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Thaneermukkam Bund as an Ecological Construct: Effects of Water Pollution on Adjacent Residents

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Abstract **- Thaneermukkam bund is famous as the largest mud regulator in the country. It is built on the Vembanad Lake, the largest lake in Kerala. It was built as part of the Kuttanad Development Scheme in 1974. The bund divided the lake into two parts and it connects two districts Kottayam and Alappuzha. The project was envisaged with the prevention of saltwater intrusion into the low-lying areas of Kuttanad and also to facilitate double crops of paddy in a year to the farmers of Kuttanad. The bund is proposed to control floods and also to facilitate road transportation as it connects two districts in Kerala. But apart from the proposed benefits, it has leads to some problems for the adjacent residents. The present study is based on the effects of Thaneermukkam bud on adjacent residents. The study is based on quantitative method and descriptive research design was applied. Simple random sampling was used in the study and an interview schedule was used to collect data. The study revealed that the residents on the banks of Thaneermukkam bund were facing many environmental issues like water pollution and water quality deterioration due to the presence of the bund.**
Keywords: **Water Pollution, Thaneermukkam Bund, Ecological Construct, Adjacent Residents**

I. INTRODUCTION

Pollution is escalating and takes many forms and shapes. It can be defined as the accumulation and adverse effects of contaminants or other constituents on human health and welfare or the environment. Pollution has negative impacts on the environmental quality of air, water, and resources. Poor waste management, overuse of resources, and uncontrolled development have led to environmental degradation which in turn brings about negative effects on the environment. These impacts reverberate throughout the environment leading to impaired soil, water, air quality, damaged habitat, and stress to wildlife populations. These issues often have direct and indirect impacts on humans. The presence of pollutions may cause illness and eventually death for human populations.

Water resources all over the world are becoming increasingly contaminated due to several factors and processes. Among these, some of the reasons were global concerns including fossil fuel emissions and climate change. While certain issues are only regional concerns. These types of local issues have far-reaching effects on the people because it affects their quality of life and well-being. This is similar to Edward Lorenz 'the Butterfly Effect' where a tiny change can have far reaching effects on the human beings. Water sustains life on earth and without water life would not be possible. Even though the earth is mainly composed of water, only 3% of the water is available to us in the form of freshwater sources. Among these .06% are easily accessible. As a result, 80% of the countries in the world face water shortages, and more than one billion people drink unclean water. According to an estimate by United Nations, by 2025 around 2.7 billion people will suffer water shortage. These types of water shortages will lead to conflicts over available water. Thus, maintaining water availability and quality is the need of the hour to attain water sustainability.

Today water pollution is a serious issue faced by India. Almost 80 percent of India's water resources are severely polluted due to activities by humans like dumping raw sewage, garbage, and silt directly into lakes and rivers. The processes like urbanization, industrialization and overcrowded slums, and the absence of waste water treatment all of it adds fuel to it (Global Health, 2020). Estimations suggest that by 2030, 600 million Indians might live in slums due to the ever-growing population. Around 70% of wastewater goes untreated and each day, more than 40 million liters of wastewater flow directly into India's lakes, rivers, and ocean. Eventually, contaminated water also enters the groundwater. Because of the poor infrastructure and lack of sewage control, around 38 million Indians were suffering from waterborne infections like typhoid, cholera, and hepatitis every year (Nayar, 2021). Water pollution in India is a serious threat as it not only harms our health and food security but also damages our GDP growth rates and leads to economic stagnation (Global Health, 2020).

One of the major challenges for the government of India is water pollution. There are various programs and large-scale projects initiated by the Government of India to improve the water quality of Indian rivers. There are numerous reasons for the pollution of Indian rivers, this include; firstly, thermal pollution or the hot water discharge from industries that uses water as a coolant like steel plants and thermal Power Station. Secondly, the river valley modification- as part of various developmental activities the river valley is

modified. This may lead to water pollution. Thirdly, turbidity - meaning addition of solids into water bodies like mine slurries, sewage, industrial effluents, diaries waste, etc. fourthly, color, taste, odour-causing wastes discharged from various sources like industries, household sewage, etc. fifthly, chemical discharges from industries like fertilizers, cement, glass, and metals. Sixthly, inorganic waste –those who are living nearby rivers were dumping many waste products into the water bodies often leading to water pollution. Seventhly, organic waste including household sewage, waste from farms, slaughterhouses. Eighthly, oil pills especially from water vehicles and oil transportation ships. Apart from these reasons, the bio-medical discharge, mixing of fertilizers as part of agriculture, the detergents, bathing of humans and animals, etc. also leads to water pollution in India.

