

1.1.

Introduction: the importance of marine ecosystems for society

MARINE ecosystems are key to the functioning of the Earth system. Their uses are the basis for the growing blue economy and form a central element of our societies.

In spite of their vast size, marine ecosystems are greatly affected by human activities and natural phenomena of anthropogenic origin. The increase in pollutant emissions, especially those that accelerate climate change; the dumping of synthetic components into the soils, atmosphere, and water; changes in the management of land and marine spaces; land urbanisation processes; the transformation of the coastline; overexploitation and the alteration of biogeochemical cycles (such as the carbon and nitrogen cycle); among many other aspects, have generated multiple impacts on the entire planet, a process known as global change.

The impact of this global change on the marine environment translates into loss of biodiversity; changes in the distribution, abundance, production, and physiology of species; destruction of the ecosystems that protect the coast; and increased levels of water pollution, among other phenomena. These transformations inevitably imply economic, social, and cultural consequences.

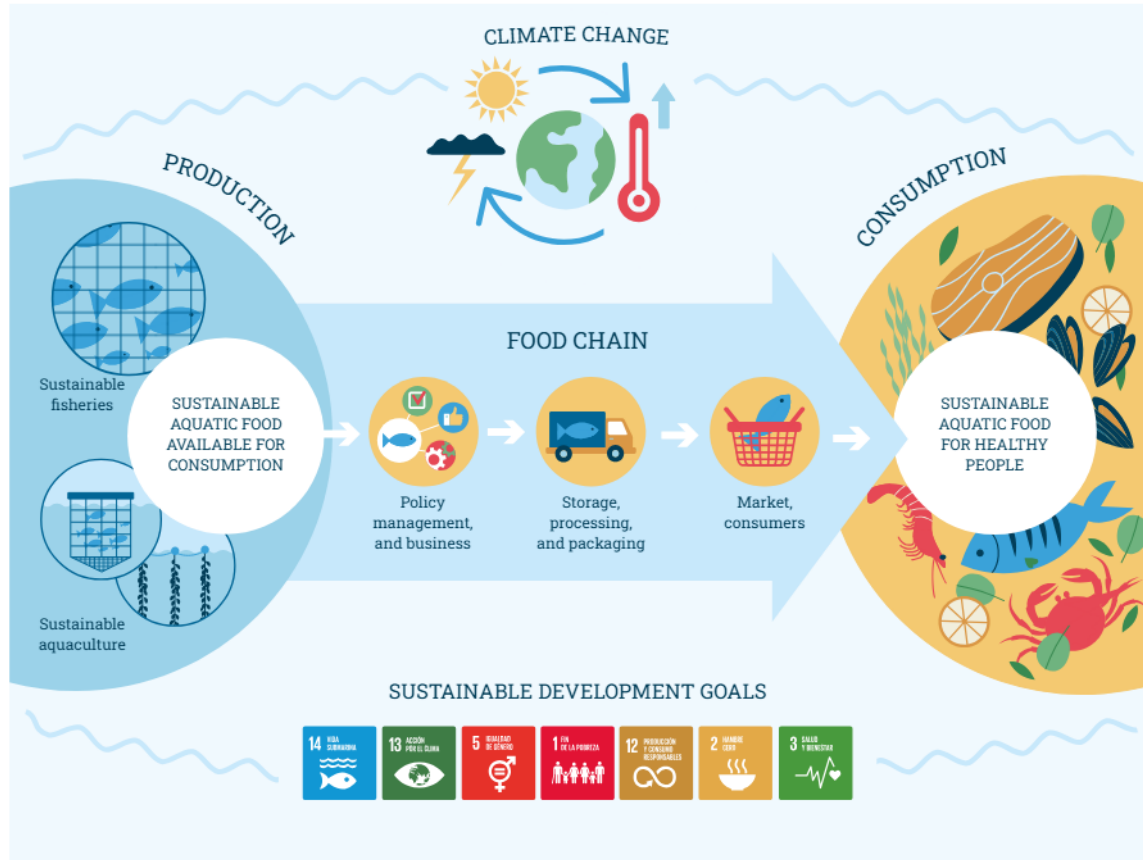
It is therefore necessary to urgently promote improvements in policies linked to the exploitation, conservation, and recovery of resources on a global scale and, in particular, in the marine environment. These improvements must be able to guarantee a good environmental status and the present and future supply of the multiple benefits that marine ecosystems provide.

