



Climate Change Adaptation through Small-Scale
and Protective Infrastructure Interventions in
Coastal Settlements of Cambodia (CCA4CS)

Drainage Rehabilitation and Installation of Garbage Nets and Eco-Treatment Systems in Prey Nob District, Preah Sihanouk Province

Improving Drainage and Climate Resilience



MAY 2025
PHNOM PENH, CAMBODIA

BRIEF SUMMARY

Under Output 3.7 of Component 3, the project aimed to improve the drainage system and roadside infrastructure in front of Veal Rinh Market, benefiting over 4,500 market vendors and indirectly benefiting the broader district population.

KEY ACHIEVEMENTS

Phase 1: Initial Implementation

- A contract was awarded on 16 March 2023 to Raknika Construction and Consulting Services Co., Ltd.
- Topographic surveys and stakeholder consultations were completed by August 2023.
- One hundred rainwater harvesting tanks were distributed to market vendors on 16 June 2023.
- Construction began in June 2024 but experienced delays due to persistent rain.
- Despite this, 1 km of drainage was rehabilitated, and garbage traps and an eco-treatment plant were successfully installed and handed over on 5 December 2024.
- NCS and UN-Habitat ensured quality control through regular site visits and safeguards monitoring.
- Infrastructure handed over to local authority (December 2024)

Phase 2: Upscaling Efforts

- On 8 August 2023, the Adaptation Fund Board approved reallocating unused funds from Output 3.4 to scale up Output 3.7 (Decision B.42/40).
- This enabled the construction of 19 resilient demonstration housing units and the extension of drainage improvements.
- An additional 1,060 meters of drainage with eco-treatment systems was constructed following new consultations and surveys.
- An additional 2,160 square meters of asphalt concrete was installed
- Three discharge drainages were improved through soil excavation.
- On 8 April 2025, a rehabilitated canal section and watergate in Kep Province were formally handed over, with key government officials, project partners, and community representatives participating.

GOOD PRACTICES

- 1. Climate-resilient infrastructure:** The upgraded drainage system successfully prevented flooding during the 2024 rainy season, demonstrating the effectiveness of robust civil works.
- 2. Utility coordination:** Alignment of cables along the drainage route improved construction efficiency and paved the way for future infrastructure upgrades.
- 3. Eco-treatment innovation:** The use of water hyacinth for natural water purification has demonstrated a cost-effective and eco-friendly alternative, with potential for resource recovery if carefully managed.

LESSONS LEARNED

- 1. Seasonal planning:** Construction delays occurred due to rainfall. Future projects should prioritise completing preparatory activities during the wet season so that construction can commence during dry periods.
- 2. Solid waste challenges:** Despite training, solid waste continues to clog drains. A more comprehensive waste management strategy, including upstream source control, is needed.
- 3. Stakeholder coordination gaps:** Uncoordinated actions, such as the unauthorised removal of garbage traps, highlighted the need for more precise role delineation and communication protocols.
- 4. Design improvements:** Infrastructure should be designed to withstand extreme weather while maintaining functionality, ensuring garbage traps do not hinder drainage during heavy rains.
- 5. Community ownership:** Limited community engagement contributed to maintenance issues. Future projects must incorporate awareness campaigns and participatory planning to build local responsibility.
- 6. Sustainability focus:** To ensure infrastructure durability, stop-gap measures like garbage traps should be supplemented with long-term waste management solutions.

RECOMMENDATIONS

- 1. Seasonal scheduling:** Complete construction works ahead of the rainy season. Assessments and designs should be finalised during the wet season for timely implementation.
- 2. Capacity building:** Provide ongoing training for local officials and market managers on solid waste management and assign clear responsibilities for garbage trap maintenance.
- 3. Community engagement:** Launch awareness campaigns and involve residents in maintenance and monitoring to foster ownership.
- 4. Monitoring and maintenance system:** Establish a structured plan for the upkeep of drainage and eco-treatment infrastructure, with designated responsibilities and sufficient resources.
- 5. Water hyacinth management:** If used in eco-treatment systems, water hyacinth must be strictly contained, with frequent harvesting and environmental monitoring. Environmental experts must conduct a risk assessment to avoid unintended consequences.