A. Thaneermukkam Barrage and Water Pollution: The Kerala Context

The state of Kerala is considered to be one of the densely populated areas in India. The rivers of Kerala have been increasingly polluted due to industrial and household waste including organic and inorganic waste materials. The fertilizer runoff, industrial discharge, and contaminants like ammonia, phosphates, insecticides, sulphides, heavy metals, and fluorides all create immense water pollution to the rivers of Kerala. The Periyar and Chaliyar rivers are notorious for water pollution and water quality deterioration. It is assessed that every day, almost 260 million liters of trade or industrial effluents were discharged into the Periyar River from the Kochi industrial belt.

The Thanneermukkam bund was constructed in 1974 to solve the water security issues of the Kuttanad region. Kuttanad has the lowest altitude in India, and is one of the few places in the world where farming is carried on around 1.2 to 3.0 metres (4 to 10 ft) below sea level. Another place in the world being, Kilimanjaro in Africa. Thanneermukkam bund is considered to be the largest mud regulator in India (Kolathayar *et al.,* 2021). It was constructed along the narrow region of the Vembanad Lake –the largest lake in Kerala. It is situated in the Thanneermukkam at the west and Vechoor in the eastern region. The bund is 1252 meters long and has 93 vents of which each one is 12.15 meters X 5.47 meters in size. A twin lock is provided for navigation from the Thanneermukkam side and a single lock at the Vechoor side (V *et al.,* 2012). This barrage was constructed to provide the following benefits.

1. One of the main purposes of the bund is to protect puncha crop (Sept to March) from floods, spring tides, and saline intrusion and to improve a second crop (June to Sept) cultivation from salt intrusion.
2. Another important aim was to improve the quality of domestic water supply to Kuttanad and the river banks upstream and Public health.
3. It is also focused to enable reclamation of shallow portions of the lake for paddy cultivation.
4. It is believed that the bund will provide uninterrupted employment to a group of unskilled workers in the coastal belt.
5. Another most important benefit of the bund was to provide a link road between the two shores of Vembanad Lake and the district headquarters of Alleppey and Kottayam district (Commision, 2008).
6. It is also envisaged to control the silt build-up in the upstream and downstream of the central bay to make flood flow easier.
7. The bund also enables to restriction of spring tides and salinity intrusion to a considerable level.
8. It also helps to control the weed growth and would make the process of flushing the weeds to the sea during the monsoon period very easy.
9. It is also envisaged to reduce the health risk created by the flooding of latrines.

The construction of the bund was considered to be a positive boost to the Kuttanad farmers as it enables the farmers to cultivate two or three crops in a year and also enabled the supply of freshwater to the Kuttanad region. But the unscientific management of the bund caused severe ecological indemnities. The bund started functioning since 1976 and remains closed from January to May every year. This has ensued in extreme ecological modifications in the lake, predominantly south of the bund, upsetting the distribution, survival, and profusion of the living resources in the estuary, and causing exhaustion of the black clam in numerous areas. Besides this, dredging conducted in various parts of the estuary has heightened this issue. The disorganized operation of bund regulators and the occurrence of mud embankment at the center of the bundare reflected as leading causes for flooding the Kuttanad region throughout the 2018 August Kerala floods.

II. REVIEW OF LITERATURE

Aloorkalarickal U. Arun, in an article titled “An assessment on the influence of salinity in the growth of black clam (Villorita cyprinoides) in the cage in Cochin Estuary with a special emphasis on the impact of Thanneermukkom salinity barrier”, stated that Environmental conditions on different parts of the estuary are varied due to the existence of Thanneermukkom bund (Arun, 2009). The periodical opening and closure of Thanneermukkam bund has to play an important role in the clams and this also became a threat to the clams in the estuary. So the proper management of bund operations is very necessary for the maintenance of clam beds and clam fishery in this area (Arun, 2009).

