International Journal of Interdisciplinary Innovative Research & Development (IJIIRD)

ISSN: 2456-236X

Vol. 02 Special Issue 05 | 2018

Water Conservation using Information Technology at Remote Areas

[1]Prof. Anshul Vyas, [2]Prof. Rakhee Kundu, [3]Tanay Sawant, [4]Rohit Yaadav, [5]Shreyas Teli, [6]Abhipreet Rai
[1,2] Assistant Professor, Mumbai, Maharashtra
[3,4,5,6] Student, Masters of Computer Application, Mumbai, Maharashtra

ABSTRACT

This paper presents a new approach regarding optimal usage and conservation of water using IT in rural areas. Water Conservation is becoming an important issue as water demand increases, but water supply is likely to diminish owing to climate change. Water Conservation in agricultural sector has much room for improvement to save water through economic and political incentives. In order to augment the water supply, we will install an automated water level sensor device that will sense water level with the help of data logger which connects to the respective ministries using wireless telemetry system. The ministry will update the data logger as per the requirements from the areas in which water is to be supplied. Data will be stored and transmitted in an encrypted format. Based on the requirements, the device will devise the average usage of water on daily basis and send the required amount of water to that area along with graphical report generation. The water supply will be restricted once the particular area utilizes the determined amount. This ensures that there is more appropriate usage of water.

Keywords— Water conservation, Wireless Telemetry sensors, Business Visualization, Data Encryption.

I. INTRODUCTION

"Water=Life, Conservation=Future" explains that water is a resource that we use every day. It is what we need to survive. It's easy to leave the water faucet running and not consider the consequences. The less water used or wasted by people, the less clean water will become contaminated. In some cases, using excess amounts of water puts strain on septic and sewage systems, leading to contamination of groundwater. Conserving water now allows regions to plan for efficient use of the water resources in the future. In rural areas, as agriculture being an important occupation, water conservation becomes an important aspect for efficient productivity of crops and maintaining the salinity and purity of soil [6].
The following pie chart shows the ideal water utilization level:

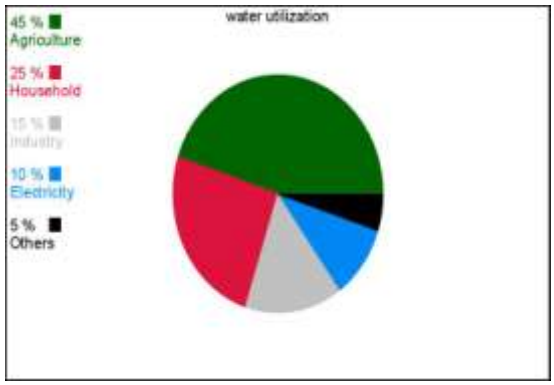

Figure 1. Water utilization pie chart

The common pool nature of water level and the difficulty of observing it directly make this resource difficult to monitor and regulate, especially in rural areas. These water resources are being depleted because of unsustainable extraction levels that exceed natural recharge rates [10]. Also the existing system is not secured as the figures can be changed or manipulated by an external entity and the data is not in an encrypted format.

In order to ensure that there is more appropriate usage of water resources, we will use a Telemetric Water Sensor Tube that will sense water level with the help of Telemetric Data Logger which connects to the respective ministries using wireless telemetric system [7]. The Telemetric Data Transmitter captures and transmits real-time data from the Data Logger to the telemetric system installed at respective ministries through CDMA network [7] [9]. It transmits data on a cellular telemetric network, automating data collection and providing remote configuration and troubleshooting.

With this, we ensure that the data is secured as it is stored and transmitted in an encrypted format. Also, we can control the flow of water and can keep track of detailed demand and supply of water using statistical analysis. Integrating statistical analytics will simplify the task of filtering data for efficient results.

