#1

COMPLETE

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Page 2: Eligibility

Q1

To which Ocean Decade Programme are you apply to be a project under?

28. ForeSea - The Ocean Prediction Capacity of the Future

Q2

Is your project already affiliated with the programme you have selected?

Yes

Page 3: Proponent and Partner Details

Q3

Lead Institution Name

OceanPredict Observing System Evaluation Task Team

Q4

Lead Institution Type

Non-governmental organization

Q5

Lead Institution Physical Address

Street Address	**1-1 Nagamine**
Town/City	**Tsukuba**
Postal/Zip Code	**305-0052**

Q6

Lead Institution Country

Japan

Q7

Is your institution based in a Least Developed Country, Small Island Developing State, or AfricaPlease find a list of SIDS here: https://www.un.org/ohrlls/content/list-sidsPlease find a list of LDCs here: https://www.un.org/development/desa/dpad/least-developed-country-category/ldcs-at-a-glance.html

No

Q8

Lead Institution Website

https://oceanpredict.org/science/task-team-activities/observing-system-evaluation/

Q9

Lead Partner Contact

First Name	**Yosuke**
Last Name	**Fujii**

Q10

Lead Partner Contact Email Address

yfujii@mri-jma.go.jp

Q11

Email contact of person completing survey

yfujii@mri-jma.go.jp

Q12

Partner Institution NamesPlease provide the names of up to five partner lead institutions. Other partner details can be provided in the supplementary information section.

Partner No. 1 Institution name	**Meteorological Research Institute, Japan Meteorological Agency**
Partner No. 2 Institution name	**Mercator Ocean International**
Partner No. 3 Institution name	**Met Office**
Partner No. 4 Institution name	**NOAA Quantitative Observing System Assessment Program**
Partner No. 5 Institution name	**European Centre for Medium-Range Weather Forecasts**

Q13

Partner Institution Countries

	Partner Institution Country
Partner No. 1	**Japan**
Partner No. 2	**France**
Partner No. 3	**United Kingdom of Great Britain and Northern Ireland (UK)**
Partner No. 4	**United States of America (USA)**
Partner No. 5	**United Kingdom of Great Britain and Northern Ireland (UK)**

Page 4: Decade Action Description

Q14

Name of Decade ActionYour Action name must be fewer than 50 characters.

Synergistic Observing Network for Ocean Prediction

Q15

Short name or acronym of Decade Action

SynObs

Q16

Is the project you are proposing an ongoing initiative or new?

New Initiative

Q17

When will your proposed Action start and end?Please use the first of the month in which your Action will start if you do not have a specific start date.

Start Date **01/07/2022**
End Date **30/06/2026**

,

Q18

Total Budget estimate for the Decade Action to the nearest whole number with no punctuation.

890000

Q19

Please indicate the currency of the above budget.

USD

Q20

Estimate of percentage of total budget securedThis can include in-kind and financial resources.

1

Q21

Please select all countries in which the Decade Action will be implemented.

Australia,

Brazil,

Canada,

China,

Denmark,

France,

India,

Italy,

Japan,

Norway,

Republic of Korea,

United Kingdom of Great Britain and Northern Ireland (UK)

,

United States of America (USA)

Q22

Please select all ocean basins in which the Decade Action will be implemented.

North Atlantic Ocean,

South Atlantic Ocean,

North Pacific Ocean,

South Pacific Ocean,

Indian Ocean,

Arctic Ocean,

Southern Ocean,

Mediterranean Sea,

Other (including regional seas):

several marginal and coastal seas

Q23

Summary of Decade Action (max. 1000 characters)

SynObs is being proposed as a common comprehensive Decade Project to the three Decade Programmes, ForeSea, CoastPredict, and Observing System Co-Design. SynObs will seek to extract maximum benefit from combining various observation platform measurements, typically satellite and in situ observation data, or combinations of coastal and open ocean platforms for ocean/coastal predictions. SynObs aims to identify the optimal combination of the different ocean observation platforms through observing system design and evaluation, and to develop assimilation methods which can enable drawing synergistic effects from these combinations. Targets of SynObs include open-ocean, such as global, tropical, mid-latitude, arctic and subarctic oceans, as well as coastal-sea, and biogeochemical observing systems.

Q24

Please select which of the Decade Outcomes your Decade Action contributes to (max. 3)

Outcome 2: A healthy and resilient ocean where marine ecosystems are understood, protected, restored and managed.

,

Outcome 5: A safe ocean where life and livelihoods are protected from ocean-related hazards.

