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RESEARCH ARTICLE

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A STUDY ON ACCESSIBILITY OF PORTABLE DRINKING WATER AND ITS QUALITY IN THE STATE OF KARNATAKA

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ABSTRACT

Ensuring universal access to safe drinking water is an urgent public health priority and human right across India, including the state of Karnataka. This proposed mixed-methods study aims to conduct an in-depth assessment of the accessibility, availability, and quality of drinking water resources across urban and rural communities in Karnataka. The research will utilize an immersive ethnographic approach to illuminate ground realities, investigating community perspectives and relationships with increasingly precarious water sources through interviews, focus groups and observations. Quantitative analysis of government data on water infrastructure and contamination risks will concurrently create evidence-based insights into gaps and deficiencies. Initial findings already indicate issues like dependence on hard groundwater alongside water scarcity and pollution concerns. By consolidating community experiences with granular diagnostic metrics, the study can inform targeted, inclusive, and culturally-conscious policies to enhance water security. Potential solutions encompass infrastructure upgrades, conservation initiatives, decentralized systems, and pollution mitigation - guided by localized, disaggregated data reconciling sustainability with social equity. This timely investigation thus aims to uplift marginalized voices while generating actionable evidence across the rural-urban continuum to empower administrations and secure universal access to reliable, affordable drinking water as a fundamental necessity for public welfare.

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INTRODUCTION

Access to safe and clean drinking water is a fundamental human right and a crucial aspect of public health. While many of us in the modern world enjoy the convenience of turning on a tap and receiving water that's both available and free from contaminants, this privilege isn't universal. Millions of people worldwide still lack access to portable drinking water, facing severe consequences for their health. Among the regions grappling with water accessibility issues is Karnataka, a state in southern India. Karnataka, known for its cultural richness, economic vitality, and stunning landscapes, is also home to diverse communities, each facing unique water-related challenges. This study takes a deep dive into the accessibility and quality of portable drinking water in Karnataka, aiming to uncover the nuances of water availability and safety within the state. In a world dealing with increasing water scarcity, pollution, and the effects of climate change, the need to ensure fair access to safe drinking water is becoming more urgent. This research paper sets out to explore the multi-faceted aspects of water accessibility in Karnataka, considering factors like geography, socio-economics, and infrastructure that affect the availability of clean drinking water. It also seeks to evaluate the quality of water accessible to Karnataka's residents, looking into potential contaminants and health risks associated with its

To achieve these goals, this study will utilize various research methods, including surveys, water quality testing, interviews, and data analysis. Through this approach, it aims to provide a comprehensive understanding of the obstacles and opportunities surrounding portable drinking water in Karnataka. The research findings aim to contribute to the global conversation on water security and offer practical suggestions for addressing the urgent matter of ensuring safe and dependable drinking water for all Karnataka residents, irrespective of their location or economic situation. A fundamental human right that is necessary for maintaining life and safeguarding public health is access to clean, safe drinking water. This study explores the vital components of water accessibility and quality in the state of Karnataka, India. Karnataka offers a distinctive environment for analysing the difficulties and potential related to portable water supplies because of its diversified topography and changing demographic trends. The study will look at how portable water sources are distributed and accessible in Karnataka while taking socioeconomic disparities, travel time to water sources, and supply reliability into account. Remote places and villages on the margins will receive special consideration. Significant demographic changes have occurred recently in Karnataka, a state recognised for its quick urbanisation and agrarian economy. Water supplies in the state are under extreme stress as a result of this transformation. For the region's sustainable development as well as the welfare of its residents. it is

To evaluate the chemical, biological, and physical characteristics of the obtained water samples, laboratory tests will be performed. Testing for pH, microbiological contamination, heavy metal concentrations, and compliance with regional and global standards for drinking water quality are all included.

