

Ocean Acidification Action Plan of the Netherlands

Background

The Government of the Netherlands joined the International Alliance to Combat Ocean Acidification (hereafter OA Alliance) at the Global Climate Action Summit in San Francisco on September 13, 2018. Ocean Acidification is one of several important stressors of ocean health. It is a global issue, surpassing the ability of any one state to address it in isolation. On the contrary, it requires a concerted action by the global community to address its cause (anthropogenic CO₂ emissions) and its effects. This insight prompted the Netherlands to join hands with many other actors within the OA Alliance.

One of the commitments involved in joining the OA Alliance is to produce an Ocean Acidification Action Plan (Action Plan). This Action Plan focusses on the five goals of the call to action of the OA Alliance:

- Advance Scientific Understanding
- Reduce the causes of Ocean Acidification
- Build adaptation and resiliency
- Expand public awareness
- Build sustained international support

This document is the Dutch Action Plan. It describes the contribution of the Netherlands to these five goals of the call for action.

A summary of main actions

- Develop dialogue with knowledge partners
- Build and share our knowledge base
- Improve monitoring and data sharing
- Reduce GHG emissions with 49% by 2030
- Realize Good Environmental Status in national waters
- Reduce anthropogenic pressures on coral
- Improve ocean literacy
- Support international initiatives to raise awareness and mitigate impact

What is ocean acidification?

The Ministry of Infrastructure and Water Management of the Netherlands requested the Royal Netherlands Institute for Sea Research (NIOZ) to prepare an overview of ocean acidification and its causes and consequences. The resulting publication “Causes and Consequences of Ocean Acidification with special emphasis on the Dutch territorial waters” was published in 2018.¹ This document gives a succinct overview of the chemistry behind Ocean Acidification and of the few knowns and many unknowns of its consequences, including an overview of recent literature and research, with an emphasis on the North Sea and Caribbean Sea.² There is no need to reproduce the complete overview provided in this publication in the current Action Plan. Suffice it to say that the oceans have absorbed around 30% of anthropogenic CO₂ emissions since the industrial revolution and will continue to absorb part of current and future emissions. The increased dissolved CO₂ causes a shift in the balance of inorganic carbon species in our oceans and moves the ocean pH towards the acidic (less alkaline) side of the pH scale. As a result the relative amount of available carbonate decreases. Both the increased acidity and the shift in relative abundance of carbonate (an important building block of life in the oceans in the form of calcium carbonate CaCO₃) have consequences for individual life forms, food webs and ecosystems and result in decreasing marine biodiversity.³ The impacts are little understood, but potentially extremely serious both in ecological and economical terms. The fact that ocean acidification does not operate in isolation, but is part of a set of little understood stressors, like ocean warming, eutrophication and anoxia, chemical and plastic pollution, (unsustainable) fisheries and invasive species, to name but a few, makes it even more difficult to understand its impact and possible courses of action.

Ocean acidification in relation to international agreements

The Netherlands is party to the UNFCCC Paris Agreement and committed to the United Nations 2030 Agenda for Sustainable Development. These two multilateral agreements provide the backbone to our commitment to healthy and productive oceans.

The Paris Agreement aims to limit global temperature rise to well below 2 degrees Celsius compared to pre-industrial levels and pursues efforts to limit the temperature increase to 1.5 degrees Celsius. The Nationally Determined Contribution (NDC) of the European Union – which applies to the Netherlands - sets an emission reduction target of at least 40% by 2030 but the Netherlands is aiming at -49%. A Climate Law has recently been adopted by parliament which sets a 95% reduction goal for 2050. The reduction of CO₂ emissions is directly relevant to ocean acidification. It is currently the only measure to limit it.

Sustainable Development Goal 14 Life below Water (Conserve and sustainably use the oceans, seas and marine resources) is the goal in the UN 2030 Agenda that specifically addresses healthy productive oceans. Its target 14.3 aims to “Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels”.

¹ De Nooijer, L.J. and Reichart, G.J. (2018) *The causes and consequences of ocean acidification*, NIOZ report 2018-04. In English with a Dutch summary. Available under <http://imis.nioz.nl/imis.php?module=ref&refid=300997>

² The Dutch EEZ and continental shelf cover an important part of the North Sea. In addition, the islands of St. Eustatius, Saba and Bonaire in the Caribbean are Dutch municipalities, whereas the islands of St. Maarten, Curacao and Aruba are autonomous countries within the Kingdom of the Netherlands. Therefore, the consequences of acidification within these seas are of direct concern to the Netherlands.