,

Outcome 4: A predicted ocean where society understands and can respond to changing ocean conditions.

Q25

Please select which of the Decade Challenges your Decade Action contributes to (max. 3)

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.

Q26

Please select which of the Sustainable Development Goals your Decade Action contributes to (max. 3)

GOAL 9: Industry, Innovation and Infrastructure,

GOAL 13: Climate Action,

GOAL 14: Life Below Water

Q27

What is the high-level objective of your Decade Action? (max. 1000 characters)

SynObs seeks to extract the maximum benefit or synergy from various combinations of different in-situ and remote sensing ocean observation platforms for the ocean (including sea-ice and BGC properties) monitoring and prediction systems. More specifically, SynObs has two main objectives: First, to design and to adopt an optimal combination of different ocean observation platforms with limited cost from which ocean prediction systems can draw effective information on the synergy among those platforms. Second, to optimize assimilation methods that can draw on the synergy between the combination of different platforms. SynObs typically targets combinations of in situ and satellite observations, but also explores the synergy among different observing platforms in the coastal and open ocean since the coastal region is characterized by an enhanced focus on observing the high frequencies and small scales.

Q28

What are key outcomes of your Decade Action? (max. 2000 characters)

1. Guideline for constructing and sustaining optimal and efficient ocean observing networks in which various observation platforms are distributed effectively to improve the accuracy of ocean predictions. SynObs will provide justifications for sustaining in situ observing systems and satellite missions, recommendations for the future evolution of the observing networks, and the means to diagnose the status of the observing systems at near real time, which facilitates a quick reaction against a critical loss of a particular observing system. These outcomes will contribute to activities of Ocean Observing Co-Design, especially to the authorized report on ocean observation requirements planned in this Decade Programme. 2. Advance of data assimilation capacity, including effective assimilation methods of in situ and satellite observation data allowing synergistic improvement, methods for assimilating satellite observation data more directly, coupled ocean-atmosphere data assimilation techniques, effective ways to assimilate coastal and open ocean observations simultaneously, and methods to represent the oceanic biogeochemical state through assimilation of both physical and biogeochemical parameters. These advances will contribute to ForeSea and CoastPredict by improving open ocean, coastal sea, and coupled atmosphere-ocean monitoring and predictions of various lead times for various areas. 3. Development of a systematic mechanism to provide feedback from ocean prediction centers to observational communities and to ingest the knowledge about the observation impacts in the evolution of the ocean observing network. This includes a framework for evaluating ocean observing systems routinely, and is based on the collaboration among various operational centers. 4. Intellectual capacity building to train an emerging generation of scientists from developing and developed nations to continue observing system monitoring and design into the future beyond the UN Decade time horizon.

Q29

What are key discrete activities that you will carry out in the first 3 years of your Decade Action? (max. 5000 characters)

This project aims to optimize various combinations of different platforms in the ocean observing network and to maximize the synergy from different platform combinations when assimilated in ocean prediction systems. SynObs will consider the following combinations as the main targets. A) Satellite altimeters (including conventional and wide-swath altimeters), satellite ocean current observations (SKIM) and Argo floats for reconstructing detailed ocean current fields affected by western boundary currents and meso-scale eddies. B) Tropical buoys, Argo floats, and satellite altimeters to detect the equatorial wave activities and its influence on basin scale variations such as ENSO and IOD. C) Satellite sea surface salinity observations and near surface in situ observations to represent influence of precipitation and runoff. D) Satellite SST-observing radiometers, near surface in situ observations, and sea surface atmospheric parameters to reproduce the diurnal SST cycle and the SST variation caused by tropical storms, especially in coupled data assimilation systems. E) Satellite ocean color observations and in situ (Core and BGC Argos) observations to better monitor and forecast the marine BGC environment variability. F) Observations of sea ice concentrations and sea ice thickness to improve sea ice predictions in arctic and subarctic regions. G) Coastal ocean radars and sensors, Gliders, Drones, Satellite remote sensing, and Argo floats to detect coastal phenomena characterized by the small scale and the high frequency. To explore the methods of effectively combining data from the targeted combination of observing platforms described above, and to ensure that the results of the project are applied to the future ocean observation network, the following collaborative experiments and tasks will be implemented. 1. Multi-System observing system experiments (OSEs), observing system simulation experiments (OSSEs), and evaluation based on observation impact and sensitivity diagnostics to identify the optimal combination of in situ and satellite data. The OSEs and OSSEs will be conducted for the monitoring and prediction of targeted ocean phenomena. Experiments will be conducted using multiple systems to alleviating the strong dependency on the numerical model and data assimilation method used by the different ocean prediction system. The robustness of the evaluation will be increased by averaging the results from multiple systems and cancelling out the systematic errors induced by the aforementioned dependency. 2. Development of improved data assimilation schemes which can extract additional benefits from the combination of in situ and satellite observation data, including assimilation of low-level processed satellite data, incorporation of the background error covariance between the atmosphere and the ocean, and assimilation schemes for coupled data assimilation systems. The project will support such developments by promoting information sharing through the internet and workshops. 3. Collocated satellite/in situ observation campaigns to identify the synergy between in situ and satellite data, and to support the development of data assimilation systems that can exploit this synergy effectively. This task is especially relevant for developing effective methods to combine satellite radiometer and near-surface temperature observations. 4. Development of best practices for evaluating the performance of ocean observing networks composed of various observing platforms. This development will facilitate regular evaluation of the ocean observing systems and contribute to the maintenance and evolution of these systems. 5. Construction of a real-time ocean observation impact monitoring system. This will facilitate the quick evaluation of the ocean observing systems when a critical change of the system status occurs due to some planned or accidental event. 6. Generating information and recommendations on ocean observation impacts and designs from the ocean prediction perspective. This will constitute part of the authorized report on ocean observations planned in Ocean Observing Co-Design. The outcomes include feedback from the ocean and coupled prediction centers to the ocean observation community. It will also be a tool to promote the communication between the two communities.

