Policy Brief

GOVERNING BLUE CARBON, COASTAL AND MARINE ECOSYSTEMS FOR CLIMATE CHANGE MITIGATION AND RESILIENCE

—

Task Force 3
Governing Climate Targets, Energy Transition, and Environmental Protection

GOVERNING BLUE CARBON, COASTAL AND MARINE ECOSYSTEMS FOR CLIMATE CHANGE MITIGATION AND RESILIENCE

Task Force 3

Rizky Januar – World Resources Institute (WRI) Indonesia

Elle Wibisono – Sustainable Ocean Alliance

Mas Achmad Santosa – Indonesia Ocean Justice Initiative

Grace Binowo – Indonesia Ocean Justice Initiative

Karenina Lasrindy – Indonesia Ocean Justice Initiative

Harish Makarim – Indonesia Ocean Justice Initiative

Eliza Northrop – World Resources Institute

Abstract

What are the key recommendations for the Group of 20 (G20) to fulfill the global potential of blue carbon, marine and coastal ecosystems as nature-based solutions for emissions reduction, disaster risk reduction and socio-economic benefit provision? The G20 should rejuvenate legal and policy frameworks to conserve and restore marine biodiversity and coastal ecosystems; promote effective community and indigenous peoples engagement and incentive-based approaches that ensure tenurial security and equitable benefit sharing in blue carbon, marine and coastal ecosystem governance; acknowledge the important role of collaborative science and innovation to bolster science-based decision making for ocean-based climate actions, including on marine protected area (MPA) management; promote a blended-finance approach to close the financing gap on marine and coastal conservation to deliver on the United Nations Sustainable Development Goals (SDGs) and other climate targets; and, finally, enhance cooperation and collaboration within the G20 on committing to treaties and regulations that promote ocean-based climate change mitigation and resilience.

Challenges

Analysis has shown significant potential that the ocean holds to support global efforts in reducing greenhouse gas emissions and bolstering climate resilience. Blue carbon ecosystems (BCE) such as mangrove[1] and seagrass could annually store 10 times more carbon than terrestrial ecosystems per hectare (McLeod et al., 2011). Ocean-based mitigation options could reduce global greenhouse gas (GHG) emissions by nearly 4 billion tonnes of carbon dioxide equivalent (CO_2e) per annum in 2030 and by more than 11 billion tonnes per annum in 2050, relative to projected business-as-usual (BAU) emissions. Reductions of this magnitude are larger than the emissions from all current coal fired power plants worldwide (Hoegh-Guldberg et al., 2019). Meanwhile, economic benefits provided by the oceans, such as fisheries and tourism, support the livelihoods of more than 3 billion people worldwide (Konar, Ding, and Teleki 2020).

Yet, as the World Meteorological Organisation's *State of the Global Climate* report on May 18, 2022 confirmed: greenhouse gas concentrations, sea levels, ocean temperature, and acidification reached new highs in 2021. These affect social and livelihood resilience within the marine and coastal ecosystems. Today, around 250 million people are vulnerable to coastal flooding (Kulp and Strauss, 2019). Also, the annual global cost of climate change impacts on fisheries and marine tourism may reach up to US$146 billion by 2050 (Noone et al. 2013). Sustainable marine and coastal management will require an aligned vision of ecosystem protection, economic activities and equitable prosperity (Winther et al., 2020).

There are multiple opportunities for ocean-based climate action which also provide wider societal benefits. Among them are the protection, conservation and restoration of marine and coastal ecosystems, and a dietary shift to sustainably-harvested and low-carbon forms of ocean-based protein. Conservation and restoration of coastal and marine ecosystems have an annual mitigation potential of 0.32-0.89 $GtCO_2e$ by 2030 (Hoegh-Guldberg et al., 2019). Every US dollar invested in mangrove conservation and restoration generates US$3 of ecological, economic, and social benefits (Konar and Ding, 2020). Meanwhile, the ocean-derived food production and dietary shift toward sustainably-harvested and low-carbon ocean-based proteins have further potential to reduce 0.34-0.94 $GtCO_2e$ of emissions (Hoegh-

---

[1] Until 2016, according to Global Mangrove Watch (https://www.globalmangrovewatch.org/), G20 Member States (excluding European Union) contained approximately 60 thousand km^2 of mangroves – 46 percent of global mangrove areas.

Guldberg et al., 2019). Every US$1 invested in increasing production of sustainably sourced ocean-based protein can yield US$10 in benefits (Konar and Ding, 2020).