³ IPBES (2019) *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. E. S. Brondizio, J. Settele, S. Diaz, and H. T. Ngo (editors). IPBES Secretariat, Bonn, Germany.

The Netherlands is also signatory to other agreements of relevance to ocean health. Of particular interest in relation to (the impact of) ocean acidification is the Convention on Biological Diversity. The Aichi Biodiversity Target 10 concerns “By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.”

At a more regional level, the European Union Marine Strategy Framework Directive (MSFD), obliges Member States to achieve and/or maintain good environmental status of their national marine waters and to take measures to meet the established criteria. The 2017 MSFD revised strategy⁴ includes the criteria and methodological standards on Good Environmental Status of marine waters. Annex III of the revised strategy mentions pCO₂ and pH specifically as possible parameters relevant for monitoring in relation to ecosystem elements, anthropogenic pressures and human activities relevant to marine waters.

Although ocean acidification is considered within these international agreements as one of the challenges to sustainable development and ecosystem integrity, it has remained in the shadow of global warming, partly because its impacts are little understood and not immediately evident. The role of the oceans in the regulation of global climate and the importance and workings of the ocean as a regulator of atmospheric CO₂ has increasingly become clear. With the recognition that the uptake of CO₂ by the oceans is not only a blessing in terms of slowing global warming, but that this uptake is impacting the chemistry of the oceans in ways that may have major consequences for ecosystems and ocean productivity, ocean acidification is seen for what it is: a factor that not just contributes to a mix of stressors, but that in its own right already may seriously threaten human survival if not checked.

Contributing to international cooperation through national action

The Netherlands joined the OA Alliance out of recognition that ocean acidification is a global problem that requires global action. At the same time, global action ultimately depends on individual actions. This is borne out by the action agenda of the OA Alliance. The driver of ocean acidification is well understood. The only viable option to limit acidification is through an ambitious reduction of CO₂ emissions. Global emission reduction to limit climate change and emission reduction to limit acidification go hand in hand. Understanding the consequences of acidification will reinforce the urgency of climate action. Even without climate change, the survival of healthy and productive oceans requires emissions reduction. And emission reduction requires common action of the global community.

Here is another reason for cooperation. Improved understanding of the effect of acidification will help build the case for emission reduction. At the same time, our knowledge of the ocean in all its aspects is limited, a problem that for instance the United Nations Decade of Ocean Science for Sustainable Development (2021 – 2030) tries to address. Improvement of our knowledge and understanding of ocean acidification must certainly be part of the Decade. The OA Alliance and its members have an important role to play to achieve this, but evidently it is not necessary to wait until 2021 or the end of the Decade to act.

Improved knowledge of the consequences of ocean acidification not only serves to build the case for mitigation, but is equally important to understand what possible action agenda we can develop in response to it. Building and sharing our knowledge base, from monitoring of ocean chemistry to understanding of impacts on ecosystems and food webs, in isolation and as part of a cocktail of stressors, is the only way to respond to the urgency of the challenge.

⁴ Commission Directive (EU) 2017/845 of 17 May 2017 amending Directive 2008/56/EC of the European Parliament and of the Council as regards the indicative lists of elements to be taken into account for the preparation of marine strategies (L125/27).

As explained in this Action Plan, the Netherlands works on the five goals of the call for action. We develop national activities and contribute to the global action agenda. As argued convincingly in De Nooijer & Reichart (2018) there are essential differences in the development and consequences of ocean acidification in Dutch territorial waters and that of the open ocean, which in itself is not homogeneous either. This is exactly why local knowledge is essential to complete the global picture.

Five Goals for Action

Goal 1: Advance Scientific Understanding

Scientific research on acidification is done by research institutes and universities.⁵ During 2019 the Dutch government publishes its Strategic Agenda North Sea 2030. The research agenda, which is part of this strategic agenda, includes research questions on acidification. An important research topic concerns how acidification affects the food web. It also stresses the need to monitor acidification and temperature of the North Sea. Dutch funding for North Sea research is increasing.

The ministry of Infrastructure and Water Management is the responsible authority for water management and implementation of the Framework Directive Marine Strategy in Dutch national waters. It publishes 'Strategic Knowledge and Innovation Agendas (SKIA)' that formulate strategic questions of importance to the development of (new) policy. This helps research institutes when developing proposals for research under calls published and financed with public funds. The SKIA strategic questions provide important input to show how research proposals serve the public interest. Strategic questions regarding ocean acidification's causes and consequences in relation to ocean health and ecosystem integrity are part of the most recent SKIA of the directorate general Water and Soil Policy.