One of the main environmental services provided by marine ecosystems is the provision of food through the activity of the fisheries sector (which includes fishing and aquaculture). Fishing refers to the capture of aquatic organisms in their natural environment (mainly fish, molluscs, and crustaceans) through the use of various techniques. Aquaculture focuses on the breeding, cultivation, and harvesting of aquatic organisms under controlled or semi-controlled conditions (mainly fish, molluscs, crustaceans, and aquatic plants). For this purpose, ponds, cages, tanks, and other similar systems are used, both in the marine and inland areas. This activity not only provides us with food, but also brings many other social benefits: it stabilises the coastal population, generates employment and wealth throughout the production and consumption chain, and is the basis of a great cultural and identity-related wealth.

However, like any other economic activity, it must be developed in an appropriate manner. The United Nations, within the framework of the 2030 Agenda, stresses the importance of ensuring that the food system is based on sustainable production, i.e., that it makes efficient use of resources, helps to maintain ecosystems in good condition and adapts to climate change. Furthermore, it must be carried out without discrimination of any kind—particularly on the basis of gender—and through quality employment. Finally, the ultimate aim of the food system must be to achieve healthy, nutritious, sufficient, and affordable food. To achieve these objectives, among other mechanisms proposed, it emphasises the need to eradicate practices that contribute to overexploitation and waste, climate change and other adverse environmental impacts.

In the field of fisheries and aquaculture, these recommendations imply maintaining the level of production and fishing within a context of good health of the fishery resource and the ecosystem in which commercial species live. This requires fair socio-economic exploitation to ensure year-round access to healthy and culturally appropriate seafood for all.

Figure 1 Conceptual overview of future aquatic food systems and their contribution to key SDGs (PREPARED BY THE UNITED NATIONS OCEAN DECADE PROJECT, CLIMEFOOD)

