CHAPTER-II

GEO- VIEW OF THE STUDY AREA
To prepare an effective planning strategy for the future development of the study region, one has to understand the salient features of the study area. Therefore, an attempt has been made to discuss the brief scenario of the region.

Goa is one of the smallest states and has a twenty-seventh rank in the country. The state has a long and chequered history and hence there are quite a few versions for the origin of the name GOA.

The history reveals that, one of sixth incarnation of lord Vishnu named "Parashuram", in a view of introducing Aryan culture in the area; released an arrow from the western ghats into Arabian sea to demarcate an area, which happened to drop at a particular spot. In Vernacular language arrow is termed as 'gaw' and end means 'ant' and hence the land was popularly known as 'GOMANT'. The Madras glossary relates the origin with Sanskrit word 'go' means cow or the land of cows or the cowherd country. Whereas Sutansanhiti mentions the land as 'Govapuri'. There is also a reference to a mountain known as 'Gomanchal' in 'Harivansha purana', where there was a fierce battle between lord Srikrishna and Jarasanda the king of Maghada, where the latter was totally defeated. Portuguese writers referred the land as 'Goemonti' 'Goemont', which means cool and fertile land or prosperous place. Later Goa came to be known as 'Kova' to the Greek invaders and as 'Gomanchal' or Gomantak' to Indian intellectuals' as recorded in the ancient texts.
It is quite astonishing to note that the names referred in various periods or versions clearly indicate some similarity is pronounce though with different meaning and explanations.

PHYSICAL CHARACTER

• Location and Extent:

The study region is tucked in the western corner of the country and covers the vast expanse of sloping land from east to west covering an area of 3702 square kilometers (Fig.1.1). The aerial expansion is between lies between $74^\circ 23'13"$ East longitude to $73^\circ 40'33"$ East longitude and $15^\circ 48'00"$ North latitude to $14^\circ 53'54"$ North latitude. The land of Goa roughly looks like high moon configuration, virtually separated by natural features like rivers and mountains to demarcate from the neighboring state in general. Towards north it is bounded by Sawantawadi taluka of Ratnagiri district of Maharashtra; on the northeast by Kolhapur district of Maharashtra; to the East Belgaum and Dharwad district of Karnataka and towards South it is shadowed by North Canara districts of Karnataka state. The northern boundary is demarcated by river Terecol and Sahyadri ranges as shield and wall to separate Karnataka towards East. The state of Goa is divided into two district comprising of even talukas for administration.
Fig. 1.1
• Physiography:

The physiography of the Study region is systematically divided into three varied physical divisions, namely:

a. The mountainous Sahyadri ranges or the western ghats in the east,

b. The middle level plateau,

c. The low-lying river basins and the coats in the extreme west.

a. The Goan Sahyadri Ranges (Western Most Division):

The hilly terrain of Goa constitutes about 600 sq kms in area with the general elevation ranging between 10 meters to 800 meters except at some isolated peaks in midland and ghats. Its crest line assumes the shape of an escarpment, which is about 125 kms in length, with some peaks standing senital at various points. This region releases the water, which form the source of drain for most of the rivers of the land. The face of escarpment is sliced at several places by ungraded stream which give rise to some waterfalls. Some of the famous ones are Harvalem and Dudhsagar which decend down from the green mountains. (Fig. 1.2).

At the outer periphery of the ranges there are many isolated peaks. Some of the most important are Sonsogad (1186 mts), Katlandri Mauli (1126 mts), Vagueri (1058 mts), Morlangad (1054 mts), Dudhsagar or Velang (600 mts), Siddhanath (440 mts) Chandranath (370 mts). The mountains after skirting a considerable portion of north and south branches off westwards across the state with many ridges. The scrape slope usually marks the quick transition to the alluvial form in the east. The terrain is deserted by number of rivers flowing westwards to meet the sea.
b. The Midland or Middle Level Plateau:

This midland is sandwiched between the Western Ghats and the plains. The plateau has an average altitude of 30 mts to 100 mts forming some deep gullies at some places sloping towards the plain gradually and abruptly. This plateau meets the count in few areas forming headlands like Aguada, Dona Paula and Murmargao.

c. Alluvial Lowlands and Coasts:

The Goan coastlands are full of creeks and estuaries formed by rivers. There is a high amount of deposition by the eroded material washed down by the rivers. The alluvial lowlands are the outcome of those two rivers of Goa, namely, Zuari and Mandovi, which are responsible to give rise to the fertile areas in the coastal areas. The Khazan lands are centered mainly in these areas; other small rivers like Chapora, Sal, Khushavati, Galgibag, too deposit some alluvial soil as these move towards coast, giving rise to the alluvial flats, which are highly productive tracts of agriculture in Goa.

