



Case Study

November 2025

Image: Sustainedge

Patkua: A Locally-led Water Access Solution in Coastal Bangladesh

Key Findings

- Each *Patkua* provides 500 – 1,000 litres of clear, odourless water daily without electricity, ensuring year-round access to safe water in salinity-affected coastal areas.
- Conveniently positioned *Patkua* units significantly reduce the time and physical effort women and children previously spent collecting water from distant or unreliable sources.
- Using RCC rings and locally available materials, *Patkua* structures remain resilient under saline, drought-prone, and flood-affected conditions, demonstrating a suitable engineering solution.
- Participatory site selection, household labour contributions, and women-led monitoring and hygiene practices strengthen accountability, empowerment, and long-term sustainability.
- Field surveys confirm strong performance and high satisfaction (4.5 – 5/5 across all sites), indicating *Patkua*'s significant potential for replication in other coastal WASH and climate resilience programmes.

1. Patkua: An Overview

The *Patkua*, a shallow, manually operated, community-managed water source, represents a locally driven adaptation to the growing challenges of salinity intrusion and freshwater scarcity in Bangladesh's coastal areas. In Keoratola, Ward 8 of Mongla Port Municipality, Bagerhat, communities face rising groundwater salinity and limited access to safe drinking water, particularly affecting women and children who traditionally bear the burden of water collection. In response, residents have revived and adapted the traditional *Patkua* system, combining local

knowledge with simple engineering innovations to address contemporary water needs.

Constructed using locally available materials such as Reinforced Cement Concrete (RCC) rings, mortar, and slabs, the *Patkua* provides a low-cost, energy-free solution capable of supplying 500 – 1000 litres of clear, odour-free water per day for domestic purposes, including cooking, washing, and limited drinking. Each unit costs approximately BDT 15,000 – 25,000, demonstrating that affordable, community-led infrastructure can significantly improve access to potable water without relying on electricity or complex machinery.



Patkua 1 in Keoratola

Through this participatory process, the *Patkua* project raised strong community ownership, social cohesion, and accountability. Women’s involvement was critical in ensuring that the system addressed gender-specific needs, such as convenient access and safe water handling for domestic chores. The initiative also enhanced collective responsibility, with households undertaking regular maintenance, cleaning, and sediment removal to keep each unit’s functionality.

Field surveys conducted by the Sustainedge team between October and November 2025 confirmed high functionality, user satisfaction, and durability across all five identified sites in Ward 8. Households reported reduced water collection times, improved water quality, and enhanced overall well-being. The *Patkua* model demonstrates a practical, low-cost, and scalable climate-resilience innovation that can be integrated into local Water, Sanitation, and Hygiene (WASH) systems and broader municipal resilience programmes. Its success shows the

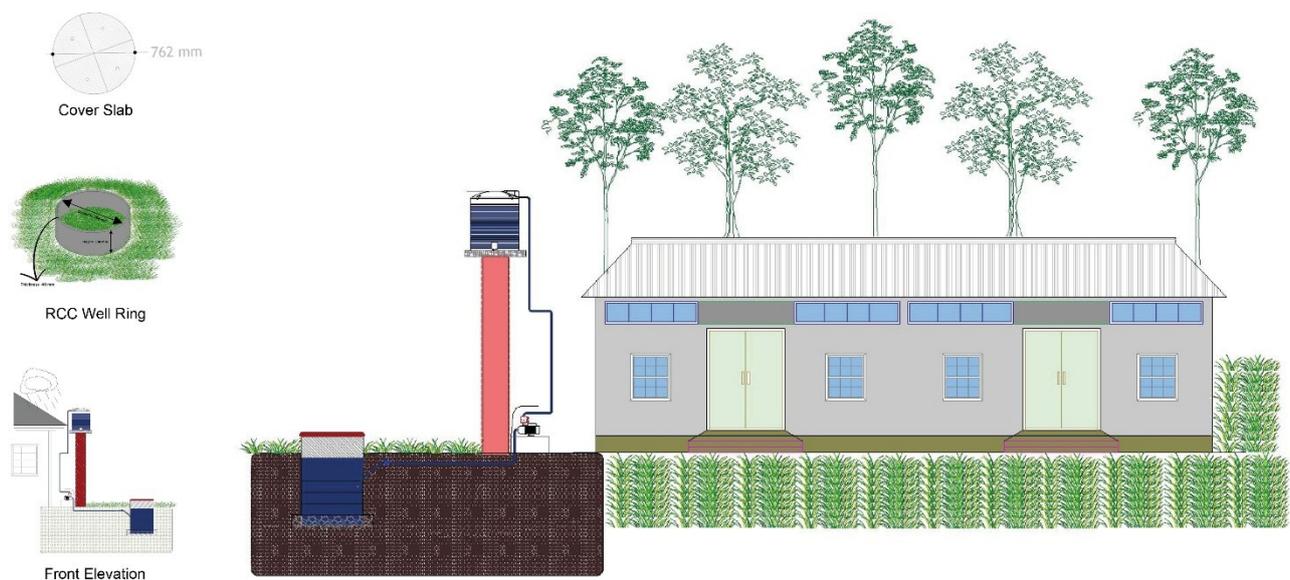
potential for replication in other coastal communities affected by salinity and water scarcity, provided it is supported by community capacity-building, systematic monitoring, and formal policy recognition.