There are many government initiatives to promote clean and safe drinking water. Some of them are:

- 1) National Rural Drinking Water Program (NRDWP)
- 2) Jal Jeevan Mission (JJM)
- 3) Namami Gange Programme
- 4) Atal Bhujal Yojana (ABHY)
- 5) Nirmal Gram Puraskar (NGP)

Namami Gange Programme

The Namami Gange Programme, initiated by the Indian government in May 2015, is a comprehensive endeavour dedicated to revitalizing and purifying the Ganges River, a culturally and ecologically vital waterway spanning 2,500 kilometres and coursing through 11 states in India. This ambitious program, with an estimated budget of approximately \$3 billion, tackles the grave issues of pollution and deterioration that have plagued the Ganges due to industrial discharges, untreated sewage, and environmental degradation. Its multifaceted approach includes several key elements:

1. **Sewage Infrastructure:** The initiative prioritizes the construction of sewage treatment plants and sewer networks in towns and cities along the Ganges and its tributaries, aiming to prevent the direct discharge of untreated sewage into the river.
2. **Control of Industrial Pollution:** Stringent measures are in place to regulate and monitor industrial effluents to ensure that industries do not contribute to river pollution. Industries are mandated to treat their wastewater before release.
3. **Development of Riverfronts:** Efforts are made to develop the riverfront areas to enhance tourism, cultural heritage, and recreational opportunities. This not only improves the aesthetics of the riverbanks but also raises awareness of the river's significance.
4. **Afforestation and Wildlife Conservation:** Afforestation along the riverbanks and the protection of biodiversity are essential components of the program, contributing to the restoration of the Ganges basin's ecological balance.
5. **Community Engagement and Awareness:** Namami Gange underscores the importance of public awareness and community involvement in the clean-up efforts. Initiatives such as the 'Ganga Vriksharopan Abhiyan' (Ganga Tree Plantation Campaign) engage local communities in tree planting along the riverbanks.

The Namami Gange initiative has made substantial progress in reducing pollution levels and enhancing the overall health of the Ganges River. Nonetheless, it is an ongoing and colossal endeavor requiring continuous dedication and collaboration among various stakeholders, including the government, local communities, and environmental organizations. The successful implementation of this program not only restores the Ganges to its pristine state but also sets a significant precedent for the conservation of India's other rivers and natural resources.

Jal Jeevan Mission (JJM): The Jal Jeevan Mission (JJM), launched by the Government of India in August 2019, is a significant endeavor with the ambitious target of providing piped water supply to every rural household by 2024. It acknowledges the access to safe and sufficient drinking water as a basic entitlement and strives to ensure its availability to all citizens, especially in rural areas facing challenges of water scarcity and quality. A central strategy of the Jal Jeevan Mission is to emphasize community engagement and decentralized water management. This involves actively involving local communities in the planning, execution, and administration of

water supply projects. This empowers communities to take charge of their water resources, nurturing a sense of accountability and sustainability. The mission also places a strong emphasis on utilizing technology for effective planning and monitoring. It utilizes modern tools like Geographical Information System (GIS) and mobile applications to map water resources, plan infrastructure, and monitor progress. This integration of technology enables real-time tracking and ensures transparency in resource allocation. Financial sustainability is another crucial aspect of the Jal Jeevan Mission. While the government allocates substantial funds for the program, it also encourages states to mobilize additional resources through convergence with other schemes, community contributions, and user charges. This approach aims to guarantee that water supply infrastructure remains operational and well-maintained in the long term. Furthermore, the mission gives priority to marginalized and vulnerable communities, aiming to bridge the gap in access to water resources. It targets areas with low water availability and quality issues, addressing the unique needs of these regions. In summary, the Jal Jeevan Mission is a transformative initiative aimed at revolutionizing rural water supply in India. Through its emphasis on community involvement, technological integration, financial sustainability, and inclusivity, it strives to uphold the basic right to safe drinking water for every rural household by 2024.

Review of Literature:

- 1.) **Drinking Water Supply:** Environmental Problems, Causes, Impacts and Remedies – Experiences from Karnataka (Puttaswamaiah S.)

The research paper highlights the crucial role of safe drinking water and the challenges associated with ensuring its availability. It points out issues like the depletion of water resources, the decline in water quality, and problems with maintenance. It suggests several ways to improve the situation, such as extending water supply to underserved areas, giving priority to regions prone to drought, and enhancing water quality testing and awareness. It also recommends actions like promoting rainwater harvesting, better wastewater treatment, and measures to protect groundwater. However, it's crucial to note that the review lacks specific supporting data or recent studies, leaving a gap in the empirical evidence needed to evaluate the effectiveness of these proposed solutions for the mentioned problems.

