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INTEGRATED WATER RESOURCE MANAGEMENT FOR THIRUPARANKUNDRAM

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ABSTRACT

Thiruparan kundram is a town in Madurai city in the Indian state of Tamil Nadu. This Panchayat has been added to the Madurai corporation and the first local body election for corporation was held on 18th October 2011. As per 2011 census, the town had a population of 48,810. It is a famous pilgrimage place, so there is floating population also during the festival and holy days. The main problem in the local planning area is mainly due to rapid increase in the population and hence present infrastructure of water and sanitation is not sufficient. Also there is tremendous growth of industrialization and agriculture production activities in the area which has led to increase in demand for water and the need for water supply infrastructure. The objective of this project is to improve the efficacy of water supply system by integrating the water resources for Thiruparankundram area.

Keywords: Water Resource Management, System Dynamics, Decision Support.

I. INTRODUCTION

Water-related problems are series threats to humankind. Water use has more than tripled globally since 1950, and one out of every six persons does not have regular access to safe drinking water. Lack of access to a safe water supply and sanitation affects the health of 1.2 billion people annually (WHO and UNICEF, 2000). The latest global environmental outlook of the United Nations Environmental Program (UNEP) reports that about one third of the world's population currently live in countries suffering moderate-to-high water stress, where consumption is more than 10% of renewable freshwater resources. The problems may be attributed to many factors. Inadequate water management is accelerating the depletion of surface water and ground water resources. Water quality has been degraded by domestic and industrial pollution sources as well as non-point sources. In some places, water is withdrawn from the water resources, which become polluted owing to a lack of sanitation infrastructure and services.

Adequate water infrastructure (like dams, reservoirs and artificial recharge structures) is required to ensure the sustainability of water resources to overcome scarcity problems. Infrastructure like pipe line network is also required to provide water related services, primarily water supply and sanitation, for the population, agriculture and industry, as well as for treatment and disposal of waste water.

Water supply and sanitation in India continue to be inadequate, despite longstanding efforts by the various levels of government and communities. The level of investment in water and sanitation, albeit low by international

standards, has increased during the 2000's. Access has also increased significantly. No major cities in India is known to have a continuous water supply and an estimated 72% of Indians still have lack access to improved sanitation facilities.

Hence it is proposed to develop a closed loop management system by improving infrastructure facilities for Thirupparankundram area.

II. INTEGRATED WATER RESOURCE MANAGEMENT

IWRM is an approach for urban water utilities to plan and manage urban water systems (i.e., water supply, waste water and storm water) to minimize impact an natural environment, to maximize their contribution to social and economic vitality and to engender overall community improvement (Maheepala and Blackmore, 2008).This approach emerged from the perception that water is an integral part of the ecosystem, a natural resource, and a social and economic good (United Nations, 1992). The overall benefits of adopting the IWRM approach in its potential to provide solutions to the common challenges faced by the urban water industry such as climate change, population growth, rising cost for new infrastructure and meet ecological requirements. Some specific and potential benefits of the IWRM approach include

- Providing Water security
- Reducing Impacts on the environment
- Improving governance
- Improving system wide performance

III. SYSTEM DYNAMICS

System Dynamics (SD) is an approach to understanding the behaviour of complex systems over time .It captures internal feedback loops and time delays that affect the entire system. Developed by Professor Jay Forrester in the1960s and popularized by the Club of Rome's *Limits to Growth* in the 1970s.SD has been successfully applied to study demographics , economic growth, business development, water and natural resources management, and environmental systems . Its capabilities to quantitatively simulate the dynamic consequences of various policies make it an ideal decision support tool for strategic policy testing and selection.

The current modelling studies of water resources mainly focus on the irrigation system of the agricultural industries. For example, SD has been used to study Yellow River in China, water for irrigation in Spain, water resources in Canada and water balance in Mono Lake, California.

IV METHODOLOGY

1. Literature Review
2. Base Map Preparation
3. Data Collection
4. Problem Identification
5. Analysis
6. Outcome

4.1 Data Collection

These are the data used as the input for the problem identification and analysis purpose.

- Rainfall
- Population
- Water availability
- Water Requirement
- Water Supply

4.2 Problem Identification

Water is the basic requirement of the human needs for their day to day life.It is very important to have sufficient water for their fullfillment. So the water scarcity can be determined by using following way.

Availability of water > Requirment of water ⟶ There is no water scarcity

Availability of water < Requirment of water ⟶ There is water scarcity

If water scarcity exits, water demand can be find out by using the following method

- Water demand = Requirement of water – Availability of water
- Requirement of water = Population x Percapita demand

By using the above methods, the water scarcity problem that identified in Thiruparankundrum area.

4.3 Analysis

4.3.1Geographical Information System(GIS)

- Used for base map preparation
- Mapping is a key output of GIS but is not the whole story.
- GIS stores the spatial data that is used to make maps.
- GIS is an analysis tool

4.3.2 System Dynamics

System Dynamics is an effective and useful method for the analysis of complex systems, integrating the subsystems and parts into a whole, which can then be simulated to develop insight into its dynamic behaviour. Even without simulation, the causal diagrams improve the understanding of the structure and the key determinants of system behaviour. By using this system Dynamics tool, integrated water resource management can be formed.

V. CONCLUSION

From the above mentioned studies, we can know the importance of water resource management. Now a days, India could not give much importance to water resource management if this level is continue then India faces severe water scarcity. By assessing and managing the water give good efficient water. Thus, the need of study about the water resource management will become the mandatory thing in the future and it will have a great scope to work through. The objective of the study is to improve the efficacy of water supply system by integrating the available water resources of Thiruparankundram area. In this project the study area identified as

Thiruparankundram. The IWRM provides many sources of water as alternatives and drastically reduces the water scarcity in a sustainable manner. Hence, it is proposed to develop a closed loop IWRM system of water resources by improving infrastructure facilities for Thiruparankundram area. By using the integrated water resource management, we can reduce the water demand at least 40% of this area. If it works efficiently it can be used for nearby areas and the water scarcity is decreases drastically.

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