2. Approach

The implementation of the *Patkua* system in Keoratola, Ward 8, Mongla Port Municipality,

followed a well-organised, participatory, and locally informed process.

Site selection and design were carried out collaboratively with community members, local masons, and residents familiar with the area's hydrogeology. Sites were raised to prevent contamination during monsoon flooding, and design features such as RCC rings and cover slabs were included to ensure durability under saline conditions.



Technical Design of *Patkua* (Source/ Sketch: Sustainedge, 2025, based on field assessment)

Households contributed labour and locally available materials, while women played key roles in hygiene management, monitoring, and reporting maintenance needs. Local masons provided technical expertise, and youth participation strengthened community capacity for long-term upkeep.

This inclusive approach promoted technical reliability, cost-effectiveness, gender responsiveness, and strong community ownership, ensuring sustainable water access in a region affected by salinity intrusion, seasonal drought, and limited infrastructure.

2.1. Using Local Knowledge

Local knowledge was essential for ensuring that the *Patkua* design was both functional and

aligned with community priorities. Traditional shallow-well practices guided the overall structure, while modern adaptations enhanced durability and performance. The *Patkua* was built with an average depth of 6.4 metres, allowing for reliable water access even during the dry season. The well's structure used RCC rings with a diameter of 762 millimetres, a height of 308 millimetres, and a thickness of 40 millimetres, each connected with concave mortar joints to improve stability and reduce leakage. An RCC cover slab of the same diameter protected it from contamination.

A well-designed Gravel Pack (GP) was installed to control sand movement by creating a stable filtration layer around the well. Water naturally seeps into the *Patkua* as the aquifer flows through porous soil and rock, ensuring a steady

supply without mechanical intervention. These specifications, developed with input from local masons and residents familiar with the area's hydrogeology, helped ensure the system remained reliable, durable, and suited to the saline, seasonally variable conditions of Mongla.

2.2. Community-led Construction

Construction was carried out by experienced local masons, with active participation from households. Families contributed labour, locally sourced materials such as sand, brick chips, and water, and participated in day-to-day construction supervision. This hands-on involvement reduced costs, allowed households to learn construction techniques, and fostered a sense of ownership.

Each construction step, from excavating the shallow well to assembling RCC rings, laying slabs, and installing simple covers, was documented and demonstrated to the community, building technical capacity for future maintenance and replication.

2.3. Maintenance and Ownership

To ensure the maintenance and performance of these *Patkuas*, households conduct routine observations, including visual inspections, measurements of water depth and yield, and collection of user feedback on water clarity, odour, and taste. These practical assessments help identify early signs of wear, blockages, or structural issues.

“We clean and maintain the Patkua ourselves. It saves time, gives good water, and we do not need electricity or machines. Everyone contributes a little to keep it running”.

By a local resident of Keoratola, Ward 8 (Interview, November 2025)

The local masons also guide improvements to this system through regular refinement of the cover slab thickness, better alignment of the RCC rings, enhanced GP to reduce sand intrusion, and

a slight increase in well depth to stabilise water availability during dry periods. This hands-on, adaptive approach ensures that the *Patkua* remains durable, efficient, and responsive to the evolving needs of the community, while also building local capacity for long-term maintenance.



Image: Sustainedge

Patkua 2 in Keoratola

3. Outcomes

The outcomes of the *Patkua* initiative are drawn from comprehensive primary data collected during site visits, physical measurements, and structured user interviews conducted in November 2025. The findings illustrate not only the system's technical functionality but also its broader social, economic, and gendered impacts on the community.

3.1. Reliable Daily Water Supply

Each *Patkua* unit supplies 500 – 1000 litres of water daily, enough to meet the domestic needs of multiple households. This consistent output significantly reduces reliance on distant or

unreliable water sources and guarantees year-round access to drinking water, even during seasonal droughts and increased salinity intrusion.

