

INTEGRATED WATER RESOURCE MANAGEMENT FOR KOVILPATTI – A FUTURISTIC APPROACH

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Abstract: Today, sustainable utilisation of water is becoming more complicated due to dwindling water resources. Hence water is so important but now a day there is insufficiency and scarcity of water in some places. Hence to solve the problem we need to conserve water. Water conservation includes all the policies, strategies and activities to sustainably manage the natural resource of fresh water, to protect the hydrosphere and to meet the current and future human demand. This paper focuses on the study of the prevailing water scarcity and demands in the southern part of Tamil Nadu, India by analysis the existing water resources available, population, quality of water and the quantity of water. Finally this paper makes appropriate suggestions to establish sustainable water management without compromising the quality of water. Population, household size, growth and affluence all affect how much water is used. Factors such as climate change have increased pressures on natural water resources especially in manufacturing and agricultural irrigation. Water resource management is the activity of planning, developing, distributing and managing the optimum use of water resources. The field of water resources management will have to continue to adapt to the current and future issues facing the allocation of water. With the growing uncertainties of global climate change and the long term impacts of management actions, the decision-making will be even more difficult. As a result, IWRM would be a better solution with alternative management strategies are sought for in order to avoid setbacks in the allocation of water resources. In this work, we are trying to implement our IWRM technique in our region. Ideally, water resource management planning regard to all the competing demands for water and seeks to allocate water on an equitable basis to satisfy all uses and demands. Integrated Water Resource Management (IWRM) will create a pavement for solving the water scarcity by means of managing water resources. By collecting all water supply data in a particular region (Kovilpatti) and we came to know that all 36 wards of Kovilpatti town are safe from scarcity but it is known that the scarcity was faced by the Kovilpatti panchayat people, Our solution for that people is by treating the water from natural tanks and thus IWRM is performed in Kovilpatti region. The characteristic study is performed for these natural tanks.

Key words: Climate change, Water Resource Management, Water supply, Water Scarcity, Management strategies.

I. INTRODUCTION

In this fast-growing world, water scarcity is a major concern in extreme regions. We know that Earth is filled of 71% of water in which it constitutes of Sea water, River and Lake water, ice caps and glaciers, water in soil as soil moisture, water in air as water vapour, in aquifers and even within living organisms and also within Trees and plants. But from that 71% of water, 96% is in saline condition and 3% is in ice or glacier conditions. Hence remaining 1% is only accessible. The 1% accessible water constitutes of freshwater sources like Ground water, River and Lake Water and other sources of drinking water. Thus, we need to manage the water resource properly otherwise the result will be feisty. Integrated Water Resource Management (IWRM) will create a pavement for solving the water scarcity by means of managing water resources. Integrated water resources management (IWRM) is a systematic process for the sustainable development, allocation and monitoring of water resource use in the context of social, economic and environmental objectives. By using this management technique, we can save water for our future world and also we can manage water resource in sustainable manner. Thus, without IWRM we will not be able to solve water scarcity problems efficiently all over the world. The kovilpatti region which is famous for its peanut candy has comparatively moderate temperature and the panchayat side of kovilpatti is at the state of water scarcity in which people are buying drinking water for cost (1pot= Rs.6-10). The town side of kovilpatti is at safer zone but there is a possibility of water shortage in upcoming years (Questionnaire survey). This project is a practical one in which the output should be managing of water resources in kovilpatti. IWRM is a common process which is evolved in recent years but the implementation of this process will lead to great output of water and it is useful for our future. Thus, we can attain sustainable management by means of the IWRM process. Sustainable management is about satisfying today's needs without affecting the future needs. IWRM will be a better solution in solving water scarcity problems.

A. Integrated Water Resource Management

Integrated Water Resources Management (IWRM) is a process which promotes the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare, paving the way towards sustainable development, in an equitable manner without compromising the sustainability of vital ecosystems (GWP 2000). Integrated Water Resource management is a key solution in which it is to be helpful for future and also in an efficient way. The other methods of water conservation are Rain water harvesting, Water shed Management, Waste water recycling and reusing, Proper Water supply and its Management. The main need is to help our society and thus to save our future. There is no alternate to water and hence it is to be saved and to be in reusing condition. Desalination is the modern advancement in water production in which modern techniques are adopted for providing water. But till now there are some areas suffering by water scarcity.