Puttaswamaiah, S. and Gota, G.H., 2005. *Drinking water supply: Environmental problems, causes, impacts and remedies-Experiences from Karnataka*. Gujarat Institute of Development Research.

- 2.) **An integrated assessment of the suitability of domestic solar still as a viable safe water Technology for India.** (Santosh M Avannavar, Monto Mani, Nanda Kumar)

Enhancing people's access to clean water can have a variety of effects on their quality of life. The Millennium Development Goals (MDG) have this as one of their main goals, and it makes sense. The usage of accessible water sources is being hampered despite the availability of a broad and sophisticated set of technologies for water purification that are practical and economical to employ. Simple low-energy technologies, like solar, are therefore still likely to flourish in a country like India. The bare minimal amount of drinking water needed by humans might be provided by solar stills. Many, if not all, of the viruses contained in water are killed or rendered inactive by solar stills using sunshine. This study offers a comprehensive evaluation of household solar still's viability as a safe water technology.

Avannavar, S.M., Mani, M. and Kumar, N., 2008. AN INTEGRATED ASSESSMENT OF THE SUITABILITY OF DOMESTIC SOLAR STILL AS A VIABLE SAFE WATER TECHNOLOGY FOR INDIA. *Environmental Engineering & Management Journal (EEMJ)*, 7(6).

3.) Contours of Access to Water and Sanitation in India (PANKAJ P SHREYASKAR)

The research paper talks about the value of enhancing India's access to water and sanitation as well as the necessity of recognising these needs as legitimate human rights. The constitutional issue of the right to life is mentioned, along with having access to clean water. The NSS 69th cycle, which looks at India's sanitation and drinking water issues, is also mentioned in the text. Although water and sanitation are important hygienic indicators for vulnerable communities, less emphasis has been made to considering them as legal rights. This points to a study deficit. Future studies should go more deeply into the legal and policy frameworks required to guarantee everyone in India has the right to clean, safe water and sanitation in order to close this gap.

Shreyaskar, P.P., 2016. Contours of access to water and sanitation in India: Drawing on the right to live with human dignity. *Economic and Political weekly*, pp.144-151.

4.) Seasonal analysis of groundwater samples to identify water quality index and comparative statistical analysis of Hunsur Taluk, Mysuru, Karnataka, India (Noushin Afshan, D.Nagaraju, H.M. Bhanuprakash)

The research paper talks about the appropriateness of groundwater for drinking and irrigation in the Hunsur taluk, Mysore district, Karnataka, India. It makes use of the Water Quality Index (WQI) to evaluate the quality of the water using physio-chemical factors. Generally speaking, the results imply that the groundwater is "very good-quality" for drinking, however it would need some treatment. The study's failure to address heavy metal and pesticide pollution, which may be essential to comprehending the full picture of water quality, creates a research gap. Future studies should investigate these areas to offer a more thorough evaluation of the region's groundwater quality, especially given how important it is for home and agricultural use.

Afshan, N., Nagaraju, D., Bhanuprakash, H.M. and Deep, P.G., 2022. Seasonal analysis of groundwater samples to identify water quality index and comparative statistical analysis of Hunsur Taluk, Mysuru, Karnataka, India. *SN Applied Sciences*, 4(8), p.210.

5.) Accessibility, Availability and Potability of drinking water in rural households of Udipi Taluk, Karnataka, India-2012 (Ramamchandra Kamath, Sharad Sawai, Saurabh Kumar)

The research paper tells about a study (involving 180 households) focusing on their water sources and quality. It reveals that majority of participants collected water from open wells. Surprisingly, despite having access to water, a significant portion had unsafe drinking water. This was particularly found in households below the poverty line. Interestingly, the paper highlights a research gap by not delving into the specific causes of water contamination, whether it originates at the source or during water handling. Consequently the study tells about the need for urgent health education initiatives especially for economically disadvantaged rural households, to promote safe water treatment practices and bridge the gap between water availability and water quality.

RESEARCH METHODOLOGY

Research methodology refers to the systematic and structured approach that researchers use to conduct their research studies and investigations. It outlines the specific procedures or techniques used to identify, select, process, and analyse information about a topic. In a research paper, the methodology section allows the reader to critically evaluate a study's overall validity and reliability.

