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SURROUNDED BY WATER, QUENCHING FOR THIRST: DRINKING WATER ISSUE IN NORTH KUTTANADU, A SPECIAL REFERENCE WITH KAVALAM

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ABSTRACT

Kuttanad, often known as the "rice bowl of Kerala," is a 900-square-foot delta region on the west coast of Alappuzha, with coordinates of 9.3428 degrees N and 76.4240 degrees E. Add diversity to the environment by incorporating Greenland, patches, fisheries, flora, wildlife, rivers, ponds, and backwaters. The only area in all of India below sea level that reclaims and converts polders, wetland areas, and backwater areas for paddy farming is Kuttanad. Every topographical configuration in Kuttanad has advantages and disadvantages. Specifically, the study examines the effects of textile washing and untreated sewage outflow on the water availability and quality in the region caused by human activities. The study analyses the quality of the water, conducts community interviews, and conducts field surveys to evaluate the extent of pollution and its impact on the local populace. The findings demonstrate the pressing need for all-encompassing measures to address the root causes of the water contamination in Kavalam Kuttanad. It is recommended that the initial steps in lessening the situation involve the implementation of awareness programs that promote acceptable water use habits in conjunction with an effective wastewater treatment infrastructure. Additionally, community involvement and stakeholder engagement are essential to ensure the sustainability of long-term solutions.

Keywords: Drinking Water, Scarcity, Kuttanad Kavalam, Basic Rights, Water Contamination, Environmental Consequences

1. INTRODUCTION

The residents of Kavalam, who are surrounded by water resources in the shape of rivers, ponds, backwaters, and straits, ran out pure drinking water. There are far too many factors contributing to the problem of clean drinking water scarcity, such as Kuttanadu's creation history, its geographic regions, human activity, agricultural waste disposal, and floods. The water balance analysis conducted by the Indo-Dutch program has shed light on the inhabitants' concerns over water contamination. The Kuttanadu flood package was created to help farmers, small businesses, local people, and water-related concerns comprehensively.[1] As far as we are aware, the primary cause of Kuttanadu's drinking water problem—which is brought on by garbage disposal, seawater barrage, and frequent flooding in the area.

Research concentrating on socioeconomic dynamics throughout the area and the influence of this socioeconomic divide on the dissemination of knowledge. To the best of our knowledge, the research gap primarily noticed is the elements that affect the availability of clean drinking water in Kuttanadu Kavalam, as well as any potential solutions that

[1] https://spb.kerala.gov.in-Kerala state plnning board

the locals may employ to lessen water pollution and analysis of the socioeconomic elements influencing the lack of potable water in Kuttanadu has not much studied. This study aims to examine how human activities affect the purity of Kuttanadu's natural water resources and to assess the steps taken by the Kerala government, the Kerala Water Authority, and panchayat authorities to enhance the area's water quality. Water derived from natural resources is directly associated with a higher risk of skin disorders and other water-borne illnesses, leading to the formulation of various health issues for the natives. Based on the objectives and hypothesis formulated human activities and improper sewage treatment plans have resulted in the contamination of natural water sources such as Strait, and Pond Lake in north Kuttanad. There is a significant relationship between diseases caused by respondents of North Kuttanad, kavalam and consumption of natural water sources.

2. METHODOLOGY

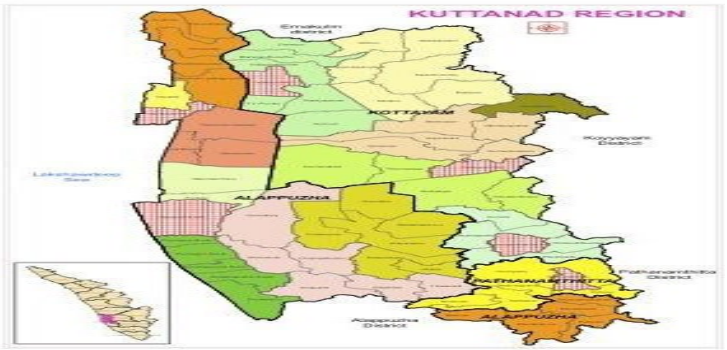
The current study is descriptive and empirical. Frequency distribution table and pie carts have been used to represent the primary Data. A stratified random sampling method has been used. Data have been collected a surveying three wards. Wart 2, Ward 4 and Ward 11 have been selected using the lottery method. A total of 100 respondents have been selected as a sample from 3 wards using solving formula. The collected sample surveys were then tested using a non-parametric test called the chi-square test. The survey was conducted during May and June 2024.