In its update of the MSFD strategy, the Netherlands stresses that acidification currently occurs more rapidly in coastal seas like the North Sea than in oceans. In 2018 the ministry assigned a multi-annual acidification monitoring program in Dutch territorial waters to the Royal Netherlands Institute for Sea Research (NIOZ) as part of the knowledge base to achieve a productive, biodiverse, healthy and climate resilient North Sea. This program will run for (at least) seven years. It consists of three hundred measurements per year, executed on a monthly and/or quarterly basis. As the CO₂ system of the North Sea has a large spatial and temporal variability, maximum effort will be taken to capture all changes in the parameters DIC, TA and pH. The measurements will allow recording of changes in pCO₂. Measurements and reporting are done according to the highest internationally accepted procedures. Acquired data will be shared through international fora, like ICES. This improved monitoring also supports reporting on SDG 14.3. A monitoring project for part of the Dutch territorial waters in the Caribbean is being planned. Scientific evidence suggests that the same level of carbon addition to the sea causes different effects for the North Sea and in the Caribbean.

⁵ Typical examples are (non-exhaustive): The University of Amsterdam (UvA) works with the Naturalis Biodiversity Center and the Royal Netherlands Institute for Sea Research (NIOZ) on the impact of acidification on snails in the Atlantic Ocean and waters off Antarctica. UvA also participates in the Atlantic Meridional Transect Program, a multidisciplinary program for biological, chemical and physical oceanographic research. Several Dutch universities and NIOZ work together in the Netherlands Earth System Science Centre (NESSC), which aims to quantify and understand climate sensitivity. Two of its five research themes are 'Greenhouse gas sources and sinks' and 'Ocean carbonate system dynamics'. The Netherlands Institute of Ecology (NIOO-KNAW) is involved in research regarding the effects of acidification on phytoplankton and (harmful) algal blooms. The Technical Universities of Delft and Twente investigate together with NIOZ, MARIN and TNO the effects of acidification on sound propagation in the ocean.

The Dutch Marine Strategy⁶ (the transposition of the EU Marine Strategy Framework Directive) defines ocean acidification as an extraordinary pressure. The pH is included in the regular monitoring programs under the strategy, and it recognized that a second indicator will be needed in order to adequately monitor the impact of acidification.⁷ The Netherlands supports the joint development by the OSPAR Commission (for protection and conserving the North-East Atlantic and its resources) and ICES (the International Council for Exploration of the Seas) of guidance on this second indicator, in order to come to a coordinated choice for joint monitoring.

In 2018 the Netherlands was one of the parties to establish an intersessional correspondence group (ICG) on acidification within the OSPAR framework. Its concluding statements will be incorporated in the OSPAR 2023 Quality Status Report. The 2019 – 2023 working program of the ICG will focus on:

- Promoting, coordinating and collecting the results of research programs on measuring, monitoring and analyzing acidification variables. Data will be reported by member states to the ICES data base;
- Presenting impacts (or predicted impacts) from observed declines in pH, including for example consideration of impacts on marine protected areas (MPAs) and the consequences of OA on sensitive species;
- Research of (a) suitable indicator(s), measurements, and analyses.

The Global Ocean Acidification Observing Network (GOA-ON) supports setting up regional hubs. In March 2019 the GOA-ON North-East Atlantic Hub has been established. The Netherlands has joined this hub. The hub aims to:

- Foster communities of practice for the efficient collection of comparable and geographically distributed data to assess ocean acidification;
- Share information on OA monitoring (and experimental and modelling) activities;
- Facilitate capacity building and training activities;
- Promote community “best practices”.

The aims of the North-East Atlantic hub are complementary to the working program of OSPAR.

The ministries cooperating to contribute to SDG 14 in the international context participate in a national half-yearly meeting “Living Oceans” with NGOs, knowledge institutes and private sector parties to discuss issues of common interest. Improving knowledge of ocean acidification is promoted there. In this way the government strives to increase attention for, and scientific knowledge of, ocean acidification.

Goal 2: Reduce the causes of Ocean Acidification

The Netherlands has committed itself to a reduction of 49% of Greenhouse Gas (GHG) emissions by 2030 compared to 1990. Currently the government is preparing the action agenda that will allow achieving that target. For detailed information we refer to the ministry of Economic Affairs and Climate Policy: <https://www.government.nl/topics/climate-change>. Of particular relevance to the sustainable development of the North Sea is the setting up of 11 GW of wind farms over the next decade, which is an important part of the transition to renewable energy to meet the requirements of the Paris Agreement, and the ambition to produce and harvest seaweed for the production of biofuel. The

⁶ Marine Strategy for the Dutch part of the North Sea 2012-2020 Part 2 - MSFD Monitoring Programme – summary. Available under <https://www.noordzeeloket.nl/beleid/europese/achtergrond/documenten-mariene/@171617/marine-strategy-2/>

⁷ Although monitoring the pH and related variables (like alkalinity, pCO₂, DIC) is essential, in itself the pH value tells us little. What concerns us is the impact in local ecosystems, widely differing between for instance the Caribbean and the shallow North Sea, resulting from changes in pH and related variables. The Netherlands favors a discussion regarding the indicators reported for SDG 14.3 that pays attention to this issue.

