

### Ocean Decade: Call for Actions 01/2020

Word version to prepare for submission at <https://www.surveymonkey.com/r/Decade-Actions-01-2020>

**Thank you for your interest in submitting a proposed Decade Action for endorsement!**

Via this Call for Decade Actions, partners are invited to request endorsement under the Ocean Decade for transformative Decade Actions that contribute to the Ocean Decade vision of ‘the science we need for the ocean we want’. This Call for Decade Actions, which is the first of series to be launched as part of the Ocean Decade, focuses specifically on:

1. Large-scale, multi-country, transformative Decade programmes; and

2. Large-scale contributions of in-kind or financial resources for Decade Actions, or support to the coordination functions of the Ocean Decade through provision of in-kind and/or financial resources, and/or hosting of a Decade Collaborative Centre / Coordination Office.

Programmes or contributions that will enhance the sustainability of ocean science, including infrastructure or individual or institutional capacity, in light of the COVID-19 pandemic are welcome in response to this call.

Interested parties should complete and submit the Request for Endorsement for before 15 January 2021. Decisions on endorsement under this Call will be made in the first quarter of 2021. Further information on the call can be obtained by contacting oceandecade@unesco.org

*Please note that initiatives proposed by United Nations entities are subject to a separate process that involves registration of their Decade Actions. Further details on that process can be obtained by contacting the IOC Secretariat.*

Before starting we strongly encourage you to read the materials in the Resources page dedicated to the Call for Decade Actions.

\*\* This survey and any files transmitted within it are confidential and intended solely for the use of the individual or entity to whom they are addressed. If you have received this survey in error please notify the system manager. If you are not the intended participant you should not disseminate, distribute or copy this survey. \*\* Ocean Decade: Call for Actions 01/2020

\*A preliminary question identifies if you are ready now to submit the proposed action.

\* 1. If you are ready to get started, please select if your proposed Decade Action is a: A Decade Programme - go to p. 2 YES for OneArgo

A Decade In-Kind or Financial Contribution - go to p. 7

REQUEST FOR ENDORSEMENT OF DECADE ACTION: **DECADE PROGRAMMES**

Please only use this section of the questionnaire if your proposed Decade Action is a Decade Programme.

**1. Overview of Proponent and Proposed Decade Programme**

\* 1. Lead Institution

The Argo Steering Team

https://argo.ucsd.edu/organization/ast-and-ast-executive-members/

\* 2. Lead Institution Type

International intergovernmental organisation

Regional intergovernmental organisation

Other regional organisation

National government

Sub-national government

University

Research institute

Private sector enterprise

Philanthropic Foundation

Corporate Foundation

Multilateral or bilateral funding agency

NGO / civil society organization

**Working group / expert group / taskforce**

Community group

Other (please specify)

\* 3. Lead institution physical address:

Argo Project Office

Scripps Institution of Oceanography

9500 Gilman Drive #0230

La Jolla, CA 92093-0230

\* 4. Contact person:

Megan Scanderbeg, Deputy Director of the Argo Program

\* 5. Contact details

Address, City/Town, Country, Email Address, Phone Number

Megan Scanderbeg

Scripps Institution of Oceanography

9500 Gilman Drive #0230

La Jolla, CA 92093-0230

mscanderbeg@ucsd.edu

858-534-9780

6. Partner details if relevant (for each partner please list Institution name, contact details including address & email and role of partner)

Argo involves the effort of many national programs which often comprise multiple agencies. A full list can be assembled if required, but representatives of each national effort can be found here: <https://argo.ucsd.edu/organization/ast-and-ast-executive-members/>

Argo is just one component of the integrated Global Ocean Observing System (GOOS). It is designed to be synergistic with major satellite observing missions measuring sea level, surface temperature, salinity, wind, colour and velocity, as well as other global in situ networks of tide gauges, surface drifters, long-term moorings, gliders, regular ship surveys and animal-borne sensors. Argo delivers most of its impact through its user communities, which include the ocean forecasting community (OceanPredict – see ForeSea Program), operational climate and weather forecasting community and the global climate, ocean and earth system research community and educators.

\* 7. Name of proposed Decade Programme

OneArgo: an integrated global, full depth and multidisciplinary ocean observing array for beyond 2020

 8. Short title / acronym of proposed Decade Programme for communications purposes (if any)

Argo

\* 9. Summary description of proposed Decade Programme

OneArgo will transform the revolutionary ‘core’ Argo array (which tracks the upper ocean physical state) to one that has truly global reach, including the polar oceans and marginal seas, extending to the full ocean depth and including ocean biogeochemical measurements. Through Argo’s novel data management system, all data will be freely shared in real-time with a very high quality version delivered within 12 months. Implementing OneArgo will greatly increase Argo’s already remarkable impact on ocean and climate services, predictions and research, and enable groundbreaking developments in understanding ocean ecosystems, forecasting ocean productivity and constraining the global carbon and energy budgets.

