

CLIMATE RESILIENT WATER

Enhancing Water Security and Disaster Resilience in Ghoramara Island

2022 - 2023

IMPLEMENTED BY

SEED (Society for Socio Economic & Ecological Development)



SUPPORTED BY



**Bharat Petroleum Corporation Limited
(BPCL) - CSR Initiative**

EXECUTIVE SUMMARY

Ghoramara Island, located in the climate-fragile deltaic zone of the Indian Sundarbans, is severely affected by recurring cyclones- Bulbul (2019), Amphan (May 2020) and Cyclone Yaas (May 2021), causing saline water intrusion and flooding resulting in loss of freshwater sources. These cyclonic impacts have drastically reduced access to safe drinking water, especially during and after disasters. The need for sustainable water infrastructure that can withstand recurring cyclones and meet community needs during emergencies has become increasingly urgent. In response, SEED, with CSR support from Bharat Petroleum Corporation Limited (BPCL), launched the Climate-Resilient Water Security Project in 2022–2023 to address these challenges.

The project focused on two key interventions: desilting and embankment strengthening of 7 critical ponds that had become silted and unusable due to stormwater runoff and saline encroachment and the installation of 7 high-raised deep tubewells across seven villages of Ghoramara. The ponds were rejuvenated to restore freshwater storage capacity while the embankments were reinforced to withstand tidal surges and reduce saline ingress. The high-raised platforms for the tubewells were specifically designed to remain functional after floods and cyclones, preventing choking due to flooding; ensuring continuous access to potable water even during emergencies.

These interventions directly align with core DRRM components, including disaster preparedness, risk mitigation, infrastructure resilience and system strengthening. By restoring water infrastructure in a flood-prone, off-grid island, the project has ensured that the local population is better equipped to cope with water scarcity during and after disasters. This also reduced the burden on women and children who often bear the responsibility of collecting water from distant or unsafe sources, particularly during crisis situations. Additionally, the revived water bodies now serve multiple ecosystem services, including recharging shallow aquifers and supporting livestock and kitchen gardens, contributing to livelihood protection.





PROBLEM STATEMENT

Ghoramara Island is emblematic of the water insecurity wrought by climate change in India's coastal areas. Located in the mouth of the Ganges delta, this low-lying island in South 24 Parganas district is extremely vulnerable to sea level rise and erosion. In the last few decades, its land area and population have dramatically declined – from 26 km² to about 6.7 km², and from tens of thousands of residents to roughly 5,700 today. Those who remain are predominantly marginal farmers and fisherfolk living in precarious conditions. There are 350 climate refugee families on the island who are mainly landless laborers with very limited incomes, meaning they have little capacity to cope with environmental shocks.

Ghoramara's water crisis is exacerbated by frequent disasters. The island lies in the cyclone corridor of the Bay of Bengal. In the past 15 years, it has been struck by multiple severe cyclones – Cyclone Aila (2009) inundated vast areas with saltwater, Cyclone Bulbul (2019), Amphan (May 2020) and Cyclone Yaas (May 2021) breached embankments and flooded villages with storm surges. During such events, the few existing handpumps and ponds were contaminated or damaged, leaving communities without safe water at the very moment they needed it most. Even annual monsoon flooding causes regular displacement and well contamination. Villagers recall that after cyclones, they had to consume polluted water, leading to outbreaks of diarrhea and other water borne diseases. Saline water also renders soil infertile, compounding livelihood losses after disasters. Overall, the interplay of climate hazards – rising seas, storm surges, erratic rainfall – has created a dire water-security and public health emergency in Ghoramara.