PROJECT OVERVIEW

Since August 2021, the United Nations Human Settlements Programme (UN-Habitat) and the National Council for Sustainable Development (NCSD) have been implementing the Climate Change Adaptation through Protective Small-Scale Infrastructure Interventions in Coastal Settlements of Cambodia Project (CCA4CS), with financial support from the Adaptation Fund.

The project aims to strengthen climate resilience and adaptation in Cambodia's most vulnerable coastal settlements through targeted, on-the-ground interventions. By focusing on areas where ecotourism can support long-term sustainability, the initiative enhances communities' capacity to withstand climate-related challenges. The project is structured around three interconnected components to accomplish this in the highly vulnerable settlements in Kep Province and Prey Nob District of Preah Sihanouk Province:

Component 1: Community-scale knowledge and capacity enhanced to sustain the adaptation benefits of the project's investments.

Component 2: Government planning and technical capacity enhanced and knowledge captured and disseminated to sustain and enhance the project's adaptation benefits.

Component 3: Resilience built through investment in small-scale protective and basic service infrastructure and natural assets.

By integrating these components, the project addresses immediate climate risks and lays the foundation for long-term sustainability and resilience in Cambodia's coastal communities.

RATIONALE FOR THE INTERVENTION

The Veal Rinh Market area in Prey Nob District regularly experiences stormwater flooding during the rainy season. The stretch of land between the main road and the market lies at the lowest elevation, making it particularly vulnerable. The existing drainage infrastructure is insufficient to manage the increasingly intense rainfall. As a result, flooding occurs in and around the market each time it rains, disrupting economic activity and causing financial losses for vendors. Furthermore, water backflow risks submerging the discharge channels on the opposite side of the market, obstructing proper drainage.

Another significant issue is the inadequate solid waste management system. The market's open drainage channels make it easy for residents and vendors to dispose of garbage into nearby water bodies, leading to clogging and creating favourable conditions for spreading bacteria and other pathogens. These sanitation issues pose public health risks, while the visible accumulation of waste reflects the urgency of addressing infrastructure deficiencies and environmental neglect. To resolve these challenges, the project team designed a targeted intervention to rehabilitate the drainage system

and strengthen waste management practices in the Veal Rinh Market area.

BRIEF DESCRIPTION OF THE INTERVENTION

The intervention, delivered under Output 3.7 of Component 3, aimed to improve the roadside and drainage system in front of Veal Rinh Market, Prey Nob District. The project team expected the intervention to benefit over 4,500 market vendors directly and support all residents indirectly by reducing flood risks and improving environmental conditions. The initiative had four primary goals:

- first, to increase the drainage system's capacity to manage stormwater and minimise flooding during the rainy season.
- second, to prevent solid waste from entering water bodies by installing garbage traps in key drainage sections.
- third, to reduce water pollution by introducing eco-treatment systems that naturally clean rainwater runoff before discharge; and
- fourth, to conserve water resources by harvesting rainwater from existing roof drains into small tanks to clean wet areas.

This report summarises the project's background, implementation phases, significant achievements, good practices, lessons learned, and recommendations for scaling up climate-resilient infrastructure in Cambodia's coastal regions.

KEY ACHIEVEMENTS

The project team implemented the initiative in two phases to ensure long-term ecological and community resilience.

Phase 1



Phase 1 began with a competitive bidding process, culminating in the signing of a contract with Raknika Construction and Consulting Service Co., Ltd. on 16 March 2023. After consulting with local stakeholders, the project team launched a topographic survey in November 2023 and finalised the drainage designs by August 2024.

On 16 June 2023, the project team distributed 100 rainwater harvesting tanks to selected vendors at Veal Rinh Market.



Construction work commenced in June 2024. However, frequent rainfall delayed the completion of asphalt paving works. Despite weather disruptions, the contractor rehabilitated a one-kilometre drainage stretch, installed garbage traps, and established an eco-treatment facility.

On 5 December 2024, the project team officially handed these components to the sub-national authority.

