THANEERMUKKOM SALT WATER BARRIER TO PREVENT SALT WATER INTRUSION: AN OVERVIEW OF KUTTANAD LOW LAND DEVELOPMENT

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The Thaneermukkom salt water barrier bund was constructed in 1974 to prevent tidal action and intrusion of salt water into the Kuttanad low land across the Vembanad Lake in Kerala, India. This bund divides the Vembanad lake into two, Thaneermukkom in the south with fresh water fed by the rivers draining into the lake and Vechur in the north with brackish water fed by the Arabian Sea. This bund creates a fresh water storage reservoir by storing river flood water, which has helped the farmers in Kuttanad, where farming occurs below sea level. The gates of the bund are opened during the monsoon period and are closed after approximately six months. This article reviews the present status of the Thaneermukkom reservoir and provides suggestions for tackling its environmental and ecological problems such as the pollution of the backwaters and the entire land nearby and the rampant hyacinth growth in the freshwater reservoir.

The Theneermukkom bund was constructed in 1974 as part of the Kuttanad low land development scheme and the creation of a fresh water reservoir in the coastal area of Kerala. The Thaneermukkom salt water barrier / bund is considered the largest mud regulator in the country and has been in operation since 1976. It divides the Vembanad Lake into a fresh water lake fed by the rivers draining into the lake, and a brackish water lake fed by ocean currents into the low lands of Kuttanad. The four major rivers of Kerala, the Pamba, Meenachil, Achankovil and Manimala flow into the region before they reach the Arabian Sea. The lake is fed by ten rivers of which the above four major rivers are the largest. The region receives a good amount of annual rainfall, which is above 3000 mm. These four rivers carry a large quantity of water. By constructing the salt water barrier, a coastal reservoir having fresh water has been created for increasing agricultural activities in the area in addition to facilitating land development. However, there are reports of environmental and ecological damage such as rampant propagation of water hyacinth in fresh water and decline in brackish water fishing in the area. However, these are attributed to a faulty operation of the reservoir system and the lack of a scientific plan for the Thaneermukkum bund to function based on water level and salinity. The problems faced by fishermen and the water hyacinth problems need to be addressed with innovative alternative schemes of operation. In fact, efficient operation of this fresh water reservoir is essential for regular supply of drinking water to nearby areas and also supply fresh water for irrigation in the low lands of Kuttandu, which would help the local farmers.

Figure 1. View of the Thanneermukkom bund

Conditions before the construction of the bund

The Kuttanad region includes the lowest lying lands of Kerala. The region has the lowest altitude in India. It is one of the few places in the world where farming is carried out at 1.2 to 3.0 metres below sea level. The ecology of the Kuttanad region is greatly influenced by the mixing of flood water and sea water entering the Vembanad Lake. Before the construction of the Thanneermukkom barrier, the low-lying lands in the Kuttanad region were periodically inundated with salt water and only a single crop was raised annually from the paddy fields. Kuttanad is the major rice producer in the state and popularly known as the rice bowl of Kerala. In earlier days, the farmers usually constructed temporary bunds, known as “muttu”, across the canals and rivers to prevent the ingression of salt water, which were pulled down soon after harvesting.

The process of bund construction and operational issues

The Thanneermukkom bund has a length of 1400 m which includes a 470 m long stretch of reclaimed land at the centre of the bund. Construction began in 1955 but completion of the project took many years. The western and eastern portions of the bund have 31 shutters (gates) on each side. The construction of these parts was completed in 1967. Only two-thirds of the construction was complete by the year 1973. The remaining one-third was temporarily bunded with sand and clay by mobilising local labour. Though incomplete, the regulator was commissioned by the end of 1974. In 1977, the government started building the middle section. The second phase at the Vechoor end was completed in 1974 with 31 shutters (gates) and one lock. A coffer dam was erected in 1975 when work of the third phase was delayed.

