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Rooting for the Future: How Mangroves Safeguard Coastal Communities

Thailand is a Southeastern Asian country known for its rich culture, strong agricultural traditions, and developing economy. The nation is shaped by a mix of urban and rural communities, each contributing differently to daily life and economic activity. While cities continue to expand due to new opportunities, rural areas remain closely tied to farming and natural resources. Despite its growth and success in food production, Thailand faces ongoing challenges related to inequality, access to resources, and environmental sustainability. Issues such as changes in land use and water availability have begun to impact both the environment and the people who depend on it. These challenges highlight the importance of finding balanced and sustainable solutions that support both economic development and the well being of communities across the country.

Despite Thailand's ability to produce large amounts of food, food insecurity remains a significant issue for certain populations. An estimated 5.4 million people in Thailand are undernourished (Global Nutrition Report) representing about 7.5 percent of the population. Food insecurity is more common in rural areas, where incomes are lower and access to resources is limited. Farmers who produce food may still struggle to afford enough to eat, particularly if they experience poor harvest or low market prices. This situation highlights the complex relationship between food production and food access. Even in a country that exports large quantities of agricultural products, not everyone benefits from that production. Addressing food insecurity requires not only increasing food availability but also improving income levels, access to markets, and social support systems.

Environmental challenges are among the most pressing issues facing Thailand today, particularly in relation to agriculture and food security. Deforestation has been a significant problem due to the expansion of farmland, illegal logging activities, and urban development. From 2021 to 2024, 71 % of deforestation has occurred in national forests across the country (“Thailand Deforestation Rates & Statistics | GFW.”). As forests are cleared, the natural balance of ecosystems is disrupted. Trees play a vital role in absorbing carbon dioxide, maintaining soil stability, and regulating rainfall patterns. When forests are cleared, soil becomes less fertile over time. Additionally, deforestation contributes to climate change by increasing the amount of carbon dioxide in the atmosphere. These changes can have serious consequences for agriculture, as farmers depend on stable weather conditions and healthy soil to grow crops.

Mangrove trees are exceptionally valuable in the effort to address climate change because of their ability to capture and store carbon. Although mangrove forests occupy a relatively small portion of the world's land area, the carbon stored within their vegetation and, especially, their waterlogged soils can be extraordinarily high. The United Nations Environment Programme (UNEP) estimates that mangrove ecosystems contain an average of approximately 1,000 tons of carbon per hectare when soil carbon is included. Much of this carbon remains stored for long periods because the oxygen-poor conditions of mangrove soils slow decomposition. When mangroves are destroyed or their soils are disturbed, however, some of that stored carbon can be released as greenhouse gases, contributing to climate change. Protecting existing mangrove forests is therefore particularly important because conserving an established ecosystem can prevent the release of carbon that has accumulated over decades or even centuries. The Food and Agriculture Organization of the United Nations (FAO) similarly explains that mangroves remove carbon

dioxide from the atmosphere and that their conservation and restoration can contribute to both climate-change mitigation and adaptation. Their value extends beyond carbon storage, because healthy mangrove forests can also help communities adapt to climate-related hazards. While mangroves are not a substitute for reducing fossil fuel emissions, they represent an important component of a broader climate strategy. Protecting these ecosystems demonstrates how conservation and climate action can reinforce one another rather than being treated as separate environmental goals.

Another key aspect mangrove trees can help address is deforestation. When forests are cleared, wildlife loses essential habitat, ecosystems become fragmented, and carbon stored in vegetation and soils can be released into the atmosphere. Mangroves have experienced significant losses as a result of coastal development, agriculture, aquaculture, pollution, infrastructure projects, and other forms of human activity. Due to mangrove ecosystems occupying valuable coastal land, they are particularly vulnerable to development pressures. At the same time, recent research provides evidence that some of the long-term decline in mangrove forests can be reversed. UNEP reported in 2026 that global mangrove losses have slowed considerably and that natural regeneration and expansion are offsetting much of the historical decline in certain areas. This progress demonstrates that mangrove ecosystems can recover when environmental conditions improve and human pressures are reduced. Restoration can build upon that natural resilience by reestablishing mangroves in areas where forests have been degraded or destroyed. However, successful restoration requires more than simply planting trees. Projects must address the original causes of mangrove loss, restore appropriate hydrological conditions, use suitable native species, and involve local communities. Mangrove restoration therefore cannot eliminate deforestation on its own, but it can serve as an important strategy for reversing forest degradation while strengthening the ecological health of vulnerable coastlines.