II. RELATED WORK

Table I: Exiting Work Table

Sr. No	Author, Title	Description
1	Mwrra.org (2018). Maharashtra Water Resources Regulatory Authority.	It contains details about water conservation in Maharashtra also it includes some techniques undertaken by authorities.
2	Girma, Misrak & Assefa, Abebayehu & Molinas, Marta. (2015). Feasibility study of a solar Photovoltaic water pumping system for rural Ethiopia.	This paper contains feasibility study done in rural areas of Ethiopia using solar photovoltaic system for pumping groundwater.
3	Suhag, R. (2016). Overview of Ground Water in India.	This paper contains an overview of ground water availability
4	Rivest, R. (1992). The MD5 message - digest algorithm.	This paper contains detail about MD5 algorithm in detail.
5	Comparative analysis of neural network techniques for predicting water consumption time series. Firat, M., Turan, M. E., & Yurdusev, M. A. (2010).	This paper predicts using the series of Artificial Neural Network, where monthly water consumption time series chain is introduced.

III. METHODOLOGY

A. Architecture Diagram

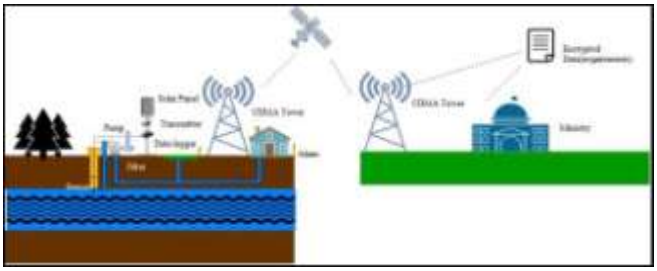

Figure 2. Water conservation architecture diagram

B. Flow Diagram

Automated telemetric sensors and data loggers will be used which are capable of sensing water level, water pressure and the temperature of water. The sensors will be in the form of a stainless-steel tube and the captured data will be transmitted to the telemetric data logger [7]. The data logger will be solar-powered telemetric unit and are fully automated system which will transmit real-time data to the transmitter via cellular network [7]. Solar power will utilize the energy efficiently, which will be ideal for long-term monitoring and high frequency sampling.

A telemetric data transmitter is connected to the data logger through a cellular network capturing data and transmitting it to the telemetric device installed at the respective ministries. The ministry will collect information about the water level from the telemetric data logging device installed in that particular region. Since the groundwater level varies according to the elevation at particular region, the telemetry sensor tube will

calculate and transmit the information to the data logging device on an average basis.

The information is stored and transmitted in an encrypted format using MD5 algorithm in order to assure security so that the data is not misused. Using MD5 Message Digest Algorithm, the transmitter accepts the data of any length as input from the data logging device and returns as output a fixed length digest value that can be used for authenticating the original message.

Below figure shows the encryption process of data using MD5 Algorithm:

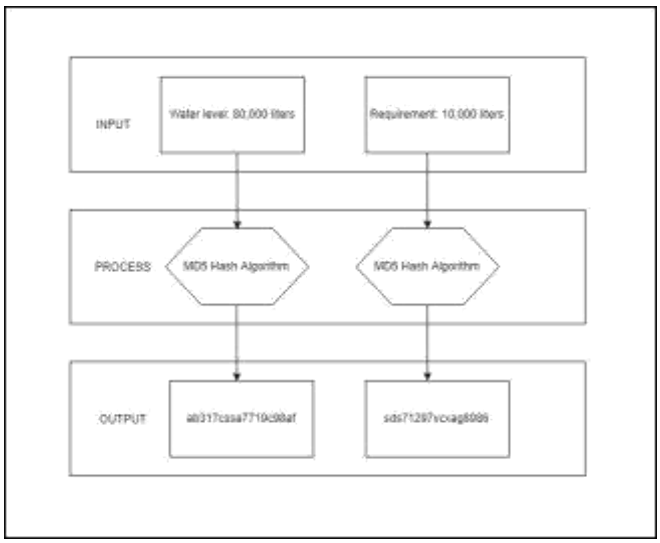

Figure 3. Data Encryption using MD5 algorithm.

When the Data Logger installed at the respective ministry receives the encrypted value, it decrypts it and then based on the requirements, the software will instruct and water is supplied to the respective regions. While the water is being supplied, the software keeps track of water utilization of every region. If one of the region's water supply exceeds the supply allotted value, then the wireless data logger will raise an alarm stating that the particular region has exhausted the supply allotted value and the software will stop/restrict the water supply for that region. If that region has additional demand for water, then it will send the request to the Ministry. The Ministry will charge certain amount based on the region's additional demand for water supply.

