

Creating blue carbon opportunities in the maritime archipelago Indonesia

Daniel Murdiyarso¹, Endang Sukara², Jatna Supriatna², Alan Koropitan³, Sonny Mumbunan³, Berry Juliandi³ and Jamaluddin Jompa³

1 Center for International Forestry Research

2 Indonesian Academy of Science

3 Indonesian Young Academy of Sciences

Key messages

- Preserving intact ecosystems is financially more effective than restoring degraded ones. We therefore propose a moratorium on further conversion of mangroves. By doing so, there is the potential to generate \$3 billion (USD) in abatement costs annually.
- A science-backed plan, including mapping, for restoring priority degraded blue carbon ecosystems will build climate change resilience and improve livelihoods.
- Activating the existing regulatory framework and its governance at provincial level is essential to meet national low carbon development goals and align with global agenda.
- Opportunities for funding restoration include public and private partnerships, and new innovative finance solutions. Income from the blue economy (fishing, shipping and ecotourism) in productive zones could also contribute to restoration.

Background

Blue carbon is the carbon stored in coastal, tidal, wetland and marine ecosystems, including carbon-rich mangroves, salt marshes and seagrass meadows.

Indonesia is the world's richest in coastal blue carbon ecosystems - housing around 3 million hectares of mangroves and 0.3 million hectares of seagrass meadows.

The carbon stored here – 3.14 billion tons in mangroves (Murdiyarso *et al.* 2015) and 0.39 billion tons in seagrass (Alongi *et al.* 2015) – is of global climate significance, and under serious threat. In the three decades running up to 2015, Indonesia lost 40% of its mangroves. Largely due to aquaculture development, this has created 0.07–0.21 Pg CO₂e in annual emissions.

Despite mangrove deforestation accounting for just 6% of Indonesia's annual forest loss, an estimated 10–31% of emissions from the land use sector could be saved every year if it were stopped. Mangrove forests excel at carbon sequestration (Murdiyarso *et al.* 2015).

Global blue carbon emissions are equivalent to 3–19% of all GHG emissions from global deforestation, resulting in economic damages of USD 6–42 billion per year (at a price of USD 41 per ton of CO₂; Pendleton *et al.* 2012). The economically viable abatement cost amounts to less than USD 10 per ton of CO₂ (Siikimaki *et al.* 2012).

Using these figures, Indonesia therefore could reap substantial economic and social benefits from avoiding mangrove conversion.

Blue carbon ecosystems provide a wide range of ecosystem services which provides: (i) protection from storm surges, tsunamis and sea-level rises, (ii) regulation of water quality, (iii) breeding grounds and rearing habitats for fish and shellfish (including rare species and apex predators), (iv) important sources of wood and other forest products for local populations, (v) valuable source of nutrients and energy for adjacent habitats, and (vi) cultural and educational values for their aesthetics and use in ecotourism.

Strategies and measures to conserve and restore these habitats may be supported by the blue economy and encompass wider economic sectors including fishing, tourism, off-shore mining, transportation and shipping industries.

Blue carbon opportunities in Indonesia's national agenda

Guided by Presidential Regulation (*Peraturan Presiden, Perpres*) No. 61/2011, the National Action Plan on Greenhouse Gas Emissions Reduction, known as RAN GRK (*Rencana Aksi Nasional Penurunan Emisi Gas Rumah Kaca*), is the current government agenda to tackle the causes of climate change. Responding to the impacts of climate

change, the National Action Plan on Climate Change Adaptation, known as RAN API (*Rencana Aksi Nasional Adaptasi Perubahan Iklim*), has also been created.

Blue carbon ecosystems can be introduced into these agendas and included in accounting systems which consider emission reduction potential. Given the substantial carbon storage capacity of these ecosystems, conserving existing ecosystems and avoiding further deforestation and degradation of mangroves and seagrass would significantly contribute to Indonesia's emission reduction target. Considering the high mitigation potential of blue carbon ecosystems (approximately 150 million ton CO₂e per year) and the European Union Emission Trading System (ETS) benchmark price of EUR 17 (USD 20) per ton CO₂e, GHG abatement costs could be well above USD 3 billion per year.