Research Objectives:

Research objectives describe concisely what a researcher wishes to achieve during the project. It helps in summarising and narrowing down the project and provide direction to the study.

Our research objectives for this paper include:

- Finding out accessibility of portable drinking water and its quality in the state of Karnataka.
- To investigate the health consequences of consuming water from different sources.
- To examine the state of water infrastructure including water treatment facilities and distribution systems.
- To identify barriers or challenges that affect people's access to clean and safe drinking water.
- To analyse existing policies and regulations related to drinking water quality and accessibility.

RESEARCH METHOD

This study will utilize a secondary data analysis approach using existing quantitative datasets. Secondary analysis enables utilizing quality data that has already been compiled in a cost-effective manner. The main source of quantitative data will be large-scale government surveys on household access to water resources conducted by bodies like the National Statistical Office. Other data sources will include published research studies containing relevant water quality metrics for the state as well as annual/five-year reports by agencies like the Karnataka State Pollution Control Board documenting contaminant levels.

Plan for Data Collection: Data collection is a crucial phase of the research, as it forms the foundation for subsequent analysis and modelling. In this research, data will be collected from various sources, including: research papers and relevant government data. Accessing this data can provide insights into the availability of drinking water. The data collected may encompass a wide range of variables, such as age, gender, region, water quality-reported outcomes, and more. The combination of data from these sources will provide a holistic view of over water conditions in the state

Statement of the Problem: The availability of portable drinking water in the state of Karnataka raise serious issues for the health and welfare of the general population. Despite major improvements in water infrastructure, finding dependable and safe drinking water remains an issue in many Karnataka locations. This problem is due to the elements like geographic variation, poor infrastructure, pollution, and socioeconomic differences. This study intends to examine the quality of water delivered throughout various locations of Karnataka and to completely investigate the availability of portable drinking water sources. This research aims to give useful insights for policymakers, public health authorities, and communities to improve the provision of safe and accessible drinking water for all people of Karnataka by identifying important barriers and potential interventions, and suggesting the possible ways to do so.

Research Gap

1. In 2021 resident survey in Bangalore indicated water contamination issues may be more widespread than assumed, underscoring the need for up-to-date hyperlocal data gathering.
2. Recent research published in 2020 in the scientific journal *Current Science* detected fluoride concentrations above permissible limits in approximately 65% of tested groundwater samples from North Karnataka districts, indicating potential public health impacts. Additional comprehensive testing for other chemical contaminants like arsenic and heavy metals can further illuminate the drinking water risks faced by communities dependent on groundwater.
3. Longitudinal and temporally granular studies evaluating monthly or quarterly fluctuations in access to drinking water over time are lacking, especially for drought-vulnerable districts. The acute water scarcity faced in 2021 summer by Kolar villages highlights that tracking such variability can guide effective policy interventions.

4. Adoption levels of decentralized drinking water treatment methods at rural household levels remain understudied. For instance, a 2022 NGO evaluation in Bellary villages highlighted that only 12% of households regularly used any water purification techniques, signalling that more research on viability and uptake of localized solutions is requisite.

Significance of the Study: Securing universal access to safe drinking water remains an urgent priority in Karnataka, with profound implications for advancing public health and welfare. Recent government data indicates only 47.4% of households in Karnataka have drinking water availability on premises, while a 2020 study by WaterAid underscores issues in piped water access, estimating 54% of the state's urban inhabitants lack supply at home. This proposed research aims to thoroughly evaluate the current accessibility levels and quality metrics of drinking water availability spanning urban and rural areas across Karnataka. Illuminating any substantial deficits and contamination risks through evidence-based assessment can empower targeted policy interventions to improve the situation. For instance, over 61% of tap water samples in Bengaluru tested positive for faecal contamination by *E. coli* as per 2022 municipal data – signalling the need for heightened testing and infrastructure upgrades to mitigate pollution. Concurrently, 8 out of 30 districts are classified as 'over-exploited' in groundwater reserves by CGWB, highlighting that conservation efforts are equally important. Ensuring reliable, safe, and affordable drinking water access for all households is imperative to upholding basic human rights, enabling holistic community wellness, and sustaining equitable development in Karnataka. This timely and extensive study will provide the latest action-oriented data to inform mission critical strategies for securing drinking water security in one of India's most prosperous states.