B. Study Area

Kovilpatti, as well known by its name for peanut candy comes under municipality in Tuticorin District in the Indian state of Tamil Nadu. Kovilpatti occupies a best place in Industrial role. As of 2020, the population of town was 1,03,047. The town was around 49 km². It has urban area around 95.4 km² and urban area population 2,40,000 as per 2020 census.

C. Kovilpatti Water Supply

There are 36 wards in kovilpatti town. The one and only main source of drinking water supply for kovilpatti region is from Tamirabarani River via seevalaperi village. In kovilpatti region, the availability of overhead tanks is about 9 and majorly used overhead tanks are 2 tanks of 9.65 lakh litres and 2.75 lakh litres. Due to new creation of extra water tanks, there is sufficient supply of water to kovilpatti town. But there is insufficiency of drinking water to kovilpatti panchayats. There is a need of proper water supply to panchayats.

D. Problems in Kovilpatti

In Kovilpatti, nearby panchayat side, there is water scarcity in some regions. Also in future, Kovilpatti is expected to face water stressed situation in some areas due to growth of population at 2035. According to census report of 2011, the population is 95,057 and in 2020 it is about 1,03,047. Due to growing population and water demand, the water requirement will be more. Today, the per capita demand in our Kovilpatti is 135lpcd. At future, there may be possibility of water scarcity. The major source is from Tamirabarani River. At the situation of drought, there is no alternative for daily water supply. It is a serious problem to be discussed. Also the natural tanks are used only for irrigation purposes and the whole waste water is drained in these tanks only.

E. Main Reason for Study

- Growing population and water demands.
- Over exploitation of water resources.
- Water scarcity.
- Lack of access to a safe water supply and sanitation affects the health of the people annually (WHO, UNICEF-2000).
- By 2040, it is predicted that 33 countries are likely to face extremely high water stress including India, China, Southern Africa, USA and Australia. (India today, Mar 22 '19)
- Thus to avoid that water curse IWRM would be an efficient solution to the whole world.

F. Our Objective

- To explore the available water resources in kovilpatti talukregion and to plan an efficient water resource management for the water scared locality.
- To separate the water enriched area and water insufficient area and thus to provide better solution to the water insufficient area.
- To find out the characteristics of unused Natural Tanks and to provide an idea to treat the water and thus to convert it into drinking water.
- The Population in 2035 is forecasted by different methods and thus to find the demand of water for each persons (Per capita Demand).
- Also the Waste water quantity is found out in which it is also to be planned to recycled and reuse it.
- The Rainfall data is to be summarized in which to calculate the amount of rainfall quantity.
- To propose the Available quantity of water till 2020 and also the water requirements in 2035. Thus, to provide Sustainable management of water resources for our kovilpatti region.

