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"DESIGN OF WATER SUPPLY SCHEME IN VILLAGE – BANEGAON, TALUKA – NORTH SOLAPUR, DISTRICT- SOLAPUR."

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Abstract - ***The design of the water supply system for Banegaon Village in Taluka North Solapur, District Solapur, Maharashtra, has been completed in the suggested study. Using the traditional technique, the hamlet of Banegaon in the Maharashtra region's Solapur district has a total area of 1741.39 hectors, which includes agricultural land. Since farming is the primary source of income for the people, water is one of their most important needs. A survey revealed that there is not enough water available, therefore we upgraded the design of the water supply plan for the hamlet of Banegaon to last for five decades.***

Key Words: Banegaon, water supply scheme, population forecasting.

1.INTRODUCTION

Water is one of the requirements for life. For all living creatures to survive, they need water. Water is used for a variety of purposes, including irrigation, industry, cooking, and drinking. Despite the fact that water covers more than 70% of the earth's surface, less than 1% of it is freshwater. Water use is rapidly increasing as a result of our growing population. In the past, each person or household was in charge of making arrangements for their water needs. To complete it, the community as a whole did not collaborate. The need for a public water supply emerged as the neighbourhood grew, and the people soon saw that their shallow wells, springs, cisterns, etc. were insufficient.

They started to carry water there by aqueducts, canals, etc. by gathering it from distant, large sources that are insufficient to suit the town's needs. When a place gets more populated, finding wells becomes more difficult. In addition to this water supply, premium items were harder to find. All of these factors have an impact on how public water supply systems are developed. The fields of engineering, economics, science, and the arts all pertain to water treatment. Treatment options include mechanical, physical, biological, and pharmaceutical ones. All technologies are founded in science, and engineering guarantees that they work as intended.

Building and maintaining water supply and waste water disposal systems is frequently handled by government bodies like the Public Health Engineering or Environmental Engineering Department. A good illustration of how the district administration mismanages water is seen in Banegaon Village in the Solapur District. "Under the group water delivery plan, Banegaon Gram-Panchayat has been providing water to Banegaon village for two decades. However, no more than 20 litres of water per family per day is provided. To bring drinking water from wells, the ladies of the hamlet must travel more than two km each day. They also depend on rain for the majority of the day. In order to make room for agriculture, they also clear forests. In addition, the villagers frequently endure summertime drought-like circumstances because they depend on the nearby lake for their daily water demands.

1.1 Aim of study

The goal of the current study is to examine the Banegaon Water Supply Scheme's design.

1.2 Objective

The following are the objective of the present research work.

The Banegaon is a hamlet in Maharashtra's Solapur district. The settlement has a 1741.39 Ha area. including farming. Since farming is the primary source of income for the locals, water is one of their most important needs. A survey revealed that there is not enough water available, therefore we upgraded the design of the water delivery network for the village of Banegaon.

1. Study of existing water supply scheme.

2. Population forecasting for next 5 decade.

3. Design of water supply scheme for next 5 decade.

2. Literature Review

A review of the literatures consulted for the study is included in this section.

Sandeep Maurya S., Y.K. Bind, Vikas Srivastava.[1] described that Due to losses happening for shorter periods of time and more careful water use by users, the intermittent delivery system has been shown to occasionally result in some reductions in water consumption.

Gandhre, N. S, Omkar Jadhav, Varsha Rane, Yogita Bahiram. [2] In order to address the village's water needs, a new water supply plan has been explored and recommended in "Water Supply Scheme for Mamdapur Village." Taluka Karjat, District Raigad is where Mamdapur Village is situated. Water shortage is an issue in this village. Prior to 2002, there were only 7 hand pumps and 3 wells in the community, according to a survey. PWSS (Pipe Water Supply Scheme) was finalised under the Gram Panchayat in 2002, but due to the scheme's delayed life and the village's increasing demand, it is already outdated. This project's goal was to examine the village of Mamdapur's water shortage issue and provide the locals with clean, safe water through the year 2051.

Bharambe. V, Dr.A.S.Wayal. [3] A study on "Analysis of Multi-Village Rural Regional Piped Water Supply Scheme" was conducted. Modifications to the design are suggested to address this problem while taking feasibility into account. Multi-village rural water supply systems are popping up more frequently in India. Multi-village water delivery programmes appear to provide a practical and long-term answer to the severe water scarcity that many regions of India experience. They have the capacity to take advantage of scale economies and to enable higher levels of service. The challenges of providing rural inhabitants in developing countries with sustainable access to water services frequently go considerably beyond those posed by the technology itself.

