

WATER QUALITY AND SPATIAL DISTRIBUTION OF POLLUTANT SOURCES OF LARGE WATER BODIES & EVALUATION OF PERFORMED MITIGATION PROGRAMMES

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Since time immemorial, estuaries are serving as spawning and nursery grounds for many important species of fish and shellfish. Fishing in the shallow water is often the only source of livelihood to a vast majority of low - income group families along coast. Man's cultural activities are transforming the life supporting estuaries into conduits for toxic pollutants and nutrients to pass into productive coastal water. In this research paper, a detailed study is carried out on a concept called as "WITH RIVERS TO THE SEA" with a special reference to bewildering variety of environmental stresses. It is called the concept as "WITH RIVERS TO THE SEA" because the river namely, Gautami - Godavari, Andhra Pradesh, India starting from Rajahmundry to the Bay of Bengal (Sea) has been undergoing environmental stresses like industrial effluents, agricultural waste discharges, domestic sewages and possible oil spills associated with world's maritime transport. It, is therefore, important to understand and be able to model the esturine processes underlying the dispersal of pollutants floating on the surface as well as those suspended or dissolved in the water column. As many as 30 industries in West and East Godavari districts of Andhra Pradesh, India are identified by Andhra Pradesh State Pollution Control Board, as units which are causing water pollution in Godavari river to a significant degree. Among them, Andhra Sugars, Tanuku; NSF Ltd., Chagallu; Rama Distillery, Jangareddygudem, Indira Distillery, Paidiparru; NCN estates Pvt. Ltd., Chinnabrahmadevaram; Kirlampudi Sugars, Pithapuram and Deccan Sugars, Samarlakota top the list. The pollution control board has stipulated that certain measures be taken to cut down water pollution.(Sai Sastry et.al.,1990) The board has prescribed that a large number of these industries could process the waste water to generate the methane gas at the preliminary stage itself so that the gas could be used in their boilers. Each industry will have to spend an amount of Rs. 1 - 1.75 crores if it went in for this method of waste recycling. The board has also advised that certain industries might adopt a less expensive procedure of treating the liquid effluents by chemical neutralisation, dilution and aeration before they are discharged into the river.

The core theme of the present research work is a compact, yet comprehensive water quality modelling for predicting four water quality parameters in a typical Indian estuarine environment namely, Gautami - Godavari River - Estuary using satellite data. Regression models for salinity, chlorophyll (a), turbidity and total suspended solids are developed by combining the IRS-IB LISS-IIA multiband radiance values with concurrent ground data from boats in the study area which encompasses the Gautami-Godavari river, its estuary, the near shore area and an adjacent intrusive bay. The formulation of these four models are based on data collected and precessed from 52 out of a total number of 74 sample sites. When subjected to multi-variate statistical test of significance, the models have all yeilded extremely satisfactory values of R², F, root mean square error and residual ranges. These models are applied to the remaining 22 sample sites which have not been used in the model development, so as to validate the models and to evaluate their predictive capacity. The validated models are then applied to the entire study area for preparing a composite colour coded map for all the four water quality parameters and four complementary black and white cartographic maps.

An attempt is made in the present paper to develop a water model of this body of water using remote sensing satellite digital data for the following reasons: (1) Godavari the parent river, is the most productive river from the view point of its potential for food production. It bisects the "rice bowl" of the nation. (2) Godavari is the largest river of Andhra Pradesh. It is the state's life line. It provides irrigation water to large areas and is also a source of drinking water for many townships in East and West Godavari districts. (3) The river and the bay are often visited by cyclones and are consequently invaded by saline water intrusion. (4) The river is the major carrier of nutrients, sediments and toxic contaminants because its drainage area is densely packed with urban settlements, industries and dairy agriculture. (5) Due to polluted nature of the river plume, a thorough examination of its transport and dispersal characteristics is essential in view of its significant effect on the biological life of the bay area. The results of this study includes tables showing water quality of the river and evaluation performed mitigation programs. The maps showing that spatial distribution of water quality parameters in the study area and the pollutant sources of this river from Rajahmundry to Bay of Bengal (Sea).

In accordance with the general expectation of increasing trend of salinity in an estuary in seaward direction, the salinity is least in the upstream reaches of the river and is maximum in the estuary. Clusters of very high salinity in the mouth of the river are attributable to large scale salt harvesting being done in the adjoining lands. (Anji Reddy.M., 1993) The concentration of chlorophyll(a) is found to be greater along strips of water hugging the entire coast of Kakinada bay and both the banks of the river, than other parts of the water body. Zones of densely packed chlorophyll(a) are related to locations where domestic, industrial and agricultural effluent water is discharged into the river and bay. Elevated levels of turbidity and total suspended solids (TSS) are found in off shore areas and in the core area of Kakinada bay. The levels of turbidity and TSS in the river are relatively lower, bearing a few pockets of highly turbid water or water with heavy TSS content. These pockets are associated with points of waste water inflow from human settlements.

The study carried out in this paper revealed that: a) Rapid and frequent monitoring of selected water quality parameters so as to initiate timely remedial steps. b) Recommendation for an integrated and sustained growth and development of adjoining habitats. c) The Andhra paper mills, one of the largest industrial complexes in East Godavari district is behaving in an environmentally mature manner. It is treating its effluent water in large open ponds at Venkatapur village and letting it into Godavari only after ensuring that it is of optimum quality standard. About 80 percent of the present population load in Gautami - Godavari is attributable to municipal waste discharge. The Nalla channel which is a large sewage drain is joining the river at Anyapuram. The Government is planning the construction of a separate channel to catch this water directly to the sea. (Masters, G.M. 1974)

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