Restoring degraded blue carbon zones would substantially enhance the adaptive capacity of coastal ecosystems and that of the communities who depend

on their health. A healthy blue carbon ecosystem provides protection for low-lying coastal zones from flooding and sea level rises, natural phenomena such as tsunamis and typhoons, and coastal erosion. They also increase food security as fish nursery and spawning habitats are protected.

However, basic data on the extent of mangroves and seagrass meadows are still fraught with uncertainties, causing significant challenges in planning both conservation and restoration/rehabilitation efforts. Using the latest technologies and satellite imagery to create high resolution maps and accurate data must take priority. This will inform decisions on size and location of areas that need either protection or restoration, and detect where sustainable use might be possible. The 'one map' policy launched by the Government of Indonesia in 2015 should be animated to speed up the availability and accessibility of data. This way Indonesia will be able to demonstrate its global commitments (see Box) through Blue Carbon programs and projects.

Box. Indonesia's global commitments

The Paris Agreement: Indonesia's ratification of the Paris Agreement through Law No. 16/2016, cemented the country's commitment to reduce greenhouse gas emissions and fight global warming. Indonesia pledged to cut greenhouse gas emissions by 29% with state budget, and up to 41% with international support by 2030. In 2016, Indonesia defined its Nationally Determined Contributions (NDCs) as reducing 834 million ton CO₂e or 1,081 million ton CO₂e with international support by 2030.

Sustainable Development Goals: Indonesia's opportunity to action and implement a blue carbon agenda will contribute significantly to Sustainable Development Goal (SDGs) 14.2: *By 2020, sustainably manage, and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience and take action for their restoration, to achieve healthy and productive oceans.*

Aichi Biodiversity Targets Indonesia is a signatory of the Convention of Biological Diversity (CBD) and its Aichi Biodiversity Targets. To meet the Aichi targets, Indonesia should promote the economic benefits of biodiversity conservation, the services provided by blue carbon ecosystems, and support ecotourism.



Vast conserved mangroves in Arguni Bay, Kaimana Regency, West Papua. The landscape is a huge storage of carbon – measuring around 700 ton per hectare, and a perfect habitat of fish and shellfish.

Photo: Courtesy of Kaimana Regency

Calls to Action

1. Research and capacity building

- Increase research capacity and build research infrastructure, including field laboratories
- Facilitate cross-disciplinary research that includes social and biophysical sciences. This is urgently needed to develop gold standard blue carbon policies
- Use knowledge developed to establish innovations that fully exploit the potential of the blue economy including food security, alternative and renewable energy, sustainable shipping and fishing industries

2. Low carbon development agenda

- Mainstream blue carbon within the national low carbon development agenda by:
 - Building coalitions across government agencies at all levels and engage a wider network of stakeholders
 - Formulating Indonesia's policy on sustainable use of marine biodiversity resources and revise regulations of existing policies to remove unnecessary barriers
 - Activating the existing regulatory framework (Presidential Decree No. 73/2012 and Permenko Ekonomi No. 4/2017)
- Develop blue carbon programs and provide governance support to ensure provincial implementation across the Indonesia archipelago. This will unlock the social, environmental and economic benefits of blue carbon exemplars include:
 - Marine Protected Area Project the pristine mangroves in Kaimana Regency, West Papua that has enabled fisher women to sell their produce to high end Bali markets
 - Indonesia's ambitious Building with Nature project on north coast Java to combat erosion, flooding and land subsidence
- Develop and enforce the widespread implementation and upkeep of a data flow system

3. Partnership

- Knowledge sharing, partnerships and collaborative activities including regular meetings and workshops with blue carbon stakeholders to be facilitated. This will improve current data gaps and best practice.
- The creation and curation of blue carbon data and information nodes/generators from various disciplines and components to be linked in an interactive open access database.



In Kaimana Regency, West Papua, a collaborative blue carbon program facilitating mud crab fishing has provided economic opportunities for local women.

Photo: Fairus Mulia/PT Kandelia

- High-quality credible data will eventually support the development and improvement of 'one map' policy processes, a national call to reduce uncertainties in official data and publicly available information.