Mangroves can also contribute to healthier water systems and increase the resilience of coastal communities facing changing weather patterns and extreme events. Their complex root systems slow water movement, trap sediments, and help prevent soil from being washed away. As water moves through mangrove forests, roots and surrounding sediments can capture nutrients and pollutants, improving water quality before the water reaches nearby coastal ecosystems. FAO identifies water filtration, climate regulation, carbon sequestration, and shoreline stabilization among the important ecosystem services provided by mangroves. These services become especially significant as communities face increasing risks associated with sea-level rise, coastal storms, heavy rainfall, and flooding. It is important, however, to distinguish between protecting healthy water systems and claiming that mangroves can control global rainfall. Rainfall is influenced by complex interactions among atmospheric circulation, ocean temperatures, geography, and other factors, so mangroves cannot be presented as a direct solution to global changes in precipitation. Instead, their value lies in strengthening the natural systems that help landscapes absorb and respond to water. By stabilizing shorelines, slowing runoff, filtering sediments, and supporting wetlands, mangrove forests can make coastal ecosystems more capable of withstanding environmental stress. In this sense, mangrove conservation represents a practical form of climate adaptation: rather than attempting to control every environmental process, communities can protect natural infrastructure that already performs valuable protective functions.

An additional benefit of mangroves is the habitat they provide for wildlife. The dense network of roots, branches, mudflats, and shallow waters creates a highly productive environment where animals can find food, shelter, and places to reproduce. UNEP reports that more than 1,533 species are associated with mangrove ecosystems, including fish, birds, mammals, reptiles, amphibians, and plants. FAO similarly explains that mangroves provide habitats, spawning grounds, and nursery areas for fish, crustaceans, mollusks, birds, and many other organisms. For juvenile fish and other aquatic species, mangrove roots can provide protection from predators while supplying access to abundant sources of food. Birds use mangrove forests for nesting, feeding, and resting, while terrestrial and aquatic animals interact within the ecosystem in ways that contribute to broader coastal biodiversity. The ecological significance of

mangroves therefore extends far beyond the trees themselves. A mangrove forest functions as an interconnected community in which plants, animals, microorganisms, soil, water, and nutrients influence one another. When mangroves disappear, the consequences can spread throughout the surrounding ecosystem because species lose the physical structures and ecological relationships they depend upon. Protecting mangroves is consequently a form of biodiversity conservation that safeguards an entire network of life rather than focusing on a single species. Restoring these forests can reconnect fragmented habitats and create conditions in which wildlife populations have a greater opportunity to recover.

Mangroves are also an important source of food and economic support for both wildlife and human communities. Fish, shrimp, crabs, oysters, clams, and other aquatic organisms depend on mangrove ecosystems for food, shelter, and nursery habitat. FAO explains that mangrove forests provide important nursery and feeding grounds for fish and shrimp, while fallen leaves and other organic matter contribute to food webs that support crabs, shellfish, fish, and other organisms. These ecological relationships have direct consequences for people because many coastal communities depend upon fishing and other marine resources for food and income. Healthy mangrove ecosystems can therefore contribute to food security by supporting fisheries that millions of people rely upon. The benefits are particularly significant in communities where households have limited access to alternative sources of income or food. When mangroves are degraded, fish populations and other aquatic resources may also decline, creating economic pressures in addition to environmental damage. Conservation can therefore be understood not only as an ecological responsibility but also as a social and economic investment. UNEP identifies food and fisheries among the important ecosystem services provided by mangroves, reinforcing the idea that protecting coastal forests can help protect human livelihoods. By maintaining the habitats that support productive fisheries, mangrove conservation connects biodiversity protection directly to the well-being of coastal populations.