Historically, residents of Mongla have depended on in-house rainwater harvesting systems to conserve water during the monsoon and partially meet essential needs. While this traditional method remains important, it relies heavily on seasonal rainfall. Recently, the Municipality has implemented a surface water treatment and piped supply system, but its coverage is limited and does not fully serve the city's needs.



Image: Sustainedge

Traditional Methods of Rainwater Conservation in Mongla

Against this background, the *Patkua* system is a highly valuable complementary solution. Its reliable daily output provides a partial but meaningful alternative that enhances local water security, alleviates pressure on the limited municipal system, and offers a low-cost, community-managed source aligned with local knowledge and environmental conditions.

3.2. Improved Water Quality and Taste

Users consistently reported that *Patkua* water was clear, odour-free, and suitable for cooking, washing, and limited drinking. While one site showed slight iron contamination, the levels did not significantly affect usability or discourage household use. Overall, the improved water quality has strengthened community confidence in locally managed water sources, encouraging proper utilisation and reducing dependence on costly or unreliable alternatives.

3.3. Reduced Collection Time

Before the establishment of the *Patkua*, women and children often spent significant time, sometimes hours daily, collecting water from distant or unsafe sources. The strategic placement of *Patkua* wells within or near households has dramatically reduced collection time to just minutes per trip. This has freed up time for women and children, allowing them to focus on education, livelihoods, and household activities, thereby enhancing overall well-being and productivity.

3.4. Cost-Effectiveness and Durability

The average construction cost of a *Patkua* is approximately BDT 20,000, significantly lower than the cost of deep tube wells or other centralised water systems. Locally sourced RCC rings, slabs, and simple covers provide medium-to-high durability, even in saline and flood-prone environments. The system's low cost and long lifespan make it highly replicable and scalable for other coastal settlements facing similar water security challenges.

Summary of *Patkua* Performance

Site ID	Year of Installation	Depth (metres)	Functionality Status	Daily Usage (litres)	Water Quality	User Satisfaction (1 – 5)	Maintenance Responsibility
1	2023	5.49	Fully functional	500 – 1000	Clear, good taste	5	Household
2	2023	6.10	Fully functional	500 – 1000	Clear, good taste	5	Household
3	2024	9.14	Fully functional	500 – 1000	Clear, good taste	5	Household
4	2024	4.57	Fully functional	500 – 1000	Clear, slight iron presence	4	Household
5	2025	6.17	Fully functional	500 – 1000	Clear, good taste	5	Household

Source: Field Survey, 2025

3.5. Enhanced Satisfaction and Social Cohesion

User satisfaction ratings ranged from 4.5 to 5 out of 5, reflecting high confidence in the quality and reliability of the water supply. Beyond technical benefits, the *Patkua* system has strengthened social bonds, as neighbours cooperate in maintenance, share knowledge, and support one another in monitoring and hygiene practices. This collective approach has reinforced a sense of community ownership, accountability, and resilience.

These outcomes show that the *Patkua* model is not only technically effective but also socially transformative, offering a sustainable, low-cost, and gender-sensitive solution to freshwater scarcity in Bangladesh’s coastal regions. Its combination of reliability, affordability, and community ownership makes it a replicable model.

4. Lessons Learned

The insights provided below are derived from community feedback and enumerator observations gathered during the field survey. These lessons emphasise the key factors that promote the success, resilience, and replicability

of the *Patkua* system, offering guidance for similar initiatives in other coastal regions.

4.1. Community Ownership Ensures Sustainability

Active household participation in both the construction and ongoing maintenance of the *Patkua* system has been fundamental to its long-term functionality. When users are directly involved in decision-making, site selection, and labour contribution, they develop a sense of responsibility and pride in the system.

This ownership translates into diligent maintenance, timely problem-solving, and effective use, all of which are crucial to the sustainability of community-managed water systems. The shared responsibility also improves social cohesion, as neighbours collaborate to ensure that the system continues to serve everyone equitably.

4.2. Local Materials and Knowledge Improve Relevance

The *Patkua* system relies on locally available materials, thereby reducing construction costs and ensuring ease of repair without specialised equipment. Leveraging traditional local knowledge in site selection, well depth, and structural design has allowed the system to

adapt to the specific hydrogeological and environmental conditions of Keoratola, Ward 8.

By combining modern engineering practices with local techniques, the *Patkua* remains resilient against salinity intrusion, seasonal flooding, and other climate-related stresses, demonstrating that context-specific solutions are often more practical and effective than standardised models.

