

# To study the hurdles in designing a water supply system for a city

Tejas Bhangale<sup>1</sup>, Pankaj Attarde<sup>2</sup>,

<sup>1</sup>Student, Dept. of Civil Engg., SSGB College, Bhusaval

<sup>2</sup>Second Associate Prof., Dept. of Civil Engg., SSGB College, Bhusaval

\*\*\*

**Abstract** – Water supply system has been a key concern for any country since a lot of time now. While many of the countries in the world have successfully tackled water scarcity, India remains quite passive in its approach towards providing ample amount of water to its huge population. The study has been focused on studying the processed involved in water supply system and its difficulties. A successful completion of water supply project will require overcoming difficulties arrived in every phase of the project like planning, execution and quality control.

**Key Words:** Water scarcity, Water Supply System

## 1. INTRODUCTION

India, often called as a land of people, is fighting its way up in the leading countries ladder day by day. But the lack of basic infrastructure and awareness has led India to fight with many basic issues live poverty, hunger and water scarcity. A country with 1.3 billion people and that too more than 70% living in the urban areas has to deal with a tremendous load on its basic infrastructures like transport, housing and water supply. Day by day, the weathering patterns are changing and India is facing two extremes of rainfall throughout the country: the northern half is dealing with flood situation and the southern half with drought. So, in these changing patterns, it is our duty to be responsible and to use the water carefully. At the same time, it is mandatory to install water supply grids across countries as well as better water supply systems in the urban area.

### 1.1 Problem Statement & Scope of the Study

According to a survey conducted by World Bank Group, around 90% of the urban population have access to drinking water but only for few hours a day or periodically in a week. SVery few cities in India have 24 hours 7 Days a week running water. The water received is lacking the important treatment most of the times. So it is a challenge for us to design a full proof action plan for using the available water resources sensibly.

The current study has been focused on studying various processes involved in construction of water supply system and also the setbacks experienced in the execution of the same. The literature will be studied for important parameters related to water scarcity and available water resources in India. A small city of Jalgaon is taken up for case study which has recently taken an initiative called “Amrut Yojna” aimed at providing fresh and clean water 24

x 7. The Water distribution system for the city will be studied in the future.

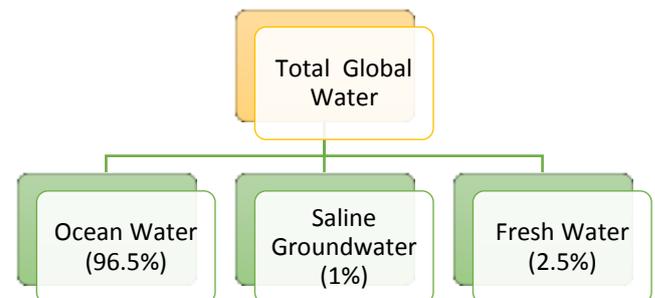
### 1.2 Objectives of Study

As discussed in the above paragraph, the paper study is limited to following objectives:

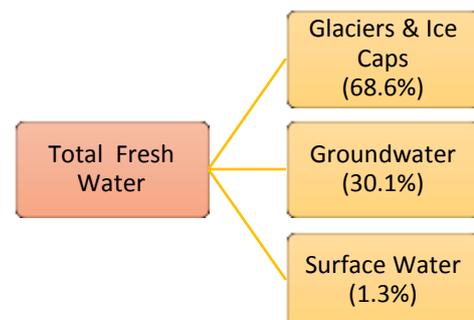
- To understand various process involved in designing a water treatment plant
- To study various setbacks and difficulties occurred in the project

## 2. Literature Review

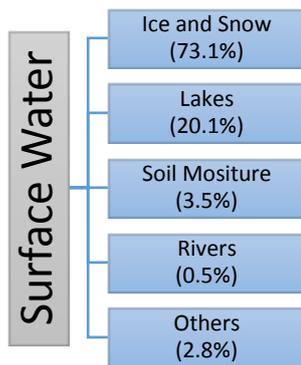
Water is a very dynamic resource which keep on fluctuating day by day and it becomes difficult to measure it in terms of time and space. However, roughly globally available water is shown in detail below which results in a simple fact that very few amounts of water (roughly 1% of total available water) can be used by human beings. The quantity available is still well enough for everyone if we are using it with proper distribution and sharing.



(a)



(b)



(c)

(Source – *Water in Crisis : A Guide to World’s Fresh Water*, Peter H. Gleick)

**Chart -1:** Distribution of Water on Earth

Water scarcity is troubling India for quite some time now but still we are very much behind in tackling it. In recent year, tow of the country’s oppositely faced cities faced a fate of Day Zero (A condition where no fresh water is available), Shimla and Bangaluru. One being the hottest of the tourists destination and another being the heart of the IT industry in India. Both the cities have experienced opposite weather conditions but yet their fate remains same. From a recent study carried out in NITI Aayog, it has been seen that more than 600 million people are suffering from extreme water stress, that’s around (50% of the total population). And more to that having 70% of supply water contaminated, India is shamefully taken place of 120 in a survey of 122 countries in water quality index [1]. With the water demand to be doubled by the year 2030, we need a better treatment and supply system for cities right now.