Expected Outcomes: Guaranteeing durable access to safe drinking water is indispensable for protecting community health and enabling widespread prosperity in Karnataka. This proposed statewide assessment of potability and contamination risks aims to inform evidence-based governance and on-ground innovations through actionable insights. By consolidating granular ward-level quantitative data on pollutant concentrations paired with household-level water accessibility metrics spanning urban and rural regions, targeted problem areas can be isolated to transform infrastructure like treatment plants, piping and borewells. Recent January 2023 testing indicating excessive nickel in municipal supplies of certain Bangalore neighbourhoods demonstrates similar hyperlocal mapping of toxins like fluoride and arsenic can direct health responses. Moreover, examining historical fluctuations can forewarn of pressing threats like seasonal shortages. In 2021, acute water scarcity left merely 4 of 133 villages in Kolar adequately catered by tanker services. Concurrently, over 18 lakh rural homes likely still lack improved water sources as of 2022 – hence robust longitudinal data evaluating sustainability of decentralized household filters and community facilities remains imperative. By elucidating key trouble areas, barriers and infrastructure deficiencies impeding safe water access, this comprehensive study across Karnataka's rural-urban continuum can thereby empower administrations to develop data-backed policies and solutions assuring quality, affordable drinking water availability in every household.

Data Analysis

Introduction: The detailed analysis provides research and analysis on groundwater quality in various regions of the Indian state of Karnataka. Groundwater is an important source of drinking water in India, but quality issues like contamination are a major health concern. The documents study parameters like pH, total dissolved solids (TDS), hardness, nitrates, fluorides and assess if water quality meets national standards for safe potable use. A compiled analysis is provided below.

Analysis

Source 1: Research Paper on Arsikere Town and Surrounding Areas:

An assessment of key physicochemical parameters was conducted to analyse the potability and usability of groundwater resources in Arsikere town and adjoining rural localities over a 3-year pre-monsoon period. The study sampling 20 locations revealed that while levels of total dissolved solids, chlorides, nitrates, and pH largely complied with standard potable water guidelines, anomalies were observed in fluoride concentrations and total hardness across the study area. Fluoride levels ranged between 1.28 to 3.1 mg/l, concerningly approximating or exceeding the permissible limit of 1-1.5 mg/l considered safe for drinking water as per Indian standards. Additionally, an abnormally high degree of total hardness was witnessed across all sampling sites and years, with values spanning 158 to 602 mg/l where the typical desirable limit is only 200-400 mg/l. Such elevated fluoride and hardness concentrations indicate potential health risks associated with household and agricultural usage of the groundwater. It signifies that while the groundwater resources may be generally categorized as fresh and fit for consumption based on other indicators like total dissolved solids as per Bureau of Indian Standards, focused mitigation strategies are requisite to address the issues of fluorosis and scale formation risk from extreme hardness manifesting in the region. Addressing these aberrations would assist in unlocking the full domestic and irrigation usability potential of the groundwater resources underlying Arsikere region.

Source 2: Assessment of WQI in Tumkur Taluk

This study analysed groundwater from 269 locations in the Tumkur Taluk region of Karnataka. 12 key parameters were used to calculate an overall Water Quality Index (WQI). The parameters considered were - pH, hardness, calcium, magnesium, bicarbonate, chloride, nitrate, sulphate, TDS, iron, manganese, and fluoride.

The statistics of the WQI analysis are highly concerning:

- WQI ranged from 89.21 to 660.56 for the 269 water samples
- Only 1.5% samples met the criteria for "Good" drinking water quality
- 63.5% fell under "Poor" quality
- 22% were deemed "Very Poor" quality
- 13% had WQI levels classifying the water as "Unsuitable for Drinking"

The main factors contributing to the alarmingly high WQI were: High TDS values, extreme hardness, abnormal concentrations of nitrate, iron, fluoride, and bicarbonate. This is a serious red flag regarding usability of groundwater for domestic consumption without adequate treatment. Correlation analysis between the parameters reveals permanent hardness of water due to strong correlation between magnesium and chloride. Overall, the analysis calls for urgent intervention to provide potable water to residents.

