

**Brazilian Agricultural Research Corporation
Ministry of Agriculture, Livestock and Food Supply**



Sustainable Development Goal 14

LIFE BELOW WATER

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Chapter 1

Life below water: conservation and responsible use of seas, oceans and coastal environments

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Introduction

Oceans cover three quarters of the planet surface, connect populations through ports and markets; are, thus, an important natural and cultural heritage for humanity. Marine environments offer important environmental services: they provide approximately half of the oxygen we breathe, absorb more than a quarter of the carbon dioxide (CO₂) we produce, play an important role in water cycle and climate system, and are an essential source of biodiversity. All this contributes to marine and continental ecosystem sustainability, to economic development, to poverty eradication, to food security, to transportation and maritime traffic, to decent work opportunities and means of survival (United Nations, 2017).

Despite the many benefits that life in water brings us, the adverse effects of global changes aggravated by human action can be perceived in ocean temperature rising, acidification of seas and coastal zones, deoxygenation of marine environments, rising sea level, polar ice caps melting, erosion of coastal zones, silting of river mouths, extreme winds, pollution, disorderly exploitation of oil resources, reduction of fish stocks, changes in physiology and metabolism of aquatic species as a result of harmful substance bioaccumulation in the environment, overfishing, illegal fishing, conflicts, among many other.

In order to organize a forum for discussing and aligning decisions on the sustainability of the oceans, in 1982 in Montego Bay, Jamaica, the *United Nations Convention on the Law of the Sea* (UNCLOS) was signed, which has standardized numerous actions, such as maritime transit, border delimitation, environmental regulations, scientific research, trade and international conflict resolution. Brazil

ratified its participation in UNCLOS on December 22nd, 1988 (United Nations, 2017). In 2012, the *United Nations Conference on Sustainable Development (Rio+20)* considered the oceans and coastal waters as fundamental for the planet survival, emphasizing the importance of their conservation and responsible use, also for poverty eradication, food security and decent work, while protecting biodiversity, the marine environment and populations and countries dependent on marine fishery resources, and proposing reduction and remediation of climate change impacts on these ecosystems (Beirão; Pereira, 2014).

Faced with this worrying scenario, in September 2015, 193 United Nations (UN) member states gathered to discuss a new global agenda committed to people, the planet and peace. The 2030 Agenda for Sustainable Development presents 17 sustainable development goals (SDG) and 169 targets designed to foster a better world (Machado Filho, 2017). Among these goals, Goal 14, entitled Life Below Water, was created to promote, in general terms, the conservation and sustainable use of oceans, seas, other fishery resources and coastal zones.

SDG 14 and its relation with the world

The movement of the oceans, through marine currents, distributes nutrients and heat to coastal areas (Figure 1), being the energy that moves life on the planet, the motor that regulates various natural processes that generate our food, renew the water and air we breathe. Throughout history and to the present day, oceans and seas are vital for trade, transportation, energy and wealth generation and food (United Nations, 2016).

Oceans contain 97% of the planet's water and cover three quarters of the Earth's surface. It is not by chance that more than 3 billion people depend on the seas and oceans for their livelihood, generating about 5% of the world's gross domestic product (GDP) or approximately US\$ 3 trillion per year as a result of use, trade and other activities related to marine resources and industries. However, the potential value of these resources can never be estimated, since there are millions of unidentified marine species and only 200,000 known (United Nations, 2017).

Among the many biological functions seaweed species perform, they absorb atmospheric carbon dioxide from greenhouse gas emissions, whose main side effects have been acidification of the seas and oceans and global temperature rise. These same species that help regulate the planet's climate join the food chain that feeds billions of people who depend solely on the oceans. Indirectly,



Photo: Fabiola Helena dos Santos Fogaça

Figure 1. Detail of the coastal area of Piauí, Brazil.

marine fisheries employ 200 million people worldwide. Besides offering jobs and food to the world's populations, fisheries, if managed irresponsibly, contribute to the depletion of many fish species and hamper organized and sustainable management of global fisheries, leading to immeasurable social, environmental and economic losses. It is therefore estimated that up to 40% of the oceans are affected by human activities, such as pollution, depleted fisheries and loss of coastal habitats (United Nations, 2017).