*(100 words or less to be used on website and in communications – please use lay terms that can be understood by a wide audience)*

\* 10. Start & end date of proposed Decade Programme

Establishing the new array will take around 5-8 years, with the goal to sustain it beyond that.

\* 11. Estimated total budget of proposed Decade Programme

US$100M/year - $33M/year original ‘core’ 2000m mission with spatial enhancements, $33M/year Biogeochemical (living ocean) mission, $33M/year Deep mission

 12. Percentage of estimated budget that is secured

35% - original core Argo largely has sustained funding, but most of the new expansions are operating in pilot mode on a short-term funding basis.

 13. Secured funding sources (donor name and approximate amount secured)

2000m physical ‘core’ Mission: US - 50%, 25% via Euro Argo and its Members, 25% remaining contributions from other national partners.

Contributing nations are: Argentina, Australia, Brazil, Bulgaria, Canada, Chile, China, Costa Rica, Denmark, Ecuador, European Union, Finland, France, Gabon, Germany, Greece, India, Indonesia, Ireland, Italy, Japan, Kenya, Lebanon, Mauritius, Mexico, Morocco, Netherlands, New Zealand, Norway, Peru, Poland, Romania, Russian Federation, Saudi Arabia, South Africa, South Korea, Spain, Sri Lanka, Turkey, United Kingdom, United States of America

BGC Mission: US ~ 30% (only first 5 years), 15% via Euro Argo and its Members (only first 5 years), 5% via Canada (first 5 years), 3% via other national pilots. No nation has sustained funding for the Biogeochemical mission.

Deep Mission: US ~ 10%, 12% via Euro Argo and its’ Members (only first 5 years), 5% other nations. No nation has sustained funding for the Deep mission.

\* 14. Do you require support to find additional resources for your Decade Programme?
 Yes

\* 15. Would you like to be put in touch with partners working on similar issues or proposing Decade Actions that could have synergies with your proposed Action?

 Yes

\* 16. Countries in which the proposed Decade Programme will be implemented

Initial commitments are provided by the historical implementers of the Argo array, including:

Argentina, Australia, Brazil, Bulgaria, Canada, Chile, China, Costa Rica, Denmark, Ecuador, European Union, Finland, France, Gabon, Germany, Greece, India, Indonesia, Ireland, Italy, Japan, Kenya, Lebanon, Mauritius, Mexico, Morocco, Netherlands, New Zealand, Norway, Peru, Poland, Romania, Russian Federation, Saudi Arabia, South Africa, South Korea, Spain, Sri Lanka, Turkey, United Kingdom, United States of America.

We expect the UN Decade will create momentum to attract more partners and some are already committing to this new Argo phase, including Monaco and Portugal

\* 17. Ocean basins in which the proposed Decade Programme will be implemented

Indian Ocean

North Pacific Ocean

South Pacific Ocean

North Atlantic Ocean

South Atlantic Ocean

Arctic Ocean

Antarctic Ocean

Marginal Seas

**2. Description of the proposed Decade Programme**

\* 18. What is the high-level objective(s) of your proposed Decade Programme?

Building on the success of the original core Argo array, OneArgo will target major gaps in the global ocean observing system through a greatly expanded fleet of profiling floats. Objectives for the new fully global, integrated, and multidisciplinary OneArgo program are:

1. Expand subsurface ocean sampling to be as spatially complete as possible by urgently filling observing voids in the deep ocean, polar regions and many marginal seas. Tune the array density in key regions (equatorial, boundary currents) to enhance its utility in state estimates and ocean, climate and weather predictions.

2. Monitor the ocean and Earth’s warming rate, currents and other drivers of the patterns and rates of sea level rise.

3. Provide data to quantify the global carbon cycle, including the biological carbon pump.

4. Monitor ocean acidification and deoxygenation and the planktonic ecosystem responses.

5. Collaborate with the modeling and forecasting community and local resource managers to optimize the use of Argo data in prediction services for societal decisions (from weather to centennial time-scales), including marine resource management, preparing for extremes such as hurricanes and marine heat waves, for use in search and rescue and the safe operation of marine industries, and for use in ocean and climate assessments.

6. Modernize data and metadata flow to democratize access to timely, high-quality, multidisciplinary global ocean data

 a. in real-time to both global and regional prediction services for improved ocean, climate and weather forecasts

 b. in a 12-month delayed, highest quality fashion for the scientific community for goals 2-4

7. Expand the international, national, and regional partnerships for global ocean observing and pilot solutions for facilitated EEZ access so that all nations benefit from a transparent and predicted ocean.

8. Reduce Argo’s environmental footprint and increase its cost efficiency through improving the lifetime of profilers, sensors and to optimize array maintenance.

9. Work with industry to develop innovative new platforms and sensors to improve data quality and quantity, and reduce both capital and operational costs.

