Contributions and perspective of the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), on the United Nations consultative process on Oceans and the Law of the Sea, in regard to the following aspects:

i) Advancing ocean science and identifying and addressing gaps in ocean knowledge and science
ii) The United Nations Decade of Ocean Science for Sustainable Development: Ideas, proposals, perspectives
iii) Cross cutting role of ocean science in Sustainable Development Goal (SDG) 14 of the 2030 Agenda
iv) Emerging technologies
v) The science-policy interface

i) Advancing ocean science and identifying and addressing gaps in ocean knowledge and science

Together with the Center for Applied Ecology and Sustainability (CAPES) and the Center for the Socioeconomic Impact of Environmental Policies (CESIEP), ECLAC organized a plural and participatory process in progressive stages in Chile that identified and prioritized gaps and bottlenecks in the form of questions of high relevance, whose knowledge is necessary in order to strengthen the sustainable development of the country.[1] It is also useful to prioritize vulnerable habitats (a figure that is lacking in SDG14), such as underwater mountains and mangroves, - which are very relevant for the reproduction of species of fishing interest - or hydrothermal vents.

The actions that could address the identified gaps and bottlenecks include:

- The creation of learning platforms which focus on vulnerable coastal communities affected by climate change and the development of adaptation capacity.

- Research which can disentangle social and ecological determinants of vulnerability to multiple stressors including climate change, sources of adaptation capacity and key features of what could be termed social-ecological climate refugees in the coastal ocean, are elements which can inform concrete input into policy and development initiatives, aimed at sustaining ocean ecosystems and coastal livelihoods.

- Multidisciplinary studies on algal blooms to understand the cycles and processes from their ocean iteration - atmosphere, sea-coast gradient, the coupling in the water columns and their productivity. The increase of coastal algal outcrop is a priority given that it is strongly associated with health problems and poverty (as they prevent fishermen from collecting marine products on which they depend economically).

- Systematization of the information of the increase of swells, its magnitude and its effects.

- Systematization and regional and global follow-up of the increase of massive mortalities of cetaceans, cuttlefish and other populations of marine species that surprisingly beach on the coast.

[1] The process was attended by representatives of government, companies, science, financers of science and NGOs. The results of this process regarding oceans, seas and coasts can be found in Annex 1. (https://www.cepal.org/es/notas/necesidades-conocimiento-ambiental-chile).

- The study of marine pits or deep canyons (some reach around 8000 meters below sea level), such as the Peruvian or Atacama Trench equivalent to Mount Everest or the Grand Canyon in Colorado, which are almost unexplored so far.

ii) The United Nations Decade of Ocean Science for Sustainable Development: Ideas, proposals, perspective

Marine systems are continuing to be faced with unsustainable fishing and biodiversity declines. While conventional marine management tools, such as marine protected areas and fisheries quotas, have shown some success, a growing recognition and understanding of the complexities of marine social-ecological systems is leading to more complex management approaches.

An approach that is transversal to practically all aspects of interest in this consultative process of the United Nations is around the governance of fishery resources. It as a unit that should be fostered throughout the UN Decade and will be developed further in the section below.

Marine resources governance systems: Developing innovative locally relevant management strategies to achieve sustainability [2]

In general, the conservation and use of marine resources (oceanic and coastal) is fragmented by different authorities, which implies a high level of coordination of inter-institutional integration for planning, execution, monitoring and evaluation of programs, standards and applied measures. In addition, some of these institutions employ an approach oriented towards productive development and others towards the conservation of biodiversity. Hence the orientation towards sustainable development is not facilitated. An important contribution to the short and medium-term management and vision necessary for sustainability is to increase dialogue and inter-institutional planning.

On the other hand, the multitude of social and legal governance systems – in addition to the well-studied ecological complexities – are starting, and should continue, to be embraced in marine management solutions. For example, a trend towards multi-level governance has begun to manifest itself by mixing "top-down" directives from government with "bottom-up" approaches in which stakeholders participate directly in the implementation of policies.