V. K. Ravi Varma Thampuran in his study entitled “Choking the Largest Wetlands in South India: The Thanneermukkam Bund” examined that the main force behind the construction of Thanneermukkam bund was farmers and Kayal land cultivators from the Kuttanad region. They want to block the saltwater intrusion for the sake of their crop yield. On the other hand, the Fishermen community was against the construction of bunds from the

very beginning because they require saltwater intrusion for a better catch. The study also revealed that the bund leads to the creation of siltation and the depth of the Vembanad Lake was decreased by 5m. Kuttanad is a major tourist destination in Kerala and backwater tourism in Vembanad Lake is very famous and the houseboats and other tourist activities also pose high pressure on the lake environment. The saltwater intrusion was blocked with the bund and as a result, the tidal flows and natural flushing process is disturbed (Thampuran *et al.,* 2008).

In their study on "Appraisal of Thanneermukkom bund as a coastal reservoir in Kuttanad, Kerala", Sreevalsa Kolathayar, U. S. Amala Krishnan, T. G. Sitharam highlights the fact that the Thanneermukkam bund is a coastal reservoir. The bund splits the Vembanad Lake into a freshwater lake in the south and a brackish water lake fed by the ocean in the north (Thampuran *et al.,* 2008). This paper reviews the problems and challenges connected to the inefficient operation of the bund and presents conceivable resolutions. The paper recommends reinstating this exceptional coastal reservoir to guarantee freshwater supply for consumption and irrigation in the low-lying areas of Kuttanad (Kolathayar *et al.,* 2021).

C. Susheelan, in his study on "Impact of environmental changes and human interference on the prawn fishery resources" clearly states that the Thanneermukkom Bund Project of Vembanad Lake in Kerala is a perfect specimen for such blockades put in the natural brackish water environments, which have significantly swayed the prawn resources. The study also states that it has also fetched few problems regarding the natural resources of the lake and the socio-economic condition of the people residing in that area. Since the tidal flow was entirely blocked by the bund and the salinity reduced to nearly zero levels, the penaeid prawns became threatened in the lake beyond Thanneermukkam (C. *et al.,* 2010).

U. P. Nazir, in his doctoral thesis on "Water quality assessment and isotope studies of Vembanad Wetland System" revealed that due to the improper management of the Thanneermukkam bund which flushes high iron concentrations to the freshwater regions and this negatively affects the paddy fields. The bund also negatively affects the amount of dissolved oxygen in the water and poses a threat to aquatic organisms. The study also revealed that the bund disrupts the natural flow of water and as a result, the microbial contamination from domestic sewage, tourist boats, and other human activities is increasing in the lake and this even affects the quality of groundwater in the region (Nazir, 2010).

The above-mentioned studies revealed the alterations found in the Vembanad ecosystem as a result of Thanneermukkam bund. The different organic and non-organic compounds change due to the opening and closing of Thanneermukkam bund in the Vembanad Lake ecosystem. The above studies mainly focused on the aspects related to ecological and environmental significance. But the present study analyses the effects of Thanneermukkam bund on the adjacent residents which provides a new perspective of understanding.

III. METHODOLOGY

A. Significance of the Study

Vembanad Lake is the largest lake in the state of Kerala. The lake is considered to be the hotspot of biodiversity. But now the water pollution levels have risen dangerously in the lake. The adjacent residents depend on the Vembanad Lake for their daily needs. Their livelihood activities including agriculture, fishing, inland navigation, coir retting, tourist activities, lime shell collection depend on the quality of water in the lake. The sewage run-offs and the high amount of organic material dumped by the neighbouring areas are responsible for the reduction in dissolved oxygen content in the lake water. The present study deals with water pollution and its effects on adjacent residents of Thanneermukkam bund which was constructed to regulate the saltwater intrusion and thereby provide freshwater to the farmers of Kuttanad for better crop yield.