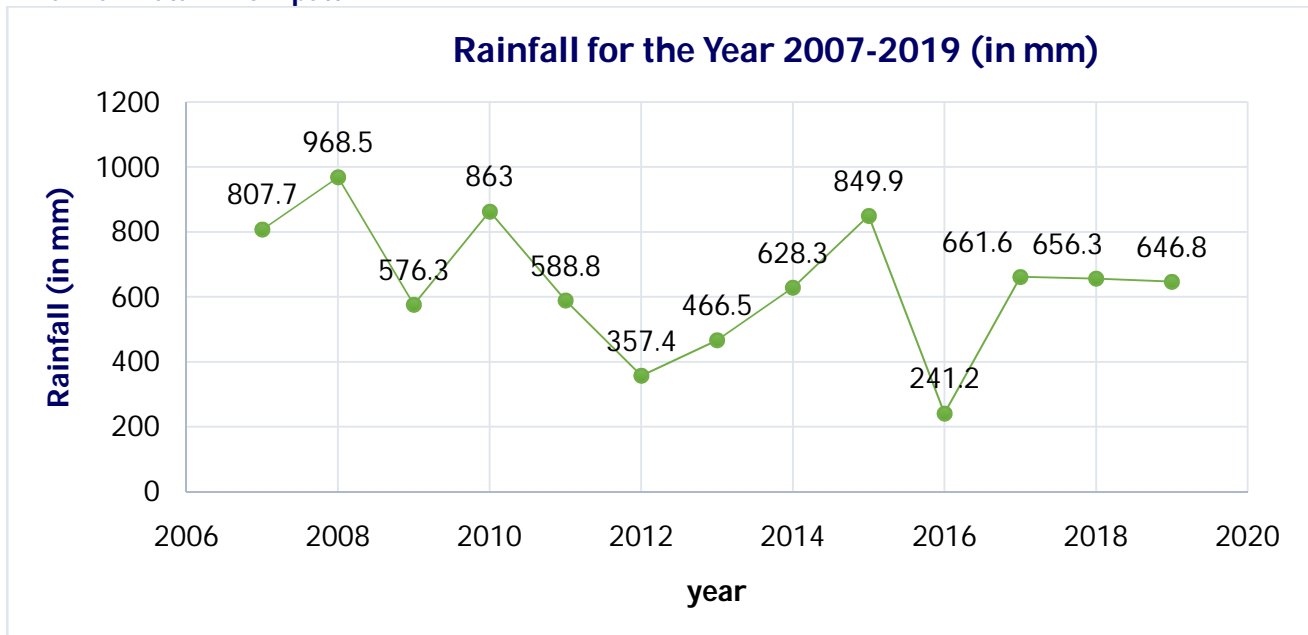
II. DATA PREDICTION

The following are the necessary data about the availability of water in kovilpatti region in which from these data we can provide a proper solution of managing water resources and thus we can save future generation from water scarcity.

A. Rainfall Data

Rain water is an important source of water in which it is observed by means of Rain Gauges. Rain Gauges are fixed in different locations in which it is used to monitor the Rainfall depth (Precipitation data). Based on the values collected from Rain Gauge it is plotted in a graph and thus the graph is plotted as Time (Year) in X-axis and Rainfall value (mm) in Y-axis. It is observed periodically in which the data gets recorded.

B. Rainfall Data in Kovilpatti



C. Ground Water Availability

Table I- Ground Water Quantity in kovilpatti

Ground Water	Quantity (M .Cu. m)
Net Ground water Availability	14.02
Existing Gross Draft for Irrigation	14.81
Existing Gross Draft for Domestic & Industrial water supply	2.01
Existing Gross Draft for all uses	16.82
Allocation for Domestic and Industrial Requirement supply up to 2035	2.06
Net Ground water for Future Irrigation	0(Nil)

D. Municipal Water Availability

The main source of municipal water supply is from Tamirabarani River through Seevalaperi village which is located in Tirunelveli district. The pipe length is about sixty two kilometres and piper perimeter is about five hundred and twenty five inches. This pipe covers nearly twenty six villages. Hence there is proper supply of municipal water in which it is used for drinking. Thus it should be in proper form otherwise there will be problems in health.

Also the disinfectant used is chlorine in which it is properly tested by government officials who are responsible for it. We have done the characterization study for this municipal water in which the results are tabulated.

E. Different Natural Tanks

In kovilpatti region there is availability of more natural tanks but most important natural tanks found in which these are available nearby people living places. There are four most important natural tanks. They are as follows: Aalampatti, Moopampatti, Thitangulam, Athaikonadan, There is more number of natural tanks but these tanks are found with large quantity of water which is in non-potable form. Hence the samples are taken from these water bodies in which they are contaminated by means of intruding of waste from Industries and also by domestic wastes. These wastes are the main reason for contamination of these tanks. Hence the characterization study is done for these tanks.