3. CAUSES OF WATER POLLUTION

3.1. GEOGRAPHICAL LOCATION

Squeezed between the western Ghats in the east and Alappuzha in the west, Kuttanadu, which includes divisions like Changanacherry, Kottayam, and Alappuzha, is rich in its broken mosaic environment, covered with water sources, and paddy fields.[2]The origins of Kuttanadu, which caused flooding in the area all year long, are the five main rivers in Kerala: Manimala, Achenkovil, Pamba, Meenachilaru, and Muvattupuzha, because of human creation, the area is referred to as an artificial environment.[3] The area was once a forest during the colonial era, but the Travancore King took the initiative to cultivate more paddy in order to alleviate Kerala's wheat shortage. This led to the Pattom Proclamation of 1865, which began the process of reclaiming land for cultivation and earned the region a spot on the Ramsar list,[4] Because the backwaters were reclaimed for farming, Kuttanadu's paddy fields are always wet. When weeds and insects are controlled with fertilizers and other chemicals, the runoff from these fields carries these chemicals into sediments and streams, contaminating the water.[5]

Figure 1.1 -Location map of kuttanadu, obtained from research gate



[2] https://village.kerala.gov.in-Government of kerala
[3] https://spb.kerala.gov.in-Kerala state plnning board

[4] https://www.keralaeconomy.com-changes in agrarian structure and land tennures in kerala ,BA Prakash,2017.
[5] ibid

4. SALINITY AND ACIDIC NATURE OF WATER

Farmers in Kuttanadu employ fertilizers and insect control. Many of them become lodged in the soil and paddy fields, only to be eventually carried away by rain and confluence with streams.[6] The Thaneermukkom Bund was built by the government to protect the area from salt water intrusion into water sources, but it also has drawbacks. While salt water intrusion helps small streams and straits remove pollutants from the water, the construction of the bund made this less possible and reduced the strait's fish catchments.[7]

Figure 1.2 Image captured during field survey, kuttanad kavalam north,with vivo phone on may 23/05/2024

Figure 1.3 (right) and Figure 1.4 (left) images of Kuttanad North water streams

5. HUMAN ACTIVITIES AND HOUSE BOAT TOURISM

Visitors are captivated by the beautiful splendor of Kavalam's backwaters. The governor's office receives money from houseboat tourism.Alappuzha tourism is lacking because sewage waste is released into the water directly from faulty sewage treatment plants, making environmental cleanliness essential to maintaining the area's attractiveness.[8][9]The biological oxygen requirement in Kuttanadu backwaters and Vembenattu Lake should be between 1-2 parts per million, according to a marker put up by the Kerala State Pollution Board (KSPCB).District Tourism Promotion Control stopped STP (Sewage Treatment Plans)in *Kunnumma* Kuttanadu as a result of the extremely contaminated characteristics of the lake, and dumping of sewage waste into lake, which were discovered to be 8 to 9

[6] https://www.ids.ac.uk-institute of development studies,march 2022
[7] ibid
[8] (www.times of India).
[9] https://thewire.in

parts per million. This was determined after reviewing complaints from the KSPCB regarding the inappropriate operation of the sewage treatment plant in Kavalam.[10] Houseboat waste output, according to district environment specialists, is estimated to be between 15 and 45 billion barrels in the houseboat band. Waste is disposed of in the water as Alappuzha houseboat tourism lacks a functional sewage treatment system. Water supplies are contaminated by household practices like washing clothes and throwing away food trash. Domestic tasks like cleaning clothes and discarding food trash contaminate water supplies. When garments are being washed in water it gets contaminated by detergents, TDS, chloride, sulphate, carbonate, and bicarbonate dissolve in the water.[11]