Q30

How does your project align with your chosen Decade Programme's priorities? (max. 3000 characters)Please review the Call for Decade Actions No. 02/2021 for details of each programmes' priorities.

SynObs is being proposed as a common comprehensive Decade Project to the three Decade Programmes, ForeSea, CoastPredict, and Observing System Co-Design, but its main affiliation is ForeSea. ForeSea aims to increase ocean prediction capacity globally and to strengthen the operational oceanography value chain connecting ocean prediction systems, ocean observing systems, and end users of ocean predictions. SynObs aims to increase the ocean prediction capacity by developing data assimilation schemes through which ocean prediction systems can draw synergy from combining different ocean observing systems, and by improving the ocean observing network through evaluation and design based on the observation impacts in ocean predictions systems. SynObs also aims to establish a systematic mechanism to provide feedback from ocean prediction centers to observation communities and to ingest the knowledge on the observation impacts in the evolution of the ocean observing network. Thus, it will strengthen part of the operational oceanography value chain between ocean observations and prediction systems, contributing to ForeSea, CoastPredict aims to increase the capacity of coastal predictions and their use for social benefits. Due to the small scale and high frequency of coastal ocean phenomena, the number of available observation data in coastal seas is usually not sufficient although a variety of observing platforms is used in coastal seas. Therefore, SynObs intends to design efficient coastal observation networks and to develop effective assimilation methods of combining coastal observation data. Through this, SynObs will contribute to CoastPredict by supporting construction of coastal observing systems and by increasing coastal prediction accuracies. Ocean Observing Co-Design aims to design ocean observation networks through collaboration of observational communities and various stakeholders, including operational ocean and weather prediction centers, and to improve the observing networks to maximize their societal benefits. In particular, the program plans to publish an authorized report on ocean observation impacts and future evolution of the observing networks. SynObs will evaluate ocean observing systems and explore improvements of their designs through international collaboration from the perspective of ocean prediction science. Such activities will allow SynObs to provide a guideline for constructing and sustaining optimal and efficient ocean observing networks in which various observation platforms are distributed effectively to improve the accuracy of ocean predictions. The guideline will be provided to Ocean Observing Co-Design and used as part of the authorized report.

Q31

Please describe the management structure which will be used to coordinate your Decade Action (max. 2000 characters)

Although SynObs, as a common comprehensive project is most closely linked to ForeSea, it will be deeply engaged with the three Decade Programmes, ForeSea, CoastPredict, and Ocean Observing Co-Design. SynObs is mainly led by the OceanPredict Observing System Evaluation Task Team (OP OS-Eval TT), but also supported by OceanPredict Science Team (OPST) and GOOS, and the OceanPredict task teams, specifically the Data Assimilation Task Team, the Coastal Ocean and Shelf Seas Task Team and Marine Ecosystem Analysis and Prediction Task Team. Ocean prediction centers will support SynObs through OceanPedict. SynObs will also be supported by operational weather centers (i.e., NOAA, ECMWF, UK Met Office, JMA, etc.) which provide coupled and seasonal predictions in which the ocean state is initialized through ocean prediction (or coupled atmosphere-ocean data assimilation) systems. SynObs will set up a project steering team, which will be led by the OP OS-Eval TT co-chairs. SynObs will appoint coordinators for each targeted observing system combination (see Question 29). Coordinators and OP task team representatives will be members of the SynObs steering team, as well as representatives from ocean prediction and operational weather centers, and observational communities. SynObs will be advised directly by the steering teams of ForeSea, CoastPredict, and Observing System Co-Design. The OceanPredict programme office will initially cover the administration tasks required for SynObs. SynObs is open to grow and to accept requests from groups and individuals for membership who are willing to support the project. SynObs is planning to organize regular online webinars for all members. SynObs also plans to organize relevant international workshops and/or symposiums in its first five years.