Globally, less than 17 percent of land and 8 percent of the ocean are protected, falling short of the multilaterally agreed Aichi Biodiversity Target 11 (Bingham et al., 2021). Also, efforts to protect BCE, marine and coastal ecosystems through marine protected areas (MPAs) establishment are still lacking—currently around 42 percent of all remaining mangroves fall within legally designated protected areas, albeit recognising that the levels of actual protection these provide can be variable (Spalding et al., 2021). Protecting at least 30 percent of ecologically important marine and coastal areas can allow these ecosystems to thrive (Baillie and Zhang, 2018; Dinerstein et al., 2019). Although marine reserves are no panacea for the ocean's problems, they provide outstanding ecological and economic benefits within and beyond their boundaries (Sala and Giakoumi, 2017).

Realising these benefits, by sustainably governing marine and coastal areas and ecosystems, requires action on five key challenges:

1. Vague legal and policy frameworks in protecting marine and coastal ecosystems. Despite continuing marine habitat loss and degradation driven by anthropogenic pressures, most countries have not specifically classified BCE and coastal ecosystems as fragile and threatened ecosystems in their legal framework. Moreover, overlapping authorities in coastal management and unclear institutional arrangements challenge protection, monitoring and restoration efforts.

2. Restrictive BCE and coastal ecosystems governance. The absence of indigenous people and local communities' (IPLCs) genuine participation in decision-making is still prevalent. Therefore, inclusive governance, which robustly incorporates the voices of different stakeholders particularly IPLCs, and gives them a lead role in governance, is essential. As critical actors, IPLCs should be ensured of their rights – especially their rights to receive equitable benefits from environmental protection efforts and tenurial security. Unresolved tenurial issues can hamper communities in protecting BCE and coastal ecosystems from gaining financial benefits. The latter will also underpin an effective BCE protection, as evident in India's Sundarbans Mangrove Restoration and Ecuador's Socio Bosque programme, among others.

3. Limited application of data and science to support policymaking processes on BCE, coastal ecosystems and marine biodiversity. There are limited available data related to governing marine and coastal ecosystems – such as on the health of BCE and coastal ecosystems, impact and management of protected areas, and fisheries monitoring. Greater availability of reliable data, and data-driven innovative solutions,

are necessary to strengthen policies towards achieving Aichi Biodiversity targets and United Nations Sustainable Development Goals (SDGs).

4. Insufficient capital mobilisation to support marine and coastal management. Resource availability is key to fully realising the oceans as nature-based solutions for climate change. However, the amount of marine and coastal conservation finance available is currently insufficient to efficiently protect and restore the ecosystems. Countries must explore innovative financial mechanisms and enhance the adoption of available funding.

5. Limited international collaboration to achieve ocean-based climate change mitigation and resilience at scale. The global governance of sustainable fisheries, marine protection and blue carbon, requires global cooperation. From promoting BCE as a nature-based solution (NbS) to climate change, up to ensuring sustainable fisheries production – countries need to find mechanisms of collaboration for advancing these measures.

Proposal

To meet these challenges, following the framework from Transformations for a Sustainable Ocean Economy report[2] outlined in Appendix 1, we recommend that G20 leaders in Bali commit to the following five things:

1. REJUVENATE THE LEGAL AND POLICY FRAMEWORKS TO CONSERVE AND RESTORE MARINE BIODIVERSITY AND COASTAL ECOSYSTEMS.

The G20 needs a strong political will to double down on ambitions to protect BCE and other aspects of marine biodiversity that are critical (Gutes, 1996; Ekins, 2003). As the health of BCE, marine and coastal ecosystems functions are consistently threatened (Crain et al. 2009), pushing the urgency for effective protection is needed through strengthening legal and policy frameworks. Statutory laws should be utilised to overcome gaps in constitutions that do not recognise these ecosystems as "fragile and threatened". Such protection can be done through regulating MPAs as a primary tool of marine conservation, in which strict nature reserves and wilderness areas (defined by IUCN Category Ia-b) are by far the most effective types.

All G20 countries have significant coastal and marine ecosystems, with members covering large parts of the world's BCE. Five of the biggest mangrove countries in the G20 alone account for 49 percent of the total global mangroves. The G20 has also been instrumental in creating agendas for global action on protecting marine and coastal ecosystems – for instance, the G20 Action Plan on Marine Litter adopted in 2017 has led to enhanced international action on plastics with EU countries, Indonesia, and Canada, among others.