6. INITIATIVES TAKEN THROUGH SPECIAL PACKAGE FOR KUTTANAD AND PANCHAYAT AND GOVERNMENT

The infiltration of salt water, inadequate sewage treatment, and recurrent flooding are the causes of Kuttanad's water scarcity. In addition to treating the challenges the region encountered as a result of the 2018 flood, a "Special Package for Kuttanad" was made available. Because of Kuttanad's unique geographical location, the area has been designated as a Ramsar site. 1839.75 crore rupees were allocated for the Department of water resources, of which 1518 crore were used for Kuttanad's post-flood package.

Kuttanad Flood Management Programme (FMP), a specific grant aid from the state government's 13 Finance Commission Plan resources. Major activities of several kinds were carried out under the Special Package for Kuttanad programs. The outside boundaries of padashekharams were first agreed to be strengthened under KEL-1, KEL-2, and KEL-3, covering padashekharam of Kuttanad, Kayal area.KEL-4 sought to enhance Kuttanad River drainage. In addition, three more projects were suggested by FMP: updating the Thottapally spillway's barriage, enhancing channel efficiency, and modernizing the Thaneermukkom Barriage. by the 13th Finance Commission's special grant in assistance award. Three further initiatives were started: building a bridge-cum-regulator in the Thalayazham panchayat over the Karair regulator, renovating the Pattanakkad regulator, and one more. building of an AC canal from Onnamkara to Mannakal Chira. Funds for rejenuvation and allocation of drinking water necessities have been discussed and allotted each year in Kuttanad the details of which are presented in the table given below. In annual planning, funds have been allotted to clean available natural drinking water sources in Kuttanad, an amount of 10,59,000 has been utilised to clean contaminated water sources in 2021-2022, An amount of 7,02,000 received by fisheries department has been spent for access to clean drinking water in Kuttanad.

Table 1.1 Fund allocated for various drinking water projects

S.NO	Year Of Project	Project Number	Name Of Project	Amount
1	2019-2020	11	Pattikajathi kudumbangalkku Kudivellom tank	169000
2	2019-2020	99	O.R plant naveekaranom	44230
3	2019-2020	101	Kalavarsha keduthi Duritashwasa Pravarthanangal	699200
4	2019-2020	120	Ambedkar colony water tank tower maintainance	1454
5	2019-2020	129	O.R plant Sambharana Kettida Nirmaanom	73318
6	2019-2020	151	Electric connection for O.R plant	35694
7	2019-2020	154	Electricfication of O.R Plant	38400
8	2020-2021	24	Pattikajathi kudumbangalkku kudivella Tank	188160
9	2020-2021	106	U.P SCHOOL R.O plant kettigom	68502

[10] https://ijaers.com>issuefiles-pollution due to backwater tourism and possibility for use of green energy technologies.
[11] An investigation into drinking water problems of Kuttanad,shiney varghese

10	2020-2021	120	Kudivellom Vitharana padhati	1,50,000
11	2020-2021	133	Venal kudivellom vitharanom	857955
12	2021-2022	12	Venal kudivellom vitharanom	970000
13	2021-2022	120	500 ltr kudivellom tank	10,04700
14	2021-2022	1	Venalkala kudivellom vitharanom	773814
15	2022-2023	3	Mazhavellom sambharani	225000
16	2022-2023	31	500 ltr kudivellom tank	753525
17	2023-2024	19	Venalkala kudivellom vitharanom	118849

