Intervention by
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Lead Discussant:
SDG14 Implementation, Challenges and Opportunities
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Excellencies, Ministers, ladies and gentlemen, friends of the ocean.
All protocol observed.

As a member of the International Science Council's Governing Board, I speak to you on behalf of 'the global voice for science':

We have just heard about the challenges in making progress in the implementation of the 2030 agenda in general and the ocean's dimension in particular, in the face of armed conflicts and a global pandemic.

Global Cooperation:

Comprehensive and shared knowledge underpinned by the world's best science is needed to solve the mayor global challenges. Knowledge production critically depends on international cooperation and exchange. Climate, biodiversity, and environmental research, and especially ocean science, benefit substantially from international exchange. No nation can advance these issues alone. The International Science Council and its partner support international research programs, the conduct well-coordinated ocean expeditions, and established programs to share the data and new knowledge gained around the world.

Climate change and biodiversity loss affects everyone on our planet, and the ocean is no exception. Ocean science must be able to share critical information across systems and borders to develop common knowledge-based solution strategies to limit ocean change and inevitably adapt to it. The International Science Council and its programs and partners take special responsibility for shaping this in the most inclusive way possible. This is in line with the G7 motto: "Progress towards an equitable world" and the UN leitmotif "Leaving no one behind".

A sustainable human ocean interaction:

We are committed to a sustainable world that takes into account the opportunities of current and future generations.
A rapidly growing and increasingly affluent population is leading to ever-increasing anthropogenic pressure on natural resources. Ocean pollution, overexploitation, and the loss of natural areas are leading to a significant reduction in marine biodiversity; some speak of the emerging "biodiversity crisis." At the same time, the growing demand for energy,

unfortunately still mostly carbon based, leads to further increasing concentrations of CO2 and similar greenhouse gases in our atmosphere. This will inevitably lead to increased warming and undesirable climate change. We have already reached over 1.3°C warming today and the most credible projections see no realistic chance of staying below 1.5°C. Even the 2.0°C target is likely to be missed. The ongoing climate change is already having a noticeable impact in almost all parts of the world ocean; often referred to as the "climate crisis". Land and ocean-based pollution, overuse of natural resources is still growing and resulting in compromised marine eco-systems we speak of “declining ocean health”. Together, loss of biodiversity, climate chance and pollution are closely linked and need to be understood and addressed holistically. And all have dramatic effects on the future of mankind, the ocean and partly also on human health in a direct and metaphorical sense.

Expand and sustain observation systems.

At the beginning of science is discovery, systematic observation and measurement. Observations are initially driven by curiosity to understand the environment, biodiversity, climate, or the ocean. However, if the overall system is to be understood, the observation systems should also be globally networked. This is not possible without international cooperation in science, for example through the programs supported by the International Science Council and UN organizations. The Global Climate or Ocean Observing System uses all data from satellite-based Earth observations and direct in-situ measurements. From research vessels to robots that can measure marine biodiversity and document changes due to climate change. The GOOS program has made important contributions to the advancement of the global ocean observing system. However, better arrangements in our nations are needed for sustainable funding; it is not just about research but also about data-driven stewardship of the ocean. For example, what works well in observing systems for weather is far from being achieved in the ocean.

Improve the earth system model and link it in a modular way.

Observations and systems knowledge gained through basic research allows science to develop powerful Earth system and ocean models. These models are able to represent past and expected future changes in the ocean. They can simulate what today's climate would look like without human influence only due to changes in solar radiation or volcanic eruptions. This non-anthropogenic future looks starkly different when compared to the significant warming when man-made CO2 emissions are factored in. Not quite as far along is modeling of the complex ecosystems and associated biodiversity. But new approaches via eDNA and evolution-based modeling approaches are promising. Basically, it is important to further develop the ocean components of Earth system models and to verify their realism in international comparison and through observations.

Ocean science can make robust statements about human-induced changes.

The diagnosis by observations and model simulations is clear. Human activity is undoubted causing changes in the environment. Ocean biodiversity is declining at an unprecedented rates. Coastal regions are heavily used by humans and particularly affected but the deep sea is not spared. Coral reefs, mangrove forests or seagrass beds are coming under stress from

pollution, invasive species, overexploitation, but also especially climate change. Rising sea levels, marine heat waves and chemical changes lead to coral bleaching, oxygen-depleted zones and thus massive changes or the extinction or migration of species.
Sea ice in the Arctic is declining dramatically and nearly all land-based glaciers are shrinking. Dissolved oxygen in the ocean is also decreasing due to warming and slowed ocean circulation. CO2 dissolves in the water and changes PH causes ocean acidification, and calcium-shell-forming organisms, for example corals, are increasingly stressed or die out.

From knowledge to action - Digital twins can simulate futures and optimize human actions.

Science also shows ways to mitigate change through smart human development actions. To keep global warming below 1.5° or 2°C, CO2 emissions must be massively reduced and brought to 'net zero' in a few years. The ocean together with the maritime sector can contribute up to 30% of the needed CO2 emission reduction.
Science also shows that marine species can survive better in sufficiently large protected areas. Less pollution and a transformation to sustainable use will secure the contributions of nature that are essential for our survival.

Digital twins of the ocean offer a new possibility to optimize human actions with regard to the environment in terms of sustainability. Digital twins have long been used in the field of engineering to optimize processes. Digital twins map parts of the ocean into the virtual space and are supported by ocean system data and models. They help to answer 'what if' questions. They can be used to future proof sustainable development and guide rules based management such as marine spatial planning.

Accelerate implementation of global initiatives and promotes interdisciplinary collaboration.

The "UN Decade of Ocean Science for Sustainable Development (2021-2030)" aims to generate and share knowledge about the ocean globally. The motto of the Ocean Decade is "The Science We Need for the Ocean We Want." The Ocean Decade is about nothing less than co-creating transformations in science and ocean, environmental, and climate policy and implementing them through strong international research and policy. It's science agenda has been informed by the specific needs to make progress on the implementation of SDG14 but also more widely the ocean dimension of the 2030 Agenda. The Ocean Decade has articulated 7 outcomes and 10 challenge areas. It has endorsed about 40 global programs each of them supported by a number of more regional or topical projects. It is the frame for action connecting ocean science capabilities with the needs to implement an ambitious ocean agenda.

A systemic view of the Earth and ocean system can succeed better when research is conducted in interdisciplinary teams. It is important to explore the impacts of human activity on, for example, climate, biodiversity, or human health together. When it comes to illuminating the solution space, as for example articulated in SDG14, cooperation with politics, administration, the private sector and civil society is central. Only together it will be

possible to find wise and acceptable solutions for both mitigation and adaptation to a changing environment. But also, options for renaturalization or active intervention in the ocean environment with the intent to optimize the contributions of the ecosystem for us humans are questions that urgently need to be answered in a transdisciplinary way.

In summary science is providing already indispensable knowledge to inform the ocean dimension of sustainable development. Sustained ocean observations, improved ocean system models and digital twins of the ocean combined with co-delivery of the information are tremendous opportunities to transform the human-ocean relationship to become more sustainable. Science can help to find optimal development pathways and thus 'future proof' sustainable development actions.

I look forward to the discussion, thank you very much for your attention!