To enhance BCE, marine and coastal protection, the G20 Bali Summit should encourage rejuvenated national legal frameworks that accommodate:

1. Recognition of BCE, marine and coastal ecosystems as "fragile and threatened" ecosystems. Consequently, BCE, marine and coastal ecosystems should utilise MPA and protected forests as conservation tools. BCE, marine and coastal ecosystems should be further managed using spatial planning based on the Integrated Coastal Zone Management (ICZM) criteria. These criteria include (i) using non-sectoral and ecosystem approaches, (ii) employing a multidisciplinary and holistic system perspective, and (iii) providing a mechanism to reduce or resolve conflicts (Post and

---

[2] The report can be checked as follows: https://oceanpanel.org/ocean-action/files/transformations-sustainable-ocean-economy-eng.pdf

Lundin, 1998). In areas where IPLCs heavily rely on BCE, marine and coastal ecosystems for their livelihoods, MPA measures should fully accommodate their primary sustainable use of the resources.

2. Institutional arrangements for BCE, marine and coastal ecosystems management that define distinct roles, functions, tasks and responsibilities among relevant institutions. Coordination mechanisms among cross-sectoral institutions should also be laid out. In this regard, institutional arrangements should ensure clarity in administering coastal ecosystems through developing effective mechanisms for cross-cutting coordination, such as Indonesia (BRGM[3]) which optimises the role of a national coordinating ministry .

3. Instruments that provide (a) access to IPLCs to manage and utilise coastal resources without degrading the health of those ecosystems; and (b) guidance on carbon finance and investment.

4. Well-regulated and transparent decision-making processes on coastal management for all stakeholders, particularly IPLCs.

5. Improvements in monitoring, management and surveillance capacities. Enforcement officers should possess the ability to promptly detect violations before damage occurs, followed by the ability to respond to and punish the perpetrators.

Promoting policy initiatives in addition to the significant roles of constitutional and legal frameworks is needed to protect coastal ecosystems. The G20 should promote policy initiatives that accelerate practical actions to rehabilitate, restore and conserve coastal ecosystems with meaningful IPLCs' engagement—such as in Indonesia, through its established mangrove and peatland agency (BRGM). Further, this policy brief encourages G20 members to include blue carbon in their nationally determined contributions (NDCs) and biodiversity targets.

---

[3] BRGM stands for *Badan Restorasi Gambut dan Mangrove* (Peatland and Mangrove Restoration Agency)

2. PROMOTE EFFECTIVE COMMUNITY AND IPLCS ENGAGEMENT AND INCENTIVE-BASED APPROACHES THAT ENSURE TENURIAL SECURITY AND EQUITABLE BENEFIT SHARING IN BLUE CARBON, MARINE AND COASTAL ECOSYSTEM GOVERNANCE.

Experience in various countries show that community-based BCE and coastal ecosystems protection initiatives with support from the government can strengthen social and ecological resilience (Herr et al., 2017; Wylie et al., 2016). The role of communities, particularly the IPLCs in stewardship of BCE, marine and coastal ecosystems should be strengthened. BCE, marine and coastal ecosystem management should be inclusive, reflecting principles of local wisdom, equity and gender. Several studies have shown the importance of local ecological knowledge in influencing local capacity to sustainably manage coastal resources and achieve conservation goals (Carrasquilla-Henao et al., 2019; Berkstorm et al., 2019). Together with civil societies and indigenous peoples, governments should also ensure meaningful and effective engagement of IPLCs from conservation planning to benefit sharing. A step that can be taken to ensure the feasibility of IPLCs' participation in the decision-making process is through reviewing existing legislation and policies, and removing systemic barriers.

G20 leaders should agree to strengthen the tenurial security of communities protecting BCE, marine and coastal ecosystems. Addressing the tenure rights of local communities and indigenous peoples is critical when developing genuine, equitable and sustainable safeguards for BCE, marine and coastal ecosystems. The lack of clear tenure rights has been stated to directly influence community engagement in conservation governance and hampers the implementation, monitoring and enforcement of benefit-sharing schemes (Davis and Goldman, 2017). Providing formal recognition of communities' rights ensures access to equitable benefit sharing and empowers local communities to manage their resources. Addressing tenure may start with informal institutions through evaluation of local tenure setting, aiming to identify sources of insecurity, conflict and inequality (Robinson et al., 2017). Investment is needed to enhance government capacity to implement land tenure reforms and make documentation systems affordable and accessible (Robinson et al., 2017).

