# The Role of Clean Water Access in Enhancing Workforce Productivity and Economic Outcomes in Puttalam District

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**Abstract:** Access to clean water plays a pivotal role in improving public health, increasing workforce productivity, and driving economic growth. In regions like Puttalam District, Sri Lanka, where water scarcity and poor water quality persist, the impact of clean water access on productivity and economic outcomes remains underexplored. This study investigates the relationship between clean water access and its influence on workforce productivity and economic outcomes. Using a quantitative approach, data were collected from 200 respondents across community-based organizations through structured questionnaires featuring Likert-scale items.

The research focuses on three independent variables: health improvement, time savings, and organizational efficiency, and their effects on two dependent variables: workforce productivity and economic outcomes. Statistical analysis reveals that health improvements significantly reduce absenteeism and improve physical and cognitive performance, while time savings from reduced water-fetching efforts lead to higher participation in productive and income-generating activities. Organizational efficiency, driven by reliable water access, enhances profitability and operational sustainability. These findings highlight the necessity of investing in water infrastructure, promoting community engagement, and fostering policy reform to maximize the socio-economic benefits of clean water access. The study provides actionable insights for policymakers, organizations, and community leaders seeking sustainable solutions to water-related challenges.

Keywords: Clean Water Access, Workforce Productivity, Economic Outcome

# 1. Introduction

#### 1.1 Background

Clean water is an essential resource for sustaining life, but its significance extends beyond basic survival to influencing economic and social wellbeing. In Puttalam District, Sri Lanka, access to clean water is a critical issue, particularly for communities reliant on agriculture, fisheries, and labourintensive industries. Poor water quality and inconsistent access not only compromise health but also reduce the efficiency and productivity of the workforce, ultimately affecting household incomes and organizational performance. This study explores the direct and indirect impacts of clean

W.D.I.C.Weerasiri, B.Sc. Mgt. (Special) (Rajarata University), DABF, MATT, CAB-II, CIMA-II Development Officer, DNCWS Email: imashi.weerasiri@gmail. water access on workforce productivity and economic outcomes, offering evidence-based recommendations for sustainable development.

#### 1.2 Research Problem

Inadequate access to clean water in Puttalam District leads to waterborne water-fetching diseases. prolonged times, and inefficiencies in workplace operations. These challenges have a ripple effect on workforce productivity and household income levels, yet their systematically impacts are not documented. Addressing these gaps is for formulating targeted essential interventions improve socioto economic conditions in the region.

1.3 Research Objectives The objectives of this study are:

To assess the relationship between clean water access and workforce productivity through variables such as health improvements and time savings. To evaluate how organizational efficiency and household income are influenced by improved water access. To identify barriers to clean water

access and propose strategies for maximizing its economic benefits.

#### 1.4 Variables

#### Independent Variables

#### Health Improvement:

Clean water access directly reduces the incidence of waterborne diseases such as diarrhea, cholera, and dysentery. Healthier workers are less likely to take sick days, leading to increased attendance and higher physical and cognitive performance. Improved health also reduces household medical expenses, allowing more income to be directed toward productive or developmental activities.

#### Time Savings:

In many communities, significant time is spent collecting water, particularly by women and children. Access to clean water sources closer to homes reduces for this burden. freeing time economically productive activities, education, and leisure. Time savings also enable workers to engage more effectively in their jobs, contributing to higher increased output and organizational productivity.

#### Organizational Efficiency:

Reliable access to clean water enhances operational efficiency in workplaces. Employees in industries reliant on labour, such as agriculture or manufacturing, benefit from improved hydration and hygiene, which directly impacts performance. Organizations also save costs related to absenteeism and staff turnover, improving overall profitability and sustainability.

#### Dependent Variables

Workforce Productivity:

Workforce productivity encompasses work attendance, task efficiency, and overall output. Improved access to clean water ensures that employees are healthier and less distracted by waterrelated challenges, allowing them to perform better in their roles. This study measures productivity through metrics such as hours worked, tasks completed, and absenteeism rates.

#### Economic Outcomes:

Economic outcomes include household income stability, organizational profitability, and broader community

well-being. financial Households benefit from increased income due to fewer health-related expenses and higher participation, work while organizations experience higher profits to improved efficiency due and employee satisfaction.

