



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

Prevention of Saltwater Ingress through Improved Channels and Embankments in Kep Province

Lessons from Water Gate and Embankment Rehabilitation



MARCH 2025
PHNOM PENH, CAMBODIA

BRIEF SUMMARY

The project focused on installing a water gate and reinforcing a 370-meter embankment to protect 3,500 beneficiaries (at least 50 per cent women) in Pong Teuk and Angkaol Communes from flooding and saltwater intrusion.

KEY ACHIEVEMENTS

1. Infrastructure Completed: By November 2023, the project team had completed the construction of embankments and a climate-resilient water gate system—including five automatic sluice gates and one manual gate with double-layer reinforcement. They also constructed a motorable access road and installed a mesh trash screen to improve flood resilience and waste management.

2. Environmental & Land Compliance: The team reassessed environmental and social safeguards, facilitated the transfer of land ownership from private to public with support from local authorities, and ensured full compliance with donor policies.

3. Effective Oversight: NCSD and UN-Habitat actively monitored the construction process, submitted monthly progress reports, and conducted the official handover on 5 December 2024, with participation from 57 stakeholders.

4. Stakeholder Engagement: Strong collaboration with local landowners, district authorities, and communities ensured shared benefits, including improved irrigation and flood control.

5. Capacity-Building Efforts: Development and distribution of an operation manual in Khmer and English, along with training sessions for local communities and government officials on operation, maintenance, and long-term management of the water gate and embankment.

6. Build Back Better Applied: Infrastructure designed based on risk assessments to withstand extreme weather events, integrating climate adaptation principles.

7. Land Transfer: The gates were initially on private land, requiring successful negotiations to transfer ownership to public land.

GOOD PRACTICES

1. Effective Stakeholder Engagement: The project secured the landowner's cooperation, ensuring the intervention benefited farmers and residents in Pong Teuk and Angkaol Communes.

OUTPUT 3.3

2. Build Back Better Approach: The improved design includes five automatic sluice gates, one manual gate, and a 2-meter-wide embankment to handle extreme floods. A mesh trash screen was installed to prevent solid waste accumulation, reducing the risk of infrastructure damage.

LESSONS LEARNED

1. Timely development and distribution of the operation manual are essential for building the capacity of local stakeholders (farmers, water management committees, and provincial water resource officials). To ensure effective implementation, the project should be conducted before the rainy season.

2. Need for extended monitoring: to sustain project impact, UN-Habitat, NCSD and relevant stakeholders are required to provide 6 months to 1 year of follow-up support.

3. Community-led construction (community implementation agreement): a participatory construction approach fosters community ownership, strengthens local technical knowledge, and reduces long-term maintenance costs.

RECOMMENDATIONS

1. Strengthening participatory management & sustainability: shift responsibility to local stakeholders (commune representatives and residents) for better ownership and long-term commitment. Clearly define roles among national, provincial, municipal, and commune authorities to avoid accountability gaps.

2. Integration into commune development & investment plans: nominate responsible individuals for regular monitoring and corrective action. Allocate financial resources within local investment plans to ensure sustainable maintenance.

3. Continuous refresher training and stakeholder coordination: newly assigned personnel should receive regular training sessions. Provincial and municipal authorities, in collaboration with the Ministry of Water Resource and Meteorology (MOWRAM), should monitor and provide ongoing technical support to ensure long-term infrastructure sustainability.

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, in Kep Province and Prey Nob District of Preah Sihanouk Province, through targeted interventions around three interconnected components:

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.

These initiatives will enhance communities' capacity to withstand climate-related challenges by focusing on areas where ecotourism can support long-term sustainability. Through 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 INTERVENTION

Coastal communities in Cambodia, particularly those dependent on agriculture (primarily rice production), face a significant risk from saline intrusion. Seawater and tidal rivers wash inland during extreme tidal events, salinising the crops, degrading soil fertility, and jeopardising future harvests. This situation increases food insecurity and imposes economic hardship on already vulnerable populations. The coastal areas of Kep and Preah Sihanouk Provinces experience particularly severe impacts. Some regions benefit from tidal flooding embankments, but others remain exposed to direct seawater intrusion, which worsens agricultural losses and accelerates long-term land degradation.

The project designed a dual-purpose intervention to address this issue: (a) to prevent inland saltwater intrusion and protect farmlands by maintaining soil fertility, and (b) to ensure proper drainage during the rainy season and prevent water logging.

A key feature of the intervention involved installing sluice gates with one-way non-return valves. These

valves allow excess surface water to flow out, preventing seawater from moving inland. This strategic infrastructure strengthens climate resilience, safeguards local livelihoods, and promotes sustainable agricultural practices in vulnerable coastal settlements.

