

G7 Future of the Oceans Initiative - Initial Action proposals

At the G7 Science Ministers meeting in Tsukuba, Japan which took place in May 2016, Ministers recognised that the seas and oceans are changing rapidly, with overuse and destruction of marine habitats, warming, increased ocean acidity and depleted oxygen. They agreed that the health of the oceans has rightly been recognised as a crucial economic development issue through the adoption of a specific United Nations (UN) sustainable development goal (SDG 14 - to 'conserve and sustainably use the oceans, seas and marine resources for sustainable development'). In support of achieving this goal, and other relevant goals, including the closely related SDG 13 (to 'take urgent action to combat climate change and its impacts'), Ministers supported further action to develop the far stronger scientific knowledge necessary to assess ongoing ocean changes and their impact on economies, and to develop appropriate, coordinated policies to ensure the sustainable use of the oceans and seas.

Following the mandate given to G7 ocean science experts by Ministers, and with considerable support for the initiative from across the G7, experts developed proposals for each of the five action areas outlined in the [Tsukuba communiqué](#). A workshop of technical and policy experts from G7 countries was then held in November 2016 at the UK's National Oceanography Centre in Southampton to discuss and refine the action proposals. This document, which outlines the action proposals, was agreed and finalised by experts in February 2017.

The G7 Future of the Ocean and Seas expert group acknowledges the efforts carried out by the G7 member states in implementing the recommendations of the *Tsukuba Communiqué* and recognizes that the complexity of the challenges faced calls for long-term sustained action to achieve an effective advancement in our observation of the oceans and seas.

Broadly, experts suggest that the G7 nations use this initiative to strengthen international collaboration, particularly on areas beyond national jurisdiction. To this end, the goal of the expert suggestions included in this document is to realize a more efficient and effective network of scientific ocean observing which supports the conservation and sustainable use of resources from the seas and oceans.

The expert suggestions have been set out according to the five Action areas that Ministers have asked experts to address and they fit together in the following narrative: the challenges identified in building a scientifically robust assessment and consensus view of the state of ocean to inform policy (Action 2) and address SDGs 13 and 14, highlights the need for an extension of routine observations into hitherto under-sampled key geographical regions (Action 4) as well as expanding our global ocean observing capacity using the full range of existing and emerging technologies and capabilities (Action 1) if SDG 13 and 14 are to be robustly addressed. This extension of new observations in new areas needs to be linked to a coordinated, state-of-the-art means of transmitting and sharing the data (Action 3), all extending in a manner respecting national and international agreements (Action 5).

The expert proposals under each Action areas are as follows:

Action 1: *To better understand and predict the impact of human activities on ocean ecosystems and the effect that they have on the Earth's climate, we need a deeper understanding of our oceans and seas and why they are changing. This requires the continuation of existing observations augmented by new observations, using new technologies, in new locations, in a more coordinated and consistent way.*

To achieve Action 1, experts suggest that the G7 agree that the initial primary policy drivers should be climate variability, sea-level and ecosystem health/biodiversity. Experts recommend that the G7 work together to attempt to establish the funding mechanisms that are essential to sustain and extend the existing global ocean observing system.

Experts also recommend the establishment of a G7 GOOS Implementation group to liaise with and support GOOS whilst coordinating enhancements to G7 observing. In doing so the G7 would affirm the importance of GOOS and other internationally coordinated programmes coupling physics, chemistry and biology. This is considered important as it would benefit from and complement, but not compete with or duplicate the UN GOOS framework, allowing the G7 to focus its actions within a GOOS context and at the same time overcome some of the weaknesses and under-resourcing currently affecting GOOS. The group would also help to coordinate some of the more specific actions identified under Action 1, thereby adding value and synergy to those proposed actions. Finally, it would enable the G7 to demonstrate transparency in their actions and their willingness to play a leadership role in GOOS implementation. The coordination would also seek to strengthen the integration of in-situ data with satellite data and models which is essential to provide an integrated assessment (Action 2), description and forecast of the state of the oceans (e.g. Copernicus Marine Service, GODAE OV).

Experts recommend the development of a G7 strategy for extending observations focussed on the following priorities:

- **Bio-Geochemical Argo (BGC-Argo)**
- **Deep Argo**
- **Gliders in polar and boundary regions**
- **Underway data (e.g. climate relevant data and CPR)**
- **Sensor development (particularly biological/biogeochemical sensors)**
- **Augmented observatories (to allow deeper investigation of marine biology)**
- **GLOSS sea level network**
- **Research vessels (including GO-SHIP)**

Experts suggest that the first step to take this work forward should be for the G7 to develop road maps for the next five years for each high-priority area above.