By disrupting the natural flow of water, bund leads to some ecological concerns like accumulation of sewage waste, silt formation and decrease in the depth of the lake, the decline in fish, propagation of the Water Hyacinth in freshwater, etc. Thus the study is very significant as it reveals the effects of Thanneermukkam bund and resultant water pollution on the adjacent residents.

B. Theoretical Framework

The present study is based on the theory of "three competing functions of the environment" put forward by Catton and Dunlap. The Catton and Dunlap's model specifies three general functions which the environment serves for human beings. They are supply depot, living space, and waste repository. As a supply depot, the environment is a source of renewable and non-renewable natural resources (air, water, forests, fossil fuels, etc.) that are essential for living. With the waste repository functions facilities, the environment serves as a sink for garbage, sewage, industrial pollution, and other by-products. As a living space, the environment provides basic amenities for all living beings.

In recent years, it is observed that because of exploitation of resources, industrialization, urbanization, etc. each of these functions compete for space often impinging upon the others. By applying these concepts to the present study, it is revealed that the majority of respondents depend on the Vembanad Lake for their livelihood. The Vembanad Lake provides them the necessary resources for their living and also the nearby residents were dumping their garbage into the water and the lake also act as a waste repository. It was observed that in the lake ecosystem, the space for the

function of waste repository overlaps into other spaces performing the functions of living space and supply depot. This overlapping causes many environmental disasters affecting living beings.

C. Objectives

1. To analyze the socio-economic background of adjacent residents of Thaneermukkam bund.
2. To find out the nature of issues faced by the adjacent residents of Thaneermukkam bund.
3. To identify the psychological problems of the adjacent residents due to water pollution.

D. Sample and Method

Descriptive research design was used in the study. The study is based on the quantitative method. All the residents on the bank of Vembanad Lake constitute the universe of the study. The sample size consists of 100 respondents selected through a snowball sampling method. Data required for the study was collected both from the primary and secondary sources. The primary data was collected from the respondents based on interview schedule. The secondary data were collected from books, magazines, journals, the internet, etc.

IV. FINDINGS AND DISCUSSION

The major findings of the study are categorized into three sections. The first section deals with the socio-economic background of the respondents. The second section consists of issues faced by the residents on the banks of Thanneermukkom bund. The third section deals with the psychological problems of the adjacent residents of Thanneermukkom bund.

The socio-economic background of the respondents revealed that 43% of the respondents belonged to the age group of 50-59 years.

TABLE I EDUCATIONAL QUALIFICATION

Education	Frequency	Percent
Below SSLC	32	32
SSLC	43	43
Pre degree /Plus Two	25	25
Total	100	100

The above table shows the distribution of the respondents based on educational Qualification. Among the respondents 32 percent have an educational qualification below SSLC and 43 percent of the respondents have SSLC. And 25 percent of the respondents completed pre degree /plus two.

The religious distribution shows that 83 percent of the respondents were Hindus and 87 percent belonged to the OBC section.

TABLE II NATURE OF FAMILY

Nature of family	Frequency	Percent
Nuclear family	57	57
Extended family	43	43
Total	100	100

The above table shows the distribution of respondents based on the natures of the family, 57% of the respondents belonged to nuclear families and 43% belonged to extended families. And 38 % of respondent's family consist of 4 members.