The coastline of the state is uneven and consists of inlets and outlets which give rise to small bays and capes. Of the bays, the famous ones are Baga and Calangute in the North Goa and Colva and Betul in the South Goa, which exhibits there aesthetic beauty and attracts the tourists not only from local but also from global.
• Geology:

The study area has a very typical geological stratum when compared to immediate surroundings. The substantial part of the region belongs to the Basaltic outflow of Deccan lavas. The major part consist of Pre-Cambrian rocks like quartzite and quartz-seritite schist, Which occurs as narrow beds in central and western parts of the state. The other Geological formations traced in the region are, quartz-chlorite-biotic-schist, quartz-chlorite-schist with thin beds of quartzite, slate, meta-greywacke and conglomerate (tilloid). Pink ferruginous quartzite. The iron and manganese ore mining is dominated in this stratum. Upper Meta-Greywacke is noticed in the northern tip of the state. Some of the scattered formations are ultra basic and Basic Intrusive, Gneissic Granite, Porphyritic Granite, Younger Delorite Dylces, Deccan trap extending along the border of the state from northeast of Vaingueuinim upto Goa-Karnataka-Maharashtra border at the altitude varying from 600 mts to 700 mts. The most important noticeable feature is the occurrence of lateritic cap intensively over almost all the rock types where its thickness varies from 5 mts to 75 mts. This lateritic cap is of recent origin and covers extensively the upper Sahyadris and the medium and low level plateaus that stretches below the mineral-bearing Pink Phyllite rocks. (Fig. 1.3).
• Drainage:

The hydrographic network of majority of rivers draining the state has their origin in western ghats. The state is criss-crossed by many rivers, rivulets and streams. However the most important rivers are Zuari and Mandovi.

Mandovi takes its birth in Sahyadris of Karnataka state. The main tributaries joining from left are Ragaro, Kushavati and from its right Nonorem, Namis, Valvota Mapusa join the river. It takes a wide meandering course through the irregular plateaus with islands in its midstream like, Divar and Chorao, and thereafter takes north-east direction to meet the Arabian sea. Towards its mouth the capital city of the state, Panaji is located. (Fig.1.4).

The rise of river Zuari is at Hemad Barcem in Sanguem taluka of Goa draining for 631 kms in the study region. The other input of water for Zuari lies within the state. The important streams joining the river are, Sanguem Talaulim, Kushavati, Sanvordem, and Cortalim estuarine. At the mouth of this river, Port of Murmagao is located. This river also gives rise to some islands due to constant siltation. The islands are St. George, Pegay, Kambari, and the Bat islands. Both the rivers, Zuari and Mandovi are navigable and have a lot of economic importance for the state.

The other drainage channels of the land are Terekol, rising in Sahyadris of Karnataka, flowing along the northern border of Goa over a stretch of 131 kms. Ram ghat hills of Belgaum delivers river Chapora having its length of 311 kms of drain in the state before meeting the sea. Besides these, other small drainage lines are, Colvale, Sal, Talpona, Galgibag, Khandepar and Saleri river systems, originating from the streams of highlands in the state.
Fig. 1.4

GOA
DRAINAGE PATTERN
There are number of lakes having limited local economic use but more of ecological importance, which owe their origin to bunds and across stream valleys. Some of the lakes are created due to diversion in the flats. The lakes found in the interior of the state serve as the valuable source of irrigation to the nearby rice fields and ‘kulagars’ (agricultural land). The important lakes in Goa are, Mayem, Chimbal, Carambolim, Cacora, Curchorem and Calapur.

A large number of springs with clear water in the midland are, Bimbol in Sattari, Fatorpa in Balli, Raidor in Cavelossim, Gongo in Nachinola, Torvalem in Shiroda have light carbolic and sulphurous quantities. Most of the springs are neglected in the state.

