



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

134 ha of Mangrove Plantation/Restoration in Kep Province

**Building Resilience, Sustaining Livelihoods,
and Protecting Ecosystems**



**MARCH 2025
PHNOM PENH, CAMBODIA**

BRIEF SUMMARY

OUTPUT 3.1

To address coastal erosion, saltwater intrusion, and livelihood vulnerabilities, a key intervention under Component 3 was the restoration and plantation of 134 hectares of mangroves along Kep's coastline (Output 3.1). This intervention, benefiting 17,754 people (at least 50% women), aims to enhance protection from coastal flooding, erosion, and saltwater intrusion.

KEY ACHIEVEMENTS

1. Site Identification and Planning: Through multi-stakeholder consultations, five suitable sites (Angkaol, Ou Krasar, Sangkat Kep, Sangkat Prey Thom, Phum Thmey) were identified on public land, totaling 134 ha. This process involved local fishery communities and authorities, ensuring social acceptance and ecological viability.

2. Development of the Mangrove Planting and Management Plan (MPMP): A comprehensive MPMP was developed and validated, outlining species selection, nursery requirements, and plantation methodologies, which were subsequently approved in November 2022.

3. Community-Driven Implementation: Local communities collected seeds and raised seedlings. By October 2023, 110 hectares of mangroves had been planted, with the remaining hectares restored in degraded areas—thus achieving the full 134 hectares target.

4. Two-Phase Restoration in Phum Thmey: Due to low survival in earlier planting, 24.39 hectares were restored in a second phase led by the Provincial Department of Environment. Over 14,000 seedlings were planted in August 2024 with the participation of 500 individuals, including students and teachers.

5. Livelihood Support: Employment opportunities were created for 20–30 local workers per day, particularly women, who earned fair wages. Local boat owners were also engaged, boosting the local economy.

6. Monitoring and Mapping: GPS mapping of planted areas was conducted using KOBO tools. Regular monitoring by local stakeholders and project staff, including the ESS Consultant, ensured oversight and informed decisions on survival rates and replanting needs.

GOOD PRACTICES

1. Restoring Ecosystems for Climate Resilience: The project restored 134 hectares of mangroves in Kep Province to buffer against coastal erosion, storm surges, and saltwater intrusion. These green buffers stabilise soil, support biodiversity, and maintain ecological balance.

2. Livelihood Support Through Restoration: Mangrove rehabilitation boosted marine biodiversity and revitalised income-generating activities such as fishing and shellfish collection. It also preserved access to essential forest resources for daily community use.

3. Community Participation and Local Expertise: Local fishery groups led restoration efforts, using traditional knowledge to guide planting and monitoring. Daily stipends encouraged active, widespread participation.

4. Institutional Collaboration and Local Engagement: The NCSD and Kep Provincial Hall formalised roles through agreements, while 500+ participants—including teachers, students, and officials—joined in coordinated planting efforts, especially during the August 2024 campaign.

5. Blending Incentives with Indigenous Knowledge:

Financial support alongside traditional ecological expertise ensured sustained participation and stewardship. This community-led model resulted in the successful planting of thousands of seedlings.

6. Education and Public Awareness: School programs, social media, and community campaigns increased environmental awareness, particularly among young people, and helped promote broader engagement in mangrove conservation.

LESSONS LEARNED

1. Lack of Distinct Mapping for Planted vs. Replaced Areas: The absence of detailed mapping that differentiates between newly planted and replanted areas reduced monitoring efficiency. Future projects should invest in GIS-based mapping with layered data and regular updates to ensure accurate tracking of progress.

2. Site Suitability Must Be Prioritised: Poor survival rates in certain areas highlighted the need for more rigorous site assessments. Environmental factors like soil salinity, tidal patterns, and solid waste must be considered to improve planting success. Participatory mapping, incorporating community input, can enhance site selection.

RECOMMENDATIONS

1. Establish Routine Monitoring and Maintenance: Photo documentation and regular assessments by local fisheries communities should be conducted monthly. Dead seedlings must be replaced promptly to maintain full coverage and ecological functionality.

2. Empower Sub-National Leadership: Local governments and communities have proven better positioned to manage plantation efforts effectively. Establishing local working groups with specific mandates and resources is crucial for long-term sustainability.

3. Strengthen National-Local Collaboration: While sub-national actors play a pivotal role in implementation, national agencies must ensure policy alignment, capacity building, and sustained financial support. Bridging these levels is essential for scaling climate adaptation interventions nationwide.