G20 countries should adopt legal instruments providing access and custody for local communities to manage BCE, marine and coastal ecosystems. Best practices of such legal instruments can be found in the Sustainable Use Agreements and Mangrove Custody (AUSCM) policy in Ecuador (Lopez-Rodriguez, 2021), and social forestry schemes in Indonesia (Erbaugh, 2019). The AUSCM policy in Ecuador grants mangrove concessions to local stakeholders to sustainably utilise and monitor mangrove forest resources. Under this policy, mangrove custodians are also given incentives from mangrove protection and management efforts. Social forestry in Indonesia grants rights for communities to use,

manage and benefit from forests and their resources. Community forests (*hutan kemasyarakatan*) as one of the social forestry forms, supports the livelihoods of local communities by providing access to produce mangrove-based services and products.

Effective facilitation by governments in providing financial benefits for communities protecting BCE, marine and coastal ecosystems should be carefully planned. Benefit-sharing processes should start with determining the system, form and amount of benefits together with the communities. Benefits received by communities that protect ecosystems should be fair and equitable to their efforts of conservation. In ensuring equity, there is a need for careful assessment of the costs and benefits of the beneficiaries that can be carried out by scientific stakeholders.

3. ACKNOWLEDGE THE IMPORTANT ROLE OF COLLABORATIVE SCIENCE AND INNOVATION TO BOLSTER SCIENCE-BASED DECISION MAKING FOR OCEAN-BASED CLIMATE ACTIONS, INCLUDING ON MPA MANAGEMENT.

During the G20 Osaka Summit in 2019, leaders committed to among other things fostering innovation in climate-resilient development, especially through nature-based solutions and indigenous knowledge. However, the commitment fell short of highlighting the role of innovation in the coastal and marine sciences in advancing innovation. Further, six countries did not achieve full compliance with the commitment (Lopez and Popova, 2020).

To advance ocean-based solutions to mitigate climate change threats (e.g., loss of biodiversity) and increase the resilience of coastal communities, scientists require data and partnerships to conduct research on carbon-rich, coastal and marine ecosystems (the National Academies of Science, Engineering and Medicine, 2002; Lemieux, et al., 2018). To achieve this goal, the UN Decade of Ocean Science was launched in 2021 to improve international ocean science collaboration. To build on the momentum of the launch and ensure tangible scientific output that supports decision making and policy, each G20 member should acknowledge the important role of collaborative science and innovation in creating climate change mitigation and resilience policies and solutions. For example, countries should include this in their national research agenda and international research partnerships to improve the collective understanding on:

1. Proper MPA definitions, targets, design and implementation. The different definitions of MPAs can lead to confusion amongst stakeholders, scientists and policymakers, especially because most global MPAs have different zones, from no-take zones to limited-use access. Using a science-based approach to determine the level of protection needed to achieve biodiversity and climate change resilience and mitigation goals can help stakeholders achieve a united front on what the definition and targets

of MPAs are. Scientific rationales can bolster and amplify the definition of protected areas to include sustainable use, as defined by the Convention for Biological Diversity at other international meetings such as the UN Conference of Parties and can help to standardise the global MPA goals and approaches. A united front can encourage other countries to adopt the same definition to ensure that future biodiversity targets have comparable and quantifiable metrics.

2. Best practices for the integration of local ecological knowledge into MPA, management of carbon-rich ecosystems and fishery data collection.

3. Advancing sustainable fisheries management through novel ways to collect data on and monitor global fisheries, quantifying the impact of MPAs on fisheries biomass through larva seeding or spillover, and innovative collaborative data-collection and research are needed to conduct stock assessments and determine the most socio-economically viable approach to rebuilding global fish stocks.

4. Development and use of natural capital accounts (NCAs) to inform the decision-making process on carbon-rich ecosystems and MPAs through quantifying the potential for carbon storage and economic valuation of MPAs, conducting socio-economic analysis of MPAs and other fishery management strategies; determining baseline biodiversity as a benchmark to assess the impact of different MPA and fishery policy interventions.

5. Improvements in data-sharing, increasing database interoperability and international scientific collaboration   .

While the list of research needs is not exhaustive, a targeted approach to answer some of the most pertinent scientific questions of MPAs and sustainable fisheries can reduce uncertainties in decision making and build a more science-based marine conservation approach.

4. PROMOTE A BLENDED-FINANCE APPROACH TO CLOSE THE FINANCING GAP IN MARINE AND COASTAL CONSERVATION TO DELIVER ON THE SDGS AND OTHER CLIMATE TARGETS.