- Vegetation:

The study region has rich natural vegetation covering about 28.4% of total land having dwindled considerably from that density in recent years. The vegetation of Goa can be analysed comparatively with that of physical division found in the state. The land has three varied physical divisions, namely coast, midland and highlands. The vegetative cover dominated in all these three divisions varies remarkably. The forest cover of the state can be analysed in three broader categories:

a. Coastal vegetation,

b. Plateau vegetation and

c. Forest in the ghats.
a. Coastal Vegetation:

The coastal vegetation is again of varied types like estuarine vegetation concentrated with mangroves all along the swampy river banks and strands; and creek vegetation found along the coastal belts and intended creeks. This type of greenery can be traced right from the sea level to the altitude of 50 mts. The mangrove forests sprawl along the estuarine of the Mandovi and the Zuari particularly in the silted areas, and also in those of the other rivers, north and south of them to a lesser extent. Laterite thorn forest is also found at the small patches in the coast. Some of the species found intensively in this belt are, Rhizophera, Bruguiera, Kandelia, Thespesia Cerbera, Pandanus and Cocos necifera.

b. The Plateau Vegetation:

The vegetation dominated in the midland, which is a table land is called as ‘Plateau vegetation’ found at the altitude of 50 mts to 500 mts above sea level. Plateau vegetation can be classified as Open scrub jungle and Moist deciduous forest. The major part of Goan forest is of this type. Open scrub jungle is traced over undulating rocky plateau of Panaji to Cortalim, Panaji to Colvale, Cortalim to Margao and Bicholim to Sanquelim. The species found in open scrub jungal are, Carina, Lantana, Calicopteris, Woodfordia Vitex etc.

Moist deciduous forest in this region has a good economic and commercial potential. It is spread of 385 sq kms, providing timber and fuel wood. Natural teak appears extensively in these forests. Other prominent species are, Rubiacia, Bignoniacia, Anacardiacea, Febacea, Terminalis
Crenulata, Xylia xylocarpa, Terminalia bellerica etc. The ground vegetation consist of, Randia dumetorum, Hehcteris isora, Murray kaonigli, Ranvolflia Serpentine and Tabernae Montana Keynaena are the important once. Some creepers like, Wagatea Spicata, Smilax caly coptexis floribunda are common.

c. Forests in the Ghats:

This forest is very thick and dates back to nearly 50 million years. The noticeable feature of the forest is, it is identified as the ‘hotspot’ of biodiversity by the Department of Forest. With the influence of north-west monsoon there is a wild growth of vegetation, which is either Semi-evergreen or Evergreen forest. Semi-evergreen forest can be seen in the region bordering Ratnagiri district in Maharashtra state towards north and till North Canara district in Karnataka state in the south, with the species of Garcinia indica, Diospyrous Montana and Artocarpushirtusis. Evergreen forests occur in Ponda, Ambaulim-Ramghat belt and at some parts of northern border of the state. Some of the tree components traced here are Catephyllum, Litsea, FicusArporasa. Very thick undergrowth is also noticed in this forest comprising a range of varities like Lobelia nicotinae folia which have medicinal properties.

• Soils:

Goan soils can be classified into five categories:

a. Laterite soils.

b. Alluvial soils.

c. Sandy coastal soils.
d. Saline soils.
e. Marshy soils.

The major portion of the soils is of Laterite category. They are highly acidic in nature but poor in lime, phosphorous and potash. The nitrogen and organic content is fairly good. Alluvial soils which are ideally fertile are found all over river banks. The coastal inland soil has a stretch of land with coconut plantation. These soils are acidic, sandy or loamy, rich in organic matter but deficient in phosphate and potash. The Saline and Marshy soils are very less of importance; at a very few places these soils are used for Salt Panes (Fig. 1.5).

• Climate:

As a region belongs to tropical area and due to its location and physical structure the land has tropical maritime and monsoon type of climate. The climate is pleasant and warm through out the year. Monsoon winds touch Goa in first week of June and it receives an average rainfall of 400 cms near the ghats, whereas temperature declines rapidly from foothills of Sahyadris towards the summit. Temperature varies from 20°C to 32°C. May is the hottest month with about 30°C and January the coolest with mean daily temperature about 20°C. The average temperature being 26°C keeps the climate cool and pleasant. Due to the proximity of the sea it has a direct influence in the humidity of the region. The maximum humidity is about 90% during monsoon and the relative humidity is about 60%, even in summer. Winds in the morning are easterly to north-easterly during October to April, and north or north-east in May; while in the afternoon, they tend towards west or north-west due to the sea breeze effect. Winds are generally strong during monsoon.
DEMOGRAPHIC CHARACTERISTICS:

The pattern of population distribution in a region is generally controlled by the natural, economic and the historical factors. The influence of these factors individually or in combination, disturbs the uniformity of population distribution over a landscape. One cannot deny the fact that the distribution of population is dynamic in nature and its cause and effect varies from space and time. As far as the study region is concerned, it has recorded an enormous growth in its residential population during last four decades, and large movement of labour force getting attracted for the employment in the public and private sector soon after the declaration as an independent state. The population as recorded in 2001 census was put at 1343998 persons with male constituting 685617 and females 658381 that being the ratio of 51.02: 48.98 respectively.