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 THE INTERVENTION

Mangrove forests serve as natural defenses for coastal regions. They stabilise shorelines, reduce the impact of storm surges, prevent saltwater intrusion into agricultural lands, and support biodiversity. They are also integral to the livelihoods of coastal communities, providing fish nurseries, non-timber products, and opportunities for ecotourism. However, rapid urbanisation, aquaculture development, and insufficient protection measures have degraded Cambodia's mangrove forests. In Kep Province, projections show that up to 343 hectares of land may be submerged with just a 1-metre rise in sea level. Additionally, 13 hectares already lie within this vulnerable elevation zone. The dual threats of mangrove loss and rising sea levels compound the risk of coastal erosion and reduce the ecological and social capacity to adapt to climate change.

Community consultations held during project formulation reinforced these concerns. Residents, particularly fisherfolk, reported falling fish stocks, increased storm damage, and declining ecosystem health—direct consequences of environmental degradation linked to climate change.

The removal of mangroves not only undermines economic opportunities but also compromises ecosystem services essential for human survival. Destroying these habitats will hinder the potential for ecotourism development, an alternative income source for local communities. This underscores the urgent need for integrated community-based mangrove restoration efforts that enhance resilience, protect livelihoods, and preserve natural resources.

BRIEF DESCRIPTION OF THE INTERVENTION

As a response to the critical issues identified, Component 3 introduced a targeted mangrove restoration initiative in Kep Province. The Intervention focused on planting and restoring 134 hectares of mangroves, particularly in degraded or unprotected coastal areas, contributing directly to ecosystem recovery and climate adaptation (Output 3.1).

The Intervention is expected to promote long-term adaptation benefits and ensure sustainability.

- Enhance or maintain agricultural productivity and surface water availability by preventing or minimising saltwater intrusion into the local farmland and water sources caused by storm surges.
- Support the regeneration of fish and crab populations by enhancing the health of local ecosystems and safeguarding the land of local communities.
- Reduce threats of potential loss of life and property damage by increasing the resilience of houses in the coastal areas to flooding and high winds.
- Raise awareness and promote community engagement in mangrove conservation by organising local communities and providing selected community members with basic training in monitoring and maintaining mangrove plantations.

This report summarises the project's experiences related to mangrove plantation and restoration on 134 hectares in Kep Province, specifically covering the background, achievements, good practices, lessons learned, and recommendations to integrate the project's experiences into future coastal resilience projects.

KEY ACHIEVEMENTS

The project employed a collaborative approach that involved government bodies, local communities, and educational institutions. The intervention benefited 17,754 people, with at least 50 per cent being women, and created direct livelihood opportunities through employment in seed collection, nursery management, and plantation. Additionally, the intervention promoted community empowerment and stimulated local economic growth. To achieve long-term ecological and community benefits, the project undertook the following activities:

1. Site Identification and Planning

A consultant facilitated consultations with key stakeholders, including the Fisheries Administration, Provincial Department of Environment, Kep Provincial Hall, and community fisheries (Angkaol, Sangkat Kep, Phum Thmey, Kampong Tralach, and Ou Krasar). These engagements identified 134 hectares of suitable mangrove plantation sites across five public state lands: 66 hectares in Angkaol, 4 hectares in Poang Teuk, 18 hectares in Sangkat Kep, 43 hectares in Sangkat Prey Thom, and 3 hectares in Sangkat Ou Krosar. The consultations also focused on discussing appropriate species and nursery availability.

2. Development of the Mangrove Planting and Management Plan

The findings of the above consultations were compiled in the Mangrove Planting and Management Plan, which was validated by stakeholders and approved in November 2022.

3. Community-Driven Implementation

Community fisheries groups led seed collection and nursery raising from March to May 2023, using seeds from existing mangrove areas.

4. Two-Phase Restoration in Phum Thmey

By October 2023, 110 hectares of mangroves were planted following site reconfirmation by the Provincial Departments of Agriculture and Environment, local authorities, and community fisheries. The restoration was carried out not only in bare areas but also in previously degraded mangrove zones — thus achieving the full 134 hectares target: 92.5 hectares in Angkaol, 7.5 hectares in Ou Krasar, and 34.39 hectares in Phum Thmey.

Planting in Phum Thmey was conducted in two phases: an initial 10 ha, followed by an additional 24.39 ha after earlier plantings experienced low survival rates. The Kep Provincial Department of Environment led the 24.39 hectares replanting under an agreement signed on 9 August 2024. Around 14,000 seedlings were planted by 500 participants, including students from Don Bosco Polytechnical School and community members.

5. Livelihood Support

Employment opportunities were created for 20–30 local workers per day, especially women, earning fair wages. Local boat owners were also engaged, boosting the local economy. Local women were primarily employed for seed collection, nursery work, and planting, earning 40,000–50,000 riel per day (\$10–\$12.50), even when working limited hours due to tidal constraints. Boat owners earned 60,000 riel per day (\$15) for transporting seedlings and supporting local livelihoods.