Analysis suggests that to achieve SDG 14 (Life below water) targets by 2030, US\$174.52 billion per year is required for ocean conservation. Currently, only \$25.5 billion is spent annually and therefore, there is a funding gap of \$149.02 billion per year for ocean conservation (Johansen and Vestvik, 2020).

In line with the funding gap, G20 countries must then continue their compliance in mobilising blended finance for climate change (Lopez and Popova, 2020) by fostering innovative financing tools to conserve marine and coastal ecosystems. For instance, Mexico implements risk insurance (The Nature Conservancy, 2020) to conserve Mesoamerican coral reefs; while mangrove-based carbon credits (Dwyer, 2021) are developed in Colombia to fill conservation budget gaps. Other sources include blue bonds, trust funds and debt-for-nature swaps. The G20 could promote further resource allocation to support sustainable seafood production and blue carbon conservation and restoration – which will make valuable investments given their high benefit-cost ratios (Konar and Ding, 2020). The G20 should further mainstream the urgency for filling the ocean finance gap within international fora, such as the COP – which will provide the basis for stronger resource mobilisation.

Applying blended mechanisms could minimise investment risks. However, information on available funding resources for oceans are largely fragmented; efforts to measure country progress on fund utilisation are limited; and there is lack of standardised methodology in estimating blue carbon offsets, and limited policy in mitigating long-term investment uncertainty on blue carbon (Vanderklift et al., 2019).

To stimulate blended-finance adoptions, G20 countries should: 1) access existing funds supporting oceans sustainability; 2) initiate a database of financial sources which supports coastal, blue carbon, and MPA management that is accessible for member countries; 3) develop a mechanism for tracking country commitments on sustainable oceans and the required financial targets – allowing for cross-country comparison and informing investment decisions; 4) establish policy to ensure high-quality blue carbon credits that safeguards coastal biodiversity and communities while upholding transaction integrity – Indonesia, holding the G20 presidency in 2022 and leading with a 600,000-hectare mangrove-restoration project (ANTARA, 2021), could further promote this.

5. ENHANCE COOPERATION AND COLLABORATION WITHIN G20 ON COMMITTING TO TREATIES AND REGULATIONS THAT PROMOTE OCEAN-BASED CLIMATE CHANGE MITIGATION AND RESILIENCE.

The cooperative measures should include, among other things, global fisheries governance and advancing blue carbon as a nature-based solution for climate change. Cooperation can take many different forms.

For example, it is imperative that G20 countries commit to implementing the recent World Trade Organisation (WTO) agreement on fisheries subsidies. In June 2022, after two decades, the WTO finally agreed on banning subsidies that contribute to illegal, unreported and unregulated (IUU) fishing on the high seas and overfished stocks. Further, to secure legal and

sustainable global seafood supplies, countries must champion seafood products from traceable and sustainably managed fisheries. The seafood industry is a global network of suppliers and buyers, requiring cooperation on a global scale. One method to achieve this goal is by ratifying the Agreement on Port State Measures (PSMA) – a treaty that allows signatory countries to block vessels carrying illegal fish from docking in their territories. To advance this initiative, four out of five tuna Regional Fisheries Management Organisations (RFMOs) implemented measures aligned with the PSMA. However, the PSMA can only be successful in deterring illegal seafood from the supply chain if most port countries ratify the agreement. Operational, informational and implementation gaps of this treaty and RFMO measures have lessened the efficacy of the treaty (ISSF, 2020).

Several members of the G20, such as Saudi Arabia, India, Argentina, Brazil, Mexico, Germany, Italy and China are still not signatories of the PSMA (FAO, n.d.) while the remaining G20 members have ratified or accessioned to the treaty. In 2019, members of the High-Level Panel for a Sustainable Ocean Economy together with the Seafood Business for Ocean Stewardship appealed to G20 governments to help deter IUU fishing by becoming parties of the PSMA. Sustainable seafood has not been central to G20 discussions surrounding climate change. However, the top two seafood producer (China and Indonesia) and top two seafood importers (EU and US) globally are members of the G20. Commitments from G20 members to agree on producing and sourcing legal seafood could be transformative for climate change resilience.