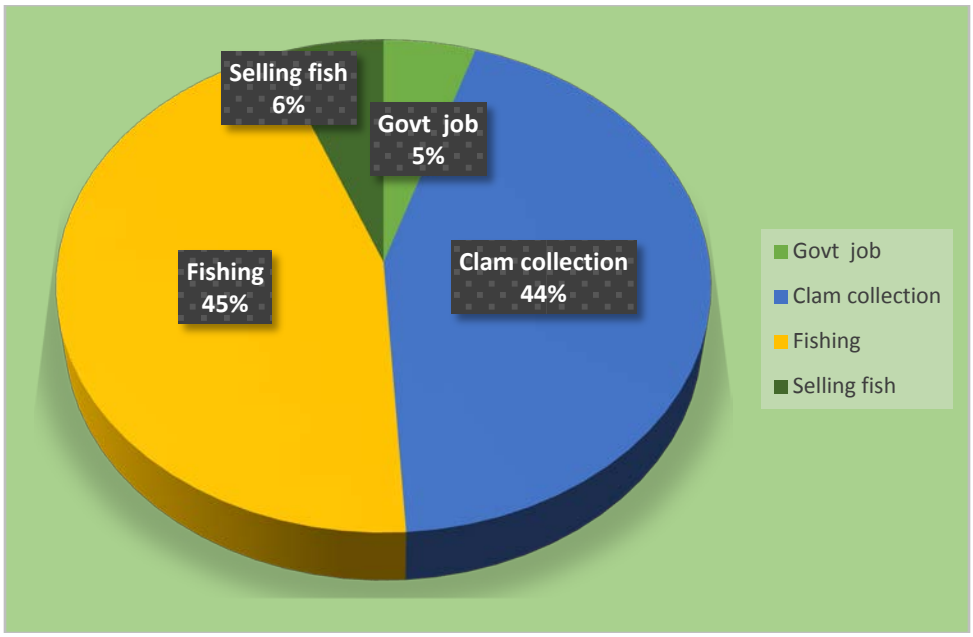

Fig. 1 Occupation of the respondents

The above figure shows the distribution of the respondents based on the nature of job. From the figure, it is clear that majority is 45 Percent were engaged in Fishing. Another 44% are engaged in clam Collection and 6% are engaged in Selling Fish only 5 Percent of the respondents are government employees. The above figure revealed that the respondents mainly depend on the Vembanad Lake for their livelihood. So the water pollution has been adversely affecting their lives. These sections revealed that majority of the resident's were belonging to low socio-economic background and were struggling a lot to manage their daily needs. They were also depending on the Vembanad Lake for their livelihood.

Second section deals with the issues faced by respondents due to water pollution.

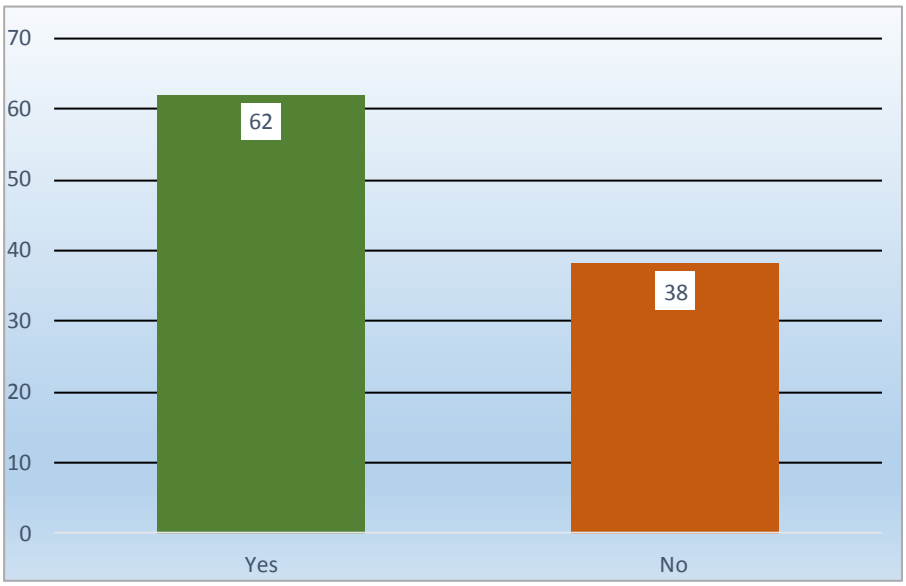

Fig. 2 Health issues faced by the respondents due to water pollution

From figure 2 it is clear that majority of the respondents (62 percent) have health issues due to the use of the lake water and 38 percent were not facing any health issues due to water pollution. It is also revealed that among these 67.74% are affected by different type of allergies and 32.26% are affected by skin disease and water borne diseases.

