Scientists detail restorative mangrove and peatland management strategies

Ensuring the health and longevity of wetland ecosystems will not only benefit the environment and help forestall the negative effects of climate change, but will also boost overall economic wellbeing at local, national and international levels, said Robert Nasi, director general of the Center for International Forestry Research (CIFOR) and managing director of World Agroforestry (ICRAF), during a recent webinar.

At the Wetlands Knowledge Exchange, which was hosted by CIFOR-ICRAF, scientists provided an update on the current status of research efforts into mangrove and peatland ecosystems.

Aquaculture and other shoreline activities — including urban encroachment — in combination with projected sea level rise caused by global warming, puts the very survival of mangroves at risk, said Daniel Murdiyarso, a principal scientist at CIFOR-ICRAF.

"Worldwide, mangroves have been severely degraded and reduced to half of their original amount over the past 50 years," he said during the event, which attracted more than 275 attendees.

Mangrove forests, which grow in tropical and subtropical saline swamp waters, store carbon at concentrations more than five times higher than any other wetland ecosystem, Murdiyarso said. They offer climate mitigation and adaptation potential and protect shorelines from erosion by mitigating the impact of major storms. Proper management can also lead to huge economic benefits.

"An investment of less than $1.8 trillion into the conservation and restoration, of landscapes featuring mangrove ecosystems will — by the end of the decade — produce a net benefit of $7 trillion," he said, urging policymakers to take concerted action during the U.N. Decade on Ecosystem Restoration 2021-2030.

Peatlands, comprised of waterlogged organic soil, which can reach thicknesses of over 15 meters, also serve as carbon sinks, but face threats from drainage due to their flammability, which leads to the release of toxic smoke and greenhouse gas emissions. They represent half of the earth wetlands, covering about 3 percent of the global total land area, said

Michael Brady, a principal scientist at CIFOR-ICRAF who leads the Value Chains, Finance and Investment (VFI) team.

Traditionally, farm and oil palm plantation rotational crop management methods have involved clearing land by burning, in a process formerly known as "slash and burn," now typically referred to as swidden. The practice can lead to widespread fires in forests and peatlands, especially during periods of drought.

In 2015, uncontrolled fires in Indonesia destroyed more than 2.6 million hectares of land and led to economic losses equal to more than $16 billion, according to the World Bank. Subsequent controversies over the role of agroforestry methods in fires accelerated action to find alternatives.

"In tropical wetlands, fires largely occur in peatlands, particularly those that have been drained and where the vegetation has been either degraded or cleared," Brady said, adding that while fires can occur in other wetlands, they are more common in peatlands due to their characteristic layer of organic soil.

"When we link peatlands to restoration, it's very clear that a key aspect is complete exclusion of fire — there's no role for fire as a tool, or a benefit in peatland restoration, and therefore, fire prevention, monitoring and early suppression are dominant management approaches in areas that are being restored."

As part of the Measurable Action for Haze-Free Sustainable Land Management in Southeast Asia Programme (MAHFSA) supported by the International Fund for Agricultural Development (IFAD) and the Association of Southeast Asian Nations (ASEAN), Brady and his team are synthesizing research and knowledge materials produced on peatlands since 1980 to provide a baseline overview, identify any gaps to help guide future efforts.

"One of the main purposes of collecting, collating and organizing knowledge products on fire and peatland management is to strengthen policy and management," Brady said, citing the ASEAN agreement on transboundary haze pollution as a key regional policy.

The team also identifies and develops tools for fire management, including danger rating systems operating at ASEAN or national levels. For example, the Indonesian Fire Danger Rating System is managed by the Indonesian Agency for Meteorological, Climatological and Geophysics.

"This system provides an indication of risk of fire starting, spreading and doing damage before fire ignition," Brady said, adding that thermal imaging fire detection tools also play a big role in fire management. "There are systems in place, but many of these require further interpretation for management actions, particularly for restoration purposes."

The scientists have also initiated the development of a standardized burned area mapping and analysis tool, which is supported by the ASEAN Secretariat and the fire management group in the Indonesian Ministry of Environment and Forestry (MOEF).

"We're working with the ministry to formalize the methodology for determining burned area and to develop some standardized approaches for accuracy assessment," Brady said. "We're also involved in a peatland and fire project which extends across the two major islands of Borneo and New Guinea to delineate upland peat areas and identify fire behavior, conditions and management needs, including for restoration."

Drones and forest fire behavior prediction systems are in use in the global north, but scientists are working to bring these technologies into common usage in the south, Brady said.

An area of research that has also ignited flash points of controversy is the restoration of degraded lands with biomass for energy production.

“Bioenergy is key to supporting the SDGs in the context of climate change and energy security,” said Himlal Baral, a senior scientist, who leads CIFOR-ICRAF research into landscape restoration and bioenergy.

Indonesia’s goals include contributing to the U.N. Framework Convention on Climate Change (UNFCCC) and the U.N. Sustainable Development Goals (SDGs), which aim to alleviate global poverty.

Under its Nationally Determined Contribution (NDCs) under the UNFCCC, Indonesia has committed to restore 14 million ha of degraded land, including 2 million ha of peatlands by 2030.

Through sustainable agriculture methods degraded landscapes can be reverted to productive landscapes.

“The myth is that bioenergy uses scarce arable land for food crops,” Baral said. “But we’re currently demonstrating that there need not be competition — degraded land can be restored for multiple ecosystem services — food and energy can be grown on the same land using an integrated climate smart agroforestry approach.”

By strengthening economic incentives, smallholder farmers and private sector investors can be encouraged to undertake restoration which can boost food production, while supporting climate and development goals, he added.

These methods help achieve landscape restoration, renewable energy, food security and greenhouse gas emissions reduction targets.

In his research, CIFOR scientist and Participatory Action Research (PAR) project leader Herry Purnomo has bundled these conservation restoration ideas together, demonstrating innovative approaches to farmers in Indonesian peatland areas.

“We combine an institutional analysis and development framework with participatory action research to help farmers understand that crops can be produced without burning land to clear it,” Purnomo said. “Our work is mostly improving livelihoods through community-based business models for peatland restoration.”

These efforts involve training local farmers to prepare the land for planting without the use of fire, through fertilizer application, monitoring moisture and water levels in peat to better understand conditions to avoid accidental fires.

As part of the project, after identifying specific areas of focus – each around 4 hectares – smallholder farmers restore the landscapes to produce a variety of trees and crops, including agarwood, coconuts, fish and pineapple.

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