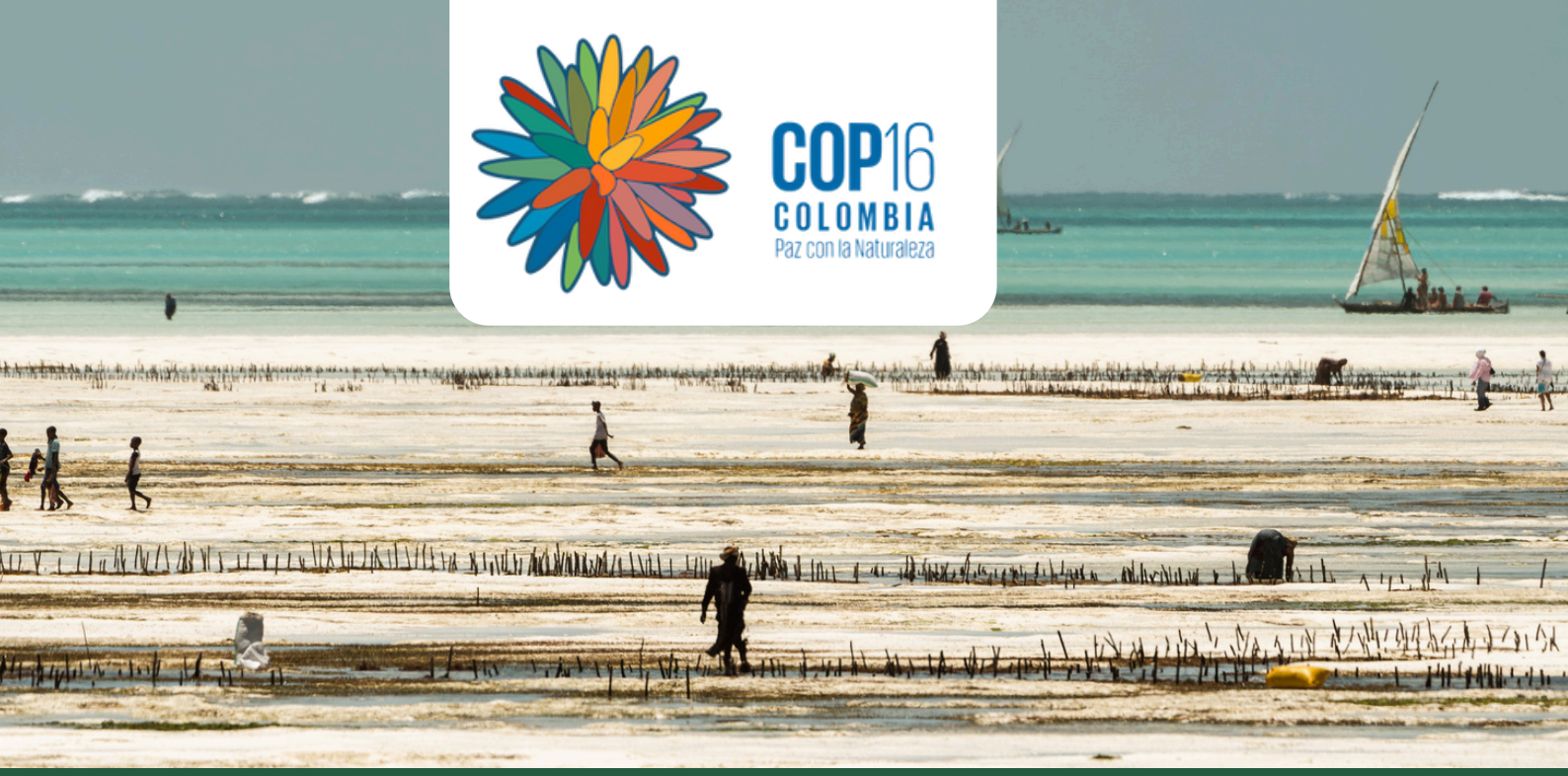

COP16 COLOMBIA
Paz con la Naturaleza

RECOMMENDATIONS
FOR PARTIES TO TAKE ACTION ON OCEAN ACIDIFICATION ACROSS CBD TARGETS

- Implement Targets 7 and 8 with a focus on ocean acidification (OA).
- Take actions in line with Targets 7 and 8 to minimize and address OA.
- Effectively communicate and report the results of the actions taken under Targets 7 and 8 with the help of OA Research for Sustainability Programme under the UN Decade and relevant OA policy bodies.