Krishna Priya R.[1], Anjali Ajay[2], Seema K. Nayar[3] [4] In the study "Sustainability of Rural Water Supply: A Case Study of Jalanidhi, Kerala," it was found that the schemes may be made sustainable by integrating watershed development programmes to create water conservation activities, effective and full community engagement, and quality assurance. This paper will discuss different water supply frameworks and programmes at the national and state levels, the limitations of the Kerala Water Authority's (KWA) role in rural water supply, decentralized, community-led water supply reforms, and the tactics employed by the Kerala Rural Water Supply and Sanitation Agency (KRWSA) or jalanidhi in community-driven rural water supply schemes. (RWSS).

Vikrant Bhakara, Nitesh Sihaga, Rebekka Gieschenb, Stefan Andrewb, Christoph Herrmannb, K. S. Sangwan. [5] examined the water supply system's environmental impact assessments for an Indian university campus. Water supply management's effects on the environment are broken down into relevant impact categories. The main effects in this category are brought on by the energy required to extract groundwater and the water wasted during reverse osmosis treatment. According to the study, using treated water for gardening will roughly 25% lessen the university's environmental effect. As the minimum temperature approaches 4 degrees centigrade throughout the winter, there will be less demand.

Tariq Ahmad Bhat. [6] performed a demand and supply study of water in India. According to research, there is a significant rise in the demand for water as a result of population growth, urbanization, and industrialization, as well as the need to increase agricultural output. India does not have a water shortage, but due to significant negligence and a lack of oversight of programmes to enhance water resources, many sections of the nation occasionally experience water stress.

Stephen Nyende-Byakika, Gaddi Ngirane-Katashaya and Julius M. Ndambuki. [7] outlined the importance of water distribution networks in supplying water. The study finds that ensuring consumers have an adequate supply of water requires both an effective distribution system and increased production. According to the explanation above, adopting a wider pipe can reduce head losses in pipelines. As has already been shown, expanding diameters can raise pressure but lower flow velocity. Therefore, network optimisation is crucial for achieving the optimum outcomes.

3. Research Methodology

General - We refer to water as being essential to life; it is just as important to breathe each day. An engineer's job is required for society's water supplies. As part of our study of water supply schemes, this chapter will focus on the many types of water supply schemes, the factors that affect them, and how, as population grows, water demand grows as well.

The village is located on the Solapur–Mardi highway. The closest railway station is in Solapur, 20 kilometers from the settlement. There are primary schools, etc. in the village. The village has electricity. The primary occupation of the residents is agriculture, and the main crops farmed there are. Cotton, Bajra Jawar, sugar cane, etc. The community is well-known for. Public Yatra local Gram Panchayat is in charge of administering local civic matters.

3.1 Flow Chart of Types of Water Supply Scheme

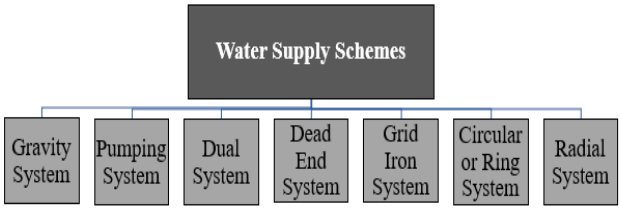

Fig -1: Types of Water Supply Systems

3.2 Principal Feature of Banegaon Water Supply Scheme

Table- 1 Population Forecasting of 5 Decades

Sr.	Year	Population
1	2021 (Present population)	2490
2	2031	2839
3	2041	3236
4	2051	3689
5	2061	4205
6	2071	4794

Table- 2 Capacity of storage reservoir

1	Gross Demand (Liters) 2031	204558
2	Required Capacity of Storage	133122
3	Existing Capacity of Storage	100000
4	Net Storage Capacity Required	33122
	Say	35000

