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POLICY BRIEF 2021/02

Policy Brief: Global and Regional Management of Ocean Acidification

SUMMARY

Anthropogenic CO₂ emission is the main contributor to Ocean Acidification (OA) because the dissolution of this gas in seawater leads to changes in its chemistry resulting in seawater acidity and a lowering of the calcium carbonate saturation state. Apart from impacting severely life at sea, OA acts in conjunction with other environmental drivers connected to climate change, such as increased ocean temperature and lower oxygen content, resulting in combined synergistic or combined negative effects to marine life.

Despite the increasing scientific certainty on its scale and consequences, and on the need for immediate action, OA stands as a highly overlooked item on the environmental agenda, generally neglected by policy-makers at the international, regional and domestic level. Scholars from different disciplines have pointed out the key challenges in dealing with OA in the current fragmented governance landscape, and highlighted that a coordinated governance effort is needed to address OA effectively. At the international level OA is neither adequately integrated in the climate change regime, which is considered a crucial forum for OA, nor in other multilateral environmental treaties, such as the Convention of Biological Diversity, or the Law of the Sea. At the European level, national policies and legislation addressing OA remains scarce and uncoordinated.

KEY RESULTS

- OA is a global problem with profoundly negative environmental, social and economic consequences.
- From a regional and global perspective, there is a need to ensure a coordinated governance effort to directly address it.
- Problems associated with OA and the solutions needed to address it are quite unique and cannot be bundled together with traditional climate change responses and measures.
- At the European level, national policies and legislation addressing OA remains scarce and uncoordinated.

RECOMMENDATIONS

- Enact specific legislation that would be able to steer OA mitigation through continued assessments in understanding the nature of the risks posed by OA in local, regional and international waters.
- Conduct vulnerability assessments to identify gaps where further research could be most useful and show whether appropriate adaptation strategies are giving the desired results.
- Strengthen the EU MSFD by making it more comprehensive towards OA abatement, which could be further synergised with other EC Directives.

THE CONTEXT

Among many other impacts, the incessant and rapid rise of atmospheric CO₂ levels by anthropogenic activities is leading to an increase of seawater acidity which is negatively impacting shell-forming marine organisms ranging widely from plankton to benthic molluscs, echinoderms, and corals. The potential for marine organisms to adapt to increasing CO₂ and its broader implication to ocean ecosystems are still yet not fully understood, as are those processes that tend to exacerbate OA, especially within coastal areas.

The OA problem needs to be seen as an increased pressure on marine living resources, which are already under intense physico-chemical and biological stress due to increased ocean warming, introduction of alien,

competing species, and to coastal pollution (such as anoxia, plastics and eutrophication). The most effective way to limit OA is to quickly implement solutions that continue reducing CO₂ emissions. However, the management of OA requires a stronger prioritisation towards managing and reducing multiple stressors, and not only to reduce CO₂ levels in the atmosphere. This Policy Brief actively encourages prioritisation of research that explores ways how to incorporate the mitigation of OA within conservation planning and management.

RESEARCH RESULTS

In the sea, the absorption is temporally and spatially regulated to variable extents by the complex interaction of physical and biogeochemical processes, including sea temperature, marine circulation, primary production of phytoplankton and algae, respiration of plants and animals. Current research is trying to uncover the causes behind the observed differential uptake of CO₂ not only at the ocean surface but also by the ocean interior. Parallel research is also leading to an enhanced understanding of how coastal waters are decreasing their productivity due to the observed increase in CO₂ uptake.

Most visibly and directly felt by European citizens is the fact that OA is negatively impacting several commercially exploited marine organisms including corals, bivalves, crabs and sea urchins. Increased acidity could reduce the ability of corals to build their skeletons and make them less resilient to other stressors, such as bleaching and nutrient overloading. In addition, indirect effects of OA include changes in the interaction among species, leading to shifts in competitive interactions and to changes in complex habitats which will also impact the marine resource extraction sectors across Europe.

OA also tends to act in conjunction with other environmental drivers related to climate change, such as increased ocean temperature and lower oxygen content. The combined effects of OA and other drivers could have both synergistic or antagonistic effects. Such perceived complexity of the processes governing OA and interacting with it, prevents the scientific community from providing clear predictions about the full and realistic impacts of OA at ecosystem level.