Beyond fisheries – as a collective, G20 countries are faced with the responsibility and opportunity for creating scientific and regulatory impacts on the governance of blue carbon, coastal and marine ecosystems. Each pillar is critical to bolstering better governance of these ecosystems and must also be considered by G20 members as they discuss climate change resilience and adaptation commitments. G20 members have also agreed to adopt the UNFCCC Glasgow Climate Pact in 2021 which, among other things, emphasises the importance of conserving and restoring marine ecosystems while ensuring social and environmental safeguards. In line with the pact, discussions on blue carbon as an imperative nature-based solution should thus be continually promoted by the G20 countries both within the G20 Summit and other relevant forums – including on how BCE protection can be financially compensated and provide equitable benefits for local communities.

References

ANTARA. 2021. "Indonesia to Showcase Mangrove Restoration Program to G20 Leaders." https://en.antaranews.com/news/203673/indonesia-to-showcase-mangrove-restoration-program-to-g20-leaders (April 18, 2022).

Jonathan Baillie and Ya-Ping Zhang, "Space for Nature", in Science, 261, 6407(14 September 2018), https://www.science.org/doi/full/10.1126/science.aau1397?casa_token=k4OCKIzRC4YAAAAA:SxuKxGiNtJAS_2Bkr-NbVKVZkZ5SVX2obuUYosTNYvcmVLHIbWIUBKf-Z_X-zrIMyjTKy2Qp1xBYayg

Charlotte Berkstrom, Myron Papadopoulus, Narriman Saleh Jiddawi, Lina Mtwana Nordlund, "Fishers' Local Ecological Knowledge (LEK) on Connectivity and Seascape Management", in Marine Science, 6:130, (22 March 2019), https://doi.org/10.3389/fmars.2019.00130.

Caitlin M. Crain, Benjamin S. Halpern, Mike W. Beck, and Carrie V. Kappel. 2009. "Understanding and Managing Human Threats to the Coastal Marine Environment." Annals of the New York Academy of Sciences 1162:39–62. doi: 10.1111/j.1749-6632.2009.04496.x.

FAO, n.d., "Agreement on the Port State Measures - Parties of the PSMA," accessed April 3, 2022, from https://www.fao.org/port-state-measures/background/parties-psma/en/

Heather Bingham, Edward Lewis, Elise Belle, Jessica Stewart, Helen Klimmek, Sylvia Wicander, Nina Bhola, Lucy Bastin, "Protected Planet Report 2020: Tracking progress towards global targets for protected and conserved areas" (2021).

Mauricio Carrasquilla-Henaoa, Natalie Ban, Mario Rueda, Juanes Juanesa, "The mangrove-fishery relationship: A local ecological knowledge perspective", in Marine Policy, 108, (5 August 2019), https://doi.org/10.1016/j.marpol.2019.103656.

Alicia Davis & Mara J. Goldman, "Beyond payments for ecosystem services: Considerations of Trust, Livelihoods and tenure security in community-based conservation projects", in Oryx, 53(3), (15 August 2018), 491–496, https://doi.org/10.1017/s0030605317000898.

Nigel Dudley (ed.), Guidelines for Applying Protected Area Management Categories. Gland, Switzerland, IUCN, 2013, Best Practice Guidance on Recognising Protected Areas and Assigning Management Categories and Governance Types, (Best Practice Protected Area Guidelines Series No. 21).

Eric Dinerstein, Carly Vynne, Enric Sala, Anup Joshi, Sanjiv Fernando, Thomas Lovejoy, J. Mayorga, D.Olson, Gregory P. Asner, Jonathan Baillie, N.D. Burgess, K. Burkart, R.F. Noss, Ya-Ping Zhang, Alessandro Baccini, Tanya Birch, Lucas Joppa, and E. Wikramanayake, "A Global Deal For Nature: Guiding principles, milestones, and targets", in Science Advances, 5,4 (April 2019).

Augusta Dwyer. 2021. "Cispata: First Mangrove Forest with Full Carbon Count Enters Carbon Market." https://news.globallandscapesforum.org/52335/the-first-mangrove-forest-with-full-carbon-calculation-enters-the-carbon-market/ (April 18, 2022)

Paul Ekins, Sandrine Simon, Lisa Deutsch, Carl Folke, Rudolf De Groot, A framework for the practical application of the concepts of critical natural capital and strong sustainability, in Ecological Economics, 44, (2 May 2002), 165-185, https://doi.org/10.1016/S0921-8009(02)00272-0

Kerri Elgar & Benjamin Schiler. 2019. G20 Contribution to the 2030 Agenda: Progress and Way Forward. https://www.oecd.org/g20/topics/agenda-2030-development/G20-SDG-Report.pdf

James T. Erbaugh, "Responsibilization and social forestry in Indonesia", in Forest Policy and Economics, 109, (29 August 2019), https://doi.org/10.1016/j.forpol.2019.102019.