OA ALLIANCE
INTERNATIONAL ALLIANCE TO COMBAT OCEAN ACIDIFICATION

OARS
Ocean Acidification Research for Sustainability

RELATIONSHIP BETWEEN OCEAN ACIDIFICATION AND BIODIVERSITY

Ocean acidification, driven by rising levels of carbon dioxide (CO_2) from human activities, is an increasingly serious threat to marine ecosystems and global biodiversity. The ocean absorbs about 30% of the human-generated CO_2 from the atmosphere (WMO Green House Gas Bulletin, 2023), leading to widespread changes in ocean chemistry. These rising CO_2 levels trigger chemical processes that decrease the pH of seawater and alter the ocean's chemistry in ways that harm many marine organisms. In coastal areas, local factors such as nutrient run off and pollution can exacerbate acidification, creating "hot spots" of rapid pH change. Consequently, these changes disrupt marine food webs, diminish ecosystem services, and pose significant risks to the billions of people who rely on the ocean resources for their livelihoods, food, and cultural practices (Bindoff et al., 2019).

Ocean acidification has the potential to significantly affect marine biodiversity, impacting organisms from microscopic plankton to large predators (Widdicombe et al., 2023). Particularly affected are those organisms that form shells and skeletons, such as corals, molluscs, and certain plankton (Doney et al., 2020; Orr et al., 2005). Coral reefs, often termed the "rainforests of the sea" due to their rich biodiversity, face the loss of structural complexity, threatening the habitats that support numerous marine species and thus reducing ecosystem function (Hoegh-Guldberg et al., 2017). Furthermore, acidification can alter the behavior, physiology, and survival rates of non-calcifying species, including fish, affecting predator-prey interactions, reproductive success, and overall ecosystem stability (Nagelkerken & Munday, 2016).

The effects of ocean acidification are compounded by other environmental stressors, such as warming, reduced oxygen levels, and pollution. The combined pressures weaken marine ecosystems' resilience and adaptive capacity (Duarte et al., 2013) posing a severe risk to global biodiversity. This includes the potential for irreversible species loss and ecosystem degradation, underscoring the urgent need for integrated mitigation and adaptation efforts.

While reducing global CO_2 emissions remains the only viable long-term strategy to combat ocean acidification, local interventions are also essential to buy time and increase resilience.

OPPORTUNITIES FOR ADDRESSING OA ACROSS CBD'S 2030 TARGETS

The Convention on Biological Diversity (CBD) has three main objectives: (1) to conserve biological diversity, (2) to sustainably use the components of biodiversity, and (3) to ensure a fair and equitable sharing of the benefits occurring through the use of genetic resources.

To further help implement these objectives, work is being undertaken under the Strategic Plan for Biodiversity 2011-2020 and the Kunming-Montreal Global Biodiversity Framework (GBF), which was adopted in 2022 at CBD COP15. The Framework includes the so-called "2030 targets" which are a set of twenty-three targets to be realized by 2030. Additionally, these targets are meant as the first step in reaching the overarching 2050 goals also laid down in the GBF. The GBF is closely connected to the 2030 Agenda for Sustainable Development as they enable each other.

The issue of ocean acidification was first considered at a CBD COP in 2008. In response to this the CBD Secretariat prepared a report on the possible implications of OA for marine biodiversity. Since then, OA has been a reoccurring topic within the realm of the CBD and its COPs. It has not only been the target of multiple expert reviews commissioned by the Parties to the CBD but has also been included in the Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets. With the most recent inclusion of ocean acidification in the action-oriented 2030 targets of the GBF, it becomes necessary to determine their role in addressing ocean acidification.

