Drone-based Forest Monitoring and Analysis in Bangladesh

The Challenge

In Bangladesh, protected forest areas are under threat from sea level rise, soil salinity, and human encroachment. Monitoring the forest canopy is challenging due to its remote location, restrictions of the airspace, restricted site access, threats within the forest including illegal poachers, and the need to preserve the critical habitat of the Bengal tigers.

How PEER Researchers are Tackling the Issue

With support from USAID's Partnerships for Enhanced Engagement in Research (PEER) program, through the activity titled "Unmanned Aerial Systems-based Assessment of Tree Cover and Deforestation Dynamics in Bangladesh" researchers from Daffodil International University (DIU) in Bangladesh developed an innovative plan to map and analyze forest cover in the Sundarbans, the world's largest mangrove forest, and the nearby Sal Forests. Their efforts will directly complement the National Forest Inventory (NFI) program of Bangladesh. The purpose of the NFI is to conduct a country-wide assessment to provide new data on forest resources using modern technology.

Through the PEER grant, Professor A.B.M Kamal Pasha is working to fully automate image data processing from a set of drones into a high-resolution map of the forest canopy cover. The technology enables forest management officials to monitor the condition of the forests, while the forest carbon estimation model would allow forest conservation personnel and policymakers to accurately assess the available forest carbon stock of a vast area.

The DIU researchers have partnered with U.S. Forest Service researcher Dr. Demetrios Gatziolis, who visited Bangladesh and trained scientists at DIU to use drones for analyzing forest canopy cover. The DIU team is now working in collaboration with the Bangladesh Forest Department to use this technology in forest monitoring.


Project Impact

High-resolution maps of forest canopy cover in the protected forest areas of Bangladesh will provide an easily integrated data layer for the NFI, which will help the Bangladesh Forest Department in monitoring forests throughout the country. This activity supports improved local governance of natural resources through the following interventions:

Project Impact (cont'd)

- Generating estimates of canopy cover and comparing them to estimates obtained by inventory personnel during field visits, which helps the conservators to compare their ground team's work with automated drone based data.

- Developing forest type-specific, carbon stock assessment models of forest biomass help to estimate the available carbon content of a swath of forest land using open source satellite imagery. This allows conservators and policy makers to determine the health and growth of a specific forest type at low cost and with considerable accuracy.

- Outlining a framework for forest change detection and quantification based on periodic satellite imagery and UAV-derived information. This helps with better management of the forests by flagging changes at a faster pace.

The team's forest monitoring approach is novel for Bangladesh, and caught the attention of government agencies and forest specialists for their innovative use of drones. The PEER researchers are pioneers of drone use in this field and their work serves as a guideline to develop the country's first policy on the use of drones for conducting research.
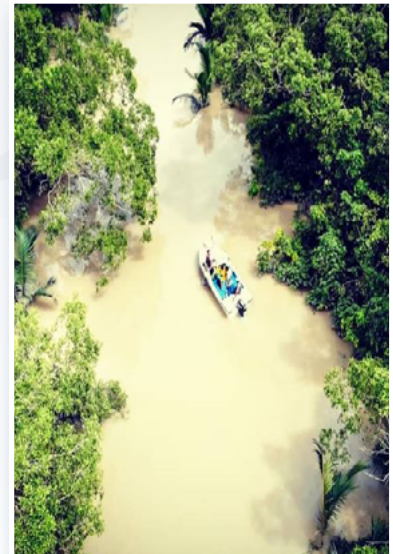
Prior to this PEER project, the use of drones in natural resource management was relatively unknown in Bangladesh. With their application for a permit with the Civil Aviation Authority, the team influenced the development of a policy for use of drones in managing Bangladesh's natural resources.

The Bangladesh Forest Department quickly realized the potential of the researchers' work and formed a collaboration with the PEER researchers at DIU to use their technology for forest research. Brig. General A.B.M Salah Uddin, one of Bangladesh's top civil aviation officials noted, "In this age of science and technology, the involvement of non-governmental research bodies and educational institutions of Bangladesh, in the application of drones in research plays a very important role for the country."

The USAID-funded PEER program is helping the Government of Bangladesh build sustainability by working with university researchers, promoting innovative solutions to development challenges, and increasing the use of science and analysis for decision-making to conserve natural resources and protect the country's critical ecosystems.

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Project website: https://sites.nationalacademies.org/PGA/PEER/PEERscience/PGA_181419

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