Chapter 6 Conclusions

The three coastal talukas of Bharuch district Jambusar, Vagra (including Aliabet) and Hansot showed substantial changes over the past 37 years. The findings of the present study provide baseline information on coastal vegetation, land use land cover changes and the characteristic of coastal sediments of the area. The conclusions that can be derived from this study have been enumerated below.

1. A major increase in mangrove cover of the district is indicated. This fact is also collaborated by the State Forest reports by FSI over the past few years. Gujarat stands second in the mangrove cover after West Bengal. In Gujarat, Bharuch stands third in the area covered by mangrove after Kachchh and Jamnagar district. The mangrove cover of Gujarat has been continuously increasing and Bahruch district has played an important role in it.
2. The overall increase in mangrove of the district masks the change dynamics observed within different parts of the district. The change detection results have shown that at several places degradation as well as destruction of mangrove has also occurred. This was on account of natural as well as anthropogenic causes. Natural causes involved mostly changes in the course of rivers and erosion. Such changes were observed to the south of Jambusar (along the coast of Nada, Asarsa and Islampor) and to the west of Vagra talukas (between Gandhar and Gajadra). Anthropogenic factors included cutting of mangrove for fodder and fuel as well as their reclamation for other activites. Such changes were observed at several locations in Hansot and Vagra taluka. Such changes also highlight the need to provide some protection to the mangroves of the district. Though mangrove areas have protection under the CRZ act, the lack of any additional protection has led to their destruction. This makes a strong case for providing these mangroves a 'protected area' status.
3. Mangrove phytosociological studies, the complexity index values and change detection studies indicate that the mangroves of the study area mostly comprise of young stands. Kanthiajal in Hansot taluka has the most mature mangrove stand in the district. The low values of the complexity index also indicate anthropogenic influence on them.
4. 110 species belonging to 88 genera and 37 families are being reported from the study area. They included one species of true mangrove, five species of mangrove

associates, seven species of salt marsh, three species of sand strand vegetation and ninety four species of land adjoining plants within 500 m area of high tide line. Several plants such as *Boerhavia plumbaginea*, *Bolboschoenus maritimus*, *Cenchrus ciliaris*, *Nothosaerva brachiata*, *Tamarix aphylla* and *Tricholepis glaberrima* are first records for the coastal areas of Bharuch district. Sorenson's similarity index indicates that the vegetation of Jambusar is quite distinct while that of Hansot and Vagra talukas have a higher among them. Several rare, endemic and indigenous plants like *Bergia suffruticosa* and *Tricholepis glaberrima* are observed in the area and efforts should be made to conserve them.

5. Major changes have occurred in the land use land cover of Jambusar, Vagra, Aliabet and Hansot over the study period. There has been substantial industrial development in all the three talukas in which areas occupied by coastal wetlands, scrub, barren land and agricultural land have been converted. This industrialization has been the major driver of changes seen in all the three talukas. All the three talukas have also seen a sustained decrease in area under agriculture.
6. Large scale industrialization has occurred in the costal wetland area of all the three talukas. While saltpans have developed in all the talukas under the study area, it is to the north of the Narmada River i.e. in Vagra and Jambusar talukas where their maximum development has occurred and they now occupy the largest area among all coastal industries. In Hansot, which lies to the south of Narmda River, aquaculture has emereged as the major industry and now occupies the largest area.
7. A huge disparity is seen in the development of land based industries among the three talukas under study. The major land based industries that developed in Jambusar taluka were brick kilns and oil wells. In addition to this there has been little industrialization except the development of a SEZ near Sarod and few industries between Piludra and Wedach. In Hansot taluka the land based industries were restricted to brick kilns, sugar factory near Pandvai, oil wells near Digas and chemical based industries near Kharach, near the south eastern part of the taluka. On the other hand Vagra has seen large scale industrial development in the past few decades.
8. The presence of oil and natural gas in Vagra taluka has made Gandhar and its adjoining region the major oil producing region in the Cambay basin. This has led to the development of a large number of oil wells in the taluka. On account of its

strategic location Vagra has also witnessed the development of port based industries, allotment of a few SEZs and development of the Petroleum, chemical, petro-chemical industrial region (PCPIR). The passing of the Delhi Mumbai Industrial Corridor (DMIC) in the vicinity has provided a further impetus to the industrialization of area.

9. With industrialization major improvement in infrastructure in the transport, health and education sectors has occurred in the area. This has pushed the literacy rate of the district to 83.03% and ranked the district at 8th position in the state.
10. A major improvement in the canal network in all the three talukas under study has been observed. While Hansot had the presence of major canals since a long time, the development of minor canals would lead to more efficient distribution of water and give a further boost to agricultural productivity. In Vagra taluka major developments in the canal network have helped both agricultural and industrial growth. The largest impact of canal growth would however be in Jambusar which has a comparatively arid climate and high amount of salinity in the ground water. Not only would this lead to better agriculture it would even provide an impetus for the development of industries. A proper maintenance of this canal network would however be required to sustain the growth in all the three talukas.
11. The analysis of the coastal sediments showed the presence of finer texture of the sediments collected from mangroves as well as salt marsh vegetation compared to open areas. This substantiates the fact that not only mangroves but salt marsh vegetation also helps in the trapping of sediments.
12. The coarser texture and negative skewness (strongly coarse-skewed) nature of sediments collected from Devla 2, Lakhigam1, Ambheta, Kaladara and Kanthiajal indicated the high energy condition prevailing at the sites. This strongly correlates with the high rates of erosion observed at all the above locations.
13. The analysis of organic carbon of mangrove and salt marsh vegetated soils indicate that there is little variation in organic carbon content in the sediments of the two vegetation types. This could be due to the young age of mangrove stands. However, this also indicates the important role played by salt marsh in carbon sequestration and storage.
14. The northern coast of Jambusar was lined by high cliffs and the height of the cliff decreased as we moved to the south. The mudflats north of Narmada River were much wider compared to its southern part. The southern part of Narmada was also

characterized by the presence of sandy ridges. The analysis of coastal sediments as well as geomorphology of the area indicates that fluvial processes were dominant in the north while coastal processes dominated the southern part of the study area.

15. Severe erosion has been observed at several locations. This has led to the loss of important economic installations like oil wells, roads and industrial areas at several locations in Vagra taluka and a few locations in Jambusar taluka. This along with information on the inundation scenario due to predicted sea level rise raises questions on sustainability of industrial development along the coast of Vagra.
16. The decrease in the rate of erosion to the south of Motimor bet after the introduction of mangroves highlight the role played by mangrove vegetation in protection of coastal features – a bioshield.