The problem with the oceans sustainability is so serious that, in 2017, an article published in the scientific journal *BioScience*, signed by 15 thousand scientists from 184 countries and entitled *World Scientists' Warning to Humanity: A Second Notice*, describes that the 1992 forecasts disseminated at the *United Nations Conference on Environment and Development*, also known as *Eco 92*, were exceeded due to the rapid world population growth (35% increase), and, consequently, there were increased carbon dioxide emissions from fossil fuel use, high impact agriculture, deforestation, drought, loss of marine life and increased so-called dead zones in the oceans (Ripple et al., 2017).

Careful management of this resource is essential for sustainable development. In addition, coastal and marine resources are extremely vulnerable to the impacts of environmental degradation, pollution, overfishing and global climate change. In this sense, the following are some important concepts related to such impacts, which are also particularly relevant to Brazil, and have based the 11 sustainable development targets proposed in the 2030 Agenda (Brasil, 2017).

The proposed targets include avoiding and significantly reducing, by 2025, all types of marine pollution, particularly those from land-based activities, which cause the dispersion of debris and pollution by nutrients, and lead actions mainly related to disposal, management and treatment of solid wastes, such as sewers and effluents. Targets also include sustainably managing and protecting marine and coastal ecosystems, thus strengthening their resilience and taking action for their restoration, in order to achieve healthy and productive oceans by means of conservation of coastal zones, regarded as marine life nurseries. In the same path, by 2020, conserving at least 10% of coastal and marine areas, in accordance with national and international laws and based on the best available scientific research is also a target (United Nations, 2017).

In order to control and monitor climate change in these environments, one of the targets is to minimize and address the impacts of ocean acidification through improved scientific cooperation at all levels. Accordingly, the European calls for submissions to Horizon 2020 (European funding program for research and innovation) are already creating inter-institutional and multidisciplinary networks with the same research focus to broaden knowledge, prioritize and plan actions for coexistence and climate change effect reduction on marine ecosystems. The relation between environment, people and fisheries, in all its aspects, is included in specific targets. Some of them are, by 2020: to regulate harvesting and end overfishing, illegal, unreported and unregulated fishing, as well as to extinguish destructive fishing practices; to implement science-based management plans in order to restore fish stocks in the shortest time feasible, at least to levels that can produce sustainable fisheries development for exploited species; and to provide access for small-scale artisanal fishers to marine resources and markets. Targets also seek to prohibit certain forms of fisheries subsidies that contribute to overcapacity, overfishing, illegal, unreported and unregulated fishing, and the negotiation of fishing subsidies should be dealt with in the World Trade Organization (WTO), prioritizing actions that also benefit the developing and least developed countries (United Nations, 2017).

A number of targets show a great deal of concern about small island developing states and least developed countries. This is because, in the UNCLOS treaty, these countries are already a priority in order to guarantee their sovereignty over their exclusive economic zone (EEZ) and territorial sea. As a result, by 2030, these states could have more economic benefits from the sustainable use of marine resources, including sustainable fisheries management, aquaculture and tourism. For this reason, there will be worldwide investment in broadening scientific knowledge, research capacity and transfer of marine technology in order to improve ocean health and increase the contribution of marine biodiversity to the development of these countries. And finally, it is expected to improve the conservation and sustainable use of oceans and their resources through the implementation of international law, as reflected in the final declaration of the *Rio+20: The Future We Want* (United Nations, 2012).

Important data and facts about SDG 14 in Brazil

Brazil has a coastal area with over 500,000 km², home to 19 Brazilian metropolises where 45.7 million people (24% of the country's population) live (IBGE, 2017). This urban concentration, which places pressure on coastal natural resources, is interspersed with low population density areas, inhabited by fishermen populations and traditional peoples with close relation with marine biodiversity (Brasil, 2017). Because of that and of the economic potential of seas and oceans, Brazil has been focusing on commitments ratified in international conventions and treaties to guarantee its sovereignty over its EEZ by means of designing national policies for the sustainability of seas and oceans.

First, Brazil committed itself to participate in discussions on the Law of the Sea by formulating a proposal for setting the ocean limits of Brazil in order to protect our interests in relation to the so-called Blue Amazonia territory, because of its scale and rich diversity; interest grew after the Pre-Salt layer (Lima, 2015) was discovered. Since then, in addition to its active participation in the *United Nations Convention on the Law of the Sea*, Brazil also became a signatory to conventions on biological diversity and climate change (Machado Filho, 2017).