A shift towards multi-level marine governance that embraces social and ecological complexity would be beneficial for marine and coastal management because it can incentivize the participation of resource users at different scales and account for social-ecological feedbacks. For example, local knowledge can inform the design of diverse, context-specific rules, while bigger organizations and the government can enhance the capacity to address regional problems and support the necessary conditions to prevent and sanction the non-compliance with rules.

Each unit within a multi-level governance system can exercise considerable independence to establish norms and rules within a specific domain. In theory, the links between social and ecological systems can be better addressed and major investments made towards developing innovative locally relevant management strategies to achieve sustainability via such approaches. In this way, future scientific

[2] PhD. Stefan Gelcich, a very recognized marine biologist dedicated to study social-ecological dimensions of marine fisheries management and environmental conservation contributed to this section.

research should put special emphasis on the "co-production" of knowledge through collaborative demonstration-scale experimental trials or learning platforms, integrating scientific, local and official government knowledge systems.

In turn, it is also necessary to promote conservation and fisheries management of the overseas areas with emphasis on the development of a unique policy for deep sea areas.

iii) Cross cutting role of ocean science in Sustainable Development Goal (SDG) 14 of the 2030 Agenda

Even though SDG 14 emphasizes reverting the reduction of species of fishing interest, it is necessary to include threatened marine species in the prioritization of research and monitoring efforts that can also be very relevant for the maintenance of trophic chains such as sharks, whales and turtles, just to give an example.
It is necessary that the main factors of the loss of marine and coastal biodiversity, such as invasive alien species, be included or mainstreamed to the achievement of SDG 14, based on an integral vision of science to conserve and sustainably use the oceans.

iv) Emerging technologies

- Development of early warnings of processes that affect the exploitation of fishery resources and human welfare (such as the algal blooms mentioned above), especially with the use of satellite systems and marine buoys.

- The use of satellite images also allows accurate tracking of fragile or threatened ecosystems or habitats in real time. A good example is *La Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO)* in Mexico, which has developed a software tool for monitoring mangrove to ensure its rehabilitation and conservation at a locally useful scale. Local authorities can consult the tool from their cell phone.

- Hydrophones, the use of microphones deep inside the sea that record and record in real time, allow us to get to know the acoustic landscape of species of priority conservation that produce songs and sounds such as marine mammals or fishes of commercial interest. Although hydrophones have not been used excessively because of their demand of a high data handling capacity, they provide a useful tool at a reasonable cost to assist in the surveillance: they can record submarine explosions that indicate the illegal use of explosives in fishing or are destined to decrease unwanted species that compete for fishery resources in commercial fisheries (e.g., sea lions).

v) The science-policy interface

Many of the public institutions that have databases of marine biodiversity are related to the development of fisheries and most of their data come from data on landings, fisheries and bycatch. There are very few fish and chondrichthyan monitoring programs that evaluate the presence and quantify the abundance of fish species in their natural habitat despite their great importance in coastal ecosystems and in many artisanal and industrial fisheries. Universities and research centers are the ones that systematically study other species, their relative abundance, their trophic relationships, their distribution and geographic variation over time, their response to various environmental variables, etc. (Navarrete et al, 2015).[3]

A priority and strategic objective is to establish institutional mechanisms that enable a cross-cutting, robust, credible and relevant dialogue between the academic sector and public institutions (different decision-makers in the resources management and those who generate or curate the information on marine and coastal biodiversity). For this dialogue to be more relevant, it must have an impact on budgets, programs and public policies.

Several concepts that are adopted from science and international standards tend to be introduced into general normative texts without being able to develop them in more detail, such as fisheries with an ecosystem approach. It is necessary to carry out an in-depth review of key concepts for sustainable development and establish the current gaps in local and regional knowledge as well as human, technical and financial capacities to implement the new regulations.

An example of science applied to public conservation policies is related to ecosystem services. Despite the increase of studies on ecosystem services in the last decade, 80% of them have been carried out in terrestrial ecosystems. As only a limited 13% corresponds to marine ecosystems (Delgado and Marín, 2015)[4], the need to significantly increase research projects and public management programs that reduce these information and planning gaps becomes evident.