F. Population Forecasting and Water Demand

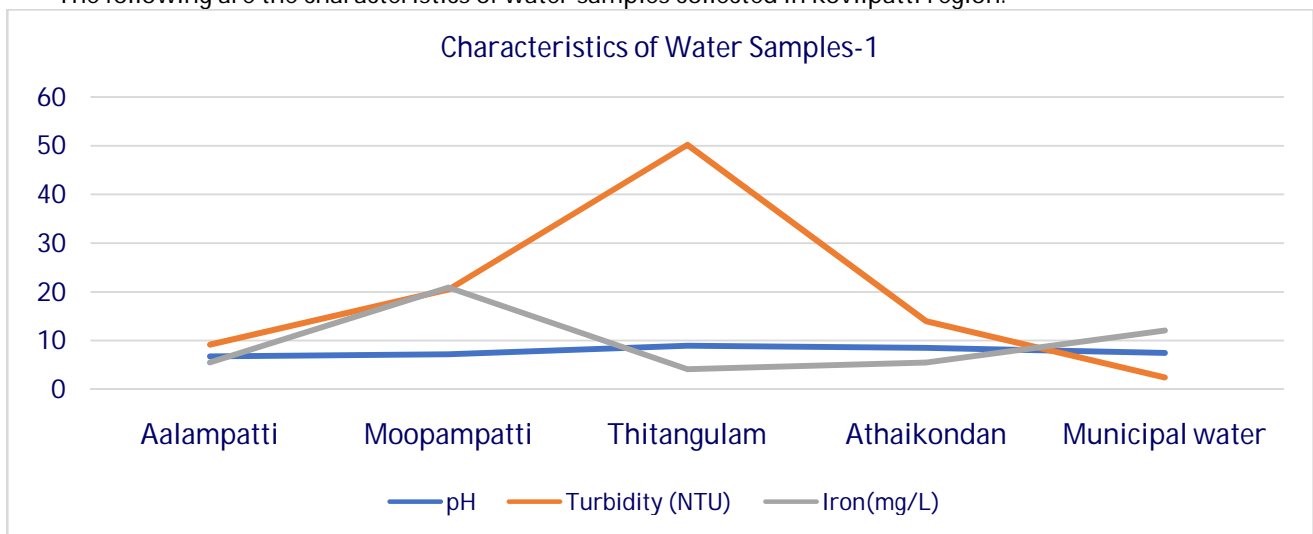
Population plays an main role in water demand calculation in which if the population is high then the water requirement will also in high quantity and if the population is low then the water requirement will also in low quantity. Also the water quantity found today does not satisfy future population and so population forecasting is done. By means of population forecasting we can predict the water requirement and also we can able to judge that the available water will satisfy the future needs. Thus the population forecasting is done. The following table is about the population and water demand and the waste water generation in which it is important in IWRM technique.

Table II - Population forecasting and Water Demand

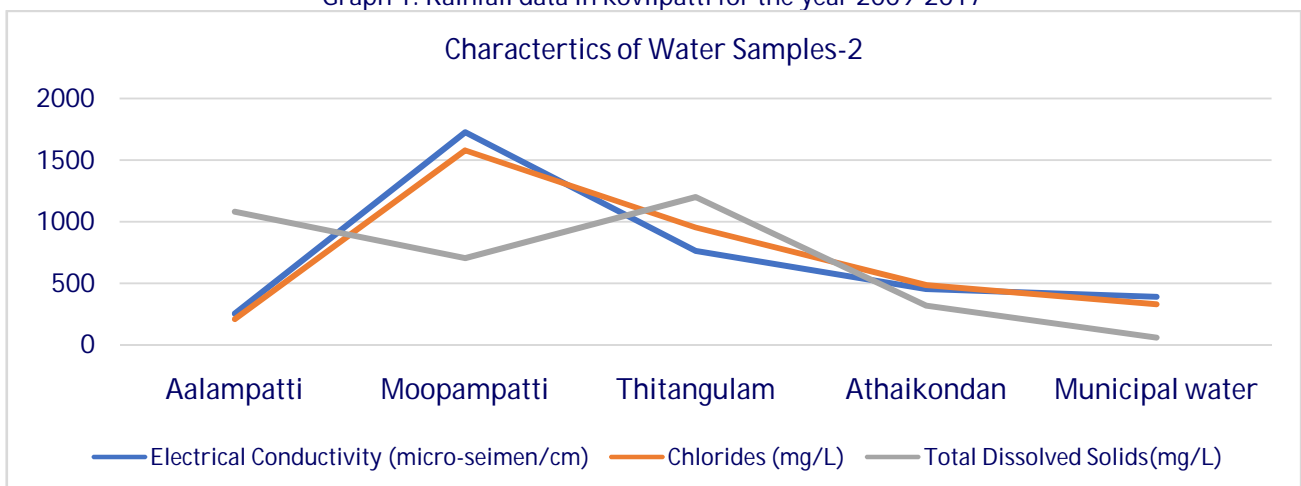
Year	Population	Water Demand (MLD)	Waste Water Generated (MLD)	Per Capita Demand (L/CD)
2020	1,03,047	13.911	11.13	135
2035	1,18.815	16.040	12.832	135

