M.S.117. SUNDARESAN PILLAI, J.–Studies on siltation in Cochin Harbour–dynamics of suspensate–1989–Dr. P.N. Krishnan Nambisan.

Cochin harbour is situated on the southwest coast of Indian peninsula at 9° 58' N and 76° 14'E.

Cochin estuary provides safe anchorage even during the roughest monsoon months. Its location on the southwest coast of India makes it an easily accessible port on the sea routes from Europe and Middle East to Japan, Far East and Australia. The Cochin harbour in its pressent form was developed by Sri. Robert Bistow and was declared as a major Port in 1936. The harbour has an approach channel of 7.8 km long and 200 m wide and two inner channels viz. Mattancherry Channel 5 km long and 225 m wide and Ernakulam channel 6 km long and 225 m wide. The port has twelve berths on Willingdon Island of which nine are wharf type. The two tanker berths in the Ernakulam channel are connected to the mainland. An inshoreoil-terminal has been commissioned recently.

Geographically, the location of this harbour serves in a significant way to the betterment of country's economy; however, the port operations are restricted in a number of ways. Siltation one among them, has been a menace eversince the construction of this harbour. The thesis encomprises the results of an investigation conducted on the problems of siltation in this labour. The dynamics of the suspended material in the navigational channels ofthe Cochin estuary is highlighted in the study.

To circumvent the problem of siltation in navigational channels, continuous dredging at considerable cost is being carried out. The approach channel is being dredged once every year to a depth of 12.8 m. This channel silts to a depth of 9.75 m per annum. Of the inner channels, the Mattancherry channel is maintained to a depth of 9.75 m and Ernakulam channel 11.6 m. The annual maintenance dredging in the approach channel is about 1.54 Mm^3 and in the inner channel 0.7 Mm^3. The cost of maintenance in dreiging incurred by the Port works out to be Rs. 862.80 lakhs per year (1984-86). Thus the cost involved in dredging operations is an enormous amount, a financial commitment recurring annually and constanly increasing too.

Dredging was once conceived as the final solution to siltation problems. However in recent years, better innovative techniques have been evolved in the Science of harbour engineering. Any form of advancement in the new technological directions necessitates the scientifically gathered data of the system. The research work reported in this thesis provides valuable environmental data on the siltation aspects of the Cochin estuary. Based on the information from environmental data collected, a comprehensive analysis has been made on the dynamics of suspended solids transport, depositional behaviour and ultimate transfer to open sea. The role of estuarine dynamics controlled by river discharge and tidal currents have also been critically examined taking into account the influx of alluvial particulates.

The thesis is presented in six chapters. Chapter I presents a short history on the development of the Port, present facilities and perspectives and introduces the problems of siltation, behaviour of suspensate in the estuarine environement and the scope of the present studies.

The Chapter II details the materials and methods adopted in this study.

The Chapter III deals with the hydrography of the Cochin harbour area and its estuarine environment. Monthly data on temperature and salinity collected from Mattancherry channel, Ernakulam channel and Approach channel are presented in figures, tables and discussed. Time series tidal variations of these parameters on a spring and neap day were worked out at 5 (five) stations. The freshwater fraction in each of these channels were calculated and the dilution of seawater studied seasonally.

The Chapter IV on estuarine dynamics report the results on the studies of water currents measured from fifteen stations in the harbour area. The longitudinal and vertical variations in the speed and direction of estuarine currents caused by the interaction of tides and river discharges have been closely observed. Current variations in the three channels have been discussed separately and supplemented with data on tides, wind speed and direction and river discharges. Current measurements were also made during springtide and neaptide cycles and the temporal and spatial variations included in this chapter.

The temporal and spatial variations of the amount of suspensate and texture of bottom sediments are presented in Chapter V. The dynamics of the suspended material are clearly presented. Surface sediment samples alone subjected to sieve and pipette analysis and sand, silt and clay fractions are plotted on equilateral triangular diagrams. The analysis of results follow the extent of tidal influence on suspended solids distribution and discusses the nature of sedimentation in these coastal waters. The role of estuarine dynamics in modifying the harbour physiography is presented in detail.

Chapter VI summaries the results of the study; suggestions for further investigations are also made and recomends remedial measures. Annexure I provides a detailed account on the dredging operations conducted in Cochin harbour compiled from the bathymetry charts of the Port.