There is an urgent need for climate-resilient water infrastructure and management on the island. Any solution had to address both the chronic issue of salinity (through water source development) and the acute issue of disaster impacts (through resilient design and community preparedness). Moreover, interventions needed to be socially inclusive and locally owned, considering the socio-economic vulnerabilities (poverty, marginalization) that could otherwise impede success. Aligning the project with Disaster Risk Reduction and Management (DRRM) priorities meant that it should contribute to reducing hazard exposure (e.g. protecting water sources from floods), decreasing community vulnerability (through diversified water sources and knowledge) and increasing capacity to cope (via community governance and preparedness).

PROJECT OBJECTIVES



1. Ensure Access to Safe Drinking Water

Provide year-round, potable water access to all six villages on Ghoramara Island, especially during and after disasters. This involved developing new safe water sources (deep tubewells) that are protected from flood contamination and can supply adequate drinking water for ~350 families. Achieving this would eliminate the community's dependence on saline ponds or unpredictable rainwater, thereby improving health outcomes and daily convenience.

2. Improve Water Availability for Irrigation

Increase the availability of freshwater for irrigation and household use by restoring natural pond reservoirs. By desilting and raising the embankments of 7 key ponds, the project aimed to expand their water storage capacity and prevent saltwater ingress. The objective was to enable 150 marginal farmers to cultivate an additional crop (particularly in the dry Rabi season) and to have water for livestock and other uses, thus strengthening livelihoods and food security.

3. Build Climate Resilience into Water Infrastructure

All interventions were to be designed with climate and disaster resilience in mind, aligning with DRRM best practices. This meant installing tubewells on elevated platforms (2.5 m) and to sufficient depths to withstand cyclones and tidal floods. Ponds were to be ecologically restored and fortified to serve as reliable freshwater sanctuaries even during extreme weather events. The overarching objective was that critical water sources remain functional and uncontaminated in emergencies, thereby reducing post-disaster distress.

4. Align with DRRM Priorities

A cross-cutting objective was to align the project with DRRM frameworks – specifically focusing on preparedness, mitigation, resilience, and system-strengthening. This meant the project was intended to serve as a pilot model where a development intervention (water security) also delivers disaster mitigation (protecting against water scarcity in floods) and community preparedness (through training and planning). It sought to demonstrate to stakeholders, including the CSR funder, that investing in water infrastructure in vulnerable areas yields dual benefits: development gains in normal times and reduced disaster losses in crisis times.

5. Strengthen Community Engagement and Governance

Ensure the sustainability of outcomes by empowering the local community to manage and protect their water assets. This included forming or revitalizing community-based institutions like Water User Groups (WUGs) and village water committees to take ownership of the ponds and tubewells. Training and capacity-building of these groups was an objective, enabling local maintenance, equitable water distribution, and linkage with government support. Another related objective was to increase community awareness of WASH and water conservation, so that behavior change (like regular pond cleaning, safe water handling, and sanitation practices) would amplify the benefits of the physical infrastructure.



ACTIVITIES AND METHODOLOGY

SEED implemented a series of targeted activities on Ghoramara Island during 2022–2023. The methodology emphasized engineering solutions coupled with community participation, ensuring that interventions were technically sound, climate-resilient, and locally accepted.

The two cornerstone activities were:

- (1) Desilting and embankment strengthening of 7 ponds
- (2) Installation of 7 raised tubewells.

Ancillary activities included water quality measures, community training and coordination with government schemes. Below is a detailed overview:

1. Rejuvenation of Community Ponds

7 silted and salinated ponds, spread across different villages of Ghoramara, were selected for rejuvenation based on a participatory mapping exercise. SEED water engineers and community members (including Pradhan, village elders, SHG members and farmers) jointly identified these ponds as critical – due to their unused status and their vulnerability to saline ingress. The rejuvenation process involved:

a) Desilting (Pond re-excavation)- Over decades, these ponds had become shallow and silt-choked, reducing their water holding capacity. Under the project, each pond was re-excavated to remove accumulated silt and deepen the water column by 3 meters. This was done using a combination of labor crews and earth-moving equipment (where accessible). The excavation increased the volume of freshwater each pond could store by the end of the monsoon. As a result, even in the dry season, water would remain available for longer periods. The removed silt (largely fertile alluvium) was repurposed for embankment raising and for nearby agriculture fields.