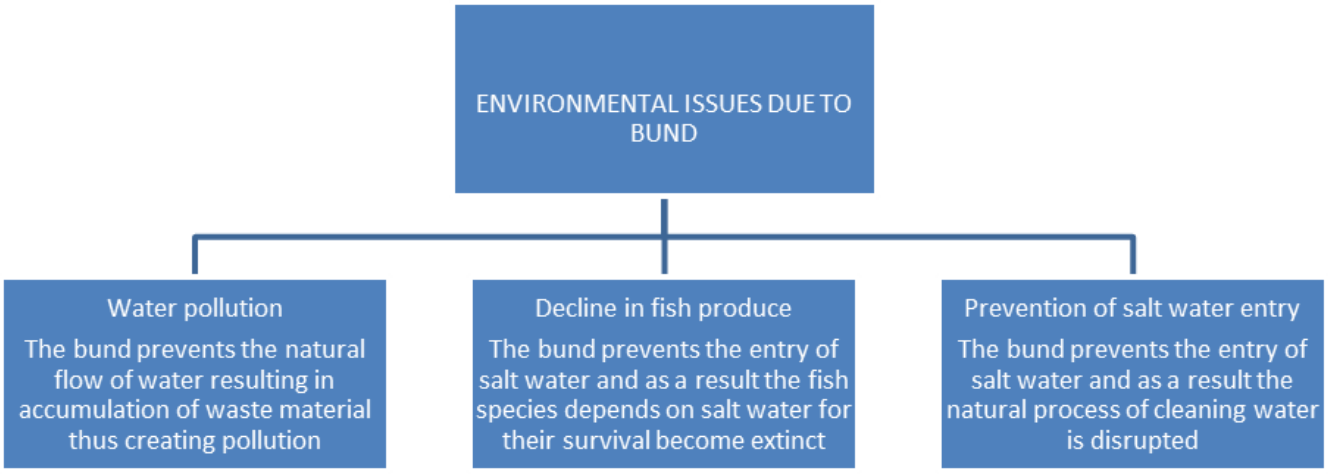

Fig. 3 Environmental issues due to Bund

The above figure shows the environmental issues due to the bund. The Thanneermukkam bund is disrupting the natural flow of water and as a result it leads to many environmental problems. Firstly the most pertinent environmental issue is water pollution. Almost 97 percent of respondents were facing water pollution and allied issues like diseases and

drinking water shortage. Secondly, decline in growth of fish is the vital issue due to Thanneermukkam bund and 62 percent of respondents were affected by it. 96 percent of respondents considered that the prevention of salt water entry by the bund leads to decline in fish produce and also it disrupts the natural processing of water cleansing and these have negatively affects the quality of livelihood of the adjacent residents. It is also revealed from the study that 96 percent of respondent's work is depending on the bund and 62 percent of them were suffering different types of allergies due to environmental degradation. 74 percent opined that water pollution affects their daily activities. From the section, it is revealed that the residents were facing many issues and it affects their livelihood also. They suffer health problems and also problems due to water pollution from the lake.

The third section deals with the psychological issues faced by the respondents. 53 percent of the respondents suffer depression due to low-quality water and environmental conditions. 59 percent were emotionally frustrated because of using polluted water for their daily needs. 69 percent were afraid of the diseases to their family members as a result of using polluted water and other resources. 76 percent of respondents were facing mental issues due to the attitude of authorities towards water pollution. The authorities were not concerned with the seriousness of the issue. Thus, this section revealed that the residents were facing psychological issues as part of living in a polluted environment. They feel anxiety and fear for depending on polluted water resources for their daily needs.

