

STRATEGIES FOR WATER RESOURCES MANAGEMENT IN THE COASTAL ZONES OF GOA

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Abstract

In the paper the necessity of coastal water resource management in the light of the likely implementation of the Coastal Regulatory Zone Act has been discussed. The various strategies that must be included in studies related to coastal water are discussed. Brief reference to Goa coastal water resources problems has been made.

Introduction

India has been blessed with a vast stretch of coastline. Major urban centres of the country are located on this coastal tract apart from thousands of villages and industrial settlements. Coastal aquifers contain much needed fresh water resources. Their study, conservation and proper exploitation must take into account the presence of sea water and the mixture of fresh ground water and sea water. It has been widely recognised that existing technologies are inadequate for the proper utilisation and management of fresh water aquifers in a saline environment. These coastal aquifer fresh water resources are likely to experience disastrous and irreversible impacts in the time to come due to overexploitation and sea level rises. Ground water withdrawals in excess of safe yields, and reduced recharges to ground due to rapidly changing land use pattern along the coasts have increased the incidences of sea water intrusions into the coastal aquifers. The manifestations of sea water intrusions in the form of salt water in the coastal wells, formation of saline soils along the coast have been wide spread both in the East and West coasts of India. There are 56 districts of different states exposed to the coastal front (Fig. 1).

The new concept of Coastal Regulatory Zone (CRZ) has come to the rescue of the overall degrading coastal environment. In the following paragraphs the likely impacts on the water resources regime in the coastal belts arising out of the CRZ act implementation have been described.

It is felt that there is an urgent need to study in detail the likely impacts of CRZ act implementation on the water resources of the coastal regions. The patterns of water

utilisation and disposal of waste water are likely to change the present situations and therefore it is but imperative to determine the most probable trends that the water resources regime is going to take in the future.

Likely Scenario After Implementation of CRZ Act

The CRZ act dictates that there will not be any further growth in the region between the high tide line and 500m line. For the analysis the assumption to be made is that there will not be any further growth in demand of land, water and other resources from the demarcated protective zone. Under these circumstances the growth will be shifted to the neighborhood of the 500m boundary and the stress on the resources will be felt at that zone. The groundwater usage in the new area would lower the water levels and as it is away from the coastal tract this will not affect the sea water freshwater front. On the other hand the reduced land use for settlements and groundwater usage in the zone immediately close to sea would show rise in the water table levels. This further inhibits the landward movement of the saltwater front (Fig. 2).

The treated sewage water, surface runoff nonrainy seasons, and rainwater from zone II can be used to recharge the protective zone close to the shore. The roof-top rainwater harvesting should be effectively brought into practice both in Zone I and II so that water table level is maintained close to the ground surface.

Zonation of the Coastal Belt for Effective Maintenance

The landuse in the coastal area can be classified into three zones viz., Zone I, Zone II and Zone III. (Figs. 2 & 3).

Zone I: It is the zone extending from high tide line to 500m inland perpendicular to the coast or estuarine river. This zone forms the CRZ as defined by the act. At present this zone is extensively used for construction and partly for agricultural use. The main problems in this zone include, excessive groundwater pumping for domestic, industrial and constructional purposes, disposal of domestic and industrial wastes, reduction in rainwater re-charges to ground, and sea water intrusion problems (Fig. 3).

Zone II: It is the zone starting from 500m CRZ line and away from the high tide fine. After implementation of the CRZ, all the future activities such as new settlements, industries, hotels and other tourist activities will be concentrating in this zone. The set of land use pattern has an advantage in respect of groundwater pumpage. As there is freezing in further development m zone I the groundwater table level will stabilise. On the other hand the increased activities in zone II would lower the groundwater levels; however this lowering m groundwater table would not cause any kind of sea water intrusion problem as the pumping centres are located at least 500m away from the coast (Fig.2). Besides there might be rising trends m the water

table in zone 1 if adequate measures are taken to use surface runoff, treated sewage water to recharge the groundwater. The rainwater harvesting might serve as a potential means for increasing the water table levels in zone I and II.

Zone III: This is the area beyond the zone II and is generally covered by nonurban land and the changes in this zone may not be significant. The groundwater table gradients generally are towards sea.

Present Scenario in the Goa Coastal Belt

The major part of coastal Goa still remains to be in pristine state environmentally. It is feared that in the coming years the entire coastal belt of Goa is very likely to experience dramatic changes in overall environment particularly water resources environment. Therefore it is essential to monitor the likely changes to forecast the water resources regime impacts in the coming years. The monitoring of any change therefore required data bank.