\* 19. What are the key expected outcomes of your proposed Decade Programme?

A sustained, multidisciplinary and truly global subsurface ocean observing system, delivering freely available ocean physical, climate and health related observations in real time from every ocean basin and major sea including the polar oceans. This free open data stream available for all peoples will improve existing global and regional analyses, enable completely new types of ocean and climate forecasting services and assessments, revolutionize deep and biogeochemical ocean research and provide huge opportunities for ocean education.

As anthropogenic pressures continue to build on our ocean, the need to establish an indisputable observationally-based and freely shared understanding of the state of the oceans is urgent. OneArgo will deliver the broad-scale subsurface view of many of these changes at all depths, helping to extend surface observations from satellites, give context to what we experience at our coasts and through our changing weather, and thus inform societal responses.

\* 20. Please describe the activities that will be implemented as part of the proposed Decade Programme

 *(600 words or less)*

The 30 national programs that contribute to the present Argo Program will build their capacity and expand to implement the new design that comprises OneArgo. Together, coordinated via the Argo Steering Team and its new Mission Teams (<https://argo.ucsd.edu/expansion/>), the global Argo community will develop, evaluate and implement the new technology and software necessary to provide full ocean depth profiles, operate under sea ice and measure expanded biogeochemical parameters. This will also involve collaboration between the float deploying and operating programs and the commercial vendors who provide the platform and sensors.

To achieve and maintain the OneArgo design, the community will ramp up its efforts over the Decade to expand and diversify today’s ~750 core Argo deployments/year to around 300 deep floats per year, 300 biogeochemical floats per year and 500 ‘core’ floats per year. Once achieved, such deployments will maintain a global array of ~4600 profiling floats. While all floats will be contributing to the ‘core’ mission, 1000 will be dedicated to the biogeochemical mission and1250 to the deep mission.

The existing Argo infrastructure will be enhanced to manage this expanded fleet and to disseminate and manage this larger and more diverse data set. Through ongoing data and technical workshops, national capacities will be developed and technological challenges shared and faced together. New mission teams and technical task teams will monitor the progress of the new enhancements, while the entirety will be coordinated through a diversified Argo Steering Team. Instrument reliability will be continuously monitored and enhanced through regular technical workshops sharing best practices and the latest technical upgrades. The core floats life expectancy at launch (6 years today) has increased by one year every 5 years over Argo’s history and such progress needs to continue with the multidisciplinary and deep floats, with the aim to reduce Argo’s footprint and increase its cost-benefit ratio.

New quality control procedures, comparable to existing ones used for temperature, salinity and pressure will be developed for the biogeochemical parameters. Improved procedures will also be necessary to increase the accuracy of the measurements in the abyssal ocean. A stronger collaboration with ship operators - both commercial and research - will be developed in conjunction with other observing system networks. Tighter collaborations with both satellite and other in situ observing networks will be sought to improve efficiency and ensure synergistic design of the entire system, facilitated via the Global Ocean Observing System’s Observation Coordination Group. Outreach to, interactions with, and feedback from the climate, ocean modeling and reanalysis community will improve the utility and impact of this expanded data stream. Similarly, educational outreach will expand to a more interdisciplinary community.

\* 21. Please describe the theory of change that underpins your proposed Decade Programme i.e. how will the activities being carried out achieve the outcomes and objectives that you envisage

  *(400 words or less) 395 words now*

To develop enhanced, cost-effective long-lived floats, new technologies for OneArgo have gone through several Framework for Ocean Observing readiness levels, from engineering and demonstration deployments to regional pilot arrays. Technical challenges were identified and solved, leading to an improved and cost-effective global array. Improvements include ice-avoidance and temporary onboard storage of profiles, biogeochemical sensors, new floats and sensors to diversify options and to operate to 6000m depths. A deep or biogeochemical float also contributes to the core mission but are not as proven as core floats. Consideration of risk/efficiency tradeoffs of the combined OneArgo array for the core infrastructure will avoid damaging the core data stream.

Argo supplies data for operational services, ocean and climate assessments, scientific research and education activities. We have consulted these user communities to determine which array enhancements will have the greatest impact and uptake. Many model-based observation design and impact studies have informed the design of OneArgo. Thus, OneArgo is well-positioned to contribute to several societal outcomes, especially “a predicted ocean”, “a safe ocean”, “a transparent ocean”, and “a sustainable and productive ocean”. The Argo data system is evolving to accommodate new mission data and improve its utility and accessibility to our partners . We have also promoted better understanding of our data, ensuring best-practices by users when interpreting their analyses. The new enhanced Argo observations are widely anticipated by our operational partners(see ForeSea Program), will be integrated into existing Argo data streams and in some cases are already in use. Many groups, particularly from the OceanPredict community, can immediately exploit OneArgo measurements. Forecasting groups have conducted many theoretical and realistic experiments to ensure immediate exploitation of OneArgo data, insuring its rapid and full exploitation.

