for example, distance from the sea, relief and geomorphic features, percentage of water logged and flooded area, type of soil, salinity of soil and underground water, percentage of degraded land, general landuse, percentage of cultivated and irrigated land to

total area, cropping pattern, yield rate and density of population.

The coastal eco-system faces severe land degradation due to marine ingressions, water logging, salinity of soil and water, leading to low yield, low cultivated and irrigated area and low density of population. These problems are relatively less severe in the interior units. However, if proper management of landuse is not done, the degradation of land will increase and will spread in the interior section soon.

METHODOLOGY

Methodologically, cartographic, tabular and statistical techniques have been used to analyse the problems over time and space. Land capability has been determined by using mainly physical variables. Changes in major landuse have been mapped during 1967 to 1988 using the data from topographical maps of Survey of India and remotely sensed data from satellite imagery from Space Applications Centre of Ahmedabad. Other sources of data are census reports, Department of Agriculture, Soil Testing Laboratory, Department of Irrigation. Later landuse map has been superimposed on the map of land capability to find out the mismatch of human activities in relation to land capability. Finally, a proposed landuse has been suggested based on micro-level eco-system for three sub-units of the Bhal region. A combination of farm and nonfarm activities has been suggested to manage the physical problems and to create more employment for the development of the region.

DEVELOPMENTAL PROBLEMS

The basic developmental problems are related to management of land resources. In the Bhal region, nearly 50% of the land has been degraded. The coastal region has been degraded before 1967. During 1967 to 1988, nearly 36% of the total area has been degraded, of which

Table - 1

Sub-units in eco-system of the Bhal-region

Variables	Coastal unit (48 villages)	Sub-coastal unit (88 villages)	Interior unit (140 villages)
1. Distance from the sea	0 - 10 kms.	10 - 20 kms.	above 20 kms.
2. Morphology	Mudflat, Swamp and marsh land	Low lying-flat land	Flat land
3. Percentage of flood and water logged area (1991)	80	40	15
4. Type of soil	Saline, sticky, clayey soil	Alluvial, sandy saline soil	Medium black soil
5. Salinity in soil (pH _{1:2.5})	above 8.5	8.1 - 8.5	7.5 - 8.0
6. Underground water	Very saline	Moderately saline	less saline
7. Depth of underground water (1992)	0 - 5 metres	5- 10 metres	10 - 15 metres
8. Degraded land (% to the total area of the region) 1988	36	9	5
9. Land use (1981)	Scrubland, waste land (salt waste, mudflat and swamps) and agricultural land	Cultvated land and waste land	Cultivated land and waste land
10. Cultivated land (% to the total area of the region) 1981	10	19	26
11. Irrigated land (% to the total area of the region) 1981	0.18	1.25	2.49
12. Cropping pattern (1981)	Jowar and Bajara	Wheat, Paddy, Jowar and Bajra	Wheat, Paddy, Cotton, Jower-Bajra and oil seeds
13. Yield rate (1981) quintal per acre	0.5 - 0.7	1.00 - 2.50	2.50 - 5.50
14. Population density (1981)	35	97	120

Source : District Census handbook, Planning Atlas of Gujarat, District Soil Testing Laboratory, Remote Sensing data from SAC, Ahmedabad and Field data.

14% is highly degraded and 22% is moderately degraded. The reasons of degradation are mainly physical factors, e.g. marine ingress, saline underground water, water logging due to flood, soil salinity due to drought and capillary action. However, human mismanagement is also responsible for land degradation. For example, use of saline underground water for irrigation, has made arable land in Kheda and Ahmedabad districts unsuitable for cultivation. Moreover, there has not been any consistent effort to check marine ingress with salt resistant plants or putting up embankments. Further, farmers have encroached on areas which are not suitable for cultivation. These areas are suitable for the growth of grass or plantation of trees.

The effects of land degradation are far reaching in a negative sense. Villages have been depopulated permanently. Many villages show negative change in density of population during 1971-1991. Settlements of smaller size have lost more population and their number has decreased over time (1971-1991). Rural-urban migration indicates lower sex ratio (485 in 1971 to 479 in 1991) in villages which are facing negative change in density of population. In other words, farmers have migrated with family permanently. The density of population in the Bhal region was 71 persons per sq km² in 1991 compared to 210 in the state as a whole in 1991.