While most of the 2030 Targets can be read in light of of OA action, a particular focus must be put on Target 8 "Minimize the Impacts of Climate Change on Biodiversity and Build Resilience" and Target 7 "Reduce Pollution to Levels that are not Harmful to Biodiversity", as both focus on distinct drivers of OA.

TARGET 8

Target 8 focuses on the impacts of climate change and ocean acidification on biodiversity. It identifies the need for impact reduction and resilience building with a particular focus on adaptation, mitigation, and the reduction of disaster risks.

Including this target and the direct reference to ocean acidification highlights the CBD's commitment and recognition of the existing threat posed to marine biodiversity and the corresponding need to address it. Such findings are further supported by the CBD Technical Series No.75 report published in 2014. The report comprises a detailed analysis of the (potential) impacts ocean acidification has on marine biodiversity.

With regard to concrete action, Target 8 recognizes the need to reduce GHG and CO_2 emissions. In addition to CO_2 reductions, Target 8 proposes ecosystem-based approaches, nature-based solutions, marine protected areas, and recovery programs for impacted species that will build resilience to ongoing impacts of ocean acidification. These efforts must be accompanied by essential reductions in CO_2 emissions to ensure long-term success.

TARGET 7

Target 7 aims to reduce pollution from all sources to a level that does not harm ecosystem functions/services or biodiversity. The target does not prescribe a specific amount of necessary reductions. Instead, it aims to reduce the risks and impacts of pollution. With regard to nutrient pollution, the target puts a particular focus on excess nutrients lost in the environment and calls for a substantial decrease in such pollution.

Although Target 7 does not directly address ocean or coastal acidification, its focus on nutrient pollution nevertheless makes it necessary to consider it in light of acidification. While CO_2 can still be regarded as the primary cause of ocean acidification, nutrient pollution may lead to local and coastal acidification effects and eutrophication along coastlines. The excessive release of nutrients into marine waters can lead to an increase in primary production of organic matter. The subsequent degradation may lead to a local increase in CO_2 within the water column, contributing to eutrophication and local coastal acidification hotspots. It is thus important to distinguish between ocean acidification caused by CO_2 and local coastal acidification caused by, or at least enhanced by, nutrient pollution.

The qualifier that pollution should be limited to a level at which it does not harm the environment also lends itself to further consideration through the acidification lens. Ocean acidification has already been shown to continuously impact biodiversity and ecosystem functions and services. One such example is the negative impact on coral reefs and how this impacts the reef's ability to function as a habitat for species exploited for commercial or substance fisheries. However, as nutrients are also used within agriculture to increase the amount and availability of food from land sources, this target seems to require a careful balancing exercise between the use and subsequent impacts of nutrients in light of food security.

Overall, as the actions taken under this target are meant to reduce the risk and impact of pollution, this target includes a clear mandate to address coastal acidification as a negative impact of nutrient pollution.

OA ACTION AT CBD SUPPORTS MULTIPLE POLICY FRAMEWORKS

The GBF distinguishes between action-oriented Targets until 2030 and goal-oriented targets until 2050. As the 2030 Targets addressed here are action-oriented, it must be highlighted that such action can and should be taken at different levels and through different institutions or organizations, depending on their nature. While coordinating actions are often best taken from an international or regional level, some more direct or applied actions might require a more local approach.

With regard to ocean acidification, the CBD, and its parties have recognized the need for an internationally more coordinated approach to addressing acidification when they sent the last updated synthesis document, "An Updated Synthesis of the Impacts of Ocean Acidification on Marine Biodiversity" (UNEP/CBD/SBSTTA/18/INF/6) to the Joint Liaison Group of the three Rio Conventions. These three conventions are the CBD, the United Nations Framework Convention on Climate Change (UNFCCC), and the United Nations Convention to Combat Desertification (UNCCD). The Liaison Group consists of the secretariats of all three Conventions and focuses on the collection and sharing of information between the three conventions regarding their work programmes and general operations. UN Sustainable Development Goal 14.3 calls on governments and civil society leaders to take actions that "minimize and address OA." Additionally, the newly adopted Biodiversity Beyond National Jurisdiction (BBNJ) agreement require ongoing risk assessments and environmental impact assessments of activities taking place in the high-seas. These risk assessments and environmental impact assessments should include considerations of ocean acidification.