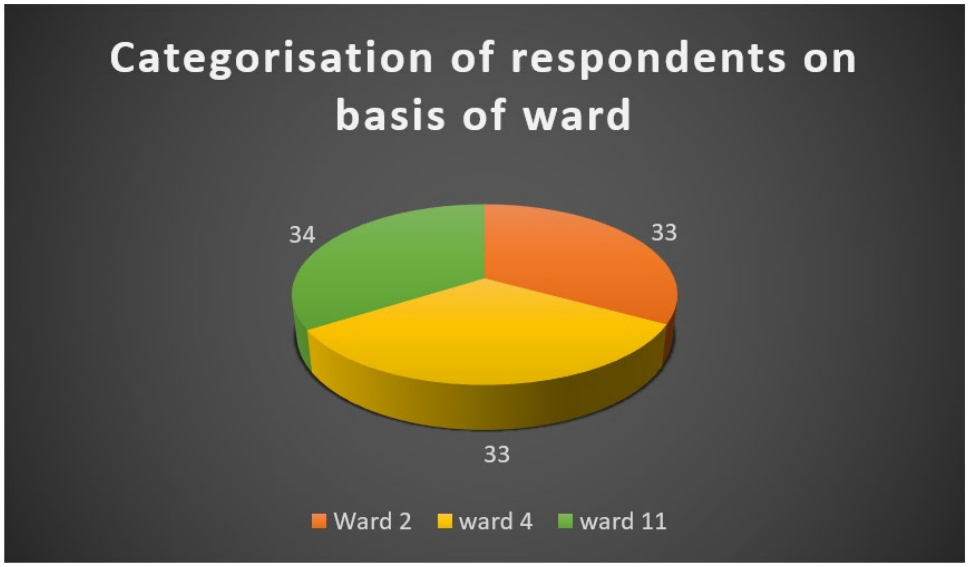
7. MEASURES TO MITIGATE SCARCITY AND WATER POLLUTION IN WATER

Salinity Intrusion in Kuttanad water is mainly due to thaneermukkom bund. Modification of phase 1 and phase 2 of thaneermukkom bund was completely as per reports of MSSRF.The report further suggested:

- Construction of three phases of thaneermukkom bund
- Closure of bund for a minimal period every year
- Demolition of cofferdam[12]
- Unscientific construction of roads, dams, waterways should be halted.
- Eutrophication and waterlogging led to steady increase in aquatic weeds and water hyacinth in Vembanattu Lake, which later spreads to all over streams, canals and rivers which resulted in oxygen depletion interference.[13]

DATA ANALYSIS

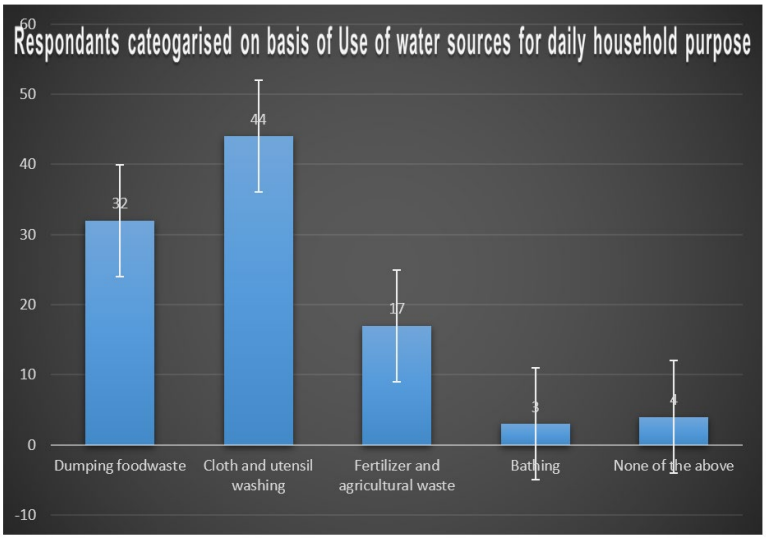
Table 1.2-Categorisation of respondents on basis of ward



The pie chart represents samples of 100 respondents in total, selected from each ward which are respectively ward 2, ward 3 and ward 11. Lottery method has been opted for selecting the samples from 13 wards of Kavalam north, Alappuzha.

