RESEARCH ON

Big Data Analysis for Water Management

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# **Introduction**

The data collected from day to day interactions with digital products or services, from smart electronic gadgets like mobile phones, computers, several banking facilities provided to the customers, from online transactions, several social networking sites, from several data connected to the ground as well as from water, all the information getting from these collectively known as a ‘BIG DATA’[2]. This has played a major role in improvising human ability to connect the world with new technologies in every sector which includes several opportunities to gain jobs and fabrication, to deliver effective and inclusive transport and energy services, to prepare for disaster and climate change control. Big Data allows Businesses to analyze large data sets in order to make more informed strategic decisions. It is also being used to meet or to satisfy some of sustainability goals.[1]. The data revolution is already transforming the society and the natural resources with the help of BIG data along with the Artificial Intelligence (AI) and Internet of Things (IOT) [3]. It can be also said that Big Data is composed of ‘3 V’s’, Volume: handles huge data setup that certain organizations implement for a better decision making. Variety: allows to various structure if datasets like structured, semi-structured and unstructured data. Velocity: describes the rate of data in which it is being generated and the speed at which it is being analyzed [3]. With the advancement in communications and sensors technology, the use of wireless sensors has been increased across smart cities, industrial environments and autonomous vehicles [4].

## **Importance of Big Data in the field of Water Resources and its Management**

With the help of present new technologies and digitalization it seems to be better benefits in water sector, healthcare, hydrocarbons sector than before. Walking through the latest technology in Hardware, Software and Data Analytics helps in providing water utilities a better understanding of their uses, dynamics and system behaviour to work more effectively by reducing loads and stresses. Big data and its field of data science are slowly gaining control to gather new information which helps in establishing increase in reliability, optimization, supply chains and customer relationships (4).Water utilities see data from Supervisory Control and Data Acquisition (SCADA) systems including flow statistics, online monitoring, dissolved oxygen (DO) measurements, and air flows, as well as data from laboratory information management systems (LIMS) and computerized maintenance management systems (CMMS), to name several examples [6].

Such Data is helpful and many of them is being implemented since years. But the way, data is collected is being degraded in quality as well as quantity. There are silos of data in computer systems that don’t always talk to each other. The Internet Age has granted to integrate that unused data into a single and meaningful way which allows water and wastewater treatment plant operators to understand and use it to optimize plant reliability and performance. Big Data initiatives and new data management tools enable us to turn all that data into understandable, useful information that helps us become more proactive and make better decisions about plant operations [6].

The management plan is the key role for proper implementation of big data in terms of water management and its resources, no matter what tools and equipment we used for it. And for a proper management plan we have to take advantage of the smart screens and servers for identifying present trends and requirements [6].

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| V’s | Parameters |
| Volume | M2M sensors, Pressure Data, customer details |
| Velocity | Valve data, Transformer Data, Social Media Message |
| Variety | Video, XML file, GPS record |
| Veracity | Power factor, junction point, equipment data |
| Value | Customer and transaction record, employee data |
| Viscosity | Climate condition record, air condition |
| Variability | Supply for individual, revenue data, customer reading record, feedback record |
| Vulnerability | Pipeline data, pumphouse record |
| Visualization | Monitoring camera record, meter reading, picture data |
| Virility | Supply voltage, Ph record, flow record, public health record |
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## **How Big Data can help to manage water?**

When talking about water management it doesn’t solely depends on drinking water since it includes all the reservoirs used for agricultural purpose, for irrigation, for industrial purpose and also involves waste or drainage water. Many parts of the world are facing water scarcity due to large amount of water being wasted every day in other parts of the world. These wastage factors can be reduced by applying a variety of remote sensors which gathers information about water leakage or water wastage. Applying a range of predictive algorithms, it can be determined usage of water in different sectors. Collected data from various sectors helps to specify the distinct patterns of water wastage. all these collected data and predictive algorithms help to relevant water management authorities and engineers for the proper prediction of water demand in each sector. With this Big data, the boost in the efficiency of water supply chain can be achieved and also it has an ability to detect the leakage points and to repair it quicker if a proper data is available across management authorities [7].

“Every Drop of Data Counts for Proper Management”

## **ICT beneficial to Water Management**

ICT is a strategic enabler for finding out innovative solutions of problem like water scarcities, wastage of water and water management [8]. Looking at the present scenario, it indicates that after twenty years from now, there will be huge increase in population which demands double the amount for portable water and waste water generation especially in urban areas. Major factors affecting management of water is increased population and influence of climate change which makes the weather phenomena bad [9]. Hence Mapping of water resources became an important factor for water utility companies.

Radio-based ICT systems such as remote sensors are a major source of information about the Earth’s atmosphere and environmental conditions. Remote sensing technologies joined with satellite radiocommunication systems, global positioning systems (GPS) and GIS have been important in identifying new freshwater sources, building models of watershed basin areas and analyzing proper environmental conditions for rainfall [8]. Mapping of Water Resources with the help of ICT can be done by Remote Sensing from Satellites, by Original Terrestrial Sensing Systems and by Sensor Networks and Internet [8]. Moreover, Smart Meters provide lots of information on domestic water use and that can be sent directly to the water company servers [7].

Hence, Data Collection in this field is not new; what is new is the way that the data is used, treated and managed. For example, the ‘Kerala Water Authority’ (KWA) in INDIA is also using Analytics and Mobility Solutions for proper managing of usage of water. Another example is of ‘CEIT-IK4’ Research Centre which provides Urban Sewage Treatment plants with an Advanced Data Management System and it is already running successfully in Spain, Finland and Sweden [7].

## **Future Scope of Big Data in Water Management**

Looking at the present situation, it has been confirmed that there is a flood of Big Data available for almost every sector, but still its applications are limited and not up to the mark in many areas. In terms of analyzing and several applications of Big Data would acquire some time. Very few applications of Big Data are available in certain sector other than information technology and data science [10]. Hence, still it is in under development stage for certain necessity requirements, Big Data has a lot of Scope in Future to ease the work in certain sectors with the help of latest advanced technologies. From the Water Management side, Big Data Analysis is useful for Energy Optimization, Demand forecasting, Resource Management, Water Quality Management, Natural Disasters like Flood Management, Non-Revenue Water Assessment and a lot more [11]. For raising the Economy of the nation and increment in use of Natural Resources with reduced wastage and harm, Big Data plays an important role.

## **Conclusions**

Although Big Data analysis is relatively new concept, it has attained a lot of achievements for water management and yet it continues. As the Technology gets advanced and more efficient day by day, it enables to produce a highly efficient water sensors, and there is more data for operators and authorities for looking into the actual water demand in order to sustain the lives as well as for sustain of environment. Big Data has enabled quick decision making by giving real-time data. Advancement in computerized data has achieved speed in collection as well as implementation of data, which has effectively reduced wastage of natural resources. Also, it helps in predictive analysis of resources like water for public demand with rise in population in future. The management plan is the key role for proper implementation of Big Data.

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