Finally, it must also be highlighted that governments are already taking certain actions to address OA. For example, ecosystem-based solutions, like restoring seagrass beds and mangrove forests, enhance coastal carbon storage and boost adaptive capacity. In the same vein, establishing marine protected areas (MPAs) or locally managed areas (LMMAS) can help bolster ecological resilience by providing refuge for species to adapt to changing conditions (Gattuso et al., 2018). These approaches not only mitigate acidification but also enhance the ability of marine ecosystems to withstand and recover from environmental stressors, which in turn enhance and protect marine resources that comprise the blue economy.

These existing actions should be incorporated into any actions taken under Targets 7 and 8 of the 2030 Targets. Integrating current efforts with new initiatives under the GBF can create a more comprehensive and effective approach to addressing acidification and its impacts on marine biodiversity. Regional action through regional institutions such as the European Union or the African Union can also ensure a more coordinated and more adaptive approach to OA action.

UN DECADE OA SCIENCE PROGRAMME CAN HELP PARTIES DEVELOP OA MEASURING AND REPORTING UNDER CBD

The Ocean Acidification Research for Sustainability (OARS) programme, endorsed by the UN Ocean Decade, includes a vast network of OA scientists and practitioners. OARS strives to address and reduce the impacts of acidification through increased collaboration, capacity building, and effective communication. OARS can support discussions between the scientific community and policymakers in their pursuit of informed mitigation and adaptation strategies, as well as Party actions to implement Target 7 and 8 with a focus on ocean acidification.

OARS has established seven different Outcomes to be achieved by 2030. In line with that, OARS Outcome #4, "Biological Impacts," aims to better under the possible impacts acidification can have on marine organisms and ecosystems by implementing biological observation strategies into marine monitoring. Overall, this may also lead to better predictions of vulnerability and resilience in addition to recommendations for targeted response to ocean and coastal acidification.

With its push toward integrating biological observations and ocean acidification monitoring, OARS Outcome #4 can facilitate the evaluation of the effectiveness of actions taken under Targets 7 and 8 in response to coastal and ocean acidification. Additionally, OARS can leverage its existing network of interdisciplinary actors to increase collaboration and ensure effective communication of the ensuing results of the actions taken under Targets 7 and 8.

Recommendations for Parties to Take Action on Ocean Acidification Across CBD Targets

- **Implement Targets 7 and 8 with a focus on ocean acidification (OA).**
- **Take actions in line with Targets 7 and 8 to minimize and address OA.**
- **Effectively communicate and report the results of the actions taken under Targets 7 and 8 with the help of OA Research for Sustainability Programme under the UN Decade and relevant OA policy bodies.**

HELPFUL RESOURCES:

- OA Research for Sustainability Programme, UN Decade of Ocean Science
- OA Research for Sustainability Programme, Commitments.
- "Ocean acidification and biodiversity loss: Connecting the dots with data," Economist Impact for Back to Blue, an initiative of Economist Impact and The Nippon Foundation.
- CBD Target 8 Guidance Minimize the Impacts of Climate Change on Biodiversity and Build Resilience.
- CBD Target 7 Guidance Reduce Pollution to Levels That Are Not Harmful to Biodiversity.

CONTACT:

For further information, please contact Jessie Turner (jturner@unfoundation.org) and Punyasloke Bhadury (pbhadury@iiserkol.ac.in), Co-champions of OARS Working Group 7 on Policy Engagement, and Amy Kenworthy (ake@pml.ac.uk), OARS Programme Officer.