These priorities are chosen to address the above policy drivers, focussing on currently under-sampled key areas. This collaboration would: develop a system capable of providing enhanced environmental intelligence by monitoring the effect of climate change on biological productivity, ocean acidification, oxygen depletion (hypoxia) and ocean uptake of CO₂ (BGC-Argo, underway data, sensors and gliders); monitor ocean temperature and salinity changes below 2000 metres and their role on the Earth energy budget and global sea level rise (DeepArgo); further sea level observations for assessing sea level risk in coastal regions (GLOSS); enhance the use of Ships of Opportunity including the long-running CPR plankton survey and CO₂ measurements; coordinate under-ice measurements using AUVs in order to better understand and document ocean changes in the Arctic and Southern oceans; utilise 'augmented observatories' and ocean process studies as foci of more detailed studies and as sites to test the new technology (e.g. sensors on gliders and floats); and use the high quality research vessels observations for reference (e.g. GO-SHIP).

All of the above extended data sources would be supported by sustained commitment to vital existing infrastructure including research vessels, moorings and satellite data.

Action 2: *To support the fulfilment of SDGs 13 and 14 and the maintenance of healthy oceans, and building on the important work done through the first such assessment, further scientifically robust and well-respected World Ocean Assessments are needed which will encourage more efficient and better coordinated international policy and funding decisions in the future.*

To enhance the World Ocean Assessment experts suggest that the G7 takes action in three areas: profile, policy, and funding.

On profile, experts suggest that G7 Science Ministers (or Leaders): underline the importance of the UN Regular Process to develop World Ocean Assessment-II (WOA-II) having a scientifically robust base as a vital international source of authoritative knowledge and analysis on the state of the oceans which will underpin more effective policy-making; **commit to raise its profile in G7 countries** and elsewhere as appropriate; **and commit to pro-actively support the Regular Process and WOA-II.**

On policy, experts suggest that G7 countries identify their respective UN Regular Process national focal points by 31 May 2017 and relay their appointments to the secretariat of the Regular Process through the proper United Nations channels; **and, establish a G7 scientific and technical experts group to coordinate collaborative input to the process.** This experts group would, among other things, be tasked to:

- Help to ensure that the assessment promotes observing and data sharing and development of products and models that provide integrated seas and ocean state knowledge; raise the profile of ocean observing in general; and underpin and capture progress towards SDG-14;
- Lead coordination of support for the UN Regular Process amongst the G7 and elsewhere where appropriate (such as through ICSU-SCOR, IOC);
- Provide joint review/feedback on the UN Regular Process Programme of Work; and,
- Support long-term implementation of the draft Programme of Work through identification of high priority actions needed for the next WOA.

On funding, experts suggest that, once the UN regular budget for the process is finalized, the G7 should discuss any budgetary shortfalls and options for ensuring the WOA process has the resources it needs to be consistent with end user needs and is effective in the long term. **They also suggest that the G7 should look to fund and/or host WOA regional workshops and meetings of the WOA writing team.**

Action 3: *We need the ability to seamlessly link data collected from the new observations with the existing but under-exploited marine data such that it can be quickly and widely shared, compared and interoperated. It is especially critical to train and enable researchers and others in developing countries to exploit the rich suite of ocean observations. This will help us to address the key policy drivers set out above, enable the World Ocean Assessment and support the achievement of SDGs 13 and 14.*

To achieve this integration of observing systems, experts suggest that the G7 increase interoperability and discoverability through discussion on developing a limited set of common data sharing standards and data integration translators and by sharing best practises for marine open data, including in-situ, satellite and model data. To encourage global coherence experts suggest that the G7 discuss development of a ‘G7 Marine Open Data Accord’¹.