b) Embankment Strengthening and Raising- Once desilted, the pond embankments (bunds) were raised and reinforced. Using the dredged soil and additional clay, the height of each bund was increased by 1–1.5 meters and compacted. The slopes were stabilized through planting vetiver grass and local mangrove associates where appropriate, to prevent erosion. This height increase is crucial for disaster mitigation – during cyclonic storm surges or spring tides, the taller bunds act as barriers to saline water overtopping the ponds. In previous cyclones, many ponds were contaminated by saltwater; the strengthened bunds now significantly reduce that risk by keeping floodwaters out. This intervention effectively “fences” the freshwater lens. In addition, bund strengthening helps improve year-round water retention by minimizing breaching and seepage. Communities reported that after these works, their ponds did not overflow or turn brackish even when high tides came with the post-monsoon cyclonic weather, validating the approach.

c) De-weeding and Water Quality Measures- Alongside structural improvements, pond water quality management was introduced. Invasive weeds (like water hyacinth) that choke ponds were regularly removed (de-weeded) by community workers. Periodic disinfection was done using bleaching powder treatment to curb bacterial contamination. Notably, with support from BPCL under the Swachh Bharat mission, SEED organized pond cleaning drives – for example, removing weeds and applying bleach in these ponds on a regular schedule. These measures ensured that the improved ponds yield not just more water, but cleaner water for usage. The methodology stressed regular maintenance: WUGs (Water User Groups) were trained to continue these de-weeding and cleaning activities beyond the project period.



2. Installation of Raised Tubewells

The second major activity was providing 7 new hand-pumped tubewells, each built to be flood-resilient and tapping into deeper aquifers for fresh water. Key steps in this process were:

a) Site Selection and Cadastral Survey- SEED's technical team conducted hydro-geological surveys to locate viable sweet water aquifers beneath the island's brackish groundwater layer. Based on community inputs, sites were chosen in or near populous habitations that currently lacked nearby safe water. The goal was to equitably cover all villages, with at least one tubewell within convenient walking distance for each cluster of households. Two of the tubewells were sited adjacent to local primary schools and local market to maximize accessibility.

b) Drilling and Casing- Professional drillers bored each tubewell to a depth of approximately 300–370 meters, reaching below the saline groundwater strata to extract fresher water. A high-grade PVC casing was installed to prevent collapse and to seal off upper salty layers. By tapping deep confined aquifers, these tubewells yield potable water even as the shallow water table remains saline – a strategy proven effective by prior ICZM projects in neighboring Sagar Island. Water quality tests were conducted during drilling to ensure acceptable salinity (< 500 ppm) and arsenic/iron levels; any tubewell not meeting standards was repositioned. All 7 boreholes yielded freshwater and were then equipped with handpump heads.

c) Raised Platform Construction- Uniquely, each tubewell was mounted on a raised concrete platform ~2.5 meters above ground. The platform design is a signature climate-resilient feature: by elevating the wellhead, it stays above typical flood heights, preventing floodwaters from submerging and contaminating the pump. A sturdy staircase allows users to climb up to pump water even if surrounding areas are flooded. The platforms were built with reinforced cement concrete, anchored deeply for stability against high winds and water flow. They also include drainage aprons and soak-pits to avoid waterlogging around the pump. This design draws from SEED's ICZM project experience where dozens of tubewells on 2.5m raisers remained operational through recurrent cyclones in Sagar island. In Ghoramara's context, these "flood-proof" tubewells are a lifeline: they ensure villagers have drinking water during disasters when ground-level sources fail.



d) Community Water Points and Connections- At ground level near each raised tubewell, standposts and faucets were installed, connected via piping to the pump above. This allows easier filling of vessels for those who cannot climb. In two locations, in partnership with the Public Health Engineering (PHE) department, the project extended piped water lines from the tubewell to a network of household or community tap points. This was especially done near the school sites, effectively creating a mini water supply scheme where handpump water is delivered to school toilets and nearby homes via gravity. The PHE's involvement, facilitated by the project, means government will maintain those connections, blending project infrastructure with public service for sustainability.