One of the biggest obstacles to evidence-based decision-making is that knowledge about different marine ecosystem aspects tends to be very fragmented and dispersed. It is essential to integrate free platforms that are accessible at national, regional, and ultimately global levels through a data curation process.

Consolidate long-term databases by studying the same element or set of elements with the same methodology in the same area is essential to understand the variations of periodic phenomena such as El Niño, decadal and climate change. The way in which science is promoted by state agencies has failed to consolidate this type of databases because it encourages "innovation" and therefore does not finance the persistence of the same question over time.

The link between science and decision-making must also be strengthened between the generation of knowledge and society to achieve sustainability and conservation. Government agencies, NGOs, and international alliances direct most of the financial resources to generate strategies and policies. In this context it is necessary to considerably increase the investment in order to make scientific results that promotes the change of unsustainable behaviors available for local populations and urban consumers.

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[3] Navarrete, Sergio. 2015. *Diagnóstico para el monitoreo de la biodiversidad de Chile en el contexto del Cambio Climático*. Final report for the Ministry of Environment of Chile. 94 p.).

[4] Delgado, L. y V. Marín. 2015. Ecosystem services: Where on Earth? *Ecosystem Services* (14):24-26.

Annex 1. Relevant knowledge gaps needed to strengthen sustainable development on oceans, seas and coasts*

*Taken from a Chilean expert consulting process

- How are knowledge and wisdom of local communities integrated into environmental management?
- How to build an integrated system of prioritizing environment threats to support decision making?
- Different institutions grant permits on environmental matters: how could they be more coordinated to have a holistic instead of a partial technical opinion?
- What are the marine species and ecosystems most vulnerable to climate change?
- What criteria (ecological, economic and social) should be used to identify, categorize and prioritize areas for rehabilitation and ecological restoration?
- What impact do conservation policies have on the behavior of producers and extractors of natural resources?
- How should we adapt fisheries management strategies to the changing climate?
- What is the economic cost behind the depletion of fishery resources?
- What are the direct and indirect impacts of the seawater desalination on marine and terrestrial social ecological systems?
- How do we use concepts such as food traceability to move towards the sustainability of ecosystems?
- What are the causes, in hierarchical order, that have put at risk the threatened species by region?
- Is it possible to reduce antibiotics in marine crops to generate less resistance in native microorganisms?
- How can the social and environmental impact of the large volumes of sludge generated by fish farms be reduced?
- Is it sustainable to deposit mining tailings and sediments on the seabed?
- What is the ecological integrity status of marine soft-bottom ecosystems affected by: a) underwater urban wastewater; b) discharges of industrial activities (mining, refinery, thermoelectric)?
- What is the relationship between the increase in the frequency of harmful algal blooms (red tide) and climate change?

- What are the ecological and social impacts of aquaculture and what are the anthropogenic and natural drivers that determine and modulate these impacts?
- How will the effects of climate change be included in the environmental impact assessment system?
- What is the role and impacts of economic instruments in the regulation of environmental services such as water, biodiversity and carbon?
- What is the contribution of Chile's wetlands to carbon sequestration?
- How should the high climate variability in Central Chile be taking in account in the calculation of available flows?
- What interventions would be necessary to mitigate desertification or, alternatively, to restore desertified environments?
- What will be the effects of the loss of white and rocky glaciers?
- What are the ecosystem services which produce algae in Chile?
- How is socioecological vulnerability to climate change characterized, including extreme events and concurrent phenomena such as air pollution?
- What is and how should the socio-environmental and economic impact of a mega-drought be counted (or discounted)?
- What are the baseline information, indicators or benchmarks to understand if the restoration of an ecosystem goes in the desired direction?
- What is the state of the art of environmental impact research and sustainable productive alternatives to salmon farming?
- What are the conservation needs of the biodiversity elements of the priority marine areas that allow a better planning of land use planning and the creation of protected areas?