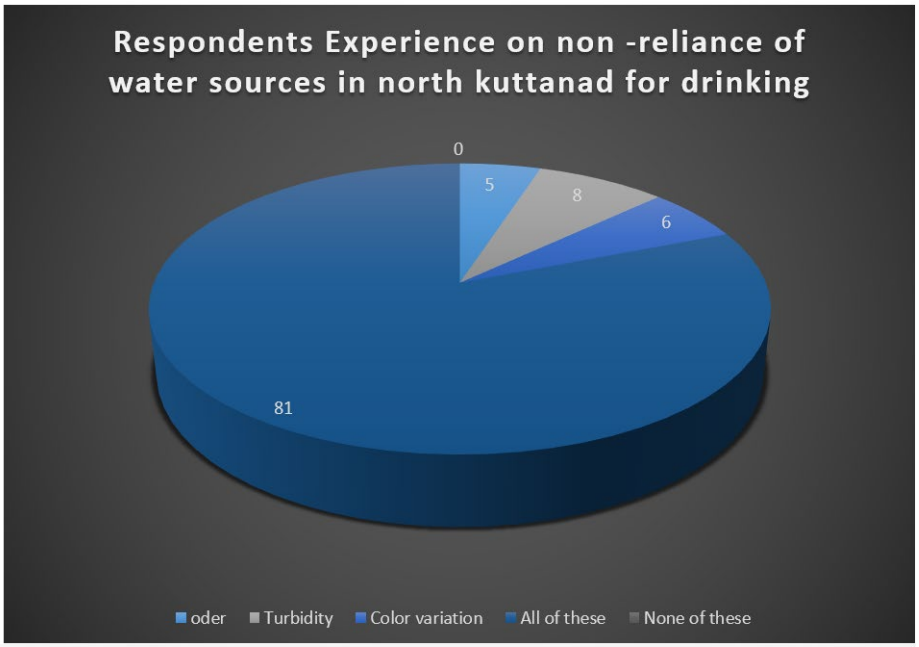
[12] Cofferdam is made of sand which works as a substitution for bund, replacing bund with cofferdam reduces efficacy of bund.
[13] A special package for post flood Kuttanad-kerala state planning board October 2019

Table 1.3 Respondents categorised on basis of Use of water sources for daily household purpose



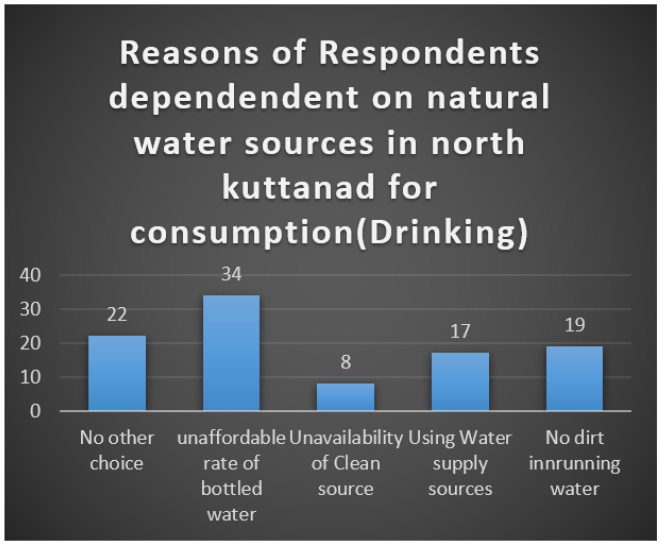
The above pictured bar graph describes respondents usage of natural water sources Strait for daily house hold activities according to the response 32 out of 100 respondents dump food waste while cleaning the utensils and 44 out of 100 respondents wash cloth and utensil in strait, 17 among 100 dump expired fertilizers waste in water , 3 among 100 use strait for bath and 4 among 100 do not use strait water any of their household purpose.

Table 1.4- Respondents Belief on non -reliance of water sources in north Kuttanad for drinking



The above table shows opinion of native of Kuttanad among selected sample on their experience over the available natural sources of water and according to them its suitability for consumption, among which 81 among 100 opined they experienced turbidity, oder, color variation in water for which it is not suitable for consumption, which is a majority number and from this table it is understood the natural water source is contaminated and not suitable for consumption and any other household activity.

