Technical Report

Field-Based Insights into the Challenges of Sustainable Forest Management in Cambodia

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Abstract In Cambodia, forest cover decreased from 73% in the 1960s to 41% in 2020. The causes of deforestation and forest degradation include forest clearing and agricultural expansion, large-scale illegal logging, and timber trade following the issuance of Economic Land Concessions (ELCs). The impact of deforestation continues due to the overexploitation of forest resources by the growing population and unofficial ELCs. The massive forest loss in Cambodia has increased the risk of natural disasters, decreased the biological and genetic diversity of indigenous trees, and jeopardized local livelihoods where residents have traditionally relied on forest resources. Therefore, the Institute of Environmental Rehabilitation and Conservation (ERECON) has been addressing the challenges of forest loss with the aim of sustainable community development across Cambodian provinces. Initiatives are formed by integrating all three organizational programs, including: 1. Environmental Rehabilitation and Conservation – We recommend promoting participatory reforestation and management activities, enhancing carbon sequestration through agroforestry, conserving biodiversity through mixed planting of native tree species, and promoting genetic diversity through the propagation of seedlings. 2. Utilization of Natural Resources: Enhancing natural resource circulation through agroforestry, compost making using locally available organic resources, and promoting sustainable forest resource utilization. 3. Environmental Education: Promoting capacity building of local communities through workshops, training sessions, and participatory rural appraisal methods; formulating management groups that play a central role in managing planted seedlings; strengthening the capacity of schoolteachers; and promoting environmental education in elementary schools. In the program year of 2024, the project on promoting school environment greening, aiming for forest environmental education in Tboung Khmum Province, as well as the project on promoting reforestation and education for sustainable development in Siem Reap Province, were implemented. Based on the cases implemented in both provinces, the achievements and challenges of sustainable forest management in Cambodia are discussed.

Keywords reforestation, forest conservation, natural resource management, environmental education, Cambodia

INTRODUCTION

In Cambodia, forest cover declined from 73% in the 1960s (FA Cambodia, 2006) to 41% in 2020 (FAO, 2020). The first major deforestation phase occurred between the 1970s and the 1990s during the Khmer Rouge regime and the subsequent activities of its remnants, reducing forest cover by 59% by the year 2000 (FAO, 2020). The main factors contributing to deforestation include the forced relocation of residents to rural areas, agricultural collectivization, overexploitation of forest resources, and war-related forest destruction. From the early 2000s to the early 2010s, the expansion of agricultural land through Economic Land Concessions (ELCs) in Cambodia became full-scale. Since 2014, some ELCs have been reclaimed and returned to residents; however, illegal logging and unofficial ELCs remain significant threats. The decrease in forest resources increases the risk of natural disasters, decreases the biological and genetic diversity of forests, and jeopardizes the local livelihoods of residents who have traditionally relied on forest resources. As deforestation has become one of the most critical threats to ecological, social, and economic systems, the sustainable management and utilization of forest resources to meet current and future needs is one of the important sustainable development goals elucidated by the Royal Government of Cambodia (RGC).

Additionally, rural residents in Cambodia often have limited educational opportunities, resulting in limited knowledge of sustainable natural resource utilization, and a lack of awareness can jeopardize their livelihoods through unplanned forest consumption. Therefore, it is crucial to improve their environmental knowledge and awareness, paving the way for the development of a society that promotes sustainable forest resource management.

Education for Sustainable Development (ESD) empowers individuals and communities by promoting the knowledge, skills, attitudes, and values necessary for creating a more sustainable and equitable society. It also supports countries in achieving their sustainable development goals (SDGs). UNESCO's Green Education Partnership has advanced the 'Green School' as a whole-institution approach to ESD, enabling schools to empower learners as active citizens engaged in promoting sustainable lifestyles and climate action (UNESCO, 2023).

The Institute of Environmental Rehabilitation and Conservation (ERECON) has promoted various projects to create harmony between agricultural and urban development and the natural environment. Since 2021, the organization has expanded its reforestation efforts as part of environmental conservation and Education for Sustainable Development (ESD), leading to the creation of new initiatives across provinces in Cambodia.

PROGRAM AIMS

New initiatives are formed by integrating all three organizational programs, including:

1. Environmental Rehabilitation and Conservation

We recommend promoting participatory reforestation and management activities, enhancing carbon sequestration through agroforestry, conserving biodiversity through mixed planting of native tree species, and promoting genetic diversity through seedling propagation.

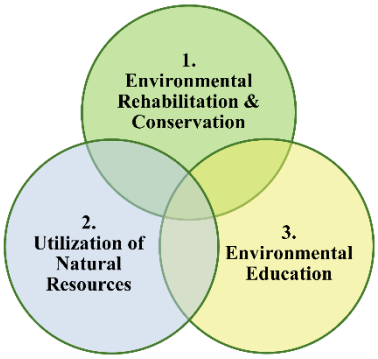

Fig. 1 ERECON's programs

2. Utilization of Natural Resources

Enhancing natural resource circulation through agroforestry, composting local organic materials, and promoting sustainable forest resource utilization.