The telemetric system also consists of a sensor which will forecast the weather conditions and natural calamities. In case of natural calamity like floods, the software will automatically notify the data logging device which will take precautionary actions. Additionally, the software will plan to keep a certain amount of water as backup so as the water supply will not halt abruptly in case of drought and famine situations.

Water resource will undergo two stage filtration i.e. conventional rapid filtration, whose purpose is to trap metallic particles for agricultural where toxicity and impurities of water is filtered and membrane & Reverse Osmosis (RO) filtration is used for purifying water which will be used for drinking purposes [8].

This system will be checked and maintained for any faults by a technician on weekly basis.

IV. CONCLUSION

Telemetry System ensures more optimal usage of water for agriculture and household purposes, as the existing system is limited to sensing water level and water pressure, also it cannot control the flow of pipeline water.

There is no cross section of wires as the entire telemetry system is wireless, working on a cellular network. Using solar panels, ideally less maintenance is required as it can last for long. Also, it is pollution free and causes no greenhouse gases to be emitted after installation.

Using Telemetry Data Logger enables to raise an alarm notification whenever the usage of water level surpasses the determined amount for day. Data is captured and transmitted to Ministry in an encrypted format, which reduces the misusing of requirements for water supply in that particular region. Also, with the help of this technology, the Ministry keeps track of detailed demand and supply of water and statistically analyze for continuous betterment.

Thus, the objective of Water Conservation can be achieved through concrete efforts on the conservation and utilization of water on sustainable basis.

V. FUTURE SCOPE AND ENHANCEMENTS

Environmental rays can replace solar energy as it is an inexpensive source of energy. Environmental radiation includes Cosmic Radiation and Terrestrial radiation. The sun and stars send a constant stream of cosmic radiation to Earth, much like a steady drizzle of rain. The Earth itself is a source of terrestrial radiation. Radioactive materials (including uranium, thorium, and radium) exist naturally in soil and rock and energy can be extracted internally.

Additional surplus water which will be conserved using our technology can be used to produce electricity which will be extremely beneficial in places where there is shortage of electricity.

Artificial Intelligence can be introduced in our system. With the help of AI, the system can automatically set the standards for allocation of water resources as per requirements of different regions.

VI. REFERENCES

[1] Mwrra.org. (2018). Maharashtra Water Resources Regulatory Authority. [online] Available at: http://www.mwrra.org/water_conservation.php?link=sustain [Accessed 5 Mar. 2018].

[2] Girma, Misrak & Assefa, Abebayehu & Molinas, Marta. (2015). Feasibility study of a solar photovoltaic water pumping system for rural Ethiopia. AIMS Journal. 2. 697-717. 10.3934/environsci.2015.3.697.

[3] Suhag, R. (2016). *Overview of Ground Water in India* (No. id: 9504).

[4] Rivest, R. (1992). The MD5 message-digest algorithm.

[5] Comparative analysis of neural network techniques for predicting water consumption time series. Firat, M., Turan, M. E., & Yurdusev, M. A. (2010). Comparative analysis of neural network techniques for predicting water consumption time series. Journal of hydrology, 384(1-2), 46-51.

[6] "Water Page Resources: The Importance of Water Conservation", *Thewaterpage.com*, 2018. [Online]. Available: http://www.thewaterpage.com/important-water.htm. [Accessed: 05-Mar- 2018].

[7] "Remote Water Level Monitoring Systems - Water Level Logger", *In-Situ*, 2018. [Online]. Available: https://in-situ.com/product-category/remote-water-level-monitoring/. [Accessed: 05- Mar- 2018].

[8] Sourirajan, S. (1970). *Reverse osmosis*. London, UK: Logos Press Ltd.

[9] Wang, J., Ren, X. L., Shen, Y. L., & Liu, S. Y. (2010, January). A remote wireless sensor networks for water quality monitoring. In *Innovative Computing & Communication, 2010 Intl Conf on and Information Technology & Ocean Engineering, 2010 Asia-Pacific Conf on (CICC-ITOE)* (pp. 7-12). IEEE.

[10] Macedonio, F., Drioli, E., Gusev, A. A., Bardow, A., Semiat, R., & Kurihara, M. (2012). Efficient technologies for worldwide clean water supply. Chemical Engineering and Processing: Process Intensification, 51, 2-17.