Synergies with other parts of the global ocean and climate observing system, including satellites, moorings, drifters and gliders, are best exploited via data assimilating model and prediction systems. Argo is the dominant subsurface data source for most decadal and seasonal forecasting systems, and is recognized as vital to nascent coupled tropical storm forecasting systems. OneArgo data will fill major gaps in the deep, polar and living ocean that are critical for existing (ocean, climate and weather) and future (ocean health, ecosystems and productivity) forecasts and analyses . OneArgo will significntly impact ocean research and education, mirroring core Argo which has been the basis for thousands of research articles and hundreds of graduate theses.

\* 22. Will your proposed Decade Programme enhance the sustainability of ocean science initiatives, including infrastructure or individual / institutional capacity, in light of the current Covid-19 pandemic?

 Yes / No

Yes

23. If yes, how will your proposed Decade Programme enhance the sustainability of ocean science initiatives, including infrastructure or individual / institutional capacity, in light of the current Covid-19 pandemic ?

*(200 words or less) 197 words now*

Due to Argo floats’ autonomous operation and long lives, the Argo data stream has been fairly resilient to the COVID-19 pandemic. Despite curtailed ship operations, we have been able to maintain some deployments. Once the pandemic is over, enhanced deployments will target regions where the array is thinning (as occurs normally). The Argo community has used virtual meeting technologies to continue its work operating the core array and developing the OneArgo concept and pilots. However, both deep and biogeochemical deployments, where ship-board data are desirable in pilot arrays, have been impacted by the COVID-19 disruptions, causing some slight delay in the array build up. Close communication with Argo sensor and platform suppliers has been maintained to help manage the situation. This will continue through the end of the pandemic.

OneArgo will be running regular basin-based planning meetings, as piloted recently to optimize the deployment strategies in a period of reduced academic ship time. Deployment opportunities are shared within the Argo community and more largely within GOOS Observations Coordination Group networks, through the OceanOPS office, including from third parties (sailing community, industry, NGOs, etc). Low cost charter based solutions are investigated and shared to target gaps more proactively.

\* 24. Please describe the coordination / management structure for the proposed Decade Programme

 *(400 words or less) 221 words including comment at end*

Argo already has a well-developed international coordination infrastructure in place, including:

* An international Steering Team (https://argo.ucsd.edu/organization/argo-steering-team/) with the responsibility for overseeing the entire program, its design and implementation.
* Dedicated Mission Teams which coordinate and implement the major new enhancements such as the Deep ( <https://argo.ucsd.edu/expansion/deep-argo-mission/>) and Biogeochemical missions (<https://biogeochemical-argo.org/mission-team.php>
* An international Argo Data Team which oversees the operations and development of the Argo data system, sets the formats and standards for Argo data management practices and protocols ([http://www.argodatamgt.org/Data-Mgt-Team/ADMT-team-and-Executive-Committee)](http://www.argodatamgt.org/Data-Mgt-Team/ADMT-team-and-Executive-Committee%29)
* A Project Program Office based at the Scripps Institution of Oceanography. The Project Office facilitates the coordination and operation of Argo, and is vital in communicating with our users.
* Array tracking, compliance with IOC Resolution EC-XLI-4 and performance analysis is carried out by OceanOPS (http://argo.ocean-ops.org) based in France/Brest with an office node being established in Monaco (with a biogeochemical and Mediterranean Sea focus).

To adapt to the larger and more complex missions envisioned by OneArgo, the Steering Team was expanded to include the co-chairs of the Mission Teams (https://argo.ucsd.edu/organization/), while the data system has been rapidly building its capacity to manage and distribute data from new parameters.

OneArgo will be implemented in accordance with IOC Resolution EC-XLI-4 guidelines, and decision EC-LI/Dec.4.8 for its biogeochemical evolving capabilities and framework for additional parameters. It will as well explore solutions spaces for a facilitated access to Exclusive Economic Zones (e.g in marginal seas) in close collaboration with IOC/UNESCO and WMO secretariats, regional nodes, and Member States.

The improvement of such procedure towards a fast track solution is seen as critical to complete and sustain the new global array which will include 30% of its yearly deployments in Member States EEZs.

**3. Contribution of Proposed Decade Programme to the UN Decade of Ocean Science for Sustainable Development (refer to the Ocean Decade Implementation Plan for details)**

\* 25. To which Sustainable Development Goal(s) (SDG) will your proposed Decade Programme contribute? Please select a maximum of three SDGs

GOAL 1: No Poverty.