# 2. Literature Review

2.1 Clean Water and Health Improvement

Clean water is critical for reducing waterborne diseases such as diarrhea, cholera. which dysentery, and significantly affect workforce productivity. Research by (Elimelech & Montgomery, 2007)found that communities with improved water access experienced a 40% reduction in healthcare costs, directly impacting their economic well-being. Recent studies have further emphasized the importance of clean water for health improvement. (Onotaniyohwo & Ogude, 2024) highlighted the positive effects of health on productivity Sub-Saharan in Africa. outcomes demonstrating that improved health increased leads to workforce participation and economic performance. These findings are relevant to Puttalam District, where waterborne diseases are prevalent.

# 2.2 Time Savings and Economic Participation

Time spent fetching water is а significant burden, particularly on women and children in rural communities. reported that accessible water sources allow individuals to reallocate time to income-generating education, enhancing activities or workforce skills and overall

productivity. А recent study on infrastructure development by 2024)reinforces (Sodoma. this perspective by highlighting the role of efficient infrastructure in boosting productivity and economic outcomes. These insights support the argument that clean water access reduces time constraints. enhancing thereby economic participation in Puttalam District.

### 2.3 Organizational Efficiency

Organizations benefit from improved water access through reduced employee absenteeism and higher job satisfaction. (Singh & Ahmed, 2021) highlighted that workplaces with reliable water access recorded a 25% increase in operational efficiency, directly contributing to profitability and sustainability. Further, (Domingues, 2024)explored the socioecological dynamics of infrastructure emphasizing projects, the interconnectedness of resource management and organizational productivity. These findings align with the hypothesis that clean water access enhances operational efficiency in workplaces, particularly in labourintensive industries.

# 2.4 Broader Economic Impacts

Access to clean water stimulates by increasing economic growth workforce participation and reducing out-of-pocket healthcare expenses. Studies by (Stikker & Juchniewicz, 2009)emphasize that regions with improved water infrastructure witness higher household incomes and better economic stability. Recent research by (Mekonnen & Hoekstra, 2023)further supports this by showing that improved

leads to enhanced water access productivity and economic resilience in low-income communities. Additionally, emerging evidence from global studies suggests that better water management contributes gender to equality, by reducing the time particularly burden on women (Oxfam, 2024).

#### 2.5 Barriers to Clean Water Access

inadequate Barriers such as infrastructure, lack of policy enforcement, and limited community awareness hinder the realization of clean water's full potential. (Bisung & Elliott, 2016)stress the importance of integrating community engagement and policy reform to address these challenges effectively. Moreover, challenges, institutional such as fragmented water governance and financial constraints, further complicate access (UN Water, 2024). Future strategies should focus on holistic water management approaches and publicprivate partnerships to overcome these barriers.

# 3. Research Methodology

#### 3.1 Research Design

This study employs a quantitative approach to systematically evaluate the relationship between clean water access and its socio-economic impacts. The focuses capturing research on measurable variables such as health improvements, time savings, and organizational efficiency and their contributions to workforce productivity and economic outcomes.

#### 3.2 Sampling

The study involved 200 respondents from community-based organizations across Puttalam District. Stratified random sampling was used to ensure representation of diverse occupational roles, including labourers, managers, and self-employed individuals.

#### 3.3 Data Collection

Data were collected using structured questionnaires featuring Likert-scale items. The questionnaire was divided into three sections:

Demographics: Captured information on age, gender, occupation, and water access patterns.

Independent Variables: Measured perceptions of health improvements, time savings, and organizational efficiency resulting from clean water access.

Dependent Variables: Evaluated workforce productivity and economic outcomes using metrics such as work attendance, income stability, and organizational profitability.

#### 3.4 Data Analysis

The data were analyzed using:

Descriptive Statistics: Summarized the demographic and response trends.

Correlation Analysis: Measured the strength of relationships between independent and dependent variables.

Regression Analysis: Quantified the impact of health, time savings, and organizational efficiency on productivity and economic outcomes.

# 4. **Results and Discussion**

#### 4.1 Key Findings

The results of this study reveal significant positive relationships between clean water access and workforce productivity, as influenced by health improvements, time savings, and organizational efficiency. The data collected from 200 respondents highlight critical insights into how clean water access impacts individual productivity and organizational outcomes. Below, we present and discuss the findings in detail.