• Population Growth:

The Decennial growth of population in study area is 14.89% and is quite near to national average, which is recorded as 21.43%. Out of the total population of the country about 0.13% is living in the state of Goa. During last 60 years the population in the state has increased from 795120 (1971) to 1343998 (2001). The study region experienced a tremendous growth which is largely due to increasing employment opportunities and economic activity like tourism, mining and fisheries. The physico-cultural traditions, high literacy rates and high standard of living attracts lots of migrants and is a main factor responsible for such a growth rate. After the liberation of the state in 1961,
there was an inception of commercialized activities and industrial establishments which provided better opportunities for employment as well as economic gains. Thus the population pressure was in the study region was in the state of continuous increase. (Table. 1.1)

Table-1.1

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Population</th>
<th>Decadal growth in percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>795120</td>
<td>34.77</td>
</tr>
<tr>
<td>1981</td>
<td>1007749</td>
<td>26.74</td>
</tr>
<tr>
<td>1991</td>
<td>1169793</td>
<td>16.08</td>
</tr>
<tr>
<td>2001</td>
<td>1343998</td>
<td>14.89</td>
</tr>
</tbody>
</table>


- Distribution of Population:

The distribution of population in the study area is controlled by physical conditions. In some areas the distribution is highly governed by the availability of economic resources in the region. The homogeneity of the population distribution is disturbed by the uneven topographical features.

The study area accounts for about 0.13 percent of the country's total population and is distributed in 11 talukas in the study region. The highly populated talukas are Salcete (19.32%) followed Bardez (16.89%) which lie along the coasts. Moderate distribution is found in Tiswadi (11.86%) and Ponda (11.13%). The low amount of population is found in the talukas such as Bicholim (6.75%), Quepem (5.50%), Pernem (5.35%), Sanguem (4.77%), Sattari...
(4.36%) and Canacona (3.26%), which are parts of midland and highlands of the study area.

- **Literacy Pattern**:

  Education is an essential element for development of a region by which one can understand the potential of human resource of any region. The census of India considers a person as a literate if he or she can read and write with understanding in any language. Literacy is a very important demographic aspect which is having a high relation towards people's awareness and development of areas. Literacy also has a very close co-relation with urbanization and poverty. The proportion of literates towards total population is recorded as 82.32% (2001) with males 88.88% and females 75.51%. The high amount of literacy is recorded in Bardez (86.49%) followed by Tiswadi (85.27%) and Murmagao (82.57%). The lowest percentage of literates is found in relatively backward talukas of Sanguem (75.25%) and Canacona (67.70%). The states literacy figures are quite appreciable when compared to other neighbouring states.

- **Density of Population**:

  The total number of people rendering in an unit area is referred as the density of that area. In other words it is the population pressure, per unit area. The census of 2001 confirms the states total density of population as 363.04 per sq km and the highest is recorded in Murmagao (1327), the lowest density is found in Sanguem (73) whereas the moderate density is recorded in Tiswadi (746), Ponda (511) and Bicholim (380).
ECONOMIC CHARACTERS

Agriculture is one of the important economic activities of the people in the study area. About 24% of the main workers and majority of the marginal workers are engaged in the agricultural sector. Prior to the liberation, agriculture was almost neglected and no systematic and planned efforts were made by erstwhile Portuguese regime. It was only after liberation (1961) the remarkable achievements have been made by adopting various measures such as high yielding variety of seeds, fertilizers, scientific methods of cultivation etc. so as to boost agricultural production. Due to physio-graphic and agro-climatic factor; the study area grows variety of crops during Kharif and Rabi seasons, out of which rice is the most predominant crop and forms the main staple food of the people in the region. Around 23.93% of total cropped area is under the rice cultivation. The prevailing important crops are cashewnut and coconut covering an area of 31.38% and 14.60% respectively of the total cropped land. Some other important crops raised in the study region are ragi, maize, pulses, fruits like mango and banana, and other like oil palm, arecanut and pepper. (Fig. 1.6)
• **Industrial Development:**