BRIEF DESCRIPTION OF THE INTERVENTION

As part of Component 3, the project aimed to install a water gate along the approximate alignment of an existing wooden bridge while reinforcing a 370-meter embankment to withstand peak flood flows from the inland catchment in Pong Teuk and Angkaol Communes in Kep Province. The project designed this intervention (Output 3.3) to prevent rice field submergence and property flooding. It is aiming to benefit approximately 3,500 people (at least 50 per cent female) by protecting land and water sources from saltwater intrusion and the long-term impacts of sea-level rise.

The intervention aimed to promote the following long-term benefits and sustainability:

- **Improved Agricultural Productivity** – Eliminating the risk of salinisation will help increase crop yields and enhance soil structure, benefiting the entire community.
- **Climate Resilience** – The embankment is designed to withstand extreme sea-level rise scenarios up to the year 2100, based on worst-case projections of a 1-meter rise in sea levels.
- **Waste Management Enhancement** – An upstream mesh trash screen will prevent solid plastic waste from clogging the outfall culverts.

This report provides an overview of the water gate rehabilitation, covering key aspects such as background, achievements, good practices, lessons learned, and recommendations for integrating these experiences into future initiatives.

KEY ACHIEVEMENTS

The project implemented the following activities to achieve the expected intervention with long-term benefits and sustainability.

Following a competitive bidding process, NCSD signed a Letter of Agreement (LOA) (No. 00112023/CCA4CS) with Raknika Construction and Consulting Service Co., Ltd. on 16 March 2023. In June 2023, the consultant team reassessed environmental and social risks and safeguards to consider the inclusion of an access road in the design. By August 2023, the subcontractor had finalised the water gates and embankment design, and site clearance and road construction commenced in September 2023.

NCSD members, particularly the national team leader and monitoring officer, closely monitored the construction process in collaboration with UN-Habitat to ensure quality control. The subcontractor submitted monthly progress reports to NCSD, providing updates on construction status. In February 2024, the environmental and social risk assessment confirmed that the project had completed the embankment expansion in November 2023 and had constructed 90 per cent of the water gate structure.

This structure includes five automatic sluice gates and one manual gate, all reinforced with double-layered materials for enhanced durability. Since the original gate site lay on private land, the project team, with support from provincial authorities, negotiated the transfer of ownership to public land. The project also upgraded the existing footpath into a motorable road, elevating its surface above the highest recorded floodwater level.

Upon completion, the subcontractor submitted as-built documentation, including drawings, material survey reports, and an assessment report on the donor's Environmental and Social Policy. The official handover of the water gate and embankments occurred on 5 December 2024 in Damnak Chang Eur District, Kep Province. The ceremony was presided over by His Excellency Pheav Sovuthy, Under Secretary of State of the Ministry of Environment and Chair of the Project Management Committee, along with Mrs. Tit Sokha, Deputy Governor of Kep Province, Mr. Thin Sina, Deputy Governor of Damnak Chang Eur District, and representatives from NCSD, the construction company, local authorities, and the community. A total of 57 participants attended the event, during which the subcontractor conducted a live demonstration on operating the water gate and explained its benefits. Additionally, the project installed a signboard at the site to enhance project visibility featuring the logos of NCSD, MoE, UN-Habitat, and the Adaptation Fund.

To ensure the sustainable operation and maintenance of the water gate, the subcontractor developed a comprehensive operation manual in Khmer and English and distributed it to subnational officials responsible for managing the infrastructure. Further, training sessions were provided under Outputs 1.3 and 2.2 to local communities and government officials on the proper operation, maintenance, and long-term strengthening of the water gate and embankment. These capacity-building efforts aim to ensure that the infrastructure remains functional, resilient, and beneficial to the communities for years to come.

GOOD PRACTICES

1. Stakeholder engagement and ensure local contributions

One of the project's key successes was the effective engagement of local stakeholders, particularly the landowner of the water gate rehabilitation site. The district authorities facilitated discussions with the landowner, securing his agreement to construct the water gate. This collaboration ensured that the project delivered shared benefits, including improved irrigation and flood control for residents and farmers in Pong Teuk and Angkaol Communes. This successful stakeholder engagement represents a best practice that future projects requiring landowner cooperation can replicate.

2. Apply the Build Back Better approach to enhance climate change adaptation

Another key practice was applying the Build Back Better (BBB) approach to strengthen climate change adaptation. Based on pre-project assessments and inspections, the subcontractor designed a water gate system comprising five automatic sluice gates, one manual gate, and a two-meter-wide embankment, ensuring protection against peak flood flows. Additionally, to address the issue of solid waste accumulation, a mesh trash screen was installed on the upstream side to prevent plastic waste from clogging outfall culverts. These strategic design improvements enhance flood resilience and protect surrounding communities and infrastructure from future extreme weather events, demonstrating the successful application of BBB principles.