One possible way to increase public participation in mangrove conservation would be to establish a worldwide educational program called **“**Adopt a Mangrove.” Through this program, classrooms around the world could symbolically adopt a mangrove tree or contribute to a specific mangrove restoration project by raising money for conservation. The purpose would not simply be to collect donations, but to connect environmental education with meaningful action. Students could study deforestation, climate change, biodiversity, coastal ecosystems, food systems, and the science of restoration while simultaneously contributing to a real conservation effort. Each classroom could establish a fundraising goal and receive educational materials explaining how mangrove ecosystems function, why they are threatened, and how restoration can benefit people and wildlife. Students could also learn about the specific geographic region where their contributions are being used, helping them understand that environmental issues are connected across national boundaries. This approach would make environmental education more experiential and authentic as students would not only study about environmental problems but also participate in a solution. A classroom might begin with a lesson about carbon storage and end by discussing how its fundraising efforts can contribute to protecting carbon-rich mangrove soils. In this way, “Adopt a Mangrove” could transform an abstract global environmental issue into something students can understand, discuss, and act upon.

The money raised through “Adopt a Mangrove” could be directed toward established mangrove conservation and restoration efforts supported by the United Nations Environment Programme (UNEP). UNEP already works with governments, communities, scientists, and other organizations to promote mangrove protection and restoration in different parts of the world. This makes the organization a logical potential partner for a program designed to connect schools with professional conservation efforts. Importantly, a successful program should avoid presenting mangrove restoration as simply a matter of planting as many trees as possible. UNEP emphasizes that restoration efforts should consider why mangroves disappeared in the first place and should involve appropriate ecological conditions, local communities, native seedlings, and functioning nurseries when active planting is necessary. In some

locations, restoring natural tidal flow or removing the pressure that caused degradation may be more effective than planting trees. A classroom-based fundraising program could therefore support scientifically informed restoration rather than encouraging students to participate in poorly planned planting projects. Donations could help fund restoration activities, community engagement, monitoring, education, and other necessary components of long-term ecosystem recovery. By connecting students with established organizations and scientifically informed projects, “Adopt a Mangrove” could ensure that the enthusiasm generated in classrooms contributes to conservation strategies that are environmentally responsible and locally appropriate.

The program could also create a powerful sense of global cooperation among students. A classroom in the United States, for example, could support a mangrove restoration initiative in another region of the world while learning about the local communities and species that depend on that ecosystem. At the same time, classrooms in Africa, Asia, Australia, Latin America, and other regions could participate in a shared international effort. Students could track how much their class raised, study the species associated with mangrove forests, research the geography and culture of the communities involved, and follow updates about restoration projects. Schools could organize environmental learning days, classroom presentations, art projects, science experiments, or friendly fundraising competitions to make participation more engaging. Recognition could be given not only to classrooms that raise the most money but also to those that demonstrate creativity, environmental knowledge, community involvement, or improvement over time. Such an approach would emphasize that conservation is not simply a competition based on money. It is a collaborative process in which different people contribute different skills and resources. Most importantly, international participation could help students recognize that environmental problems do not respect political borders. Carbon emissions, biodiversity loss, ocean health, and climate-related hazards are interconnected, meaning that cooperation among countries and communities is essential. A worldwide student program could therefore teach an important lesson alongside mangrove conservation: solving global environmental challenges requires collective responsibility.

Most importantly, “Adopt a Mangrove” would demonstrate that individual actions can contribute to meaningful environmental change when they are organized around a common purpose. A single classroom may not be able to restore an entire coastal forest, but thousands of classrooms working together could generate financial support, public awareness, and long-term interest in mangrove conservation. The environmental benefits of restoration are equally interconnected. Healthy mangroves can store carbon, stabilize coastlines, filter water, provide habitat for wildlife, support fisheries, and contribute to the food security and economic stability of coastal communities. These benefits illustrate why mangroves are particularly valuable as a nature-based solution: one ecosystem can address multiple environmental and social challenges simultaneously. At the same time, it is important to recognize the limits of mangrove restoration. Mangroves cannot single-handedly solve climate change, eliminate deforestation, prevent every flood, or guarantee global food security. Meaningful environmental progress requires reductions in greenhouse-gas emissions, responsible land use, sustainable fisheries, pollution control, and many other complementary strategies. Nevertheless, mangrove conservation represents an opportunity to protect an ecosystem that already performs valuable services while providing students with a tangible way to participate in global environmental action. By creating a worldwide “Adopt a Mangrove” initiative that combines education, fundraising, and support for scientifically informed restoration, schools could help students move from learning about environmental problems to becoming participants in their solutions. A generation of students working collectively could help strengthen mangrove ecosystems and, in doing so, contribute to a healthier and more resilient future for people, wildlife, and the planet.

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