Recognising that: 1) a high proportion of ocean data is generated by G7 nations; 2) the ability responding to key societal challenges can be constrained by difficulties accessing disparate data; and 3) there is a requirement for a seamless integration translator to make marine data more easily available; **experts suggest that the G7 direct and resource their ‘national ocean institutes’ to come together before the next Science Ministers meeting to:**

- **identify their primary ocean science and service needs to identify the key drivers;**
- **identify specific societal challenges and policy questions identified under Action 1 that a seamless data integration translator could be applied to as demonstration projects;**
- **identify the relevant data requires to meet these challenges; and**
- **consider what existing ocean science community structures exist (including IODE, JCOMM, Copernicus Marine Service, GOOS, etc.) that could:**
 - **define the appropriate standards-based marine data interfaces and integration translator**
 - **implement the marine data interfaces and integration translator through demonstration projects**

Building on the suggested implementation of the standard marine data interface (the connection between the data integration translator and the data source), the experts further recommend that the G7 should coordinate to provide access to the data and resulting data products produced to address the key policy questions identified under Action 1 as open data.

¹ The purpose of the Open Marine Data Accord is to publically demonstrate a G7 commitment to Open Data in the marine environment. By doing so will encourage a wider adoption of Open Data principles and thereby enable greater levels of access to marine data. By publishing a clearly articulated explanation of the value of open marine data and through the action of publicly endorsing Open Data by signing up to the Accord, the G7 will encourage other nations to adopt a similar open marine data policy. Other nations adopting the Accord and ensuring they put in place relevant open access mechanisms and policies will in turn lead to the increased sharing of marine data.

How would it work?

Marine science representatives of the G7 nations would draft the Accord: a short document (paragraph or 2) setting out how the world would benefit from open Marine data and how Open data applies to marine science. The accord would include a declaration stating something like the following:

'We the undersigned understand and champion the value of open marine data. We commit to making all marine data openly accessible.'

There could then be an event where G7 representatives (maybe Ministers) would sign the accord.

The responsibility to solicit other nations to sign up would then be allocated to an organization and they would engage with each nation to get them to sign up. The best route for this would be through the IOC/IODE which is the network of national oceanographic data centres.

Action 4: *To help ensure an assessment that is relevant and authoritative and which will drive coordinated policy decisions, scientific capacity for ocean science issues across the world need to be developed. This needs to be done by building networks of talent and technical skills such as the use of new autonomous observing systems as well as ensuring the provision of necessary infrastructure and modelling capacity in developing countries and the currently under-monitored regions. The first objective of this must be to protect lives; the second to conserve resources and support sustainable use of ocean resources; and the third to enhance social knowledge of the state of the global ocean through comprehensive observing.*

To do this, experts suggest that the G7 develop a programme to establish and deploy systems for the synthesis of local in-situ observations and satellite observations to deliver marine environmental analyses that would underpin sustainable development objectives and needs. They suggest that this should have two steps:

- 1. G7 nations develop a joint programme to define the implementation of essential building blocks required to develop an integrated coastal observing system.** The system design must be robust, efficient, incremental in complexity, easily managed and transferrable to other regions and applications. It would involve a team of G7 and external experts from Blue Planet, Global Ocean Observing System (GOOS), GODAE OV among others to revise and refine existing requirements, e.g. those set out by PICO (Panel for Integrated Coastal Observations);
Experts believe that such an implementation strategy needs to be a multi-component initiative including the use of new autonomous observing systems and capacity building in critical skills such as local capacity for data stewardship of historical observations, new observing systems, analysis and synthesis. The development of regional coastal modeling capacity, would also be an important element of the synthesis to allow the pilot areas to continue to observe effectively once any pilot project is complete. A roadmap to achieve routine monitoring of key aspects of the health of the regional seas will be an integral part of the strategy.
- 2. Working with the IOC to identify and propose pilot project locations (e.g. through GOOS Regional Alliances) for the incremental implementation of integrated coastal observing systems** which recognize established priority areas already identified by relevant bodies. The G7 should execute these projects in partnership with non-G7 partners in the framework of existing large scale initiatives.

Action 5: *Finally, in order to facilitate the international collaboration necessary to carry out an enhanced system of ocean observation we need to, where possible, remove political, legal and economic barriers to effective and coordinated observation including in the new activity and practices outlined through Actions 1-4 if agreed.*

Experts suggest that the G7 sets up a secretariat to drive and monitor the delivery and implementation of the action proposals and a sub-group to consider the policy, funding and regulatory issues. Such a secretariat should interact strongly with GOOS to ensure coordination and integration within the global GOOS scope. This secretariat is needed because it is clear that there are several policy, funding and regulatory issues that need to be overcome to achieve Actions 1, 2, 3 and 4 above. This group should further analyse a number of hurdles such as open access to data and agreement of standards.