Before liberation, the study area had only about fifty small scale manufacturing units consisting of fruits and fish canning, a match factory and few laundry soap making units. Most of the consumer needs of the local population were met by imports rather than local production. Lack of adequate infrastructural facilities such as electric power, portable water, transport and communication etc. were instrumental for a low profile of industrial development during erstwhile Portuguese regime. The planned industrial development was adopted only after liberation and thus encouraged the entrepreneurs to set up large scale industrial units. In 1962 bulk supply of power was taken from neighboring states like Maharashtra and Karnataka from Korba and Ramagundam projects of the National Thermal Power Corporation, from their western, southern and national grids. Since then the industrial development in the study area experienced a appreciable boost

Due to various locational advantages of the region large number of industrialists and entrepreneur were attracted to the state. The industrial setups in the study region can be classified into:

a. Mining based industries.

b. Large and small industrial units.

c. Small scale industries.

d. Household industries.
a. Mineral Based Industries:

Mining of iron and manganese ores are the most important industrial units in the state. The initial mining was started by few Germans and French companies in 1905, but was eventually put to an end the First world war. The same was resumed in 1947 and the export of these ores began in the same year itself. The extraction of minerals and export are highly practiced because of liberal policy of granting mining concessions and low rate of tax by the state government. Not only on export of minerals but the nominal duties are also implemented on import of mining machinery and other equipments. One of the important features of mining in the region is; it is wholly dominated by private companies, where such mining is a states monopoly in other states. The extracted ore from the interiors of the state is loaded into the barges which carry them in turn to by the river route upto the port at Murmagaon for export. The industrial mining has played a very important role in the socio-economic development of the state, but necessarily at the cost of fragile ecology of the region.

b. Large and Medium Industrial Units:

Large industrial setups manufacturing a wide range of goods, like chemicals, medicines and fertilizers have been coming up in the study area; which is attractively more after the merger of the study area with the nation. There are around 70 units registered in 1995-96 and are functional. The important setups are Zuari Agro Chemicals ltd. (Murmagaon), Syngenta (Tiswadi and Salcete). The Brewaries and Distilleries (Murmagaon). The
multinational pharmaceuticals companies like E-Merck, German Remedies, Blue-cross, Indoco-Remedies and Cipla.

The Metallurgical industries are Goa Shipyard Ship and Speedboats, Titan quartz are the accountable ones. There are considerably numbers of medium scale units producing variety of goods like fishing vessels, ships and barges, tyres and tubes, lenses washing machines etc. It is estimated that the total amount invested in these industrial units are 437 crores of rupees (1996-97) and provides employment to about 24160 in all categories.

c. Small Scale Industries:

These industries have comparatively low investment i.e., about 122 crores of rupees and employ around 33,666 crores persons, with the total number of units of 5430. They are devoted to manufactures goods like, soaps canned products, wooden furniture, confectionary, paints, perfumes, glass, copper, brass, aluminium, steel products, shoes etc. These industrial units are spread in almost all the talukas in the study region.

d. Household Industrial Units:

They are scattered all over the state with specialized products, like Cane furniture and wooden varieties with artistic carvings etc. have been specialized operations for generation of artisans. Wood-crafted articles of attractive shapes and sizes hanging from toys, cradles swings walkies and many such items have been created in the traditional occupation of high expertise. Similarly pottery works have been encouraged in Bicholim taluka. Dyeing and printing
has also been practiced on smaller scale in some talukas. The Goa handicrafts, Rural and Small-scale Industries Development Corporation was set up for encouraging rural and small scale units in the study area.