Subsequently, other programs and projects were developed. The main objectives of Programa Oceanos, Zona Costeira e Antártica (Oceans, Coastal Zone and Antarctic Program) are personnel training, carrying out scientific research to promote environmental conservation and learning about mineral and biological potential of international areas and the Brazilian continental shelf, and shaping

the Política Nacional para os Recursos do Mar (National Policy for Sea Resources – NPRS), which provides for the shared marine environment use and coastal zone management, including its exploitation rights (Brasil, 2017).

Another marine coastline integrated management project, named Projeto Orla (Coastline Project), focuses on the Brazilian coastline (Figure 2), whose goal is to scan 100% of the coastal zone by 2019. Based on gathered information, it will be possible to assist coastal municipalities in sustainably using and occupying terrestrial space and preventing erosive processes, contamination of water bodies and social conflicts between fishing, tourism, aquaculture and space occupancy (Brasil, 2017).



Photo: Luiz Eduardo Lima de Freitas

Figure 2. Detail of the occupancy on the coast of Santa Catarina, Brazil.

In 2016, the Plano Nacional de Adaptação à Mudança do Clima (National Adaptation to Climate Change Plan – NAP) was implemented to promote Brazil's adaptation to climate effects in coastal and marine areas. Also aiming at the conservation of coastal areas, in addition to funding federal conservation units, the government plans to create other 11 units and expand protected areas to reach 5% of the Brazilian territory by 2019 (Brasil, 2017).

With regard to fisheries and aquaculture, in addition to funding through research agencies and the Plano de Desenvolvimento da Aquicultura Brasileira (Brazilian Aquaculture Development Plan – ADP) – with over BRL 500 million available for investment in the area –, in recent years, the Ministry of the Environment (MMA) and its partners (universities, institutes, non-governmental organizations – NGOs, Brazilian Agricultural Research Corporation – Embrapa, Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis – Ibama and Instituto Chico Mendes de Conservação da Biodiversidade – ICMBio) fostered plan formulations for managing fishery resources for relevant species under risk of overfishing (lobsters, sardines, soft crabs, crabs, prawns, mullets, elasmobranchii, seahorses, groupers, snooks, sea basses, etc.) with emphasis on regulations for fishing and satellite monitoring of vessels in order to reduce marine fauna vulnerability (Machado Filho, 2017).

Embrapa actions for SDG 14 targets

Embrapa participation in research related to marine fishery resources began with the work of Embrapa Food Technology, located in Rio de Janeiro, which started developing studies on more than 27 years ago (Rebelatto Junior et al., 2014). According to a survey on the performance of Embrapa in research, development and technology transfer in the areas of fisheries and aquaculture, there are only four Embrapa Units dealing with marine and estuarine ecosystems: Embrapa Amapá, in the state of Amapá, Embrapa Food Technology, in the state of Rio de Janeiro, Embrapa Mid-North, in the state of Piauí, and Embrapa Coastal Tablelands, in the state of Sergipe (Rebelatto Junior et al., 2013).

Since 2002, Embrapa Mid-North has been carrying out research, development and technology transfer for conservation and management of estuarine and marine aquaculture resources. As of 2009, Embrapa Coastal Tablelands joined a research network with over 20 institutions and made official its participation in discussions related to marine aquaculture. There are also several both finished or ongoing actions and local projects led by other Embrapa Units throughout Brazil, mainly focused on fishing, some of which to encourage its sustainable development and others to investigate marine biotechnology, genetic resources and food processing. These projects related to marine and estuarine fishery resources will be described in the following chapters.

Thus, it is clear that Embrapa already participates in actions that coincide with SDG 14 targets. The fact that this theme is embedded in several goals of Embrapa

Master Plan (PDE), which establishes its strategic map for 2014 to 2034 (Embrapa, 2014) is a proof of this. Among these goals, the following can be mentioned: 1) developing new sciences, because of the enormous demand for knowledge and technologies in this area; 2) researching natural resources and climate change: fully aligned with targets set by UN; 3) developing production systems: developing possibilities for producing quality food in the seas, avoiding overexploitation of marine resources or even freshwater sources; and 4) generating technologies to ensure food security, nutrition and health: the importance of quality marine fish for export, for the human diet and for the subsistence of numerous Brazilian families.