4. Financial mechanisms

- Establish financial mechanisms that overcome institutional biases, with financial oversight structures that promote transparency and accountability of international and domestic generated monies.
- Establish a financial agency accessible to local communities, that promotes the local economy and champions gender balance.
- Urgently mobilize public, private, and blended public-private finance for blue carbon development. This should include loans and subsidies for mangrove restoration/ rehabilitation, marine biodiversity conservation and fishing community livelihood development:
 - Sufficient and impactful public funding must consider the fiscal needs of jurisdictions rich in coastal and marine resources and areas. Adopt general-purpose transfers (known as *Dana Alokasi Umum*, DAU) from the central government to incentivise provincial governments to protect and restore wetland forests.
 - Explore innovative private finance schemes – such as blue carbon bonds – to finance mangrove and seagrass-based local business and marine ecotourism projects at scale.
 - Tap into emerging opportunities for blended finance, combining risk mitigation (e.g. guarantees) and collateral to make business cases for impact investors for blue carbon projects.



Building with Nature on the northern coastline of Java uses Hybrid engineering to rehabilitate mangroves. Local materials have been used in its construction, which enables the mangroves to trap sediment and drastically slow down erosion.

Photo: Daniel Murdiyarto/CIFOR

- Implement financial criteria and indicators concerning blue carbon emission reductions as per monitoring, reporting and verification (MRV) and National Registry systems as part of Indonesia's commitment to the Paris Agreement under the UNFCCC.

Acknowledgments

This Policy Brief was generated from the Blue Carbon Summit organized in Jakarta on 17–18 July 2018. We are grateful to the coordinating and funding partners for their encouragement and generous support that made this Summit a success. Participants of the Summit are thankfully acknowledged for their contributions to this brief.

References

Alongi DM, Murdiyarto D, Fourqurean JW, Kauffman JB, Hutahaean A, Crooks S, Lovelock CE, Howard J, Herr D,

Fortes M, Pidgeon E, Wagey T. 2015. Indonesia's blue carbon: a globally significant and vulnerable sink for seagrass and mangrove carbon. *Wetlands Ecology and Manage.* DOI 10.1007/s11273-015-9446-y.

Murdiyarto D, Purbopuspito J, Kauffman JB, Warren MW, Sasmito SD, Donato DC, Manuri S, Krisnawati H, Taberima S, Kurnianto S. 2015. The potential of Indonesian mangrove forests for global change mitigation. *Nature Climate Change*, 5(12), 1089–1092. DOI: 10.1038/NCLIMATE 2734.

Pendleton L, Donato DC, Murray BC, Crooks S et al. 2012. Estimating global "Blue Carbon" emissions from conversion and degradation of vegetated coastal ecosystems. *PLOS ONE* 7 (9):1–7.

Siikamäki J, Sanchirico JN and Jardine SL. 2012. Global economic potential for reducing carbon dioxide emissions from mangrove loss. *Proc. Natl. Acad. Sci. U. S. A.* 109, 14369–74.

Further reading

blog.cifor.org/wetlands

blog.cifor.org/31112. Cut emissions, not mangroves: Indonesia's best hope for slowing climate change

cifor.org | forestsnews.cifor.org



RESEARCH PROGRAM ON Forests, Trees and Agroforestry

The CGIAR Research Program on Forests, Trees and Agroforestry (FTA) is the world's largest research for development program to enhance the role of forests, trees and agroforestry in sustainable development and food security and to address climate change. CIFOR leads FTA in partnership with Bioversity International, CATIE, CIRAD, ICRAF, INBAR and TBI. FTA's work is supported by the CGIAR Fund Donors: on.cgiar.org/CGIARFundDonors

Coordinating partners:

Funding partners:



Center for International Forestry Research (CIFOR)

CIFOR advances human well-being, equity and environmental integrity by conducting innovative research, developing partners' capacity, and actively engaging in dialogue with all stakeholders to inform policies and practices that affect forests and people. CIFOR is a CGIAR Research Center, and leads the CGIAR Research Program on Forests, Trees and Agroforestry (FTA). Our headquarters are in Bogor, Indonesia, with offices in Nairobi, Kenya; Yaounde, Cameroon and Lima, Peru.