GOAL 2: Zero Hunger

GOAL 3: Good Health and Well-being

**GOAL 4: Quality Education**

GOAL 5: Gender Equality

GOAL 6: Clean Water and Sanitation

GOAL 7: Affordable and Clean Energy

GOAL 8: Decent Work and Economic Growth

**GOAL 9: Industry, Innovation and Infrastructure**

GOAL 10: Reduced Inequality

GOAL 11: Sustainable Cities and Communities

GOAL 12: Responsible Consumption and Production

**GOAL 13: Climate Action**

**GOAL 14: Life Below Water**

GOAL 15: Life on Land

GOAL 16: Peace and Justice Strong Institutions

GOAL 17: Partnerships to achieve the Goal

Since a good case can be made for 4 SDGs (4, 9, 13, 14) let's just check 4 boxes and ignore the instruction (maximum of 3) unless the survey monkey won't let us. It is frustrating to be limited as the climate and weather applications of Argo impact SDG 15 (life on land) and we hope that the BGC mission will impact on food security via better management of marine ecosystems (SDG 2).

\* 26. How will your proposed Decade programme will contribute to the SDGs selected? Please Explain

 *(200 words)* 283 words now

GOAL 4: Quality Education. OneArgo will expand Argo’s primary, secondary, and tertiary education contributions (https://argo.ucsd.edu/outreach/education-materials/) through new unprecedented deep sea

and biogeochemical observations. Students anywhere in the world will explore the dynamic physical and biogeochemical state of the global ocean using OneArgo data and products.

GOAL 9: Industry, Innovation and Infrastructure. OneArgo expands Argo leadership in the ongoing technology revolution of autonomous ocean instrumentation. More stable and accurate sensors, more capable and longer-lived instruments, and expansion of international academic, government, and commercial partnerships, enhances the sustainability of OneArgo observations and enables all nations to participate and share benefits.

GOAL 13: Climate Action. The foundation for climate action is climate observation in service of climate understanding. OneArgo creates a full-depth, fully global, multi-disciplinary ocean/climate observing system to document the physical and biogeochemical ocean state and its evolution, including global ocean warming, sea level rise, acidification, deoxygenation, and the changing carbon cycle. OneArgo data will improve forecasts of the oceans and climate.

GOAL 14: Life Below Water. OneArgo’s suite of observations, including physical state, oxygen concentration, nitrate, pH, and bio-optical properties will illuminate the health of oceanic ecosystems and their variability and change.

\* 27. How will your proposed Decade Programme contribute to the vision and mission of the Decade (400 words)? 357 words now

The vision of the Ocean Decade is ‘the science we need for the ocean we want’.

By targeting major global scale ocean observational gaps at unprecedented spatial / temporal resolution, OneArgo will be the key network supporting a new era of ocean exploration and discovery. It will advance the understanding of basic ocean processes, and allow a much more rigourous assessment of the climate state of the ocean, as well as its variability and change. OneArgo additionally enables ocean and coupled reanalyses and predictive modeling of extreme weather events, and of climate oscillations such as El Nino/Southern Oscillation, and of other economically significant ocean/atmosphere phenomena. OneArgo builds on 20 years of contributions in all of these areas by the Argo Program, extending them from the upper ocean to full ocean depth, to include biogeochemical as well as physical properties, and for improved spatial coverage in special focus regions. OneArgo, as with the predecessor core Argo, is grounded in partnerships – multi-institutional, multi-national, and spanning academia, government, and commercial sectors. The partnership approach is proven, welcoming, and expandable, to encourage and employ contributions of all nations toward shared and achievable goals.

The mission of the Ocean Decade is ‘to catalyse transformative ocean science solutions for sustainable development, connecting people and our ocean’.

OneArgo is a powerful catalyst for stimulation of ocean science for sustainable development. Its defining characteristics are (1) Global, (2) Full-depth, and (3) Multi-disciplinary, providing a dataset that is (4) Near real-time, (5) Highest quality, and (6) Freely available and exchanged. The existence of OneArgo stimulates additional related regional and global ocean and climate observations by delivering the broadscale spatial and temporal context for more spatially and temporally intensive programs. OneArgo’s data quality and availability will feed many new applications in modeling and assimilation, including those that will support the Blue Economy. Catalyzing of ocean science solutions is an iterative process, and OneArgo provides a fundamental step in illuminating the path toward a sustainable and healthy ocean. OneArgo’s free and open data policy, providing near real-time and delayed-mode climate quality data and metadata, is central to achieving the transformative mission of the Ocean Decade.

\* 28. To which Decade outcome(s) will your proposed Decade Programme contribute ?

Outcome 1: A clean ocean where sources of pollution are identified and reduced or removed.

Outcome 2: A healthy and resilient ocean where marine ecosystems are understood, protected, restored and managed. Outcome 3: A productive ocean supporting sustainable food supply and a sustainable ocean economy.

Outcome 4: A predicted ocean where society understands and can respond to changing ocean conditions. Outcome 5: A safe ocean where life and livelihoods are protected from ocean-related hazards.

Outcome 6: An accessible ocean with open and equitable access to data, information and technology and innovation.