Experts suggest that the initiative collaborate with the OECD Project on Innovation in the Ocean Economy to assess in detail the economic potential of public investments in ocean observing and data collection.

The above proposals are designed to operationalise the conclusions agreed at the G7 Science Ministerial in May, however, further urgent issues under this umbrella need to be followed up by the next meeting in Italy in September 2017. The impact of a G7 initiative on ocean observations can maximise its impact by ensuring the major challenges are met by the major marine science nations collaborating in a coordinated way. This is intended to lead to a step-change in realising more rapidly and cost-effectively the potential of international ocean science to support achievement of SDG14 and SDG13.

G7 members will need to consult their relevant stakeholders on the recommended actions so that they can be finalised before clearing the plans with Ministers. The details of these action proposals will then have to be developed with implementation on certain proposals hopefully beginning before the Science Ministers meeting in Italy in September.

Summary list of all expert proposals – G7 experts suggest that/recommend:

Action 1:

- That the G7 agree that the initial primary policy drivers should be climate variability, sea-level and ecosystem health/biodiversity;
- That the G7 work together to attempt to establish the funding mechanisms that are essential to sustain and extend the existing global ocean observing system;
- The establishment of a G7 GOOS Implementation group to liaise with and support GOOS whilst coordinating enhancements to G7 observing, including internationally coordinated programmes coupling physics, chemistry and biology;
- Experts recommend the development of a G7 strategy for extending observations focussed on the following priorities:
 - BGC-Argo
 - Deep Argo
 - Gliders in polar and boundary regions
 - Underway data (e.g. climate relevant data and CPR)
 - Sensor development (particularly biological/biogeochemical sensors)
 - Augmented observatories (to allow deeper investigation of marine biology)
 - GLOSS sea level network
 - Research vessels (including GO-SHIP)
- Experts suggest that the first step to take this work forward should be for the G7 to develop road maps for the next five years for each high-priority area above.

Action 2:

- That G7 Science Ministers (or Leaders): underline the importance of the UN Regular Process;
- Commit to raise its profile in G7 countries;
- Commit to pro-actively support the Regular Process and WOA-II;
- That G7 countries identify their respective UN Regular Process national focal points by 31 May 2017;
- Establish a G7 scientific and technical experts group with appropriate bodies (IOC, ICSU-SCOR) to coordinate collaborative input to the process;
- That, once the UN regular budget for the process is finalized, the G7 should discuss any budgetary shortfalls and options for ensuring the process has the resources it needs;
- That the G7 should look to fund and/or host WOA regional workshops and meetings of the WOA writing team.

Action 3:

- That the G7 increase interoperability and discoverability by agreeing to a limited set of common data sharing standards and data translators and by sharing best practises;
- That the G7 discuss development of a 'G7 Marine Open Data Accord' and appropriately resource the designated institution(s) to be able to champion the global adoption of the accord;
- That the G7 direct and resource their 'national ocean institutes' to come together before the next Science Ministers meeting to:
 - Identify their primary ocean science and service needs to identify the key drivers;
 - Identify specific societal challenges and policy questions identified under Action 1 that a seamless data integration translator could be applied to as demonstration projects;
 - Identify the relevant data requires to meet these challenges; and
 - Consider what existing ocean science community structures exist (including IODE, JCOMM, Copernicus Marine Service, GOOS, etc.) that could:

- Define the appropriate standards-based marine data interfaces and integration translator
- Implement the marine data interfaces and integration translator through demonstration projects
- That the G7 should coordinate to provide access to the data and resulting data products produced to address the key policy questions identified under Action 1 as open data.

Action 4:

- That the G7 develop a programme to establish and deploy systems for the synthesis of local in-situ observations and satellite observations to deliver marine environmental analyses that would underpin sustainable development objectives and needs;
- Develop a joint programme to define the implementation of essential building blocks required to develop an integrated coastal observing system;
- Work with the IOC (i.e. GOOS Regional Alliances) to identify and propose pilot project locations for the incremental implementation of integrated coastal observing systems.

Action 5:

- That the G7 sets up a secretariat to drive and monitor the delivery and implementation of the action proposals and a sub-group to consider the policy, funding and regulatory issues;
- That the initiative collaborate with the OECD Project on Innovation in the Ocean Economy to assess in detail the economic potential of public investments in ocean observing and data collection.