Design of a Sustainable Water Supply Scheme for Mohadi Village, Maharashtra

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***Abstract*—Reliable access to safe drinking water continues to be a major concern in many rural areas of Maharashtra, where communities depend largely on untreated and unreliable sources. This research paper presents the planning and design of a sustainable water supply scheme for Mohadi Village. The study involves population forecasting, estimation of present and future water demand, assessment of available water sources, and the design of key system components such as pumping units, storage reservoirs, and distribution networks. Design procedures are carried out in accordance with CPHEEO guidelines and relevant Indian Standard codes. The proposed scheme aims to provide sufficient quantity, acceptable quality, and long-term reliability of water supply, thereby improving public health and overall living conditions.**

***Index Terms*—Rural water supply, Population forecasting, Water demand estimation, Elevated storage reservoir, CPHEEO guidelines.**

I. INTRODUCTION

Water is an essential resource for human survival, economic development, and social well-being. Rapid population growth, climate variability, and over-extraction of groundwater have increased stress on existing water resources, particularly in rural regions. Many villages still depend on unsafe water sources such as hand pumps, open wells, and seasonal surface water bodies, leading to frequent shortages and health-related problems.

Mohadi Village experiences irregular and inadequate water supply due to the absence of a properly planned distribution system. The current sources are insufficient to meet the daily requirements of the population, especially during summer months. Therefore, a scientifically designed and sustainable water supply scheme is necessary to ensure continuous and safe drinking water to the village.

II. OBJECTIVES

- To study existing water supply conditions in Mohadi Village
- To forecast future population and estimate water demand
- To identify and evaluate suitable water sources
- To design storage, pumping, and distribution systems as per standard guidelines
- To ensure safe, treated, and equitable water distribution

III. LITERATURE REVIEW

Previous studies highlight that proper planning and adherence to standard design practices are essential for sustainable rural water supply systems. The CPHEEO Manual provides comprehensive guidelines for planning, design, operation, and maintenance of water supply schemes. IS 1172:1992 specifies per capita water supply requirements, which form the basis for water demand calculations.

Research on rural water supply planning emphasizes the importance of reliable sources, adequate storage, and community participation for long-term system sustainability. Poorly designed systems often fail due to lack of maintenance and inadequate capacity to meet future demands.

IV. STUDY AREA

Mohadi Village is a rural settlement located in Maharashtra with an approximate population of 2,500. The village primarily depends on private wells and hand pumps for its water supply. These sources are unreliable and often provide insufficient water during dry seasons. In addition, water quality issues pose health risks to the residents, highlighting the need for a centralized and treated water supply system.

V. POPULATION FORECASTING AND WATER DEMAND ESTIMATION

The population growth rate for Mohadi Village is assumed to be 1.2% per annum. Standard population forecasting methods are used to estimate the future population for the design period.

As per IS 1172:1992, the domestic water demand is estimated to be 245,000 litres per day. An additional 15% of the domestic demand is considered to account for non-domestic uses, public services, and losses. The total demand is used for designing storage and distribution components.

VI. SOURCE SELECTION AND SYSTEM DESIGN

Various water source options, including tube wells and surface water sources, were evaluated based on yield, quality, reliability, and sustainability. The assessment revealed that existing sources are inadequate to meet future demand.

The proposed water supply scheme consists of:

- A reliable water source with adequate yield
- A pumping system for lifting water
- Rising mains to convey water
- An elevated storage reservoir (ESR) for balancing supply and demand
- A distribution network designed to provide adequate pressure and uniform supply

All components are designed following CPHEEO guidelines and relevant Indian Standards to ensure safety and efficiency.

VII. EXPECTED OUTCOME

The proposed water supply scheme is expected to:

- Provide continuous and safe drinking water to residents
- Improve public health and hygiene conditions
- Ensure uniform and adequate water distribution
- Support future population growth
- Encourage community participation in operation and maintenance

VIII. CONCLUSION

A well-planned water supply system plays a crucial role in improving the quality of life in rural areas. The proposed design for Mohadi Village addresses existing water scarcity and quality issues by providing a sustainable and reliable solution. Proper implementation, regular maintenance, and community involvement will ensure the long-term success of the water supply scheme.

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