During the construction period, the national NCSD team, in close collaboration with UN-Habitat, regularly monitored the site to ensure compliance with design specifications and safeguard standards. The contractor provided monthly progress reports and an Environmental and Social Safeguards (ESS) report.

Phase 2

Phase 2 began after the Adaptation Fund Board approved reallocating unused funds from Output 3.4—previously implemented by the Ministry of Water Resources and Meteorology—to scale up Outputs 3.5 and 3.7 through Decision B.42/40 on 8 August 2023. The donor formalised this decision in a letter dated 11 June 2024.

During the second PMC meeting on 16 September 2024, the committee approved extending Raknika Construction's contract to support additional drainage rehabilitation in the Veal Rinh Market. In October 2024, the project team, contractor, and local authorities conducted a joint inspection. Based on the findings, they designed and rehabilitated an additional 1,060 meters of drainage, incorporating more garbage traps and eco-treatment features.

Environmental and social safeguards monitoring in December 2024 resulted in key recommendations: that the project team conduct site visits at least every two weeks. The NCSD adopted these recommendations and carried them out with the cooperation of the local government.

The construction work of Phase 2 was completed in September 2025. The work included a 1,060m drainage system, installation of garbage traps, 244 trees planted along National Road Number 4, asphalt concrete pavement, eco-treatment facilities, and clearance of 3 discharge drainage canals.

In ProDoc, Output 3.7 requires a specific training to market vendors and residents. On 21 August 2025, a training on Solid Waste Management (SWM) for market vendors and residents was conducted, which was attended by 96 participants (40% are women), including market vendors, residents, students, teachers, and local authorities.

To align with the Ministry of Environment's commitment, the CCA4CS project contributed to the organizing campaign to promote waste management. On 22 August 2025, a campaign was organized to collect waste, provide garbage bins, as well as plant trees.

Additional Work

NCSD received the request from local authorities at Prey Nob for infrastructure needs that are critical to strengthen climate resilience and address community priorities. On 19 August 2025, the Project Manager of NCSD/MoE requested No Objection to the request from UN-Habitat and the PMC on the contract extension with the Raknika Construction and Consulting Service Co., Ltd, to include additional work. The request received approval from UN-Habitat and the PMC members.

GOOD PRACTICES

1. Improved Market Resilience and Drainage Performance

The project's physical investments proved highly effective. Since the beginning of the 2024 rainy season, local authorities and market vendors have confirmed that the Veal Rinh Market has not experienced any flooding or water accumulation. Stormwater flows efficiently through two rehabilitated box culvert lines, crossing National Road No. 4 and connecting with drainage works implemented by the Provincial Department of Public Works and Transport. The system directs water to the eco-treatment canal, then to Beung Thom Lake, and finally discharges it to the sea. This improved network has dramatically increased drainage capacity and enhanced the safety and usability of the market environment.

2. Coordination for Future Infrastructure Readiness

Another positive outcome was the collaboration between the contractor and Veal Rinh District to realign internet and utility cables along the drainage corridor. Previously, disorganised cabling had disrupted construction and public works. The alignment now supports smoother implementation of future infrastructure upgrades along National Road No. 4.

3. Innovative Use of Water Hyacinth in Eco-Treatment

The eco-treatment system's use of water hyacinth also stands out as a beneficial innovation. Water hyacinth efficiently absorbs pollutants from wastewater, including heavy metals and excess nutrients. The project offers a cost-effective alternative to conventional treatment methods and produces biomass that local stakeholders can repurpose as compost, biogas, or animal feed. However, they must ensure effective containment and continuous management to prevent ecological imbalance caused by the plant's invasive potential.

LESSONS LEARNED

1. Construction Timing and Seasonal Hazards

One key lesson was the importance of timing. The rainy season delayed construction activities, particularly asphalt paving. Future projects should finalise planning and design work during the wet season to allow timely construction in dry months.

2. Persistent Solid Waste Management Gaps

Persistent solid waste management issues also emerged as a challenge. Despite training sessions targeting local authorities and market managers, improper garbage disposal continued near the drainage system. While garbage traps have reduced immediate impacts, the project team must address upstream waste sources. Runoff from mountainous zones continues to carry waste from unregulated dumping into the project area. To tackle this issue effectively, they must implement a comprehensive solid waste management strategy at the watershed level.