Land had to be reclaimed from the backwaters to complete the construction. The shutters were connected on either side to control the entry of salt water. As per existing practice, the shutters remain open only during the annual monsoon. A detailed study of the economic and ecological problems of the Alappuzha district as well as the Kuttanad wetland ecosystem was carried out by the M.S. Swaminathan Research Foundation (MSSRF) in the year 2007. They recommended completing the work on phase 3 of the Thanneermukkom barrage following a modern design compatible with the renovated phase 1 and phase 2 portions and with all shutters operational. They suggested to provide a middle lock in the Phase 3 section with a width of about 40-50 m, with the modification of the bridge in a manner to open up the bridge upward for navigation. They also recommended to renovate and modernize the Phase 1 and 2 with corrosion-free shutters, with a smooth closing and opening system so that all the shutters could be totally opened and closed in 15-30 minutes like the shutters to be installed in the Phase 3 section. It was suggested to explore the possibility of computerized operation of the shutters and its lock systems based on standardised inputs on post and pre-monsoon water level, salinity level, etc.

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Conditions and challenges after the construction of the bund

In addition to supplying water for agriculture, the bund facilitates road transportation and connects two districts of Kerala (Alappuzha and Kottayam). One of the major adverse effects of the barrier is the growth of water weeds, especially Salvinia and Eichornia. The southern side of the Vembanad Lake has become a static pool because of the operational defects of the Thanneermukkom barrage, as the shutters were operated without considering the post and pre-monsoon water level and salinity. The drained waters from the paddy fields with large quantities of fertilizers, pesticides, and industrial effluents, human and agricultural wastes become stagnant in the rivers, lakes and canals. An acute drinking water shortage is felt even in the lower areas because of saline water intrusion.

During times of limited rainfall and when the water flow from the Manimala and Pampa rivers into the lake is reduced, the salinity level increases, which affects paddy cultivation. Consequently, this causes a drop in the production of rice. Paddy farming is being carried out over around 20,000 hectares of paddy fields in Alappuzha and 8,200 hectares in Kottayam.

Current status and way forward

The construction of the third stage, at the middle portion of the bund is in progress. The third phase consists of 28 shutters, of which 14 have been completed. These shutters are now mechanised and can be operated very easily. Earlier it was very difficult to operate them, and only one shutter could be operated at a time. The operation of the reservoir is now a boon to farmers of Kuttanad, since they can use salt-free water for farming throughout the year. The shutters can be kept open during the monsoon and during the fish breeding periods. During the summer, the shutters need to be closed to bring down the salt content in the water. Wireless sensors can be employed to monitor the salinity of the water and a network of sensors can efficiently aid in gate operation to control the entry of salt water into the freshwater lake. The passage of houseboats will not be affected much since there are gateways on both sides of the bund. The pollution by human activities has to be controlled and the gate operation must be adjusted to prevent the stagnation of water, which will be effective in preventing hyacinth growth along with pollution control.

Though there are many controversies regarding the Thanneermukkam Bund, it remains a fact that it is helping the farmers in the rice bowl of Kerala. If the people learn to cherish the water and take ownership of it, their inclination to pollute or vandalize will be diminished. With efficient operation and maintenance, the bund will help the local population by providing salt-free water as well as by contributing to the growth of the tourist sector by attracting people from other places. ■

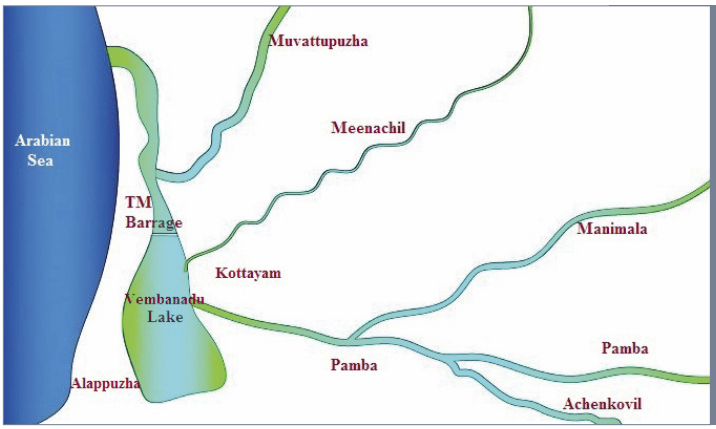

Figure 2. Location of barrage across Vembanadu Lake

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