LESSONS LEARNED

1. Timely development and sharing of the operation manual

One critical lesson was the importance of the timely development and distribution of the operation manual. Since the water gate plays a crucial role in preventing saltwater intrusion and protecting crops, it is essential to conduct capacity-building training for local farmers, water management committees, and provincial water resource departments. To maximise effectiveness, the project should schedule training before the rainy season, when a saltwater intrusion occurs. Additionally, the operation manual should be reader-friendly and accessible to all stakeholders.

2. Allow sufficient time to monitor the operational and managerial capacity of sub-national stakeholders.

Another key takeaway was the need for extended monitoring of the operational and managerial capacity of sub-national stakeholders. The project's timeline allocated small-scale infrastructure construction toward the latter phase, followed by capacity-building training after completion. However, this approach left only a few months for post-training monitoring. UN-Habitat, NCS, and other relevant stakeholders should provide continuous follow-up monitoring and guidance for a period of six to 12 months after the handover to ensure long-term sustainability and functionality. Sustaining the project's impact requires ongoing capacity-building, continued support, and long-term monitoring of the responsible focal persons.

3. Construction through the Community Implementation Agreement

Lastly, the project highlighted the benefits of community-led construction through a Community Implementation Agreement, also known as the People's Process. If time and budget permit, the project team should adopt a participatory construction approach, as it fosters community ownership, enhances technical knowledge among local stakeholders, and strengthens long-term sustainability. Additionally, involving local communities in construction can improve project quality by incorporating local knowledge and reducing long-term maintenance costs, making it a viable approach for future infrastructure projects.

These insights and best practices offer valuable guidance for future projects. They emphasise the importance of stakeholder engagement, climate-resilient design, structured training, long-term monitoring, and community participation to ensure sustainable infrastructure development.

RECOMMENDATIONS

1. Strengthening Participatory Management, Sustainability, and Capacity Building

The project prioritised a participatory approach to rehabilitating the water gate and embankment, shifting responsibility from provincial and national ministries to local stakeholders. The project fostered greater ownership and long-term commitment to sustainability by directly involving commune representatives and residents. To prevent overlapping responsibilities and gaps in accountability, it is essential to clearly define the roles of national, provincial, municipal, and commune

stakeholders and establish a collaborative support system. For instance, commune representatives are well-positioned to monitor infrastructure conditions and identify potential issues, such as an overloaded vehicle damaging the embankment. They can immediately consult other stakeholders to implement mitigation measures. This localised oversight ensures that small-scale infrastructure remains functional, well-maintained, and responsive to emerging challenges.

2. Integration of Small-Scale Infrastructure into Commune Development and Investment Plans

Infrastructure support must be strategically integrated into community development and investment plans to ensure alignment with local priorities and long-term sustainability. Proper planning and budgeting are critical for regular maintenance, timely interventions, and financial sustainability. Sub-national stakeholders are encouraged to nominate responsible individuals for ongoing monitoring and corrective action while allocating financial resources within their local investment plans.

This proactive integration prevents infrastructure neglect, reduces the risk of insufficient funding, and ensures consistent maintenance. By embedding infrastructure management into official commune budgets and policies, local authorities can safeguard long-term operational efficiency and enhance resilience to climate-related challenges.

3. Continuous Refresher Sessions and Stakeholder Coordination

Project teams should conduct regular refresher sessions and discussions to sustain knowledge transfer and ensure the longevity of the infrastructure. Provincial and municipal stakeholders, in close coordination with the Ministry of Water Resources and Meteorology, should establish a monitoring and technical support framework to assist nominated stakeholders with any operational concerns. Additionally, these stakeholders should provide periodic training sessions, especially when new personnel assume management roles and have not previously participated in capacity-building programs. Ongoing guidance ensures that technical knowledge remains up to date, preventing disruptions in operation and maintenance due to staff turnover.

By embedding participatory management, structured financial planning, and continuous learning mechanisms, the project strengthens local ownership, enhances resilience, and ensures the long-term sustainability of small-scale infrastructure.

DOCUMENTATION

Name	Type	Produced Date	Location
Detail design drawing	Drawing	August 2023	Link
Assessment of Environmental and Social Policy of the Adaptation Fund under Output 3.3	Report	March 2024	Link
Operation Manual (Khmer and English)	Manual	January 2025	Link

* As Raknika Construction and Consulting Service Co., Ltd awarded the contract including Outputs 3.3, 3.5 and 3.7, their final reports include all three outputs.

ORIGINAL SITE



ESS MONITORING (February 2024)



COMPLETED WORKS



INAUGURATION AND HANDOVER





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