4.2 Descriptive Statistics Health Improvement:

Percentage Reporting Fewer Illnesses: 75% of respondents indicated a significant reduction in waterborne diseases (e.g., diarrhea and cholera) after gaining access to clean water.

Average Sick Days: Respondents reported a reduction in sick days from 7.8 days/month to 3.2 days/month on average, reflecting a 59% decrease.

Perceived Impact: 83% of respondents agreed (rated 4 or 5 on the Likert scale) that improved water quality directly enhanced their physical and mental well-being.

Time Savings:

Daily Time Saved: Respondents saved an average of 2.7 hours per day due to proximity to clean water sources. This translates to approximately 810 hours per year per household.

Time Allocation: Of the saved time:

45% was redirected to incomegenerating activities.

30% was used for family and childcare. 25% was allocated to rest or leisure.

Organizational Efficiency:

Improved Attendance: 68% of respondents working in communitybased organizations reported improved work attendance due to fewer healthrelated absences. Profitability Metrics: Organizations reported a 12% increase in average profitability attributed to reduced absenteeism and enhanced employee productivity.

# 4.3 Correlation Analysis

relationships The between the (health independent variables improvement, savings, time organizational efficiency) the and dependent variable (workforce productivity) were analyzed using Pearson's correlation coefficient:

Health Improvement and Workforce Productivity: Strong positive correlation (r = 0.812), indicating that better health significantly enhances individual productivity.

Time Savings and Workforce Productivity: Significant positive correlation (r = 0.764), reflecting the role of time reallocation in improving productivity.

Organizational Efficiency and Workforce Productivity: Moderate positive correlation (r = 0.692), demonstrating that reliable water access benefits workplace operations.

4.4 Regression Analysis

A multiple regression analysis was conducted to quantify the impact of each independent variable on workforce productivity. The results are summarized below:

Health Improvement:

Coefficient ( $\beta$ ): 0.541

Significance (p-value): < 0.01

Contribution: Health improvement was the most significant predictor of workforce productivity, accounting for 54.1% of the variance. Time Savings: Coefficient ( $\beta$ ): 0.438 Significance (p-value): < 0.01 Contribution: Time savings had a substantial positive impact, particularly in enabling workers to engage in additional productive activities.

#### Organizational Efficiency:

Coefficient ( $\beta$ ): 0.376

Significance (p-value): < 0.05

Contribution: Organizational efficiency contributed moderately to workforce productivity, driven by reduced absenteeism and higher job satisfaction. The overall model explained 72.6% of the variance in workforce productivity ( $R^2 = 0.726$ ), demonstrating a robust relationship between clean water access and the dependent variable.

#### 4.5 Discussion

Health Improvement as a Key Driver: Clean water access directly impacts workforce productivity by improving health outcomes. Respondents who experienced fewer waterborne illnesses reported higher attendance and better task performance. This aligns with previous studies (Elimelech & Montgomery, 2007) that emphasize the economic benefits of improved health due to clean water.

#### Time Savings and Reallocation:

The significant time savings from reduced water-fetching responsibilities enable individuals to dedicate more hours to work, education, and family care. Women, in particular, benefited from time reallocation, contributing to household income and community development. Organizational Efficiency and Profitability:

Improved water access enhances operational efficiency by reducing absenteeism and boosting employee satisfaction. Organizations in Puttalam District reported tangible benefits, including increased profitability and reduced turnover rates.

#### **Broader Implications:**

The findings highlight the interconnectedness of clean water access, workforce productivity, and economic outcomes. Improved access not only benefits individuals and organizations but also contributes to regional economic stability.

# 4.6 Limitations and Future Directions Data Limitations:

The study relied on self-reported data, which may introduce bias due to subjective perceptions and recall errors. To mitigate this, future research could incorporate objective measures such as performance economic metrics. productivity records, and health data from local health departments. Using mixed-methods approaches that combine quantitative and qualitative data would also enhance the reliability of findings.

#### 5. Recommendations

Based on the findings of this research, several recommendations are provided to enhance the accessibility and impact of clean water in improving workforce productivity and economic outcomes in Puttalam District. These recommendations focus on infrastructure development, community involvement, policy reform, and research expansion.

5.1 Invest in Water Infrastructure

Develop Reliable Water Supply Systems:

Build and maintain infrastructure, such as pipelines, boreholes, and filtration systems, to ensure a steady supply of clean water. Special attention should be given to underserved areas in Puttalam District where access is most limited.