3. Environmental Education

Promoting training and participatory workshops for the capacity building of local communities, forming management groups by residents, strengthening the capacity of school teachers, and promoting environmental education in schools.

PROJECT SITES

The new projects were promoted across three provinces in Cambodia in collaboration with the Provincial Department of Agriculture, Forestry, and Fisheries of each province and local communities. The Project on Promoting Reforestation for Rehabilitating Rural Environment in Kampong Cham Province, Cambodia, was conducted to promote participatory reforestation and management activities across all ten districts in the province. The Project on Promoting School Environment Greening, aiming for Forest Environmental Education in Tboung Khmum Province, Cambodia, promoted forest environmental education in primary schools in the province.

Lastly, "The Project on Promoting Reforestation and Education for Sustainable Development in Siem Reap Province, Cambodia" was implemented for promoting agroforestry, seedling propagation, and compost making, as well as participatory extension activities in Siem Reap Province.

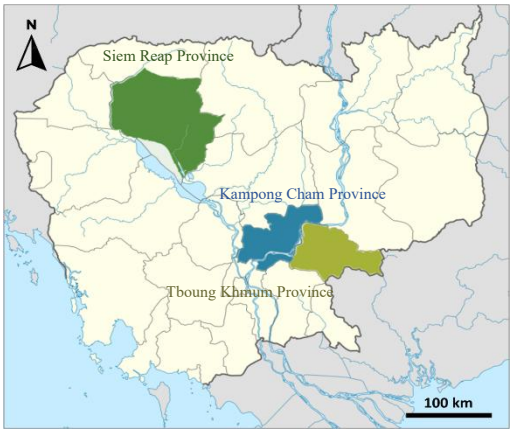

Fig. 2 Project sites in Cambodia

ACHIEVEMENTS

The achievements of each project are shown in Table 1, including restoration approaches, the number of active participants, and extension approaches.

Table 1 The achievements of each project

Project title	Project year	Restoration approaches	Number of active participants	Extension approaches
Promoting Reforestation for Rehabilitating the Rural Environment in Kampong Cham Province	2021-2023	- Community greening at 39 sites in the common area of 30 ha	1,585	- Form management groups at 39 sites - Conduct workshops on the importance of forest conservation
Promoting School Environment Greening, aiming for Forest Environmental Education in Tboung Khmum Province	2022-2024	- School greening at 26 local schools and lake sides in 18 ha - Produce 6,000 local tree seedlings at model schools - Utilize the planting site as an education platform	1,560	- Form teachers' groups at 26 schools - Promote competition among schools on the management practices as a part of environmental education - Facilitated teachers in creating nature games and in developing an environmental education guidebook.
Promoting Reforestation and Education for Sustainable Development in Siem Reap Province	2024	- Promote Agroforestry with local trees and cash crops in 15 ha - Produce 10,000 local tree seedlings - Make compost using organic materials collected from communities	136	- Promote a series of ESD workshops through Participatory Rural Appraisal (PRA), which facilitated the residents to 1) be aware of current situations caused by forest loss, 2) identify the issues to be tackled, and 3) plan for the future greening initiative.

1. Project on Promoting Reforestation for Rehabilitating Rural Environment in Kampong Cham Province, Cambodia (2021-2023)

The project promoted reforestation activities across all ten districts in Kampong Cham Province, focusing on the common areas such as pagodas, schools, and along the roads. In total, 30,000 native tree seedlings were planted at more than 30 sites in collaboration with over 1,700 active participants, aiming to restore the environment of rural areas for future generations. In addition, workshops on the "Importance of Forest and Biodiversity Conservation" were conducted to raise the environmental awareness of the residents. The planting sites are being managed by Forest Management Groups formed by residents at each site, who play a central role in management practices to maintain the tree survival rate.

Fig. 3 Planting activity in Kampong Cham Province

Based on the questionnaire survey conducted among residents after the workshop, approximately 65% of residents understood what they learned in the workshop, and more than 90% were aware of the importance of being involved in management practices after planting by themselves. The results highlight the importance of continuing awareness programs through tree planting activities at the grassroots level.

2. Project on Promoting School Environment Greening aiming for Forest Environmental Education in Tboung Khmum Province, Cambodia (2022-2024)

The project promotes a green environment in primary schools and forest environmental education at local schools in Tboung Khmum Province. Various environmental conservation activities were practiced across schools as part of environmental education by promoting planting sites as a nature-based learning platform at schools. In Phases 1 and 2 (2022-2023) of the project, school greening activities engaged more than 1,300 students and teachers from 26 primary schools across districts. In addition to the workshop on "The Importance of Forest and Biodiversity Conservation," each school held a competition on "Seedling Management" to enhance students' active participation in watering and weeding activities, leading to a higher tree survival rate at most of the schools. In Phase 3 (2024), the greening initiative was expanded to include lake conservation around Chitheang Lake, where local farmers and fishers depend on its natural resources for their livelihood. Primary school students and their families participated in planting activities on their own land.