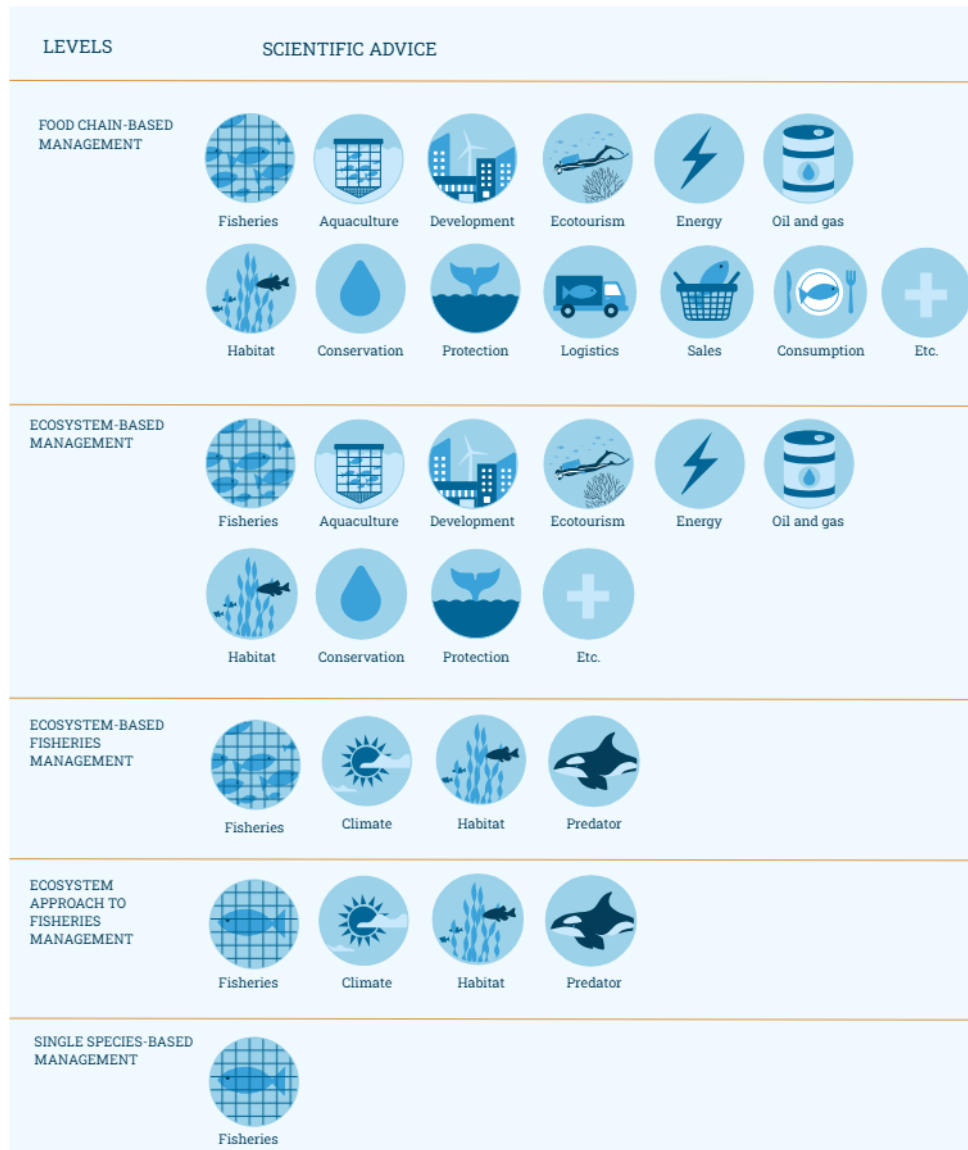


Source: <https://unesdoc.unesco.org/ark:/48223/pf0000390117>

However, the current state of the fisheries system is far from this idea. There is therefore broad agreement on the need for a blue transition based on a *One Health* approach. That is, changes need to be made in human activities associated with the provision of seafood in order to ensure human and environmental health together, on the premise that one is not separate from the other. This approach, applied to food production, requires simultaneously achieving healthier food patterns, reducing the environmental impacts associated with food provision, adapting food provision to climate change, and providing a fair distribution of the income and wealth generated.

But how much and what kind of aquatic products should be consumed? How should fishing, aquaculture, and the distribution of seafood be done to ensure planetary health and the fair distribution of the resources generated? What practices should be promoted and which should be avoided? These are necessary questions to solve the environment-health-society trilemma, the answer to which is still largely unknown and needs more research, more public debate and more political attention.

In view of the great challenges facing the supply of aquatic food-stuffs, it is urgent to broaden the focus to consider a more sustainable activity in comprehensive terms that takes into account the ecosystem in which it is developed. In this sense, management bodies such as the Food and Agriculture Organisation of the United Nations (FAO) speak of fisheries management based on an ecosystem context that includes commercial species and their physical, ecological, and socio-economic environment. This management represents an important step forward compared to the original concept of management of marine fishery resources, which focused solely on exploited species.

Figure 2 Methods for marine ecosystem analysis and management

Source: adapted from NOAA Fisheries.

Sustainable fisheries and aquaculture management requires the implementation of effective regulations, the adoption of responsible practices and the integration of ecosystem approaches to minimise negative impacts and ensure the long-term viability of the activity and the societies that depend on it. This, in turn, requires development of the food chain elements. The food chain includes the set of activities and processes that transform marine resources, such as fish, shellfish, and seaweed, from extraction to final consumption. It is composed of multiple stages: capture or farming (aquaculture), processing, distribution, marketing, and consumption. Each stage adds value to the product through improvements in quality, presentation, food safety, and compliance with standards and regulations. In addition, the food chain may involve ancillary services such as transport, storage, and logistics, as well as research and development activities to innovate and improve the sustainability and efficiency of production, distribution, and marketing. Efficient and sustainable management of this food chain is crucial to maximise the economic, social, and environmental benefits derived from marine resources and to improve their distribution. Finally, this management must also account for elements that affect what is consumed as well as focusing on understanding what is produced. All of this is necessary to move towards resilient oceans and thus guarantee food safety and nutritional quality in the face of climate and global change.



In this context, basic and applied sciences are fundamental as a driving force for the generation of knowledge. Science must generate the necessary information, on a multi-disciplinary and interdisciplinary basis, on the dynamics of marine resources and the ecosystems where these resources are found, and on the effects and impacts of the changes to which they are subject, as well as on the socio-economic implications derived from possible management scenarios. Science also plays an essential role as a source of reliable information to develop sustainable management strategies based on solutions that take into account all stakeholders. This scientific knowledge is vital to improve the management of the exploitation and use of marine resources: management based on scientific evidence that takes into account the complexity of the marine socio-ecological system and its intrinsic and extrinsic characteristics.

This report seeks to answer three interconnected questions that focus on understanding the necessary elements and existing constraints to achieve sustainable management of the supply of living or renewable marine resources. These three questions are structured around three fundamental issues related to an environmentally sustainable and socio-economically equitable production, food chain, and consumption of marine products.