V. CONCLUSION

Thus, water pollution emerged to be one of the major challenges of the world today. British poet W. H. Auden stated "Thousands have lived without love, not one without water." Water is central to life, but often we trash it anyway. 80 percent of the world's wastewater is dumped back into the environment, polluting rivers, lakes, and oceans without being treated or recycled. The study revealed that Thanneermukkam bund one of the greatest inventions for regulating saltwater intrusion and facilitating agricultural production is also a source of water pollution. The unscientific management of the barrage had led to ecosystem damage and this affected the livelihood of people of nearby areas. Due to the bund there is a decline in fish products and it negatively affects the adjacent residents of which the majority depended on the Vembanad Lake for their livelihood. As a result of the bund, the water is stagnant and it leads to the accumulation of waste materials in the premises and the residents were forced to use unclean water for their daily needs. The residents also suffer from various health issues and allergies as a result of using polluted water for their daily needs. Despite this the adjacent residents are also facing psychological stresses and mental issues as a result of using polluted water. As Catton and Dunlap say, the environment provides us with a supply depot, living space, and waste repository, like that the Vembanad Lake is considered to be a hotspot of biodiversity. It provides everything to the adjacent residents but the Thanneermukkam bund created a barrier to the uninterrupted water flow of the lake and thereby the environmental functions provided by the lake start competes for space. This leads to other issues related to environmental destruction. Even though the bund helped in improving the quality of life of the farmers by enabling better yield, the bund is assumed to have triggered severe environmental problems. The bund by restricting the entry of saltwater reduces the fish production in the region and as a result, the fishermen community are the major suffers. It has disrupted the congruence of the sea with the backwaters and has led to problems not forecasted like the omnipresence of the water weeds like water hyacinth in the freshwater areas, ultimately leading to the process of Eutrophication. Earlier the saltwater tends to clean the backwaters through the natural flow but this phenomenon is not taking place anymore leading to high levels of water pollution of the backwaters and the entire land nearby.

REFERENCES

[1] Global Health. (2020, July 14). *How water pollution in India kills millions*. BORGEN. Retrieved from https://www.borgenmagazine.com/water-pollution-in-india/.

[2] Nayar, R. (2021, January 13). *Major health risks due to untreated sewage disposal*. Media India Group. Retrieved from https://mediaindia.eu/environment/major-health-risks-due-to-untreated-sewage-disposal/.

[3] Kolathayar, S., Amala Krishnan, U. S., & Sitharam, T. G. (2021). Appraisal of Thanneermukkom BUND as a COASTAL reservoir in Kuttanad, Kerala. *Journal of Applied Water Engineering and Research*, 1-12. Retrieved from https://doi.org/10.1080/23249676.2021.1884612

[4] Arun, A. U. (2009). An assessment of the influence of salinity in the growth of black clam (Villorita cyprinoides) in the cage in Cochin Estuary with a special emphasis on the impact of Thanneermukkom salinity barrier. *Aquaculture, Aquarium, Conservation & Legislation International Journal of the Bioflux Society*, 319-329, ISSN 1844-9166. Retrieved from http://www.bioflux.com.ro/docs/2009.2.319-330.pdf

[5] Thampuran, V. K. R. V. (2008). Choking the Largest Wetlands in South India: The Thanneermukkom Bund. In K. J. Joy, S. Vispute, V. Goud, S. Paranjape, & B. Gujja (Eds.), *Water Conflicts in India* (1st ed., 6-11). Taylor and Francis.

[6] V, V. M., & A, P. K. (2012). Water Quality Assessment of a Tropical Wetland Ecosystem with Special Reference to Backwater Tourism, Kerala, South India. *International Research Journal of Environment Sciences*, *1*(5), 62-68. Retrieved from https://www.academia.edu/8137259/Water_Quality_Assessment_of_a_Tropical_Wetland_Ecosystem_with_Special_Reference_to_Backwater_Tourism_Kerala_South_India.

[7] Commision, P. (2008). *Report on Visit to Vembanad Kol, Kerala, a wetland included under the*. Thiruvananthapuram: Government of India. Retrieved August 26, 2021, from https://niti.gov.in/planningcommission.gov.in/docs/reports/E_F/Vembanad%20Kol.pd

[8] C, S. (2010). Impact of environmental changes and human interference on the prawn fishery resource version (e print). In N. G. Menon & C. S. G. Pillai (Eds.), *Marine Fisheries Information Service Technical and Extension Series*, 1-5. Central Marine Fisheries Research Institute, Kochi. Retrieved from http://eprints.cmfri.org.in/id/eprint/3179

[9] Nazir, U. P. (2010). *Water quality assessment and isotope studies of Vembanad Wetland System* (dissertation). Centre for Water Resources Development and Management, Calicut, Kerala.