6. Monitoring and Mapping

To support effective monitoring and accountability, the project team developed a mangrove plantation map using KOBO Toolbox and GPS data collected during field visits by boat. This allowed a more accurate understanding of plantation areas across the three target sites. Monitoring continued regularly with active involvement from local fisheries communities, project staff, and external evaluators, including the mid-term evaluator, financial auditor, and the Environmental and Social Safeguards (ESS) Consultant.

During his first visit in February 2024, the ESS Consultant reported a high survival rate of approximately 90 per cent and acknowledged community efforts in conducting three rounds of replacement planting. However, his second visit in December 2024 revealed slower growth in certain areas, likely due to site unsuitability, and he observed a lack of continued replacement efforts in those sections. Based on this feedback, the project team instructed community leaders to increase the frequency of monitoring and integrate replanting into their routine community patrols and maintenance schedules. Overall, the project's achievements represent a viable approach for inclusive and ecosystem-based climate adaptation, demonstrating how local knowledge, institutional coordination, and community empowerment can converge to restore vital coastal ecosystems and build resilience in vulnerable regions.

GOOD PRACTICES

1. Restoring Mangrove Ecosystems for Coastal Resilience

The project focused on regenerating and restoring mangrove forests across 134 hectares in Kep Province by planting mangrove seedlings and replacing dead seedlings. This approach aimed to strengthen the province's natural defenses against climate-related hazards. Mangroves are green buffers that reduce coastal erosion, protect inland areas from storm surges, and block saltwater intrusion into agricultural land. Their thick root systems stabilise soil and trap sediment while creating a rich habitat for many species, including fish, birds, reptiles, amphibians, and crustaceans. These ecosystems are not only critical for biodiversity but also vital for sustaining the long-term ecological balance of coastal zones.

2. Supporting Livelihoods Through Mangrove Restoration

Mangrove conservation and restoration efforts in the project area directly supported local livelihoods, especially those of small-scale fishers and shellfish gatherers in these coastal communities. By improving the mangrove habitat, the project contributed to increasing the availability of marine resources. Communities benefited from increased opportunities in fishing, crab collection, and prawn harvesting, which are the traditional economic activities of the people living in these coastal communities. Many households depend on access to the area for forest-based resources such as wood, fiber, and charcoal for cooking, construction, and crafts. The project helped protect and increase the availability of such resources.

3. Community Involvement and Local Knowledge

The active involvement of local stakeholders, particularly the community fisheries members, helped in the identification of the planting and replacement sites. Their understanding of local tidal movements, seasonal changes, and soil conditions was most helpful. The community members also collected seeds, managed the seedlings in the nurseries, transplanted them into the restoration area, and monitored their survival. The daily allowances provided to participants helped compensate for their time and labour, enabling widespread engagement and empowering local people as stewards of the mangrove ecosystem.

4. Government Partnerships and Institutional Engagement

Through a Letter of Agreement between the National Council for Sustainable Development (NCSD)/the Ministry of Environment, and the Kep Provincial Hall, government agencies were closely involved in delivering the project activities. The Provincial Department of Environment led the on-the-ground coordination efforts. Approximately 500 participants, including teachers, students, civil servants, and community members, participated in the plantation events. The local responsibility for implementation strengthened collaboration across local government departments and encouraged their engagement, with notable increases in youth participation in the mangrove planting campaign.

5. Integrating Community Knowledge with Incentives

The project's success was mainly due to the integration of traditional knowledge and ecological insights, such as an understanding of local tidal movements, seasonal changes, and soil conditions, which proved most helpful. Community participation — from seedling preparation to post-planting monitoring — also strengthened the sense of ownership and accountability for long-term forest management, resulting in the successful planting of mangrove seedlings over 134 hectares.

6. Raising Awareness Through Education and Outreach

The project prioritised public outreach to enhance the understanding of the vital ecological roles of the mangroves. School-based programs, community field visits, and hands-on activities were valuable learning experiences, particularly for the youth. Community-led awareness campaigns featured interactive events where locals could witness the progress of restoration work and learn about its benefits. To broaden its reach, the project utilised social media platforms to share success stories, mobilise support, and encourage greater involvement in environmental protection activities.

LESSONS LEARNED

1. Lack of Distinct Mapping for Planted vs. Replaced Areas

One of the key lessons from the mangrove restoration intervention in Kep Province was the absence of detailed, GIS-based mapping that clearly distinguished between newly planted areas and sections where replacement planting occurred. During the initial planning phase, the Mangrove Planting and

Management Plan identified the location of 134 hectares for restoration. However, adjustments were necessary during implementation due to site conditions, survival rates, and stakeholder feedback. This resulted in changes in the actual locations and extent of the activities in each area compared to the plan. Unfortunately, the revised maps did not capture these on-site changes, making it difficult to monitor progress accurately, assess survival rates over time and assess which areas required follow-up maintenance or additional interventions. Furthermore, the restructuring of the Ministry of Environment and the project team after the 2024 national election disrupted the documentation process.