4.3. Continuous Engagement Enhances Capacity

Ongoing community engagement and participatory monitoring have been key to strengthening capacity and maintaining hygiene standards. Women, who are primarily responsible for water collection and household use, received targeted training to monitor water quality, clean the wells, and identify issues early. These activities not only ensure proper maintenance but also empower women as local leaders and decision-makers, enhancing gender-sensitive management practices and strengthening the community's resilience against water scarcity.

4.4. Low-Cost Innovation Addresses Climate Challenges Effectively

The *Patkua* system demonstrates how simple, cost-effective, and locally managed technologies can deliver substantial benefits for climate adaptation. Despite modest financial investment, the system provides reliable, high-quality water throughout the year, even under conditions of rising salinity and seasonal drought.

The adaptability of the design, combined with community-led construction and maintenance, shows that low-cost innovations, when tailored to ecological and social contexts, can achieve high-impact outcomes and serve as models for replication in other coastal settlements.

4.5. Iterative Feedback Strengthens System Performance

Regular user feedback, combined with field survey observations, enabled minor yet essential

improvements, such as adjustments to slab materials or well depth. This iterative approach underscores the importance of flexibility and responsiveness in community-based projects, ensuring that systems remain functional, user-friendly, and contextually appropriate over time.

5. Way Forward

Building on the evidence and insights gathered from field surveys in Ward 8, Mongla Port Municipality, the following pathways are recommended to scale up, expand impact, and integrate the *Patkua* system into policy, ensuring it becomes a sustainable and replicable model for climate-resilient water access in coastal Bangladesh.

5.1. Expansion to Other Coastal Communities

The *Patkua* model has demonstrated strong functionality, user satisfaction, and cost-effectiveness in Mongla. Its simplicity, adaptability, and low-cost design make it suitable for replication in other coastal zones in Bangladesh affected by salinity. Local governments, NGOs, and community-based organisations can facilitate this expansion through awareness campaigns, technical guidance, and small-grant support for construction.

Targeted outreach should prioritise communities experiencing seasonal droughts, saline intrusion, and limited access to potable water, ensuring equitable access to this locally driven adaptation technology.

5.2. Integration into Local WASH and Climate Programmes

Patkua systems can complement municipal WASH initiatives and broader climate resilience programmes, particularly in areas where deep aquifers are saline, inaccessible, or unreliable. Integrating *Patkua* into existing water management plans ensures alignment with local infrastructure, policy priorities, and public health objectives. Municipal authorities could establish

guidelines for site selection, construction standards, and community maintenance responsibilities, positioning *Patkua* as an official component of urban and rural resilience strategies.

5.3. Capacity Building for Local Masons and User Groups

To institutionalise local expertise and ensure quality replication, structured training programmes should be offered for local masons, women's groups, youth volunteers, and community leaders. These programmes could cover technical construction methods, maintenance practices, hygiene promotion, and monitoring skills. Strengthening community capacity ensures that the knowledge and skills needed to construct, maintain, and scale *Patkua* systems are retained within local communities, reducing reliance on external actors and fostering community-led sustainability.

5.4. Long-Term Monitoring and Learning

Ongoing performance assessment and water-quality monitoring are critical to maintain trust in the system and enable iterative improvements. Monitoring could include seasonal water-quality testing, usage tracking, maintenance checks, and community feedback sessions. This approach provides a robust evidence base for design refinement, policy advocacy, and knowledge sharing, ensuring that lessons from Ward 8 can guide future interventions across other saline-prone areas.

5.5. Policy Support for Locally-led Innovations

Formal recognition of the *Patkua* system within national and municipal adaptation frameworks will strengthen community-based resilience and unlock avenues for funding, technical support, and broader implementation. Policy integration could include incentives for community participation, inclusion in local climate action plans, and standardised guidelines for replication. By acknowledging and supporting

locally led innovations like *Patkua*, policymakers can promote equitable, cost-effective, and climate-resilient water solutions across vulnerable coastal settlements.

These next steps emphasise a holistic approach that combines technical replication, capacity development, monitoring, and policy alignment. Together, they ensure that the *Patkua* system not only continues to serve Keoratola effectively but also becomes a scalable, sustainable model for climate adaptation in other saline-affected communities across Bangladesh.

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Sustainedge is an impact-focused organisation specialising in social sustainability, ESG and sustainability reporting, gender equality, climate change, and urban development. By integrating assessment, research, policy, advocacy, training, and implementation, we address complex social, environmental and governance challenges holistically. In collaboration with a wide range of stakeholders, we equip individuals, institutions, industries, and communities with the knowledge and tools to drive transformative, long-term sustainability initiatives that foster equity, resilience, and real-world change.

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