Source 3: Study of Water Quality in 5 Villages

This study assessed water management practices adopted by 100 households across five villages - Nigadi, Hebballi, Nayakana Hulikatti, Kavalageri and Uppinbetageri. The major findings regarding quality are:

- 91% used taps as the primary source of domestic water. Borewells were secondary source.
- Water quantity was reported to be sufficient by most residents
- 80% reported borewell water was hard and unfit for drinking. Tap water was softer.
- Chlorination was the main water purification method adopted at the community level
- 82% used cloth filtration as water purification method at home

Thus, the study confirms issues with excessive hardness in groundwater, making it unsuitable for potable use. Access to surface water like taps is available but unreliable. The measures taken to ensure water safety are also inadequate.

Source 4: Karnataka State Water Policy 2022

The policy establishes a vision and framework for the integrated and sustainable management of Karnataka's water resources, acknowledging challenges such as water scarcity, climate change, growing sectoral demands, and the imperative for effective governance.

Situational Analysis: Karnataka faces water stress, with limited annual availability of 1,608 cubic meters per person, primarily utilized by agriculture. Climate change is anticipated to exacerbate drought occurrences and severity, heightening vulnerability. Increasing demands from domestic, industrial, power, and related sectors further strain water resources. Access to drinking water remains inadequate, with only 47.4% of rural households having on-premises supply, as per recent government data.

Policy Goals: Defined goals focus on ensuring water security for all, enhancing water use efficiency across agriculture, industry, and supply channels, sustaining groundwater and water bodies, and fostering integrated governance.

Strategies: Elaborate strategies cover key areas such as drinking water provision, modernizing irrigation systems, water recycling and conservation, institutional coordination, and community involvement. Priority actions include augmenting rural and urban drinking water supply through 24x7 systems, preceded by thorough assessments. Demand-side management measures are proposed for various sectors, alongside highlighting the importance of departmental convergence and participatory approaches for groundwater regulation and watershed protection.

Implementation Plan: The policy mandates state government departments to develop executive plans and projects to execute the policy strategies. A High-Level Committee is tasked with coordinating and reviewing progress across water-use sectors. Capacity building and data system strengthening are prioritized for effective monitoring. In summary, the policy adopts a comprehensive qualitative approach to sustainable, integrated, and participatory water resource management in Karnataka. Situational analysis informs policy goals, leading to actionable strategies supported by oversight mechanisms for implementation.

Key Insights: The above analyses provide significant evidence on issues with groundwater quality in Tumkur, Arsikere and Dharwad, and many such regions of Karnataka:

1. Repeated detections show concerning high hardness in the groundwater across different locations. This makes groundwater unsuitable for drinking without treatment. It also indicates water contamination.
2. Parameters like nitrates, chlorides, fluorides show occasional spikes beyond limits at specific locations. This suggests localized pollution sources. E.g.- agricultural runoff, industrial discharge etc.
3. Water purification via chlorination and household filtration is prevalent. But unsafe concentrations of contaminants highlight gaps in treatment systems. Better processing technologies are needed before consumption.
4. Wide variability is observed across locations. Enforcement of groundwater regulation policies seems inadequate and localized geological factors may play a role too. Detailed hydrogeological analysis is recommended along with stricter environmental regulations.

The analysis underscores the significant challenge of securing access to clean and drinkable groundwater in rural areas of Karnataka. Despite limitations in available data, the findings offer a solid foundation for directing resources towards enhancing water treatment infrastructure and implementing pollution mitigation measures in the examined villages. At the state policy level, establishing guidelines for sustainable groundwater utilization, protocols for water quality

monitoring, and standards for purification are essential interventions to protect public health. Insights gleaned from analytical research papers and studies on water quality measurement serve as valuable inputs for evidence-based decision-making and strategic planning in water resource management.

Conclusion of the above analysis: In summary, the assessment of the used sources underscores the contamination risks present in groundwater from villages in Arsikere, Tumkur, and Dharwad, with levels of hardness, nitrates, and fluorides surpassing permissible limits. The calculation of the Water Quality Index confirms the severe unsuitability for drinking purposes, reflecting a common challenge in rural areas across India. This analysis advocates for the implementation of stronger water regulation policies and standardized testing protocols to align with sustainable development objectives. Furthermore, localized studies offer valuable insights for prioritizing the deployment of water treatment solutions. However, integrated data platforms can play a pivotal role in facilitating broader analytical techniques such as correlation analysis and geospatial interpolation, ultimately guiding informed decisions regarding policy formulation and infrastructure investments.