• Tourism:

The fact that the tourism is an important activity in the state can be traced back to 1960s. Goa has a right blend of history, culture and sun to attract the tourist of the west, which effectively put it on the tourist map of the world. Tourism holds as one of the important economic activity in the state. A large number of tourists are attracted by the natural beauty of the study area and its unique culture and heritage of its lifestyle. The land with silvery beaches, bordered by coconut grooves, swinging winds and waves, vast verdant lands, a fine network of rivers, a salubrious climate, amenable people and the delicious cuisine, attracts both domestic and international tourists. Most of tourists and tourism activities are concentrated in the western flank of the state which forms a part of coastland. The contribution by the domestic tourist to the state economy is 78%, whereas the contribution of foreign tourist is around 22%. The authentic figures in respect to the amount spent by the tourist visiting the study area are not available, however an article published recently puts the figure at 600 Rs. per day in case of domestic tourists and 1800 Rs. in case of foreign tourists. It has been noticed that there has been considerable growth in the arrival of tourists and simultaneously increase in the revenue for the state (Table-1.2). Hence this activity is considered as the back bone of the coastal economy in the study region. Besides generating for
the state, the industry has generated a lot of employment opportunities for the people, hospitality agencies like hotels, travel agencies, casinos, etc. Presently the study area has 1025 star category hotels and 1698 boarding houses.

Table -1.2

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic (%)</th>
<th>Foreign (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>878487 (79.30)</td>
<td>229218 (20.70)</td>
<td>1107715</td>
</tr>
<tr>
<td>1996</td>
<td>888914 (78.93)</td>
<td>237216 (21.07)</td>
<td>1126130</td>
</tr>
<tr>
<td>1997</td>
<td>928925 (78.02)</td>
<td>261673 (21.98)</td>
<td>1190598</td>
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<tr>
<td>1998</td>
<td>953212 (77.60)</td>
<td>275047 (22.40)</td>
<td>1228259</td>
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<tr>
<td>1999</td>
<td>960114 (77.15)</td>
<td>284298 (22.85)</td>
<td>1244412</td>
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<tr>
<td>2000</td>
<td>976804 (77.00)</td>
<td>291709 (23.00)</td>
<td>1268513</td>
</tr>
<tr>
<td>2001</td>
<td>1120242 (81.15)</td>
<td>260071 (18.85)</td>
<td>1380313</td>
</tr>
<tr>
<td>2002</td>
<td>1325296 (82.98)</td>
<td>271645 (17.02)</td>
<td>1596941</td>
</tr>
<tr>
<td>2003</td>
<td>1725140 (84.58)</td>
<td>314357 (15.42)</td>
<td>2039497</td>
</tr>
</tbody>
</table>

Source: Department of Tourism, Panaji-Goa, 2003.

- **Fisheries:**

  Fish is another economic resource of this area, which forms an important compliment to its staple food. The consumption of fish is quite high as it forms a part of daily diet of the region. The study area has a continuous coastline of about 105 kms and an inland waterway of about 250 kms. In addition to this there are many tanks and reservoirs of water. The study region is endowed with rich riverine and marine fishing potential. Like agriculture, fishing is also one of the oldest occupations in this area. The
Institute of Oceanography has assumed the potential as 70,000 tones per year and is only restricted to 6 kms from coastline. Both demersal and pelagic fish is caught in this region. The highly productive fishing grounds in the sea extend to about 30-40 fathoms in depth and cover approximately an area of 500 sq mts. Nearly half of the fish caught is consumed fresh and rest is cured, and a small amount is converted as a fish meal and fish manure. It is only after liberation the planned development of fishing industry was initiated with the aid technology. Prior to this it was carried with non mechanized fishing crafts. Fishing is practiced in almost all the villages in the coastal talukas. The total catch in the state increased from 39980 tonnes in 1971 to 67236 tonnes in 1998. The Government has provided necessary fishing infrastructure such as jetties, ramps, approach roads, cold storage complexes, ice factories, fish drying platforms etc. The important varieties of fish caught in the study region are Mackerels, Sardines, Catfish, Shark, Prawns etc. (Table-1.3).

Table -1.3

Goa
Variety of Fish Caught in (2001)

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Variety of fish</th>
<th>Quantity in tonnes</th>
<th>Volume in lakhs (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mackerel</td>
<td>16589</td>
<td>3650</td>
</tr>
<tr>
<td>2</td>
<td>Sardines</td>
<td>19836</td>
<td>3157</td>
</tr>
<tr>
<td>3</td>
<td>Catfish</td>
<td>676</td>
<td>115</td>
</tr>
<tr>
<td>4</td>
<td>Shark fish</td>
<td>981</td>
<td>422</td>
</tr>
<tr>
<td>5</td>
<td>Seer fish</td>
<td>1398</td>
<td>657</td>
</tr>
<tr>
<td>6</td>
<td>Prawns</td>
<td>2284</td>
<td>2566</td>
</tr>
<tr>
<td>7</td>
<td>Pomfrets</td>
<td>681</td>
<td>552</td>
</tr>
<tr>
<td>8</td>
<td>Others</td>
<td>221118</td>
<td>3320</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>64563</strong></td>
<td><strong>14439</strong></td>
</tr>
</tbody>
</table>