Outcome 7: An inspiring and engaging ocean where society understands and values the ocean in relation to human wellbeing and sustainable development.

\* 29. How will your proposed Decade Programme contribute to the Decade outcomes selected *(200 words)*? 300 words

Outcome 1: Through better drift modelling of marine debris, OneArgo will help identify the sources and sinks of ocean pollution.

Outcomes 2 and 3: OneArgo will deliver the first global measurements of natural and anthropogenic influences on ocean biogeochemical cycles and productivity, illuminating changes to help inform managers of ocean ecosystems and climate policy makers.

Outcome 4: OneArgo will provide an unprecedented data stream for existing ocean and climate prediction services, encourage development of new ocean productivity and health forecasting systems, and greatly improve sea level, deep and polar ocean change and variability estimates and modeling.

Outcome 5: Through its impact on ocean, climate and weather prediction, Argo will help enable more accurate and longer lead-time forecasts of ocean extremes and major weather and climate events. This will help industries and communities prepare for these extremes to mitigate loss of life and economic damage at sea and on land.

Outcome 6: At the forefront of timely and open sharing of all of its data, OneArgo will work with our partners to ensure global derived products are freely available (<https://argo.ucsd.edu/data/argo-data-products/>)

Outcome 7: With a strong track record of broad communication, the expanded scope of OneArgo brings opportunities to reach an even broader community and increase understanding of the ocean and enable sustainable exploitation of our marine resources and to stabilize our climate.

\* 30. To which Ocean Decade Challenge(s) will your proposed Decade Programme contribute?

Challenge 1: Understand and map land and sea-based sources of pollutants and contaminants and their potential impacts on human health and ocean ecosystems, and develop solutions to remove or mitigate them.

**Challenge 2: Understand the effects of multiple stressors on ocean ecosystems, and develop solutions to monitor, protect, manage and restore ecosystems and their biodiversity under changing environmental, social and climate conditions.**

**Challenge 3: Generate knowledge, support innovation, and develop solutions to optimise the role of the ocean in sustainably feeding the world’s population under changing environmental, social and climate conditions.**

Challenge 4: Generate knowledge, support innovation, and develop solutions for equitable and sustainable development of the ocean economy under changing environmental, social and climate conditions.

**Challenge 5: Enhance understanding of the ocean-climate nexus and generate knowledge and solutions to mitigate, adapt and build resilience to the effects of climate change across all geographies and at all scales, and to improve services including predictions for the ocean, climate and weather.**

**Challenge 6: Enhance multi-hazard early warning services for all geophysical, ecological, biological, weather, climate and anthropogenic related ocean and coastal hazards, and mainstream community preparedness and resilience.**

**Challenge 7: Ensure a sustainable ocean observing system across all ocean basins that delivers accessible, timely, and actionable data and information to all users.**

**Challenge 8: Through multi-stakeholder collaboration, develop a comprehensive digital representation of the ocean, including a dynamic ocean map, which provides free and open access for exploring, discovering, and visualizing past, current, and future ocean conditions in a manner relevant to diverse stakeholders.**

**Challenge 9: Ensure comprehensive capacity development and equitable access to data, information, knowledge and technology across all aspects of ocean science and for all stakeholders.**

Challenge 10: Ensure that the multiple values and services of the ocean for human wellbeing, culture, and sustainable development are widely understood, and identify and overcome barriers to behaviour change required for a step change in humanity’s relationship with the ocean.

\* 31. How will your proposed Decade Programme contribute to the Decade Challenges selected *(200 words)*? 114 words

OneArgo most directly contributes to Challenge 7, and if implemented, will radically improve the availability, timeliness and coverage of subsurface physical and biogeochemical observations from across the global oceans. Such observations are vital to nearly all of the Decade Challenges, as they will form the baseline and capture changes of ocean heat and carbon uptake (Challenge 5), ocean productivity and health (Challenge 2 and 3), and underpin model development (Challenge 8). Through facilitation model development and underpinning forecast initialization, OneArgo will help meet Challenge 6, with particular impact for polar oceans and the living oceans. Through the open and freely available Argo data system, and the products that rely on it, OneArgo enables those not able to go to sea to explore and ‘see’ what is happening in any part of the global ocean, in real time (Challenge 9).

\* 32. To which Decade Objective(s) will your proposed Decade Programme contribute?

**Objective 1: Identify required knowledge for sustainable development, and increase the capacity of ocean science to deliver needed ocean data and information**

**Objective 2: Build capacity and generate comprehensive knowledge and understanding of the ocean including human interactions, and interactions with the atmosphere, cryosphere and the land sea interface.**

Objective 3: Increase the use of ocean knowledge and understanding, and develop capacity to contribute to sustainable development solutions.