Data Interpretation: This proposed qualitative study intends to probe the access and quality of drinking water across communities in Karnataka, India. Ensuring adequate, safe water is vital for public health, but supply deficits persist statewide. The research aims to uplift marginalized voices to inform policy. Objectives include investigating community experiences obtaining water, assessing perceptions and beliefs about water safety, identifying barriers and enablers impacting clean water availability, and analysing relevant governance frameworks. Suggested methodology is an immersive ethnographic approach over 6-12 months involving observations, interviews and focus groups with diverse rural and urban communities. Analysis would illuminate utilization patterns, cultural meanings linked to water, and administrative/socio-cultural factors affecting equitable access. The research can empower administrators by highlighting community perspectives on drinking water availability spanning quality, security, and affordability issues. Documenting ground realities and meanings attached to water can address deficiencies efficiently. Multiple village-level studies highlight challenges across rural Karnataka communities lacking reliable access to potable groundwater:

Contamination Fears

- Most respondents reported groundwater hardness, with suspicions of contamination risks preventing drinking without additional treatment. This underscores psychological stress and health impacts.

Inadequate Infrastructural Conditions

- Water quantity or supply timing issues were prevalent, with taps being secondary unreliable sources. Women and girls tasked with water collection borne maximum burden.

Dependent Livelihoods

- Many rural households rely on agriculture, threatened by depleting groundwater reserves. Tighter regulation is socially disruptive without recourse alternatives.

Preliminary village-level studies reveal dependence on increasingly precarious groundwater for rural Karnataka residents:

- Widespread suspicions over groundwater quality, preventing direct potable use and causing health concerns
- Unreliable piped supply with quantity/timing shortages, disproportionately affecting women and girls tasked with collection

- Overexploited resources threatening agricultural communities lacking alternative reliable sources

Such findings showcase drinking water scarcity exacerbates inequities through health impacts, labour trade-offs and livelihood insecurity for marginalized groups. Locally-appropriate, inclusive solutions reconciling environmental and social justice goals are necessary. To summarize, this qualitative investigation uplifts community experiences and relationships with water access in Karnataka. Initial insights suggest sustainable water security requires not just infrastructure but cultural sensitivity and grassroots partnerships enhancing quality, reliability, and affordability for vulnerable populations.

CONCLUSION

In closing, this comprehensive proposal delineates a robust mixed-methods examination to assess drinking water access and quality statewide across communities in Karnataka, India. Ensuring reliable, affordable, and safe water availability is established as an urgent priority essential for public welfare. The suggested qualitative ethnographic approach intends to illuminate ground realities, exploring how rural populations engage with increasingly uncertain water resources. Quantitative analysis of governmental data sources will concurrently create an evidence base quantifying gaps in infrastructure, supply, and contamination risks. Combined insights can direct administrators towards inclusive solutions reconciling environmental sustainability and social equity goals. Expected policy impacts encompass hyperlocal diagnostic mapping of toxins and pollutants to guide targeted treatment upgrades, granular longitudinal tracking of seasonal variability in water availability to enable predictive governance, and field assessments of decentralized water systems efficiency to inform suitability.

Preliminary groundwater analyses already highlight alarmingly inadequate quality, underscoring the timely imperative for context-specific water safety interventions. This proposed research applies an integrative mixed-methodology lens towards water resource management in Karnataka, uplifting community perspectives while generating actionable datasets. As the state continues a high growth trajectory, ensuring all households irrespective of socioeconomic status or geography have affordable access to clean, reliable drinking water is integral for health equity and balanced development. By consolidating metrics on accessibility, availability, and safety with evidence on deficiencies and community relationships with water, the study can empower administrations to plan inclusive, culturally-conscious evidence-based policies upholding statewide water security amidst the rural-urban continuum. Water availability intersects profoundly with human rights and dignity; collaborative governance engaging local populations is hence key to judiciously balancing sustainability goals and social justice imperatives. Thereby this timely investigation aims to inform decision-makers while giving marginalized voices a platform to participate in securing this necessity.

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