G. Characteristics of Water Samples

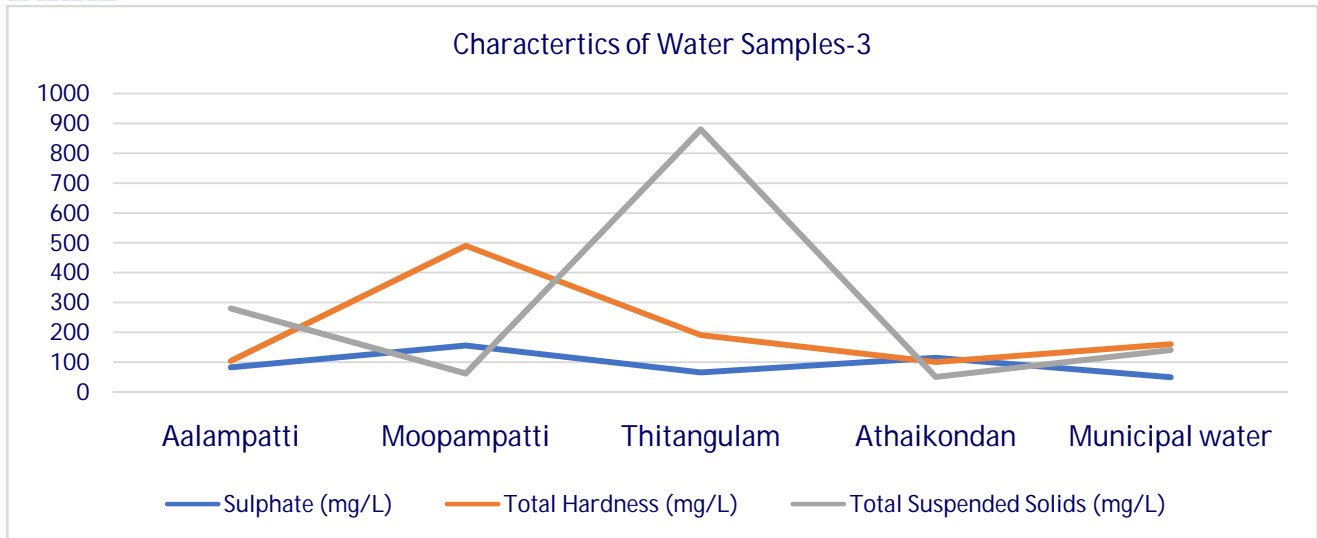
The following are the characteristics of water samples collected in kovilpatti region.



Graph 1: Rainfall data in kovilpatti for the year 2009-2017



Graph 2: Characteristics of water samples-1



Graph 3: Characteristics of water samples-2

Thus from this characterization study we can conclude that if proper treatment is provided for these natural tanks then it will be useful for all purposes. Hence by using these natural tanks we can solve water scarcity problems in kovilpatti region.