3. Stakeholder Coordination and Maintenance Roles

Additionally, when the Provincial Department of Public Works and Transport removed garbage traps during heavy rains, it exposed gaps in stakeholder coordination and unclear responsibility-sharing. This highlights the urgent need to define roles more clearly and establish formal procedures for maintenance and repair.

4. Infrastructure Design Limitations under Extreme Rainfall

The removal of infrastructure to ease water flow during floods suggests that trap designs may not have been effective in handling extreme rainfall events. Future drainage projects must incorporate technical solutions that balance water flow management with solid waste interception.

5. Community Engagement Deficits

Another challenge arose from limited community engagement during the infrastructure rollout. Without early and consistent involvement, local ownership may have weakened, leading to misuse of the drainage system. Future projects should incorporate community awareness campaigns, participatory design processes, and locally led monitoring mechanisms to prevent this.

6. Need for Long-Term Waste Management Systems

Finally, while garbage traps offer a short-term fix, long-term success will require municipal and regional waste management systems, including structured waste collection, sorting, and disposal mechanisms.

RECOMMENDATIONS

1. Seasonal Planning for Infrastructure Execution

To prevent weather-related construction delays, project teams should prioritise completing preparatory studies and design work during the rainy season, allowing physical construction to start early in the dry season. They should also finalise climate-sensitive interventions to reduce potential socio-economic impacts before seasonal hazards arise.

2. Comprehensive Waste Management Strategy

Project teams must take a holistic approach to solid waste management. They should provide market managers and vendors with ongoing capacity-building support and establish mechanisms to monitor and evaluate waste collection, trap cleaning, and maintenance responsibilities.

3. Enhanced Community Awareness and Participation

Project teams must strengthen community involvement by conducting awareness campaigns and fostering participatory engagement. These efforts can build public understanding and encourage community stewardship of infrastructure. Educational activities should highlight the importance of drainage systems and the negative impacts of improper waste disposal.

4. Institutionalised Maintenance Plans

Regular maintenance is critical to sustaining the benefits of the intervention. The project team should establish a dedicated monitoring and upkeep plan, including clearly assigned roles, defined cleaning schedules, and allocated maintenance budgets. This approach will help ensure the infrastructure's long-term functionality and resilience.

5. Controlled Use of Water Hyacinth

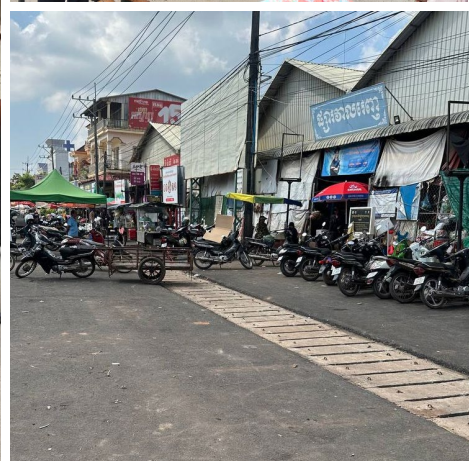
Lastly, if the project uses water hyacinth for eco-treatment, the team must implement strict containment protocols to prevent its spread. Although the plant provides clear ecological and economic benefits, its invasive nature can cause significant harm if unmanaged. The team should conduct a detailed risk assessment guided by environmental specialists with experience in the Prey Nob context and supported by appropriate mitigation measures.

DOCUMENTATION

Name	Type	Produced Date	Location
Technical Drawing (Phase 1)	Design	August 2023	Link
Technical Drawing (Phase 2)	Design	February 2025	Link
Post-construction assessment report (Phase 1)	Report		Link
Pre-survey report (Phase 2)	Report	March 2025	Link
Mid-survey report (Phase 2)	Report	July 2025	Link
Post-survey report (Phase 2)	Report	 2025	
Weekly report	Report	2025	Link
Detail Design Drawing (Additional Work)	Design	August 2025	(TBA)
Completion Report (Phase 1)	Report	November 2024	Link
Completion Report (Phase 2)	Report	September 2025	Link

PHOTOS





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