The Goa coast consists large number of beautiful and clean sea beaches to which lakhs of tourists from home and abroad come to enjoy. Tourism in Goa form one of the two backbones of the states economy.

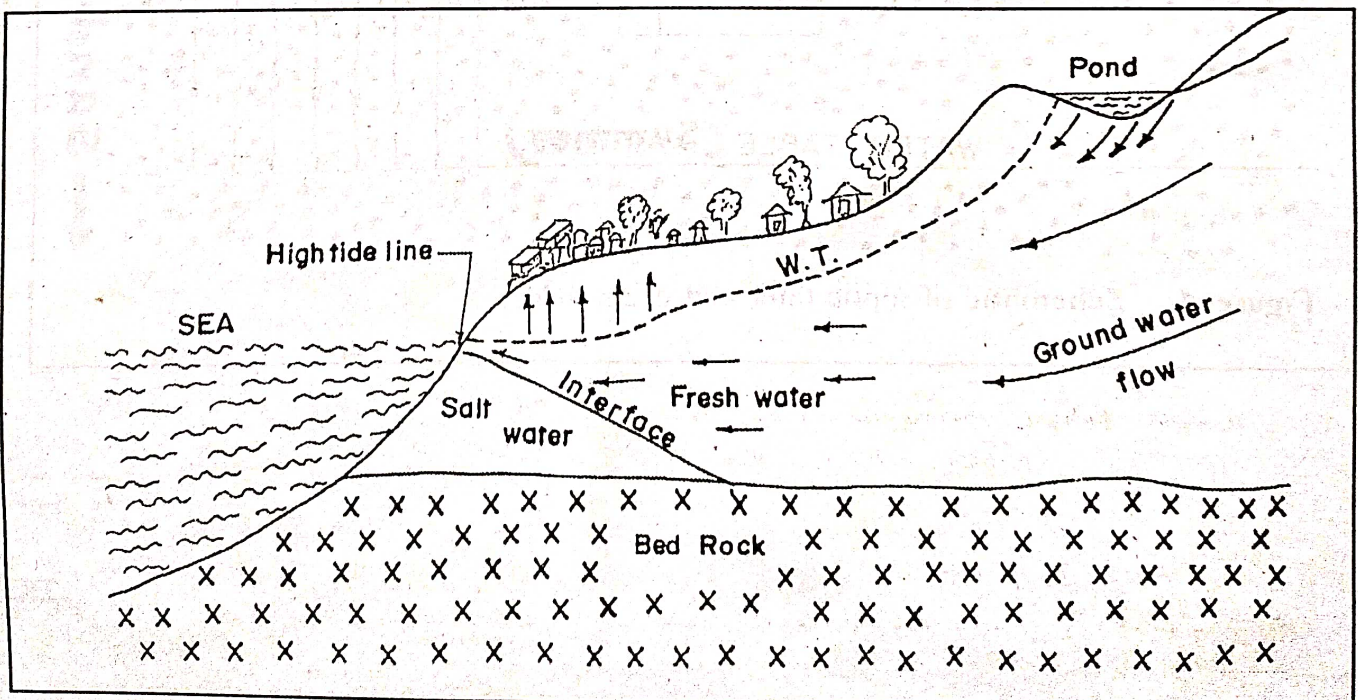


Fig.3. Schematic section of coastal ground water regime before implementing CRZ act

Thousands of people are engaged in the tourist related activities and hence provide the required base for foster tourism in Goa. Besides tourist localities, the typical flat topography, network of communication facilities, fertile land and other resources have attracted maximum concentration of settlements along the coast. This high concentration of settlements have far reaching effects on land and water resources along the coastal tracts. Although Goa receives monsoon rainfall of the order of 3000 to 4000mm most of it flows as surface runoff due to the typical flat topography. Besides this the lack of surface impoundment facilities have led to a poor public water supplies particularly when it is most needed. This unassured supply of water has led to exploitation of groundwater through wells by each of the settlers. Due

to heavy dependence on groundwater supply and reduced recharges to the ground due to land use pattern shift has caused the imbalances in the seawater freshwater front and particularly during summer months the groundwater get contaminated with salt water by intruding inland. Another important fact about the concern of groundwater is that the disposal of domestic waste. En the entire coastal belt there are no central sewage system and each of the household has its own septic tank and cesspool. These structure are built in a sandy formation which are highly permeable. During rainy season the water table gets close to the ground surface and hence submerging the septic systems and other waste sites. This eventually leads to washing off the contaminants into the groundwater regime (Fig. 4).