Fig. 5 Nature game workshop facilitated by school teachers in Tboung Khmum Province

Additionally, two model schools practiced seedling propagation under the supervision of the Forestry Administration, producing 6,000 native tree seedlings that were used for replanting in the communities. Moreover, the capacity building of the school teachers was further strengthened through workshops, where 16 school teachers from three schools developed their original Nature Games, and performed them for their students at the planting sites of Chitheang Lake. At the end of the project, these three schools were awarded under the title of "Excellence in Forest Environmental Education" in recognition of their greater engagement in promoting forest environmental education in Cambodia, acknowledged by the Tboung Khmum Provincial Department of Education, Youth and

Sport (TBK DoEYS), the Tboung Khmum Provincial Department of Agriculture, Forestry, and Fisheries (PDAFF), and the Institute of Environmental Rehabilitation and Conservation (ERECON).

During the project period, monitoring and evaluation practices were conducted to assess the project's impact. The results identified factors in students' awareness and attitudes that showed positive correlations with their active participation in management practices, leading to higher tree survival rates (Aoki et al., 2024). Additionally, the study indicated that comprehensive awareness of the diverse benefits of trees may be positively connected to students' awareness of the importance of forest conservation, which is further connected to their responsible environmental actions (Aoki et al., 2024). This finding could contribute to the development of strategic environmental education to effectively address students' awareness and attitudes toward environmental issues.

3. Project on Promoting Reforestation and Education for Sustainable Development in Siem Reap Province, Cambodia (2024)

The project targeted a rural area of Siem Reap Province, which experienced severe deforestation due to infrastructure and agricultural land development after 2000. To rehabilitate the deforested area in the Banteay Srei District, an agroforestry-based reforestation approach was promoted in a 15-ha plot, subdivided into 15 blocks, where 9,000 native trees of four local species were planted alongside cash crops such as upland rice. A nursery was established to enable the annual propagation of over 10,000 native seedlings, ensuring genetic diversity for future reforestation efforts in the region. Additionally, organic materials were recycled to produce compost, which is used for maintaining the agroforestry site and seedling propagation. Based on a survey of the survival rate conducted in November 2024, it was confirmed to be 79%, and replanting activity was conducted to maintain forest cover.

Fig. 6 Reforestation activity under agroforestry system in Siem Reap Province

To foster local engagement, a series of ESD workshops was conducted through participatory approaches in Kna Krao Village in Svay Leu District. The activities included a workshop on "Sustainable Land Management through Agroforestry," a participatory planting activity, and participatory rural appraisal (PRA) with a gender-sensitive evaluation method. The participatory planting site in a common area became an agroforestry demonstration site, initiated voluntarily by residents.

Fig. 7 Participatory rural appraisal for discussing on a greening plan in Siem Reap Province

In addition, another workshop on PRA encouraged participants to create PRA tools such as a forest resource map, a scoring table for forest resource utilization, and a timeline for land use changes, enabling them to be aware of issues and challenges resulting from the forest loss in their community. The community further developed conservation strategies by creating another PRA tool, the "Future Resource Map for Greening Plan," which served as a valuable opportunity to collect meaningful information on the community's needs for reforestation. It also highlights the risk of losing traditional practices rooted in forest resources due to ongoing forest loss. Through these activities, local awareness of deforestation has significantly improved.

Through the analysis of qualitative and quantitative data acquired through the observation of the workshops, PRA tools, and questionnaire surveys, the key deforestation drivers and their impacts on local communities were identified. The findings highlight the urgent need to develop a forest resource management system and long-term capacity-building programs in the community. Participatory Rural Appraisal (PRA) has been proven to be an effective approach that contributes to raising

environmental awareness among local people while enabling outsiders to gather the overall real information of the local context. Moving forward, we will continue to collaborate with stakeholders to enhance forest conservation efforts and strengthen sustainable development strategies in Siem Reap Province.

FUTURE CHALLENGES

International NGOs play a vital role in addressing environmental conservation and human resource development challenges in Cambodia. To respond to the urgent need for greater stakeholder engagement in sustainable practices, promoting a comprehensive approach centered on education is essential. In line with international frameworks, our initiative aims to promote community-based and context-specific agroforestry, as advocated by the Center for International Forestry Research (CIFOR, 2020), as well as Education for Sustainable Development (ESD), promoted by the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2014). As part of this effort, we are integrating agroforestry models into various land types, including farmlands, schoolyards, common areas, and residential spaces, to develop practical and localized solutions that reflect the needs of local communities. Moreover, we recognize the critical role of traditional knowledge in these processes, which not only contributes to sustainable resource use but also supports biodiversity through the preservation of cultural practices. Furthermore, by embedding environmental education into school curricula, we are investing in long-term human resource development, which is essential for achieving sustainable development in Cambodia.

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