Adopt Smart Water Management Technologies:

Integrate IoT-enabled monitoring systems to detect leaks, measure water quality, and optimize resource distribution, reducing wastage and ensuring efficiency.

Expand Public-Private Partnerships (PPPs):

Encourage collabouration between government bodies and private entities to pool resources for large-scale water projects. PPPs can offer financial sustainability and technical expertise to ensure long-term success.

5.2 Promote Community Awareness and Engagement

Conduct Educational Campaigns:

Raise awareness about the socioeconomic benefits of clean water access, emphasizing its impact on health and productivity. Include tailored messaging for different demographics, such as workers, women, and community leaders.

Encourage Community-Led Initiatives:

Empower local organizations to take ownership of water management systems. Training programs should build technical and leadership skills to ensure effective operation and maintenance. 5.3 Strengthen Policy Frameworks

Implement Supportive Regulations:

Enforce policies that prioritize clean water access as a fundamental right, ensuring legal protection and government accountability for waterrelated services.

Provide Financial Incentives:

Offer subsidies, tax relief, or grants for organizations and households investing in clean water systems. These incentives can encourage widespread adoption of water infrastructure upgrades.

Promote Regional Collabouration:

Establish partnerships between districts to share best practices, resources, and technologies, fostering a unified approach to water management challenges.

5.4 Expand Research and Monitoring Efforts

Establish Data-Driven Decision-Making: Develop centralized databases to monitor water access, usage patterns, and quality metrics. Regularly updated data will enable policymakers and organizations to make informed decisions.

Explore Long-Term Impacts:

Conduct longitudinal studies to assess the sustained economic and social benefits of clean water access. These findings can help refine strategies for future interventions.

Focus on Gender-Specific Outcomes:

Evaluate how clean water access affects different groups, particularly women and children, to develop inclusive policies that maximize benefits for all.

# 6. Conclusion

Access to clean water is a cornerstone of public health and economic

development, and its role in enhancing workforce productivity cannot be overstated. This study demonstrates that clean water access in Puttalam District significantly impacts workforce productivity through health improvements, time savings, and organizational efficiency. Healthier individuals experience fewer waterborne illnesses, leading to reduced absenteeism and enhanced physical and cognitive performance. Time saved from reduced water-fetching responsibilities enables individuals to engage in productive activities, further contributing to income generation and welfare. Additionally, family organizations benefit from improved employee attendance and satisfaction, which translate into higher profitability and operational stability.

The findings underscore the interconnectedness of clean water access with broader socio-economic outcomes, such as household income stability and community resilience. However, challenges such as inadequate infrastructure, limited awareness, and policy gaps must be addressed to realize the full potential of clean water access. Investing in infrastructure, sustainable water fostering community engagement, and implementing supportive policy frameworks are critical steps to unlock these benefits. This study provides a foundation for future research and interventions aimed promoting at equitable and sustainable access to clean water, thereby contributing to the achievement of regional and global development goals.

# References

Bisung, E., & Elliott, S. J. (2016). Psychosocial impacts of water and sanitation access. Journal Article, e0159001 Domingues, A. (2024). Socio-Ecological Dynamics of Infrastructure Projects: Implications for Organizational Productivity. Journal of Environmental Management. Elimelech, M., & Montgomery, M. A. (2007). Water and sanitation in developing countries: including health in the equation. *Environmental Science* & Technology, 17-24. Mekonnen, M., & Hoekstra, A. (2023). Economic Resilience through Water Access: Insights from Low-Income Communities. Water Resources Research. Onotanivohwo, F., & Ogude, C. (2024). Health and Productivity Outcomes in Sub-Saharan Africa: The Role of Clean Water Access. Journal of Public Health. Oxfam. (2024). The Impact of Water Access on Gender Equality and Economic Empowerment. Singh, M., & Ahmed, S. (2021). IoTbased water management systems for sustainable development. Materials Today: Proceedings, (pp. 5211-5218). Sodoma, V. (2024). Infrastructure **Development and Economic Outcomes:** A Case Study Approach. Journal of Development Economics. Stikker, A., & Juchniewicz, D. (2009). Innovations in water management: Challenges and opportunities. Journal of Environmental Innovation, 200-215. UN Water. (2024). Global Water Management Challenges and Future Directions. United Nations.