Maita Cabeza Gutes, "The concept of weak sustainability", in Ecological Economics, 17(3), (1996), 147-156.

Dorothee Herr, Moritz von Unger, Dan Laffoley, Alexis McGivern. "Pathways for implementation of blue carbon activities", in Aquatic Conservation, 27(1), (7 September 2017), 116-129, https://doi.org/10.1002/aqc.2793.

Ove Hoegh-Guldberg, Ken Caldeira, Thierry Chopin, Steve Gaines, Peter Haugan, Mark Hemer, Jennifer Howard, Manaswita Konar, Dorte Krause-Jensen, Elizabeth Lindstad, Catherine E. Lovelock, Mark Michelin, Finn Gunnar Nielsen, Eliza Northrop, Robert Parker, Joyashree Roy, Tristan Smith, Shreya Some, and Peter Tyedmers. 2019. The Ocean as a Solution to Climate Change: Five Opportunities for Action. Washington, DC

Fabian Huwyler et al. 2014. Conservation Finance Moving beyond Donor Funding toward an Investor-Driven Approach.

ISSF, 2020, "PORT STATE MEASURES IN TUNA RFMOS: Benchmarking RFMO Port State Measures Against the 2009 FAO PSMA and Identifying Gaps", accessed April 3, 2022, from https://www.iss-foundation.org/issf-downloads/download-info/issf-2022-07-port-state-measures-in-tuna-rfmos-benchmarking-rfmo-port-state-measures-against-the-2009-fao-psma-and-identifying-gaps/

Manaswita Konar & Helen Ding. 2020. A Sustainable Ocean Economy for 2050: Approximating Its Benefits and Costs. In Secretariat of the High Level Panel for a Sustainable Ocean

Economy, World Resources Institute. https://oceanpanel.org/sites/default/files/2020-07/Ocean Panel_Economic Analysis_FINAL.pdf

Mansi Konar, Helen Ding, and Kristian Teleki. 2020. "4 Investments to Secure Ocean Health and Wealth." World Resources Institute. Retrieved April 22, 2022 (https://wri-indonesia.org/en/blog/4-investments-secure-ocean-health-and-wealth)

Scott A. Kulp & Benjamin H. Strauss. 2019. New elevation data triple estimates of global vulnerability to sea-level rise and coastal flooding. Nature Communications, 10(1). https://doi.org/10.1038/s41467-019-12808-z

Lemieux, et al., 2018. "Evidence-based decision-making in Canada's protected areas organizations: Implications for management effectiveness," accessed April 3, 2022, from https://www.facetsjournal.com/doi/10.1139/facets-2017-0107

Sofia Lopez & Irina Popova. 2020. 2019 G20 Osaka Summit Final Compliance Report. http://www.g20.utoronto.ca/compliance/2019osaka-final/18-2019-osaka-final-compliance-financing.pdf

Fausto López-Rodríguez., "Mangrove in Ecuador: Conservation and Management Strategies", in Yuanzhi Zhang, Liang & X. San Liang (eds), Coastal Environments, 2021.

Elizabeth McLeod, Gail L. Chmura, Steven Bouillon, Rodney Salm, Mats Björk, Carlos M. Duarte, Catherine E. Lovelock, William H. Schlesinger, and Brian R. Silliman. 2011. "A Blueprint for Blue Carbon: Toward an Improved Understanding of the Role of Vegetated Coastal Habitats in Sequestering CO2." Frontiers in Ecology and the Environment 9(10):552–60. doi: 10.1890/110004.

Kevin J. Noone, Ussif Rashid Sumaila, and Robert J. Diaz. 2013. Managing Ocean Environments in A Changing Climate (1st ed.). Elsevier.

Jan C. Post & Carl G. Lundin (ed.)., Guidelines for Integrated Coastal Zone Management. Washington D.C., U.S.A., The World Bank, 1996, (Environmentally Sustainable Development Studies and Monographs Series No. 9).

Brian E. Robinson, Yuta J. Masuda, Allison Kelly, Margaret B. Holland, Charles Bedford, Malcolm Childress, Diana Fletschner, Edward T. Game, Chloe Ginsburg, Thea Hilhorst, Steven Lawry, Daniela A. Miteva, Jessica Musengezi, Lisa Naughton-Treves, Christoph Nolte, William D. Sunderlin, & Peter Veit, "Incorporating land tenure security into conservation", in Conservation Letters, 11(2), (4 June 2017), 1-12, https://doi.org/10.1111/conl.12383.