H. Inference from these Tests

The pH content of the samples is normal in which it is neither acidic nor basic and it is neutral. The sample collected from Thitangulam has more alkaline in which further treatment is required for it. All the other samples are found within the limit. The Electrical conductance value for these samples are lies within the acceptable limit except the sample collected from Moopampatti in which it has more Electrical conductance value in which further treatment is required for it. All the other samples are found within the limit. The Turbidity values are high in which it should be in the range of 5 -10 NTU and so it should not be used for potable uses. Hence treatment is required for this water. The Total Hardness value are higher in which it should be in the range of 200 - 600 mg/L , but the water samples has higher hardness value and so treatment is required to make it to a potable condition. The Chloride content in the water samples is in normal acceptable limit and hence chloride content does not have large impact on it. The normal range is between 250 – 1000 mg/L. The sample collected from Moopampatti has more chloride content in which further treatment is required for it. All the other samples are found within the safe limit. The Iron content is high in which it should be less than 0.3 mg/L and so it should not be used for potable uses. Hence treatment is required for this water. The Sulphate content in the water samples is in normal acceptable limit and hence there is no special treatment is required. The normal range should be less than 250 mg/L. All the samples are found within the safe limit. The Total Dissolved Solids in these water samples are found to be higher in which special treatments are required for removing the total dissolved solids. The Total Suspended solid is found maximum only for Thitangulam natural tank. Hence the proper treatment is required. Finally, we can conclude that by means of small treatments we can remove the impurities. After treatment we can use it by supplying this water in water scarcity regions.

III. FUTURE PREDICTION

- Hence, by these data it is predicted that Kovilpatti region is in Poor condition in which it has limited amount of Ground water which can be used only for some years.
- Even it is not in critical condition, it is in Over Exploited state.
- After that, there will be insufficiency of water in which it is to be monitored.
- Thus proper management is to be adopted to save our future generations from water scarcity.
- Also by the above study it is observed that there is water scarcity in kovilpatti panchayat side and hence we want to overcome from this problem.

A. Ideas for Managing Water

- Imposing Waste water Treatment Plant in every new building house and also in existing buildings.
- Onsite Waste water Treatment Plant plays a vital role in which the treated water may be used for supplementary uses.
- By these methods we can reduce the usage of ground water up to 40-60%.
- Usage of the Natural tanks by means of treatment plants so that we can get more amount of water and can save our future.
- The characteristics of each natural tanks are found out in which it is predicted that the water found in these tanks are more turbid and also they had some chemical properties greater than permissible limit. Hence after some treatment it can be used for drinking also.

- Also due to improper regulation these natural tanks are used as drainage area of some industries surrounding these natural tanks in which it causes contamination. These contaminations will result in mosquito formation which results in causing of water borne diseases to the surrounding people. Thus proper treatment is to be provided for these natural tanks.
- The main source of drinking water is from Tamirabarani River in which if it is depleted then there will be no source of drinking water for future generations. Thus we want to reduce the usage by using the natural tank water.
- Ground water recharge is done naturally in which every house should contain Rain water harvesting system. Awareness is to be done so that the water is to be conserved efficiently for the future usage.

B. Summary

In this paper, the total available water resources quantities are found out in which they are important for IWRM technique. The characterization study of natural tanks and municipal water are studied in which the results are tabulated. The Rainfall quantity and runoff depths are calculated in which they are used. The Ground water quantity is estimated and then it is used in calculation of total available water quantity. The Population is forecasted for the year 2035 and the water demand is also calculated. The prediction of water demand in future is done for kovilpatti region. The ideas for managing water is proposed in which if they are practiced then it will help in saving future from water scarcity. Water scarcity is the severe problem in which it is because of improper management of water resources.

IV. CONCLUSION

From this paper we can conclude that there will be water scarcity in 2035 in which IWRM will help in managing water resources. Thus, IWRM will be helpful for meeting our future needs. By using IWRM, Sustainable management can be easily achieved and hence the future generation does not get affected by water scarcity. The ideas are proposed in which if it is followed then we can save our region. Not only for this region, even if this IWRM technique is followed in any water stressed regions then they will also get advantages. IWRM is an important technique in managing water resource in efficient way. The characteristic study of water samples taken from Aalampatti, Moopampatti, Thittangulam and Athaikondan natural tanks are found out in which they all require certain treatment process. After treatment they could use for drinking and other purposes. The rainwater and runoff quantity are predicted in which total quantity of water is derived. The ground water quantity is also estimated by means of official information. Hence the total available quantity of water is found in which it is related with water demand as per population. The population is forecasted in 2035 and the water demand is calculated. The ideas are proposed for managing water resources. If the ideas are properly utilised then it will be helpful in overcoming the water scarcity.

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