Coming to the execution of the projects, delay I a common phenomenon in worldwide construction industry. A project must be completed within the time and resource limits planned for it. Any overrun in the quantity is set to reduce the efficiency and suitability of the project. A project is delayed by three reasons : 1)Improper decision making 2)Inefficiency of contractor & 3)Difficulties in execution[2]. Considering a water supply system project, the most important issue is the execution phase. Right from land acquisition to execution in very hard or very soft soils and dealing with the narrow roads and heavy traffic, every front of the project is suffered. The execution in some areas becomes very sensitive due to local residence influence, presence of existing underground utilities and again heavy traffic. So, the water supply system needs a proper project management approach which will not only establish healthy communication between decision making bodies and executing bodies but also it will help in increasing the overall efficiency of the project.

### 3. Water Supply System

#### 3.1 Construction of Water Supply System



(Source-<https://alfacombrasil.com/2019/04/18/abastecimento-de-agua/>)

**Fig -1:** Layout of Water Supply System

A water supply system mainly consists of Source, Treatment unit, Distribution network [2]. Various surface sources like rivers, dams, lake and some sub-surface sources like wells, aquifers are used for continuous supply of water into treatment unit. A treatment unit will further remove the floating impurities like debris, organic matter as well as dust and sand particles. Water will be then filtered out to remove microscopical impurities and then it will be disinfected to kill any present micro-organisms. Sometimes extra treatments of hardness removal or metal detection and other treatments can be applied based on the quality of water collected from source. The treated water is stored into various elevated storage reservoirs. These reservoirs will be transporting the water to extreme corners of the distribution grid. The distribution grid have lot of main and branch lines. The supply in an area can be controlled and water pressure will be maintained using valves attached to the main lines. For better performance of a water supply system it is very necessary to design each of the component with uttermost care and considerations. Various factors like leakage, theft and non-revenue water result in failure of a water supply system.

#### 3.2 Difficulties in construction of Water Supply System

A water supply system must be constructed starting from outside of a city to its most interior areas. A city undergoing the changes or upgradation in the supply system has to face many issues like planning the work processes over large areas, diverging the mainline traffic, finishing up the excavation works in important areas and most important being the rectifying the errors in pipeline installations. Some of the important factors causing delay in construction of water supply system are highlighted and briefly summarised below.

**Table -1:** Factors causing Delay in Construction of Water Supply System

Type of Difficulties	Details
Planning (Preconstruction) difficulties	<ul style="list-style-type: none"> <li>▪ Land Acquisition</li> <li>▪ Lack of Proper Planning &amp; Project Management Studies</li> <li>▪ Absence of healthy communication within the authorities</li> </ul>
Executorial difficulties	<ul style="list-style-type: none"> <li>▪ Diverging the traffic flow</li> <li>▪ Excavation problems</li> <li>▪ Disturbance to existing underground utilities</li> <li>▪ Pipe &amp; Joints Installation</li> <li>▪ Restoration of roads</li> </ul>
Performance related difficulties	<ul style="list-style-type: none"> <li>▪ Inadequate resource</li> <li>▪ Lack of Motion Study</li> <li>▪ Local Festivals &amp; Events</li> </ul>
Post Construction difficulties	<ul style="list-style-type: none"> <li>▪ Quality Checks</li> <li>▪ Rectification of errors</li> </ul>

**Planning Difficulties** – Land is the most primary need for an infrastructure and any delay in land acquisition causes huge changes in project costs. Before commencing any project, it is advisable to study its parameters using project management analysis and at the same time the entire information must be properly transferred to respective departments. If failed to do so, the project will be adversely affected and there will be a lot on confusion considering the role and responsibilities of authorities.

**Executorial Difficulties** – When any construction project is to be started, the important factor is the ease of site clearance. Since, water supply system needs roads for construction, a huge challenge of diverging traffic arises in front of authorities. Effective measures must be taken so that construction activities will be least affected and people can communicate within the city without any hassle. Excavation of roads must be done with care so that the underground utilities like service cables and old pipelines must not be disturbed and damaged. Joints in pipes are the next hurdle which might induce problems of leakage in discharge and pressure. After pipes and joints are installed, all roads must be restored to proper conditions or else accidents and pollution will increase in the area. Restoration of roads takes large resources of time and labor which influences project costs.

**Performance Difficulties** – Contractors play an important role in successful completion of project. However, negligence of a contractor towards project management analysis, resource allocations and motion studies result in delay in project construction. Use of equipment in installing water pipes or excavation are to be properly scheduled so that costs are minimized. Many a times, labor laws and some other factors like festivals, strikes and local events will delay the project.

**Post Construction Difficulties** – After the construction is complete, several quality checks must be performed to check pressures and leakages. If any of the pipe connection fails, entire process must be repeated and it further delays the project.

#### 4. CONCLUSION

Water, being the most consumed material on earth, must be made available to everyone in ample quantity. In India, water availability is reducing day by day and hence we need an efficient water supply system in the country. The construction project is hugely affected by various factors like planning and execution related difficulties. All of them must be carefully analyzed and effectively tackled. The study will be further extended in applying project management for water supply system in Jalgaon city.

#### REFERENCES

- 1) Rana, Mamta and Guleria, Vishal (2018): Water Scarcity in India: A Threat to Sustainable Management of Water. ESSENCE Int. J. Env. Rehab. Conserv. IX (1): 35—44.
- 2) A.K. Aaditya, D.A. Douglass, M. Bhattacharya, “Urban Infrastructure Development Works in India: Delay and Difficulties in Implementation with Reference to a Water Supply Project”, J. Inst. Eng. India Ser. A (September 2017) 98(3):349-354