For future restoration projects, integrating real-time, GIS-based mapping tools with clearly labelled layers that distinguish between original plantations and actual plantations is crucial. These tools should be updated consistently throughout the project cycle and linked with field data collection, such as GPS tracking and photographic monitoring. Capacity-building for project staff and local partners in the use of mapping technologies would enhance data quality and reporting.

2. Site Suitability Must Be Prioritised

Another critical lesson from the Intervention was thoroughly assessing site suitability before plantation activities commence. The second visit by the Environmental and Social Safeguards Consultant in December 2024 revealed that some mangrove plantations exhibited poor growth and reduced survival, likely due to unsuitable environmental conditions. Factors such as soil salinity, wave exposure, tidal inundation patterns, and solid waste all influence the ability of mangroves to establish and thrive. Planted seedlings could not root or suffer from stress in specific locations due to inconsistent hydrological conditions. These challenges underscore the need for more robust and systematic site selection processes that go beyond land availability. Participatory site assessments involving local stakeholders such as fishers and environmental groups can improve accuracy and appropriateness significantly. Tools such as participatory mapping, field observations, and ecological indicators (e.g., the presence of mature mangrove species or root networks) can be used to evaluate biophysical conditions and identify high-potential restoration sites. Ensuring that plantations are carried out in ecologically viable locations improves survival outcomes, reduces the need for costly replanting efforts, and enhances long-term ecosystem stability.

RECOMMENDATIONS

1. Establish Routine Monitoring and Maintenance

To ensure the long-term success of mangrove restoration, routine monitoring and timely maintenance must be institutionalised as part of the restoration strategy. Community fisheries groups, which are already engaged in plantation and protection activities, should be supported in conducting regular monitoring using photo documentation and basic data collection tools to capture variations in seedling growth, survival, and damage. Regular monitoring will help identify problem areas and serve as an early warning for any replacement planting. Timely replanting or replacement of dead or unrooted seedlings is crucial to prevent the fragmentation of mangrove belts and maintain their function as a green buffer against erosion, flooding, and saltwater intrusion. Capacity-building for local monitors, supported by clear monitoring protocols and mobile data collection apps such as KOBO Toolbox, can enhance data accuracy and empower communities to lead in ecosystem stewardship.

2. Empower Sub-National Leadership

The project experience in Kep demonstrated that sub-national authorities, particularly provincial departments and commune councils, are well-positioned to lead mangrove restoration efforts due to their proximity and local knowledge. Their leadership was critical in mobilising participation, validating planting sites and coordinating logistics during the plantation period. To build on this strength, it is recommended that future restoration initiatives establish local working groups composed of government representatives, community leaders, technical staff, and youth volunteers. These groups should be given clear mandates, budgets, and ongoing training to oversee implementation, monitoring, and maintenance activities. Decentralising authority in this way enhances responsiveness and accountability, contributing to institutional capacity-building at the local level. Sub-national empowerment can lead to more context-sensitive, culturally appropriate, and adaptive restoration strategies that are more likely to be sustained over time.

3. Strengthen National-Local Collaboration

While sub-national entities play a vital role in implementation, their effectiveness depends on a supportive policy and financial environment led by

national agencies. The success of climate adaptation interventions, including mangrove restoration, depends on strong collaboration between local, provincial, and national actors. National-level institutions, such as the NCSD and the Ministry of Environment, must continue to provide policy guidance, capacity-building, coordination, and funding. Platforms for regular dialogue, such as joint planning workshops and review meetings, can facilitate knowledge sharing and address bottlenecks. Cambodia can scale up ecosystem-based adaptation across coastal provinces, improve inter-agency coordination, and create a more resilient governance framework for climate change response by institutionalising this

collaborative model. Ultimately, this partnership approach ensures that restoration efforts are not implemented in isolation but are part of a broader, systemic, and nationally endorsed climate resilience strategy.

DOCUMENTATION

Name	Type	Produced Date	Location
Mangrove Planting and Management Plan (MPMP) for Kep Province	Plan	March 2022	Link
A completion report of Kep Provincial Hall (Khmer Language)	Report	September 2024	Link
Map	Map	September 2024	Link
The event in 2024 was promoted and featured on the web stories.	Video	September 2024	Link 1 , Link 2
Mangrove planting campaign was featured on minister’s Facebook page	Social media	September 2024	Link

PREPARATION FOR PLANTING



PLANTATION



MONITORING BY AUDITOR, OCTOBER 2024
ESS MONITORING, JULY AND DECEMBER 2024





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ADAPTATION FUND

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