Table 1.5-Reasons of Respondents dependendent on natural water sources in north kuttanad for consumption



The above table shows respondance reasons for dependence natural water source available in kavalam, 34 among 100 respondent opined that the bottled water , or water which could be purchased for daily drinking purpose is costly ,22 among 100 respondents opied that they are left with no other choice instead reling on the natural water source as drinking water is not available nearby, 19 among 100 respondents believe with an age old saying theat "*ozhukulla vellathill azhukilla"* which means running water is less contaminated therefore it is ok to consume for household activities and if necessary for drinking purposres.8 among 100 clearly stated that clean drinking water is unavailable all the time.17 among 100 use sources of water supply which they buy from external agents for consumption.

Table 1.1 is contingency table of observed values where chi square is been conducted to analyse significant relationship between diseases caused by respondents of North Kuttanad, kavalam and consumption of natural water source. Skin diseases and change in pigmentation in teeth among respondents of north Kuttanad was analysed.

Observed Frequency Table

Diseases	Respondents Consumes	Respondents who consume natural water source of Kuttanad (strait /pond/streams)	Total
Skin diseases	10	32	50
Yellowish color in teeth	9	49	50
Total	19	81	100

Observed Value	Expected valued	O-E	(O-E)2	(O-E)2/E
10	9.5	0.5	0.25	0.0263
32	40.5	-8.5	72.25	1.783
9	9.5	-0.5	0.25	0.0263
49	40.5	8.5	7 2.25	1.783
X2 VALUE				1.85343

df = 0.05

Null Hypothesis = There is no significant relationship between diseases caused by respondents of north Kuttanad, kavalam and consumption of natural water sources.

Alternative hypothesis = There is a significant relationship between diseases caused by respondents of North Kuttanad, kavalam and consumption of natural water sources.

Chi-square value obtained = 1.85343

Critical range at a significance of 0.05 = >3.842

8. RESULTS

The value of the chi-square calculated does not belong to the critical region therefore, the null hypothesis is not rejected hence, and the variables are independent.

8.1. RECOMMENDATIONS TO MITIGATE DRINKING WATER SCARCITY

1) The 2018 floods contaminated the streams and canals in KavalamKuttanadu.Streams and .canals in Kavalam are influenced by five river systems: Meenachilary, Achenkovil, Pamba, Muvattupuzha, and Manimala. The wastewater debris gathered in the low-lying areas of Kavalam, made it difficult for the locals who relied on natural water supplies throughout the flood restoration process. A river-room concept might be a useful way to get around this crossing in the area.
2) Pollution of lakes, rivers, and streams might be partially avoided by implementing appropriate sewage treatment programs to carry out houseboat sewage treatment plans.
3) Using low-cost rainwater collecting methods, such as tarpaulin sheets to gather rainwater for drinking, might lessen the shortage of potable water.
4) The locals would benefit from having their water needs met by having the kiosk tanks-which are placed in each Kavalam ward - refilled.
5) By employing techniques like ozonation and nanofiltration, it would be possible to lessen the number of pesticides and fertilizers present in water supplies while also eliminating turbidity, colour pollution, and the presence of E-coli and coliforms.

9. CONCLUSION

The study's findings, showed a mixed result, authorities ineffectiveness is not solely responsible for contamination of water although authorities through various activities have do the needful but due to human activities and geographical condition water scarcity and contamination of water in kavalam continue to pursue in kavalam region.which are related to human activities like fabric washing and untreated sewage discharge, emphasize the serious problem of drinking water scarcity in Kavalam Kuttanad. The data acquired highlights the pressing need for all-encompassing action to stop the deterioration of the water quality and guarantee that the local populace has access to drinkable water. Policymakers, local government officials, and community stakeholders must work together to address this urgent issue. To reduce pollution and bring water quality back to acceptable levels, substantial investments in wastewater treatment infrastructure are necessary. To encourage a culture of conservation and stewardship among communities, awareness initiatives encouraging appropriate water consumption practices must also be put into action.

CONFLICT OF INTERESTS

None.

ACKNOWLEDGMENTS

None.

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