References

BEIRÃO, A. P.; PEREIRA, A. C. A. (Org.). **Reflexões sobre a Convenção do Direito do Mar**. Brasília, DF: Fundação Alexandre de Gusmão, 2014. 589 p. Available at: <funag.gov.br/loja/download/1091-Convencao_do_Direito_do_Mar.pdf>. Accessed on: Nov 10, 2017.

BRASIL. Secretaria de Governo da Presidência da República. **Relatório nacional voluntário sobre os Objetivos de Desenvolvimento Sustentável**: Brasil 2017. Brasília, DF, 2017. 76 p. Available at: <http://www.secretariadegoverno.gov.br/snas-documentos/relatoriovoluntario_brasil2017port.pdf>. Accessed on: Feb 7, 2017.

EMBRAPA. **Visão 2014-2034**: o futuro do desenvolvimento tecnológico da agricultura brasileira. Brasília, DF, 2014. 194 p. Available at: <<https://www.embrapa.br/visao-2014-2034>>. Accessed on: Dec 1, 2017.

IBGE. **Pesquisa agrícola municipal**. Available at: <<https://sidra.ibge.gov.br/pesquisa/pam>>. Accessed on: Dec 2, 2017.

LIMA, S. E. M. Direito do mar: notas sobre uma narrativa de valores. **Revista da Faculdade de Direito da Universidade de São Paulo**, v. 110, p. 493-512, 2015.

MACHADO FILHO, H. (Org.). **Documentos temáticos**: Objetivos de Desenvolvimento Sustentável 1 · 2 · 3 · 5 · 9 · 14. Brasília, DF: ONUBR, 2017. 107 p. Available at: <www.br.undp.org/content/dam/brazil/docs/.../documentos-tematicos-ods-07-2017.pdf>. Accessed on: Nov 21, 2017.

REBELATTO JUNIOR, I. A.; FLORES, R. M. V.; LIMA, A. F.; PRYTHON, A.; ROSA, D. K.; PINHO, M. S. de; SOARES, S. S. Diagnóstico estratégico de instituições ofertantes e demandantes de tecnologias em pesca e aquicultura – Projeto Aquapesquisa. In: CONGRESSO BRASILEIRO DE ENGENHARIA DE PESCA, 18., 2013, Paulo Afonso. [Anais...]. Paulo Afonso: Ed. Unep, 2013. Available at: <ainfo.cnptia.embrapa.br/digital/bitstream/item/166683/1/CNPASA-2013-conbep.pdf>. Accessed on: Nov 20, 2017.

REBELATTO JUNIOR, I. A.; FLORES, R. M. V.; LIMA, A. F.; SILVA, A. P.; ROSA, D. K.; PINHO, M. S.; SOARES, S. S. Strategic diagnosis of institutions suppliers and demanders of technology in fisheries and aquaculture. **Brazilian Journal of Aquatic Science and Technology**, v. 18, n. 2, p. NB5-NB8, 2014. Available at: <<http://ainfo.cnptia.embrapa.br/digital/bitstream/item/120413/1/cnpasa-2014-bjast.pdf>>. Accessed on: Dec 11, 2017.

RIPPLE, W. J.; WOLF, C.; NEWSOME, T. M.; GALETTI, M.; ALAMGIR, M.; CRIST, E.; MAHMOUD, M. I.; LAURENCE, W. F. World scientists' warning to humanity: a second notice. **BioScience**, v. 67, n. 12, p. 1026-1028, 2017. Available at: <<https://doi.org/10.1093/biosci/bix125>>. Accessed on: Dec 8, 2017.

UNITED NATIONS. **Goal 14**: conserve and sustainably use the oceans, seas and marine resources. Available at: <<http://www.un.org/sustainabledevelopment/oceans/>>. Accessed on: Nov 21, 2017.

UNITED NATIONS. **The first global integrated marine assessment**. New York, 2016. Available at: <www.un.org/Depts/los/woa>. Accessed on: Dec 10, 2017.

UNITED NATIONS. **The future we want**. 2012. Resolution adopted by the General Assembly on 27 July 2012. Available at: <https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/66/288&Lang=E>. Accessed on: Dec 1, 2017.