Objectives 1 and 2

\* 33. How will your proposed Decade Programme contribute to the Decade Objective(s) selected *(200 words)*? 219 words

Objective 1: Through supporting enhanced analysis and forecasting services for weather, oceans and climate, OneArgo will help better arm communities to deal with extreme events, design resilient infrastructure and adapt to future climate change. Diagnosing the causes of local extremes, whether due to regional activities or from global processes, is essential in understanding how to mitigate them.

Objective 2: By expanding sustained, real-time and multidisciplinary observations across the global oceans into major blind spots (polar oceans, deep oceans and living oceans), OneArgo lays the foundation to detect the impacts of human activities on the ocean’s physical, chemical and biological state. As one major element in the Global Climate and Oceans Observing System, OneArgo is synergistic with key satellite observing missions and other observing networks, which together enable linkages across the interconnected elements of the Earth System. The enhanced atmospheric water cycle leaves a footprint in ocean salinities, warming oceans speed the melting of ice-sheets and drive sea level rise through water column expansion. By providing critical data for forecast systems that include prediction of parameters that inform coastal development and industries including aquaculture, fisheries, offshore energy and shipping, OneArgo will promote sustainable use of our marine resources.

\* 34. With respect to the Decade Objectives selected above, to which Decade Sub-Objective(s) will your proposed Decade Programme contribute?

**1.1: Provide the scientific basis for regular integrated assessments of the state of the ocean and identify priority gaps at different scales and in different geographies to frame efforts in exploration, observations and experimentation.**

**1.2: Promote new technology development and enhance access to technology to generate ocean data, information and knowledge.**

**1.3: Enhance and expand existing ocean observing systems across all ocean basins to deliver information on standardized essential ocean variables including social and economic, geological, physical, chemical, bathymetric, biological, ecological parameters, and observations on human interactions with the ocean.**

1.4: Develop mechanisms that support community-led science initiatives and the recognition and inclusion of local and indigenous knowledge as a fundamental source of knowledge.

1.5: Undertake regular assessments of the state of ocean science capacity to identify and overcome barriers to generational, gender and geographic diversity, and promote sufficient and sustainable investment.

**2.1: Generate a comprehensive inventory, mapping, and understanding of the role and function of ocean components including their human interactions and interactions with the atmosphere, cryosphere and the land sea interface.**

2.2: Generate a comprehensive understanding of thresholds and tipping points for ocean components, including human interactions.

2.3: Innovate and expand the use of historical ocean knowledge to support sustainable development solutions.

**2.4: Improve existing, and develop new generation ocean models for improved understanding of the past, current and future states of the ocean, including human interactions.**

**2.4: Improve prediction services and increase predictive capability for oceanic hazards or events including extreme weather and climate.**

**2.5: Expand cooperation in ocean-related education, training, capacity development and transfer of marine technology.**

3.1: Broadly communicate and promote the role of ocean science for sustainable development across diverse stakeholder groups including through formal and information education and an expansion of ocean literacy approaches across stakeholder groups.

3.2: Develop interoperable, open access platforms and applications to share data, information and knowledge in a format that connects knowledge generators and users.

3.3: Undertake interdisciplinary, multi-stakeholder co-design and co-delivery of ocean solutions including policy, decision making, integrated ocean management frameworks, applications and services, and technology and innovation.

**3.4: Expand and enhance spatial planning processes to contribute to sustainable development across regions and scales.**

3.5: Expand and enhance inclusive and integrated management frameworks and tools, including nature-based solutions, to maintain ecosystem functioning, provide for adaptive processes under changing ocean conditions, and incorporate community values and needs.

3.6: Expand and enhance services, applications and management tools for building and mainstreaming preparedness and adaptive responses to multiple stressors and hazards.

3.7: Expand and enhance tools, applications and services that integrate and facilitate use of data, information, and knowledge on ocean-related natural capital including the social, cultural, environmental, and economic characteristics of the ocean.

**1.1, 1.2, 1.3, 2.4 (both), 2.5, 3.4**

\* 35. How will your proposed Decade Programme contribute to the Decade sub-objectives selected (200 words)? 120 words

OneArgo most directly contributes to 1.3 through its global reach; multidisciplinary data stream; and open, timely, and comprehensive data system. OneArgo data lay the foundation for many of the aspirations in Objectives 1.1, 2.4, 2.5 and 3.4. OneArgo also contributes to 1.2, as it develops and uses state-of-the-art autonomous platforms and sensors, and is building the capacity to operate these across the many nations that contribute to Argo, and encouraging new national partners. Such technology is one of the most efficient, cost effective, and lowest impact means of collecting deep ocean observations.

\* 36. Please check which of the following criteria are relevant to your proposed Decade Programme as far as they are relevant to your proposal:

Accelerate the generation or use of knowledge and understanding of the ocean, with a specific focus on knowledge that will contribute to the achievement of the SDGs and complementary policy frameworks and initiatives.