OA ALLIANCE
INTERNATIONAL ALLIANCE TO COMBAT OCEAN ACIDIFICATION

OARS
Ocean Acidification Research for Sustainability

REFERENCES:

- Bindoff, N.L., Cheung, W.W.L., Kairo, J.G., Arístegui, J., Guinder, V.A., Hallberg, R., Hilmi, N., Jiao, N., Karim, M.S., Levin, L., O'Donoghue, S., Purca Cuicapusa, S.R., Rinkevich, B., Suga, T., Tagliabue, A. and Williamson, P., 2019. Changing ocean, marine ecosystems, and dependent communities. In: H.-O. Pörtner, D.C. Roberts, V. Masson-Delmotte, P. Zhai, M. Tignor, E. Poloczanska, K. Mintenbeck, A. Alegría, M. Nicolai, A. Okem, J. Petzold, B. Rama and N.M. Weyer (eds.), *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*. [online] Cambridge University Press. Available at: https://www.ipcc.ch/srocc/ [Accessed 23 Sep. 2024].

- Doney, S.C., Busch, D.S., Cooley, S.R. and Kroeker, K.J., 2020. The impacts of ocean acidification on marine ecosystems and reliant human communities. *Annual Review of Environment and Resources*, 45, pp.83-112.

- Duarte, C.M., Hendriks, I.E., Moore, T.S., Olsen, Y.S., Steckbauer, A., Ramajo, L., Carstensen, J., Trotter, J.A. and McCulloch, M., 2013. Is ocean acidification an open-ocean syndrome? Understanding anthropogenic impacts on seawater pH. *Estuaries and Coasts*, 36(2), pp.221-236.

- Gattuso, J.P., Magnan, A., Bopp, L., Cheung, W.W.L., Duarte, C.M., Hinkel, J., McLeod, E., Micheli, F., Oschlies, A., Williamson, P., Billé, R., Chalastani, V.I., Gates, R.D., Irisson, J.O., Middelburg, J.J., Pörtner, H.O., Rau, G.H. and Sumaila, U.R., 2018. Ocean solutions to address climate change and its effects on marine ecosystems. *Frontiers in Marine Science*, 5, p.337.

- Hoegh-Guldberg, O., Poloczanska, E.S., Skirving, W. and Dove, S., 2017. Coral reef ecosystems under climate change and ocean acidification. *Frontiers in Marine Science*, 4, p.158.

- Kroeker, K.J., Kordas, R.L., Crim, R.N. and Singh, G.G., 2013. Meta-analysis reveals negative yet variable effects of ocean acidification on marine organisms. *Ecology Letters*, 13(11), pp.1419-1434.

- Nagelkerken, I. and Munday, P.L., 2016. Animal behaviour shapes the ecological effects of ocean acidification and warming: moving from individual to community-level responses. *Biological Reviews*, 91(2), pp.401-429.

- Orr, J.C., Fabry, V.J., Aumont, O., Bopp, L., Doney, S.C., Feely, R.A., Gnanadesikan, A., Gruber, N., Ishida, A., Joos, F., Key, R.M., Lindsay, K., Maier-Reimer, E., Matear, R., Monfray, P., Mouchet, A., Najjar, R.G., Plattner, G.K., Rodgers, K.B., Sabine, C.L., Sarmiento, J.L., Schlitzer, R., Slater, R.D., Totterdell, I.J., Weirig, M.F., Yamanaka, Y. and Yool, A., 2005. Anthropogenic ocean acidification over the twenty-first century and its impact on calcifying organisms. *Nature*, 437(7059), pp.681-686.

- Widdicombe, S., Isensee, K., Artioli, Y., Gaitán-Espitia, J. D., Hauri, C., Newton, J. A., Wells, M. and Dupont, S. (2023) 'Unifying biological field observations to detect and compare ocean acidification impacts across marine species and ecosystems: What to monitor and why', *Ocean Science*, 19(1), pp. 101–119. doi: 10.5194/os-19-101-2023.