POLICY RECOMMENDATIONS

To date, OA is still not a focus area at the global stage. The international community is aware of the challenges of climate change and the potential devastating consequences of OA, though. We see this with the creation of the International Panel on Climate Change (IPCC) in 1988 and the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 notably. Moreover, the UN Sustainable Development Goals (SDG) in particular, SDG 14 – Life Below Water, dealing with ocean sustainability, specifically targets the reduction of OA (Target number 14.3). However, within the international climate change regime, there still has not been put forward a clear approach towards reaching an agreement on how to mitigate, and curb the effects of, OA. In fact, OA has been consistently side-lined in the development of climate change and related environmental policies at the global as well as the domestic arenas (Kim, 2012).

There are nonetheless a number of international agreements that are relevant for OA governance, either because they already include or have the potential to include OA in their multilateral governance frameworks (Harrould-Kolieb and Hoegh-Guldberg, 2019). First, the international climate change regime is a natural arena in which to reach an OA agreement or road map for mitigation (Harrould-Kolieb, 2019). This is because OA is considered an effect of change in 'the state of the climate system', and importantly, the climate regime already provides funding mechanisms and could include integration methods with national adaptation plans for OA (Harrould-Kolieb and Herr, 2012). However, proper concrete actions on how OA could be integrated within the UNFCCC are still lacking to date. In 2015, when the Paris Agreement was agreed upon, the goal of the agreement was to halt the increase in global average temperature and ensure that it was kept well below 2°C above pre-industrial levels. The tools of choice for this mitigation and adaptation approach to climate change was through Nationally Determined Contributions (NDCs). These were national pledges to reduce emissions within a given country, which could be a roadmap for how to integrate OA as an indicator at the national level. However, the Paris Agreement did not include any reference to OA or even to ocean warming as a concept. In fact, there is only one reference to the ocean in the Agreement, which was a note on "...the importance of ensuring the integrity of all ecosystems, including oceans..." (UNFCCC, 2015).

The governance and regulatory framework for OA has nevertheless developed in a number of other arenas, for example in the Convention on Biological Diversity (CBD) (1992). This agreement recognises OA as a threat to an accelerated loss of marine biodiversity, and brings attention to how it could affect livelihoods and economies of communities that depend on marine life across the globe. Despite this recognition, further action is needed under the CBD regime (Harrould-Kolieb, 2021). The United Nations Conference on Sustainable Development adopted 'The Future We Want' which also reflects OA concerns (UN General Assembly 2012) and in 2012, a conference was launched to promote, facilitate, and communicate global initiatives on ocean activities, namely the Ocean Acidification International Coordination Centre in Monaco (OA-ICC). This latter has as its aim to encourage states to develop adaptation strategies to curb OA, while using the precautionary and ecosystem-based approaches (International Atomic Energy Agency, 2012).

Regional and domestic level approaches suffer from similar gaps in the regulation and implementation. A recent study by Galdies et al. (2020) on 90 legislative documents from 17 European Economic Area countries, has shown that though OA was acknowledged in the higher levels of governance throughout Europe, its status as an environmental challenge was greatly diluted at national levels. In fact, with the exception of Italy and the Netherlands, it was notable that member states were inadequately or not all reporting to the Marine Strategy Framework Directive by EU members on OA in their country. In 2013, the EU did adopt an Adaptation Strategy Package COM/2013/216, which, though it is of a general and non-binding nature, still aims to reduce the vulnerability in the Union to the impacts of climate change, but no specific provisions for OA have been included here either.

Clearly, a stronger and more coordinated approach is needed to build environmental, economic and social resilience of the observed and anticipated changes to the coastal marine systems. One way forward could be to enact specific legislation that would be able to steer OA mitigation through continued assessments in understanding the nature of the risks posed by OA in local, regional and international waters. To this end, vulnerability assessments will help identify gaps where further research could be most useful and show whether

appropriate adaptation strategies are giving the desired results. Within a European dimension, this process could well mimic the development of the Nitrates Directive (91/676/EEC), which is one key instrument in the protection of waters against agricultural pressures leading to eutrophication. In a similar way, an OA Directive could well be a new instrument for the Water Framework Directive (2000/60/EC) towards the education of aquatic pollution (in this case by increased dissolution of CO₂). The EU MSFD could also be used more comprehensively towards OA abatement, which

could be further synergised with other EC Directives such as the WFD and the ND that can affect OA levels in coastal locations of the EU. In this regard, the MSFD is seen by many as the next cohesive framework aimed at ecosystem-oriented management of water resources at the European level, taking note however, of its current limitations and the need of reinforcing this Directive by the need to set 1) quantifiable and determined environmental thresholds and targets, and 2) regional and/or sub-regional cooperation to facilitate that attainment of GES in European waters.

REFERENCES

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The European COST Action "Ocean Governance for Sustainability - Challenges, Options and the Role of Science" comprises a unique, transdisciplinary network of 29 European countries.

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