Netherlands is also developing a maritime Green Deal with Dutch stakeholders as part of the current Cabinet agenda. The ambition of the Green Deal is to attain 70% reduction of GHG emissions by Dutch seagoing vessels in 2050 and zero emission for inland shipping by that same year.

Goal 3: Build adaptation and resilience

We refer to goal 1 above in relation to the development of knowledge about impacts that will help to eventually understand what possible actions there are to improve adaptive capacity. Currently the Netherlands sees the avoidance of cumulative pressure as the obvious immediate action to increase resilience against acidification. In the North Sea this is achieved through the implementation of the EU Marine Strategy Framework Directive (MSFD) and efforts to reach Good Environmental Status. The Strategy North Sea 2030 is currently being developed to facilitate the realisation of various economic usages of the Dutch territorial waters that often have conflicting spatial claims against the premise of improved ecosystem integrity. The importance of considering the additional stressor of ocean acidification, also as part of the cumulative effect of its combination with other stressors, is part and parcel of this process.

The North Sea is a shallow coastal sea and acidification is not straightforward and linear in relation to atmospheric pCO₂, but fluctuates seasonally and depending on biological productivity and the influx of river and North Atlantic waters. Long term monitoring will help better understand the relation between acidification and other processes in the North Sea.

The issue is at least as complicated in the Caribbean Dutch waters, in view of limited understanding of the local marine chemistry. However, the coral systems surrounding the Caribbean territories are under immense pressure of a variety of stressors like eutrophication, limited water treatment, soil erosion and unsustainable fisheries. The coral systems play a very important role in the economies of these islands through their ecosystem services, for instance in food security or through tourism. Improving the resilience of these essential ecosystems is an urgent task and the Netherlands is currently working with local authorities on for instance the reduction of erosion (through the control of invasive and feral species) and water quality improvement. An action plan for Caribbean⁸ coral is expected in the autumn of 2019.⁹

Goal 4: Expand public awareness

There is intense public debate in the Netherlands (as elsewhere) on anthropogenic CO₂ emissions in relation to climate change and the transition to a renewable energy supply. In this public discourse ocean acidification is not yet a mainstream topic. The ministry of Infrastructure and Water Management is promoting more widespread attention to the issue through the distribution of the study by De Nooijer & Reichart (2018) and promotion of ocean acidification research through its Strategy North Sea. In this way the ministry strives to make ocean acidification better known and to shift it from the scientific to the policy realm. The government of the Netherlands aims to improve awareness of the issue, for instance by raising the issue strategically in (high-level) meetings, conferences and at other relevant occasions. Its membership of the OA Alliance must be seen in this light. The Netherlands views ocean acidification as one of a combination of stressors to ocean health that need addressing by improved "ocean literacy". That is why the Netherlands support the work of the SDG

⁸ "Caribbean" refers to the Caribbean islands that are part of the Netherlands: Saba, St. Eustatius and Bonaire.

⁹ The Netherlands Initiative Changing Oceans (NICO) expedition of 2017-2018 discovered some Coral Reefs in the Saba Bank that appeared to have escaped negative impacts until now. This underlines the importance of action now. For more information see https://nico-expeditie.nl/application/files/6015/5134/3169/NICO_magazine_NL_en_ENG_-small.pdf

Charter, a Dutch NGO working to support the ambitions covered by the UN Sustainable Development Goals by improving public awareness and ocean literacy.¹⁰

Goal 5: Build sustained international support

The Dutch government considers raising the awareness of, and scientific knowledge about, ocean acidification as an important part of the drive to achieve emissions reduction, healthy and productive oceans and biodiversity targets that it is committed to through multilateral agreements. As such, the Netherlands will support initiatives to raise awareness and scientific understanding of mechanism and actions to mitigate the impact of ocean acidification in multilateral negotiations. The aforementioned support and activities in OSPAR, the GOA-ON hub and others reflect this.

¹⁰ See for instance <https://www.sdgnederland.nl/> and <https://www.sdgnederland.nl/nieuws/the-dead-zone/>