Both global climate policy and marine resource management require a global and interconnected view of how the ocean interacts with the rest of the Earth System, human societies, and how the oceans vary and change. Predictions of sea level, storms, ocean health, and carbon uptake all require a global and real-time data stream, of which OneArgo will be a major contributor.

Is co-designed or co-delivered by knowledge generators and users, and does it facilitate the uptake of science and ocean knowledge for policy, decision making, management and/or innovation.

OneArgo was designed with our operational and research partners, and is expected to impact the assessments and prediction services that policy and decision makers rely upon every day, as well as support new knowledge and discoveries.

Will provide all data and resulting knowledge in an open access, shared, discoverable manner and appropriately deposited in recognized data repositories consistent with the IOC Oceanographic Data Exchange Policy[1] or the relevant UN subordinate body data policy.

The Argo data management system (<http://www.argodatamgt.org/Data-Mgt-Team/Argo-Data-System-components>) is built on free and open data sharing. Documents describing Argo data processes are here <http://www.argodatamgt.org/Documentation>. Argo data are shared in real-time via the WMO’s Global Telecommunications System in BUFR messages and are assembled and distributed through two Argo Global Data Assembly Centres (<http://www.argodatamgt.org/Access-to-data>) in netCDF format

If you check this criteria, please provide in the question below details of where data will be deposited and where it exists, attach a data management plan.

Strengthen existing or create new partnerships across nations and/or between diverse ocean actors, including users of ocean science.

Argo has been one of the most internationally diverse observing systems with about 30 national partners. This diversity needs to keep growing, through an unprecedented communication campaign (still to be shaped), and through better use of capacity building mechanisms. The addition of biogeochemical data entrains additional communities who will be using Argo data.
Argo has also been at the forefront of the development of partnerships with civil society, in particular the sailing community which is deploying floats through individuals, racers, NGOs, etc, and promoting the benefits of Argo and of the GOOS to a larger public.

Contribute toward capacity development, including, but not limited to, beneficiaries in Small Island Developing States, Least Developed Countries and Land-locked Developing Countries.

Argo has run a number of ad hoc float donor programmes and regional capacity building workshops to help scientists use Argo data and to help educators incorporate Argo data into K-12 education. It wishes to integrate these programmes in the larger GOOS Capacity Building initiatives, led by IOC/UNESCO and its WMO partners.

Overcome barriers to diversity and equity, including gender, generational, and geographic diversity.

Collaborate with and engage local and indigenous knowledge holders.

OneArgo will keep engaging with coastal peoples with regard to implementation (deployment, securing of beached instruments e.g.) and communication on its benefits and outreach.

\* 37. How will your proposed Decade Programme contribute to the Decade criteria selected *(no word limit)*?

**4. Communications**

\* 38. Please describe how you plan to communicate about your proposed Decade Programme including the main target audiences and methods of communications *(400 words or less)*.

The OneArgo plan will be communicated to governments, funding agencies, the scientific community, manufacturers, and the general public through current Argo Steering Team and Argo Data Management Team members, Argo Mission Teams, Argo National Programs, the Argo Program Office, and OceanOPS. These groups will hold meetings, workshops, and conferences and utilize the Argo website (<https://argo.ucsd.edu/>); and issue press releases to relay the OneArgo plan.

Since Argo is currently funded through national programs, each National Program and Argo Steering Team member will work within their country’s infrastructure to communicate the OneArgo plan via meetings with various government stakeholders, scientists, and float and sensor manufacturers.

Argo Science Workshops will be held to communicate directly with scientists and the modeling community about how to use oneArgo data, what the new data are reporting about the physical and biogeochemical state of the ocean and how to continue to implement the OneArgo plan effectively and efficiently. Argo Mission Teams will continue to hold workshops to improve and monitor implementation, consider technical challenges, and receive feedback from scientists and operational user teams.

A series of technical workshops will be held to interact directly with scientists and manufacturers to encourage continued improvement on the float and sensor technology as well as to manage the increased demand for newer sensors and float types.

The Argo Program Office will continue to update the Argo website with the plan objectives and status of these over time. OceanOPS will continue to monitor the technical aspects of the Argo array and its implementation towards fulfilling the OneArgo plan.

\* 39. Have you developed a communications strategy or plan as part of your proposed Decade Programme? If so, please attach it as part of the supporting documentation.

  **No**

40. If yes, please attach the communications documents requested.

**5. Supporting Documentation**

 41. Please attach any relevant supporting documents to your submission that will aid in its evaluation e.g. project log frame, research proposal, high-level budget, data management plan, communications strategy, or letters of support. Please note that none of these documents are obligatory, but can be provided at the discretion of the proponent if they feel it will help in the understanding of their request.

[OceanObs 19 paper, BGC implementation paper, the Argo data paper, Argo environmental impact statement and Argo framework paper ]

\* 42. Please confirm that you have completed your form submission:

I have completed my form submission.

STOP HERE FOR ARGO PROGRAMME SUBMISSION.