4. Study area

Kakinada (long. 82°14' - 82° 22' E and lat. 16°5' -17°05') is situated on the east coast of India, about 160 km southwest of Visakhapatnam. It has an average elevation of 2 metres (6 ft) from mean sea level. The city has a rough north-south orientation in a long, narrow strip parallel to the coast. The 10 m depth contour is observed at 0.2 to 1.2 km, 20 m contour at 6 to 8 km, 30m contour at 15 km, 50, 100 and 200 m depth contours are 22, 32 and 45 km from the shore. It is the main receptacle for the river run into the Godavari estuarine system. The total area of the bay is 132 km$^2$, which contribute two major distributors of the river Godavari which are Coringa and Gaderu open into the Kakinada bay. Other small channels viz., Chollangi, Mattlapalem and Pillavarava also open into the bay on the southwestern and south -eastern corners, respectively. The discharge data of Godavari estuary for a 16-year period from 1988 to 2003 recorded at the Dowlaismaram barrage (about 10 km downstream of the delta apex) had shown that out of the total average discharge of 96.5 km$^3$ yr$^{-1}$, about 64.6 km$^3$ yr$^{-1}$ (67%) was through Gautami distributary, while 31.9 km$^3$ yr$^{-1}$ (33%) flowed through Vasishta branch. River Godvari transports considerable quantity of sediments to the sea, which nourish the sandy beaches in the vicinity. The continental shelf off Kakinada is dominantly silt till 1.8 m depth of 9.4 m. The Seafloor upto a distance of 3km is sand, from 3-20 km it is covered with clay and up to 20-30 km it is covered with shells the outermost zone consists of clay, fine sand and shell fragments (Reddy and Mohan Rao, 1996). The geomorphology of the Kakinada coast consists of mudflats, mangrove swamps, sandy beach and sandy Island. On the western side is the mainland, formed of deltatic and flood plains. The coastal strip north of Kakinada consists of windblown sand and sand dunes which are
succeeded landward by laterites, sand stones and Khondalities. The lowest part of the delta is made of a series of sand ridges interpreted to be ancient beach ridge forms, due to high waves and detrital materials brought by the river from its drainage basin. On the eastern side of the bay, there is a long narrow sand bar continuous with the eastern tip of the Hope Island separating the bay from the sea. Due to the presence of the sand bar, the Kakinada bay forms a semi-enclosed body of water where the water movements are unique. An industrial belt, running north-south the length of the city, separates the eastern part of the coast. Kakinada is bordered on the southeast by Kakinada Bay and a marshy wetland to India's second largest mangrove forest and the Coringa Wildlife Sanctuary. Kakinada has a tropical savanna climate with hot, humid weather, with maximum temperatures around 38–42 °C (100–108 °F) and a minimum of 18–20 °C (64–68 °F). The city gets most of its seasonal rainfall from the southwest monsoon, although considerable rain also falls during the northeast monsoon (from mid-October to mid-December). The tides in this region are characterized as predominantly semi-diurnal. Based on the Kakinada port tidal data for the year 2000 the spring tidal range was about 1.34 m and the neap tidal range was about 0.53 m. Cyclones in the Bay of Bengal frequently strike the city. The city's average annual rainfall is 110–115 centimeters (43–45 in). Hope Island, about 5 kilometers (3.1 mi) from the coast, makes Kakinada Port a natural harbour. It has two ports: an anchorage port and a deep-water port. Kakinada's deep-water port is the second-largest in the state (after Visakhapatnam port) and the first in the country built in a public-private partnership, in 1996. It is operated by Kakinada Seaports. Before the deep-water port was built, the anchorage port was the largest of India's 40 minor ports. Uppada
beach is primarily considered as Kakinada beach which has one of the longest coastlines in Indian beaches.

A comparison of the 1965 and 2001 satellite images had shown that the shoreline had retreated as much as 500 m in 35 years. The overall shore zone morphology indicates a divergence in the Longshore drift between the Gautami and Vainateyam mouths. Presumably, the material eroded here is drifting toward the northeast and southwest and deposited on the updrift sides of Gautami and Vainateyam/Vasishta, respectively. In turn, the material eroded from the downdrift side of the Gautami mouth contributes to the accretion on the updrift side of Nilarevu and the sand eroded from the downdrift side of Nilarevu mouth is moved toward the Kakinada spit. Nageswara Rao (2004) estimated a net loss of 1836 ha of land during the past three decades due to erosion along 106 km stretch out of the total 160 km long Godavari delta shoreline.
Figure 4.1 Study area and Sampling locations for Kakinada coast