3. Supporting Activities

In addition to the core physical works, the project's methodology integrated several supporting components:

a) Formation of Water User Groups (WUGs)- For each rehabilitated pond and for clusters of tubewells, local WUGs were formed. These groups, typically 5–7 members (with at least 40% women representation), were trained to oversee the upkeep of the water assets. Their responsibilities include monitoring pond water levels, organizing cleaning campaigns, minor repairs of tubewell handpumps and ensuring fair access (preventing any one group from monopolizing a resource). Training sessions were conducted on technical skills (e.g., how to chlorinate a pond, fix a pump washer) and bookkeeping for any user contributions. This participatory approach is crucial – as seen in SEED's other projects, involving communities in planning and maintenance leads to better long-term outcomes.

b) Community Mobilization and WASH Education- The project ran a community awareness campaign parallel to infrastructure works. This included village meetings and school programs about water conservation, hygiene, and sanitation practices. Notably, SEED leveraged the “Swachhta Pakhwada” programme (Cleanliness Fortnight) with BPCL’s support to engage residents in climate-sensitive WASH topics. Over 2022 and 2023, consecutive campaigns involved school children in rallies and drawing competitions on hygiene, women’s self-help groups in sanitation drives, and folk theatre spreading messages on clean water. These activities fostered a culture of cleanliness – for instance, villagers committed to keep cattle out of the pond water and to not dump waste around tubewells. By improving behavioral practices, such as regular handwashing and safe water storage, the software component reinforced the hardware investments. The community’s engagement was enthusiastic; local youth clubs volunteered in building the tubewell platforms and painting pro-water slogans on them.

c) Stakeholder Coordination- Methodologically, the project emphasized collaborating with local governance. The Ghoramara Gram Panchayat and the Block Development Office were consulted, aligning the project with government schemes (like the national Jal Jeevan Mission for rural water supply and MGNREGS for labor contributions). While CSR funds covered materials and technical expertise, unskilled labor for pond excavation was partially drawn from MGNREGA, giving wages to local laborers and reducing costs. The Public Health Engineering (PHE) Department provided water quality testing kits and later extended pipelines, as noted. Regular coordination meetings were held with the District Disaster Management Authority as well, to sync the project with broader DRR plans. This multi-stakeholder approach ensured that the intervention was not in isolation; it plugged into institutional frameworks that support continuity (for example, panchayat plans to allocate budget for bleach for the WUGs in future).



COMMUNITY ENGAGEMENT

Under the Swachhta Pakhwada campaign supported by BPCL, SEED conducted creative daily activities to engage different segments of the community. School children participated in rallies and painting competitions on themes of clean water and hygiene. Self-Help Groups of women organized neighborhood clean-up drives, removing garbage that could pollute water sources. Folk theater shows and puppet plays on weekends drew large crowds, delivering messages about stopping open defecation and protecting water bodies from pollution. These activities were not one-off – they spanned in consecutive fortnights of intensive engagement.

The result was a noticeable shift in community mindset: villagers collectively pledged (via oath ceremonies during the campaign) to keep their environment clean and treat water as a shared precious resource. The sense of stewardship increased, with many community members volunteering for monitoring the condition of pumps and ponds.

In summary, community engagement and governance under the initiative were robust and multi-layered. By project completion, Ghoramara's residents were not just passive beneficiaries but active custodians of their water resources. The social capital built – through WUGs, trained volunteers, and informed citizens – forms a “human infrastructure” as important as the physical infrastructure. This human infrastructure enhances disaster preparedness (people know what to do to protect water during cyclones) and ensures resilience (quick collective action to repair or maintain systems). The initiative thus leaves behind empowered local institutions and an engaged community that together will drive the sustained impact of the project.





