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CROSS-COUNTRY MANGROVE CONSERVATION: SYNERGY OF PUI MANGROVE USU AND PUI UNPRI SPATIAL DEVELOPMENT IN THE 3RD SUMMER COURSE IN LANGKAT

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Abstract

Mangrove ecosystems have a crucial role as coastal fortresses as well as supporting the ecological and economic balance of the community. As a tangible manifestation of the implementation of the Tri Dharma of Higher Education, the Center for Excellence in Science and Technology (PUI) of the University of North Sumatra in synergy with Universitas Prima Indonesia held a 3rd Summer Course with the theme "International Community Service for Conservation and Mangrove Ecosystem Service". This international community service activity was held on September 6-7, 2025 in the Mangrove Forest of Beras Basah Village, Lalat Regency. The programme involves multidisciplinary and cross-border collaboration, bringing together experts and students from renowned global institutions, including Dilliman College, Chulalongkorn University (Thailand), Universiti Sultan Zainal Abidin (Malaysia), as well as the National Research and Innovation Agency (BRIN). PUI Bina Ruang UNPRI also actively participates in conducting in-depth observations on the correlation between the preservation of mangroves and the spatial layout of human life in coastal areas. Through a participatory and educational approach, this activity not only aims to accelerate environment-based national development, but also formulate innovative solutions in maintaining mangrove ecosystem services for global sustainability.

Keywords: ***International_Community_Service, Mangrove_Conservation, PUI_Mangrove, Ecosystem_Services, Global_Collaboration***

I. INTRODUCTION

Mangrove forests are not just trees by the coast; It is the most resilient natural infrastructure in the world. Able to survive in extreme environments that are salty and lack of oxygen, this ecosystem is a center of life for various species as well as the economic foundation of coastal communities. Some of the things that make mangroves so vital, namely: 1) coastal natural shield, meaning that sturdy mangrove roots function as natural "breakwaters" that dampen storm energy, prevent abrasion, and become the main protector of humans from the threat of tsunamis; 2) blue carbon heroes mean that as carbon absorbers that are much more effective than terrestrial forests, mangroves are the key to mitigating global climate change; 3) and biodiversity centers, which are homes, fish spawning grounds, and resource providers for the survival of marine and human life.

Indonesia is the owner of 20% of the world's total mangrove ecosystem with an area of 3.44 million hectares. However, this vital asset is in an "alarm" status due to the rate of destruction of 19,501 hectares per year triggered by land conversion, illegal logging, and pollution. The pillars of conservation success, namely concrete actions with a focus on the rehabilitation of damaged areas, protection of intact areas, and the development of education-based ecotourism, providing nature-based solutions by arranging the structure of trees and mangrove roots have proven to be effective in eliminating wave energy (storms & tsunamis) and becoming a climate mitigation solution through massive carbon (CO_2) sequestration, and carrying out multisectoral synergy with ecosystem sustainability depends on close collaboration between governments, foreign institutions, universities, and the private sector by placing local communities as the main actors in management.

A collaboration of local and foreign academics (USU & UNPRI) carried out community service in the form of planting mangroves at KTH Peduli Pesisir. This activity aims to be a means of learning, promotion of mangrove forest conservation, and long-term conservation for future research objects.

Partner Problems

Based on the analysis of the situation and direct observation in the partner environment, several partner problems, including:

1. Public knowledge about the importance of maintaining the Mangrove Forest ecosystem as a protector of coastal areas and the sustainability of marine life as well as as part of disaster management.
2. Knowledge about the potential of mangrove processing.
3. Increasing understanding of direct mangrove planting in the KTH Peduli Pesisir area.
4.

II. ACTIVITY OBJECTIVES

This activity aims to introduce mangrove conservation efforts to the international world as well as educate the public about the important role of mangrove ecosystems. Through a community-based management approach and technical training, the program seeks to increase local capacity and motivate various parties to be more concerned about the preservation of mangrove forests.

III. TIME AND PLACE

Day/Date : 6 September 2025 – 7 September 2025

The place of activity is KTH Peduli Pesisir, Wet Rice Village, Pangkalan Susu District, Langkat Regency. A rundown table of activities containing the time and place of each international community service activity can be found in Appendix 2.

IV. SOLUTIONS AND METHODS

A. Solution

Solutions offered to Partners include:

1. Socialization about the impact of abrasion on coastal areas and mangrove planting efforts as part of disaster mitigation and maintaining marine biota ecosystems.
2. Collaboration between the central government, local governments, research institutions, NGOs, and the private sector is essential for restoration programs to be synergistic and sustainable.
3. Strengthen international partnerships (e.g. with global conservation-organizations) especially for nature-based climate mitigation programs and blue carbon trading.
4. Training and assistance in planting mangroves directly at KTH Peduli Pesisir.

B. Solution Approach Method

Based on the priority of the Partner's problem, in accordance with the expertise possessed by the Proposer/Implementation Team of activities and agreements with the Partners for an implementation period of only 6 (six) months, the solution approach carried out is socialization about abrasion mitigation and planting efforts as part of mitigation, socialization about mangrove potential, and training and assistance in planting mangroves directly in the Coastal Care KTH area.

C. Partner Participation

Partners are local and foreign students. This community service activity is expected to help prevent abrasion by planting mangroves directly in the KTH Peduli Pesisir area.

D. Results Achieved

1. Socialization

This socialization activity was carried out to provide understanding to the community, local and related governments, academics and partners about mangrove forests and the potential they contain. The form of activity is in the form of presentations and discussions.