Due to depopulation of rural settlements, agricultural land has not been taken care of and land has been degraded to a great extent. As a result, percentage of agricultural land has decreased; Correlation co-efficient (r) is $- .73$, between degraded land and agricultural land in villages. The correlation is $- .63$ between degraded land and yield rate of major crops in the region in 1981. Hence population density is sensitive to agricultural land, especially in the

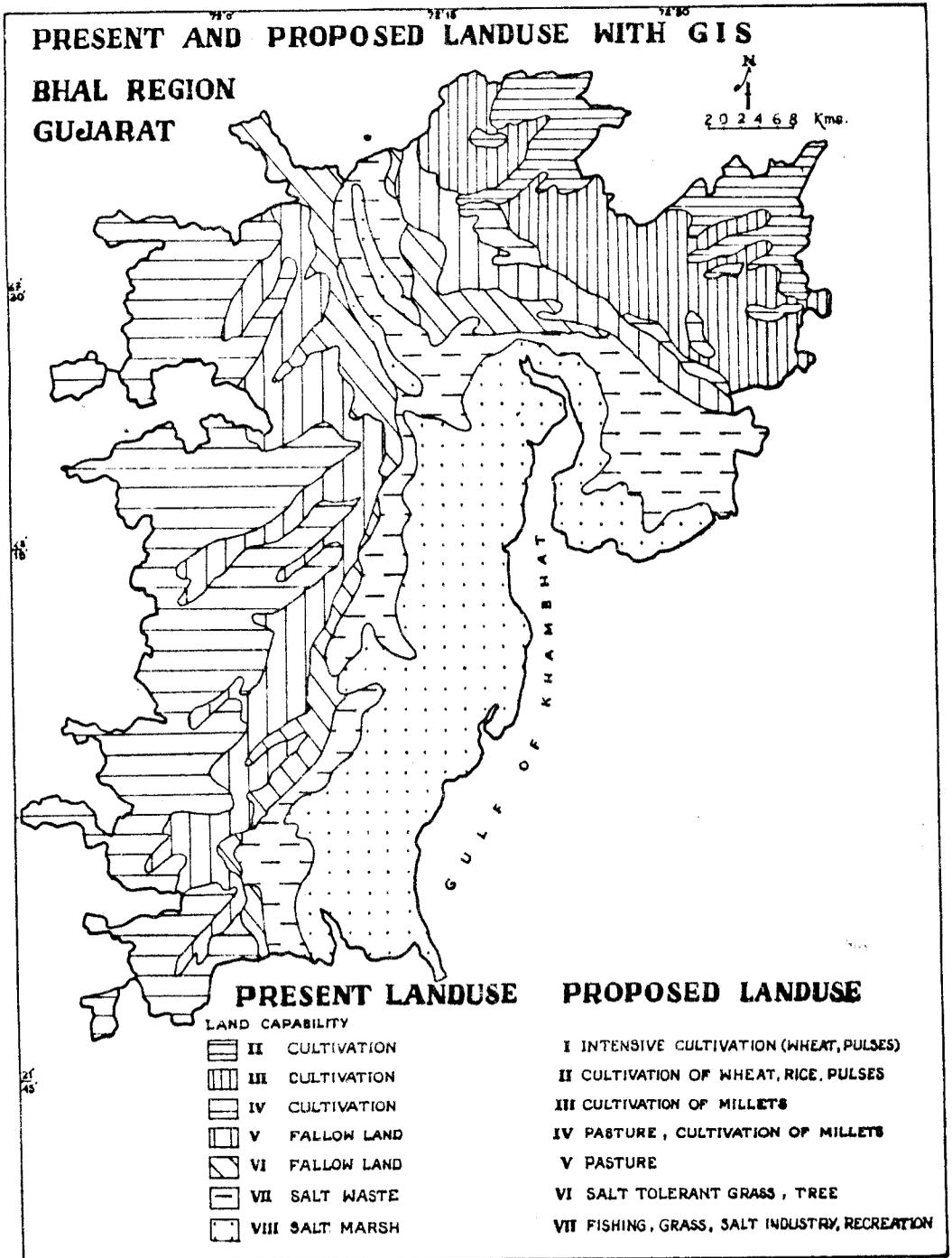
coastal area. In other words, the density of population is low in coastal area where the percentage of agriculture land is low due to high level of salinity in soil and underground water. The percentage of irrigated land has also decreased in the north-east as the underground water is saline and is not suitable for cultivation.