OUTCOMES & IMPACT

- Over 350 households across seven villages now have continuous access to safe drinking water through the installation of 7 elevated tube wells, reducing dependency on contaminated sources during floods and cyclones.
- 7 desilted and embankment-strengthened ponds have enhanced local water retention, ensuring reliable year-round access to freshwater for agriculture, livestock, and household use.
- The rejuvenated ponds are expected to support multi-season cultivation across approximately 100 acres, leading to an estimated 30–35% increase in crop productivity and improved food security for marginal farmers.
- Water User Groups and community volunteers have been mobilized to manage water resources locally, ensuring long-term sustainability and maintenance of the infrastructure created.
- 40+ community members, including women farmers, have been trained on water conservation, disaster preparedness, and safe water usage, fostering local capacity and knowledge ownership.
- The project has significantly improved hygiene conditions, particularly for women and children, leading to an expected 20–30% reduction in waterborne illnesses and skin infections.
- By aligning water management efforts with local governance and resilience-building practices, the project directly contributes to community-level disaster preparedness and the goals of climate-resilient development in the Sundarbans.



LESSONS LEARNT

- **Community ownership is key** — Engaging local villagers in planning, implementation, and maintenance ensured better usage, protection, and sustainability of the ponds and tube wells.
- **Raised infrastructure is essential in flood-prone regions** — The elevated design of tube wells proved highly effective in maintaining access to potable water during and after heavy rains and tidal surges.
- **Small-scale water interventions can yield large-scale resilience** — Even with just 7 ponds and 7 tube wells, the project significantly improved water security and agricultural productivity for hundreds of families.
- **Integrated approach builds stronger outcomes** — Combining water access with agriculture, hygiene, and disaster risk reduction ensured holistic benefits rather than isolated impacts.
- **Timely execution before monsoons enhances effectiveness** — Completing desilting and embankment reinforcement ahead of the rainy season maximized the ponds' ability to store fresh water.
- **Women's involvement enhances impact** — Involving women in water management led to better hygiene awareness and more inclusive decision-making at the household and community levels.
- **Convergence with local governance boosts sustainability** — Collaborating with Panchayats and aligning with public water programs (like PHED) helped institutionalize water management in local development plans.



CONCLUSION

The Climate-Resilient Water Project in Ghoramara embodies a holistic Disaster Risk Reduction and Management (DRRM) approach by integrating mitigation, preparedness, and resilience-building into a single, community-centered intervention. Through desilting and embankment strengthening of 7 key ponds and installation of 7 raised tubewells, the project significantly reduced the vulnerability of over 350 households to water scarcity during climate-induced disasters. By restoring water access for drinking, agriculture, and hygiene—even during cyclones and tidal floods—the initiative strengthened both human and environmental systems to withstand future shocks.

Critically, the project advanced key DRRM components: it built climate-resilient infrastructure, empowered community institutions for ongoing water governance, promoted health and hygiene to reduce disaster-related disease outbreaks, and aligned with local government bodies to ensure continuity and sustainability. The success of this intervention reinforces the importance of localized, nature-based, and participatory solutions in addressing the long-term impacts of climate change. It serves as a replicable model for safeguarding livelihoods and ecosystems while building disaster-prepared communities in fragile coastal geographies like the Sundarbans.

As climate uncertainties intensify and vulnerable geographies like Ghoramara stand at the frontline of disaster impact, the question is no longer whether to act—but how urgently and effectively we can strengthen resilience. This project is not just about ponds and tubewells; it is about restoring dignity, securing livelihoods, and building hope in communities that battle climate threats every year. The path forward lies in scaling such integrated, community-driven solutions—because in resilience, there is both protection and possibility.