• Minerals:

The study area is endowed with abundant mineral resources. These minerals are mainly concentrated in the hilly tracts of Western Ghats, in the form of iron ore, manganese, bauxite limestone. Iron ore deposits are confined to the Pink phyllite stretch, spread over a length of 95 kms. In South Goa these deposits are traced on Villiena in the east to Rivona in the west. Some narrow strips are also found near Betul towards the coast of Shiroda in the midland. The concentration of iron ore decreases as one move from north to south and simultaneously the ores of manganese increases instead in that direction. The iron ore deposits are mainly of hematite and partly of magnetite, limonite and goethite. The iron ore found in the study area is of stratified formation having a general stratigraphic sequence. They occur as repeated folded bonds. Toward upwards the ore has been laterized to very extent according to their proximity to the surface.

Manganese ore are of lateritoid type formed either at, or near the surface above ground water level by weathering and residual concentration by secondary processes. These ores are found enveloped by Laterite, with concentration of black iron and manganese ores. The quality deposits are traced towards south of the state at an altitude of 363 mts above mean sea level, with a very few in the central and northern part of the state. Around 16,456 tonnes of ore was extracted and exported in the year 1999-2000.

Bauxite deposits of Goa are the product of residual chemical weathering of two varieties of rocks like, Deccan traps and metabasalt and phyllites. These
ores are best preserved in the central part of the folds. The Geological Survey of India has prospected the zones which are spread over an area of 130 sq kms along the western coast. These regions are Polem- Galgibag area, Cavelossim-Raia and Betim- Porvorim region of Canacona, Salcete and Bardez talukas respectively. Around 37,000 tonnes of ores was mined in 1998-99 in the study area. (Fig. 1.7)

• Transport and Communication:

Transport sector plays a vital role in the economy of Goa, directly influencing mining, industry, constructions, trade and commerce, tourism and other services and controlled by the physiography of the study region.

The state has a fairly well developed network of transport and communication. It is well served by railways, roadways, inland waterways and airways as well as post and telegraph services, telephone, telex etc.

a. Roadways:

The roads in the study region are well integrated and connected with the neighboring states. The total length of the road network in the state is recorded as 9275.53 kms as on March 2001. There are two National highways namely, NH-17, which links Panaji with Karwar and NH-4A connecting Panaji with Belgaum. The state highways have an aggregate length of 232 kms and the district roads of about 815 kms. Besides these other village and taluka roads account to about 1868 kms. With the objective of providing safe, regular, reliable and comfortable road transport to the traveling public aid to connect interior remote villages with urban centers, the Kadamba Transport Corporation (KTC) is put to function in October 1980. Besides almost all the routes in Goa are managed by Private bus owners association.
b. Railways:

The state also has an advantage of connecting other states with railway line. Two zones of rail are functional in the state namely, Konkan Railway Corporation and South Western Railway.

Konkan railway track moves from north to south, running parallel to the coast of the state. Some of the important rail junctions in Konkan railway are Tivim, Karmali, Verna and Margao. South western railway line runs from west to east direction, from the central part of the study area. This is the oldest railway line connecting the study area with the states of Karnataka and Andhra Pradesh. Some important railway stations are Vasco, Curchorem and Colem there was only 6.76 kms of railway line for every one lakh population of Goa, before the introduction of Konkan railway. With the inception of Konkan railway track in 1995 the rail network increased to 19.59 kms in 2001.

c. Waterways:

Goa is connected to Mumbai by a sea route as well, for passenger traffic as well as with other parts of India and the world for cargo trade through its excellent natural harbour of Murmagao. There are number of navigable rivers in the interior of the study region like Zuari, Mandovi, Talpona and Colvale which ultimately connect the port of Murmagao. All these inland waterways are heavily navigable for carrying minerals from interior to the port. The total inland waterway is of about 555 kms of which 256 kms are navigable through the rivers of Mandovi and Zuari. There are 19 routes on which regular ferry are operational.
d. Airways:

Goa has an international airport at Dabolim (Murmagao taluka). Air links from the study region are available through all the leading countries, linking important cities in the country like, Delhi, Mumbai, Hyderabad, and Pune; as well as international destinations.