The change in land use during 1967 to 1988, is mainly in the form of saline waste and fallow. The coastal unit does not show much change as it was already a saline marshy tract by 1967. The sub-coastal unit has shown the major change, as agricultural land with the cover of trees has been changed into saline waste or fallow land. The interior unit is still an agricultural land having not much change. However, if proper action is not taken now, this unit may also get affected by salinity soon.

The problems of development in this region have been analysed both at a micro and macro level. The levels of sustainability have decreased from various points of view. For instance, during 1981-1991, both gross cropped and net sown area have decreased. Due to degradation of land both land for food crops and non-food crops has reduced. Similarly, the yield rate for major (grain) crops has decreased during 1981-82 to 1991-92. Earning from farms, production of calories and protein per acre, have also decreased during the same period in the region as a whole. The situation is grim if calculation is done per rural person. Here also the farm earnings and consumed calories and proteins are far below the recommended value.

MICRO-LEVEL PLANNING

Micro-level planning is urgently required to check land degradation and depopulation in the Bhal region. There has been increasing land degradation due to both physical and human factors, leading to loss of agricultural land,



FIGURE

Fig. No. 2

reduction of yield per acre and per person. Instead of conserving soil and water, farmers have encroached upon areas for cultivation, which are meant for pasture, forest and other non-farm activities. As a result, land has been exposed to soil erosion, marine ingress and flooding. This has resulted in land degradation and there has been more outmigration of labour, leaving their land without being upgraded and maintained. A proper long term management of land resources at a micro-level, as seen in China and Japan, can bring Indian farmers out of poverty with sustainable employment, earnings, amenities and high life-style in villages, which will be useful in decentralizing Indian developmental processes.

The carrying capacity of land based on basic physical variables, has to be estimated at a village level. Each farmer should be knowledgeable regarding the quality of his land and should be able to decide on its best use so that the eco-system is not disturbed in the process of development. In the Bhal region the following micro-level planning can be taken up by farmers themselves in an organised manner to cope up with physical hazards.

- (1) Landuse planning for checking soil erosion and conservation of soil moisture with suitable grass and forest cover is of utmost necessity. Land which is not suitable for agriculture, should be used for other type of plantation or as pasture.
- (2) Each village should be able to do water harvesting through check dams and collection-wells for rain water. Drip and sprinkle irrigation should be used as new techniques of water conservation. Flood water can be distributed through canals and marine ingress has to be checked with proper barriers along the coast.
- (3) A new cropping pattern should bring in

crops which grow well in less water. Fruits and vegetables, like beet root, pomegranate, berries which can resist salinity, should be grown in this area.

- (4) Yield rate can be increased with better inputs like seeds, organic fertilizer and relevant farming techniques.
- (5) Income of farmers can be increased with farm related other activities on a co-operative basis; if the land is not suitable for agriculture, e.g. dairy and poultry farming, fishing, mushroom growing, sericulture etc. can be taken up.
- (6) Non-farm activities should also be introduced for diversification of occupation for their survival. Various types of small scale industries, like fruit canning, dairy products, silk industry, cotton ginning, salt making, recreation and tourism etc., can certainly increase the purchasing power of farmers with full employment in the region itself.
- (7) Efforts are needed from all sides - farmers, government and non-government agencies to achieve sustainability of people in their own area. Conservation of land and water is the basic duty of farmers. In this effort, non-government agencies can be of much help in organizing farmers. Along with that, the government subsidy and proper pricing system, availability of information on farm techniques, vocational training, marketing assistance on farm and non-farm products are essential parts of the integrated programme of rural sustainability.

Based on these concepts of land capability, a proposed landuse has been suggested for the Bhal region (Fig.No. 9). In this area the land capability ranges from 2nd to 8th category. An intensive cultivation has been suggested in the

interior eco-system. In the north-east of Kheda district, cultivation along with tree plantation and reclamation of land have been suggested. In the extreme west, livestock rearing along with millet cultivation has been suggested. In the subcoastal region, plantation of salt tolerant grass and trees is needed while in the coastal eco-system fishing, salt industry, recreation and tourism can be developed. (Fig 2)

The fundamental need is to increase employment opportunity in villages. Secondly, farmers need to be organised in such a way that they can manage their resources so well that they will not be migrating from their region. Such a

developmental plan will ensure better earnings and better consumption of nutritious food for farmers to be out of the cycle of poverty. Self sustained villages will check rural-urban migration and also attract people from urban areas to rural region with peaceful, clean and natural environment for living and working.

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