Enric Sala & Sylvaine Giakoumi, "No-take marine reserves are the most effective protected areas in the ocean", in ICES Journal of Marine Science, (16 March 2017).

Mark D. Spalding and Maricé Leal (ed.), The State of the World's Mangroves 2021. Global Mangrove Alliance, 2021.

The National Academies of Science, Engineering, and Medicine, 2002, "Science and the Role in the National Marine Fisheries Service," accessed April 3, 2022, from https://nap.nationalacademies.org/download/10387

The Nature Conservancy. 2020. "Insuring Nature to Ensure a Resilient Future." https://www.nature.org/en-us/what-we-do/our-insights/perspectives/insuring-nature-to-ensure-a-resilient-future/ (April 18, 2022).

United Nations Environment Programme, World Economic Forum, and Economics of Land Degradation Initiative. 2021. State of Finance for Nature: Tripling Investments in Nature-Based Solutions by 2030.

U. Rashid Sumaila et al. 2019. "Updated Estimates and Analysis of Global Fisheries Subsidies." Marine Policy 109: 103695.

U. Rashid Sumaila et al. 2021. "Financing a Sustainable Ocean Economy." Nature Communications 2021 12:1 12(1): 1–11. https://www.nature.com/articles/s41467-021-23168-y (April 18, 2022).

Mathew A. Vanderklift, et al. 2019. "Constraints and Opportunities for Market-Based Finance for the Restoration and Protection of Blue Carbon Ecosystems." Marine Policy 107: 103429.

Jan Gunnar Winther, Minhan Dai, Therese Rist, Alf Håkon Hoel, Yangfan Li, Amy Trice, Karyn Morrissey, Marie Antonette Juinio-Meñez, Leanne Fernandes, Sebastian Unger, Fabio Rubio Scarano, Patrick Halpin, and Sandra Whitehouse. 2020. "Integrated Ocean Management for a Sustainable Ocean Economy." Nature Ecology & Evolution 2020 4:11 4(11):1451–58. doi: 10.1038/s41559-020-1259-6.

Lindsay Wylie, Ariane E. Sutton-Grier, Amber Moore, "Keys to successful blue carbon projects: Lessons learned from global case studies", in Marine Policy, 65, (March 2016), 76-84, https://doi.org/10.1016/j.marpol.2015.12.020.

Appendix

Appendix 1. About the Transformations for a Sustainable Ocean Economy

Transformations for a Sustainable Ocean Economy is a document denoting the commitment of 14 heads of state and government which are the members of the High Level Panel for a Sustainable Ocean Economy (the Ocean Panel). These countries represent people from across all ocean basins, nearly 40 percent of the world's coastlines and 30 percent of exclusive economic zones. At its foundation, heads of state and government are setting a goal to achieve 100 percent sustainable ocean management of areas within national jurisdiction, guided by Sustainable Ocean Plans, by 2025, and to support a global target to protect 30 percent of the ocean by 2030 – which a growing body of science is indicating is the engine for ocean replenishment. This commitment is paired with a set of bold, yet pragmatic recommendations to transform how to protect and use the ocean and ultimately manage humanity's impacts on it.

The Transformations set out 5 key areas[4]: Ocean Wealth, Ocean Health, Ocean Equity, Ocean Knowledge and Ocean Finance. The following table summarizes the link between each key area with the key aspect of the recommendations in this brief, as elaborated in the Proposal section.

---

[4] https://www.oceanpanel.org/ocean-policy

Transformation Areas	Key proposal for G20
Ocean Wealth	Enhance cooperation and collaboration within G20 on committing to treaties and regulations that promote ocean-based climate resilience, including sustainable fisheries governance.
Ocean Health	Rejuvenate the legal and policy frameworks to conserve and restore marine biodiversity and coastal ecosystems.
Ocean Equity	Promote effective community and Indigenous Peoples engagement and incentive-based approaches that ensure tenurial security and equitable benefit sharing in blue carbon, marine and coastal ecosystem governance.
Ocean Knowledge	Acknowledge the important role of collaborative science and innovation to bolster science-based decision making for ocean-based climate actions, including on MPA management.
Ocean Finance	Promote blended finance approach to close the financing gap on marine and coastal conservation to deliver on the Sustainable Development Goals (SDGs) and other climate targets.