Therefore new ESR of 35000 Ltr is proposed at higher level

Source – Ekruk Lake

Daily Demand – 357713 MLD

Rate of water supply – 55 LPCD

Table- 3 Design of Pumping Machinery

Description		Intermediate Population	Ultimate Population	Unit
Year	=	2031	2071	
Population	=	2839	4794	Souls
Rate of Water Supply	=	55	55	LPCD
Floating Population	=	500	1500	Souls
Rate of Water Supply	=	15	15	LPCD
Total Demand	=	0.17	0.29	MLD
W/ 20% Losses	=	**0.275**	**0.338**	MLD
Pumping Hours	=	8	8	Hours
Discharge Q	=	0.825	1.014	MLD
Pipe Material	=	HDPE	HDPE	
C Value	=	145	145	
Diameter	=	200	200	mm
Class of Pipe	=	6	6	
Length	=	6000	6000	M
Inner Diameter of Pipe	=	162.50	162.50	mm
Outer Diameter of Pipe	=	200.00	200.00	mm
Friction Losses Hf = $2.78(Q/CD^{2.63})^{(1/.54)}$	=	1.35	1.98	M/Km
Frictional Losses for Total Length	=	8.10	11.87	M
Frict. Loss for Total Length W/ 10% add	=	8.91	13.05	M
Static Head = FSL - LSL of Well	=	47.00	47.00	M
Velocity Head	=	2.00	2.00	M
Total Head on Pump	=	57.91	62.05	M
Say Head	=	**58.00**	**63.00**	M
Discharge Q	=	34375.00	42250.00	LPH
Discharge Q	=	9.55	11.74	LPS
Efficiency of Pump = η	=	70%	70%	
Power of Pump = ($Q_{(LPS)}$ x H) / (75 x η)	=	10.56	14.09	BHP
Add for Temp. Alt. Difference	=	20%	20%	
Total Power of Pump	=	**12.67**	**16.91**	BHP
Say Power of Pump	=	13.00	17.00	BHP

Fig -2: Areal map of Banegaon Village

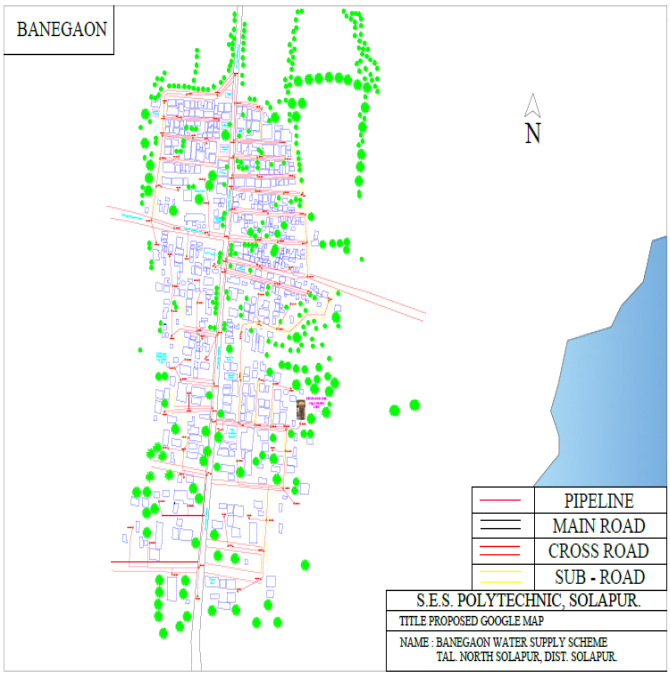

Fig -3: Water supply Network Diagram of Banegaon Village

4. Detailed Costing of Scheme

Table- 4 Detailed Costing of Scheme

Sr. No	Name of subwork		Amount In Rs
1	Pumping machinery (17.5 HP/8 stages)	Rs.	2,51,761.00
2	Rising main (6000 m 200mm 6kg)	Rs.	96,12,667.00
3	RCC ESR (Capacity-35000 ltr)	Rs	14,12,390.00
4	Distribution system	Rs.	49,41,033.00
5	Miscl. Work	Rs.	7,968.00
6	Trial Run (1 Month)	Rs.	26,244.00
	Total	Rs.	1,62,52,063.00
	Add 18 % for GST	Rs.	29,25,371.34
	Total Work Portion	Rs.	1,91,77,434.34
	Gross Total	Rs.	1,91,77,434.34
	Say	Rs.	1,91,77,434.00
	Per Capita Cost	Rs.	4,000.00

5. CONCLUSIONS

1) Population forecasting has been done for 5 decades by using 1. Arithmetic Increase Method, 2. Geometric Increase Method, 3. Incremental Increase Method. from this calculated data, the maximum population is as follows :

2031 :- 2839

2041 :- 3236

2051 :- 3689

2061 :- 4205

2071 :- 4794

2) From above calculated population data, for 2071 population forecasting, design of water supply scheme was designed.

3) From the designed data, estimation has been workout. the total cost of this project is Rs. 19177434.00 /- only including all the work, labour and material.

4) From present population point of view the cost of the project per capita will be Rs. 7702.00 /-

5) From future population point of view the cost of the project per capita will be Rs. 4000.00 /-

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