2. Attendance List

The international community service activity was attended by members of PUI Mangrove, lecturers of the Faculty of Forestry USU, members of PUI-PT Palliative Care UNPRI, PUI Bina Ruang, PUI-PT Gentle Baby Care UNPRI, PUI-PT Phytodegenarative UNPRI, PUI-PT Pertanahan UNPRI, PUI-PT Inovasi Teknologi Sains Sains Computer (iTiK), PUI PT Agro Sustainable Center, PUI PT Finance, lecturers and staff of UNPRI, and international guests from Malaysia, Thailand, the Philippines, and Pakistan. The list of participants from Universitas Prima Indonesia is in appendix 1. Assignment letter.

3. Activity Materials

International Community Service activities have several activities that have been planned and implemented which are contained in Table 1, as follows:

No.	Activity Name	Remarks
1	Planting mangrove seedlings	International service participants planting 1000 mangroves Seedlings
2	Harvesting of siakap fish, crabs, and shrimp	From crab and shrimp traps that have been installed on the edge of mangrove planting ponds, trapped fish, crabs and shrimp will be harvested.
3	Pandan coconut harvesting	Coconuts that have grown are directly harvested and processed for direct consumption at the Wet Rice Coast KTH location
4	Honey harvesting	Each participant tried to harvest honey directly from the beehive at the location of the Wet Rice Coast KTH

Source: data processing, 2025

V. MATERIAL DISPLAY

This community service began with socialization about the importance of mangroves as plants that have a lot of ecological and economic potential, as well as mentoring and planting mangroves directly on the beach as an effort to mitigate abrasion at KTH Peduli Pesisi. Mangroves are plant communities around the coast that have a unique morphology with a root system that has the ability to adapt to areas that have a fairly high salinity content and are able to adapt to tidal areas with mud or sandy substrates. The mangrove area is also a fairly fertile area, both in terms of its waters and land, because there is always nutrient transportation due to the tides of seawater. Mangrove forests, also known as mangrove forests, are one of the most important production factors whose existence must be maintained and maintained. Sumar (2021) explained that the benefits of mangrove plants for the surrounding environment where they grow, namely:

1. Nourishing Mangrove plants have good nutrients for the surrounding environment. At high tide, this plant will be seen in the sea. Meanwhile, at low tide, this plant will be seen on the plain. The location of mangrove plants is influenced by the growing distance between the plains and the ocean.
2. As a food chain The next function of mangrove plants is as one of the food chains, where these plants play the role of producers. Mangrove plants are widely liked by small fish and crabs. Not a few fish depend on their livelihood by eating the leaves of these mangrove plants for their survival.
3. The water around becomes clear Mangrove plants that grow around the shore will make the water clear. Try to compare the shoreline that has mangrove plants around it and those that do not have mangrove plants. There will definitely be a difference between the two, that the coastal water that is overgrown with mangrove plants becomes clearer compared to that that which is not overgrown with mangrove plants. Therefore, many socialization about the benefits of planting mangrove trees on the beach is encouraged.
4. Protecting the beach Furthermore, mangrove plants are also useful for protecting the beach from erosion. Mangrove plants that grow on the coast can protect the plains from the direct blowing of the waves. So that the waves do not directly hit the plains which will cause erosion and landslides, because they are protected by mangrove plants.
5. Boat docking places Not a few also make mangrove plants a place to dock ships after sailing around the coast. The small boats are moored to mangrove plants.

6. Taking Care of the Climate and Weather
7. Climate and weather change can occur due to a variety of factors, one of which is the breakdown of systems in nature. Mangrove forests are a very clear source for maintaining aquatic ecosystems between the sea, coast and land. In addition, the benefits of mangrove forests will also help humans in getting the most comfortable climate and weather to prevent natural disasters.

Community service activities at KTH Peduli Pesisir are focused on socialization, mentoring, and planting mangroves as a concrete step to mitigate coastal abrasion. Mangroves are chosen for their unique biological characteristics, namely:

1. High Adaptation: It has a strong root system that is able to survive in environments with high salinity as well as sandy mud substrates.
2. Ecosystem Productivity: It plays a role as a fertile area due to the continuous transport of nutrients due to the tidal cycle of seawater.
3. Strategic Value: Serves as a vital production factor with ecological potential (coastal protection) as well as economic for local communities.

VI. ACTIVITY RESULTS

In the 2025 international community service, it will be held at KTH Peduli Pesisir Beras Basah, Pangkalan Susu District, Langkat Regency, North Sumatra Province. Participants receive a certificate as proof of participation in international community service activities, an example of a participant's certificate can be seen in Appendix 3.
Take pictures with participants and resource persons for international service activities

Mangrove Planting with International Service Participants

Harvesting siakap fish

VII. CONCLUSIONS AND SUGGESTIONS

A. Conclusion

The community service about "International Community Service by Planting Mangrove as an Efforts to Prevent Abrasion on KTH Peduli Pesisir" went well, this can be seen from the enthusiasm of the participants in participating in a series of service activities. The form of activity began with an explanation about the potential of mangrove forests and the importance of caring for mangrove forests, followed by related discussions about mangroves, honey harvesting, siakap fish and pandan coconuts directly to their gardens, planting mangrove seedlings directly to the field. Routine and educational activities are needed so that this environmental awareness education does not only become a momentary euphoria, but also becomes a form of good habits for the environment. Further research is needed on the socio-economic impact of restoration (e.g. effects on local fishers, livelihoods of coastal communities) so that restoration strategies can be tailored to community needs.

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