Q32

Decade Actions 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. If applicable, please describe here how your proposed Action responds to the impacts of the COVID-19 pandemic? (max. 1000 characters)

SynObs will contribute to reducing the cost and human resources of maintaining ocean observing systems by optimizing the design of the whole ocean observing network and improving its efficiency. This goal will be even more valuable during and after the Covid-19 pandemic in which efficient use of limited resources is preferable.

Page 5: Alignment with Ocean Decade Endorsement Criteria

Q33

Please indicate if the following are relevant to your Decade Action

Contributes to achieving one or more of the following Decade objectives: Objective 1: Identify critical ocean knowledge; Objective 2: Build capacity and generate knowledge; Objective 3: Increase the use of ocean knowledge.	**This criteria IS relevant to my Decade Action**
Accelerates 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.	**This criteria IS relevant to my Decade Action**
Is co-designed and/or co-delivered by knowledge generators and users, and thus facilitating the uptake of science and ocean knowledge for policy, decision-making, management and/or innovation.	**This criteria IS relevant to my Decade Action**
Ensures that all data and resulting knowledge are provided in an open access, shared, discoverable manner	**This criteria IS NOT relevant to my Decade Action**
Strengthens existing or creates new partnerships across nations and/or between diverse ocean actors, including users of ocean science.	**This criteria IS relevant to my Decade Action**
Contributes toward capacity development, including, but not limited to, beneficiaries in SIDS, LDCs and LLDCs.	**This criteria IS relevant to my Decade Action**
Overcomes barriers to diversity and equity, including gender, generational and geographic diversity.	**This criteria IS relevant to my Decade Action**
Collaborates with and engages local and indigenous knowledge holders.	**This criteria IS NOT relevant to my Decade Action**

Page 6: Alignment with Ocean Decade Endorsement Criteria

Q34

Please provide a description of how your Decade Action aligns with the criteria you selected in the previous question. Your responses should be no more than 5000 characters.

Contributes to achieving one or more of the following Decade objectives: Objective 1: Identify critical ocean knowledge; Objective 2: Build capacity and generate knowledge; Objective 3: Increase the use of ocean knowledge.	**SynObs promotes the development of methods of assimilating ocean observation data from various kinds of observing platforms effectively for use in ocean prediction systems. It also aims to develop best practices for evaluating the performance of ocean observing networks composed of various observing platforms. These developments will contribute to Objective 2. SynObs attempts to establish a systematic mechanism to provide feedback on the observation data impacts from ocean prediction centres to observational communities, and, thus, intends to increase the use of knowledge on ocean observation impacts accumulated in operational centers to improve the ocean observing networks. This meets Objective 3.**
Accelerates 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.	**SynObs aims to advance ocean prediction capacity by optimizing ocean observing networks and improving ocean prediction systems to draw more information about the synergy of various observing systems. Improvement of ocean predictions will especially contribute to SDG 14 “Life below water” by facilitating the protection and management of ocean environment and marine ecosystems.**
Is co-designed and/or co-delivered by knowledge generators and users, and thus facilitating the uptake of science and ocean knowledge for policy, decision-making, management and/or innovation.	**SynObs is co-designed by OceanPredict and observational communities as a common comprehensive project contributing to the three Decade Programmes, ForeSea, CoastPredict, and Ocean Observing Co-Design. The OceanPredict community generates relevant and sophisticated knowledge about the impact and effectiveness of ocean observation data in ocean prediction systems. The knowledge will be used by observational communities in the activity of co-designing and reforming the ocean observing network in Ocean Observing Co-Design. The fact that SynObs is designed by both OceanPredict and observational communities enables SynObs to make effective and feasible proposals on the reformation of ocean observing systems and facilitates their actual implementation.**

Strengthens existing or creates new partnerships across nations and/or between diverse ocean actors, including users of ocean science.	**SynObs intends to strengthen partnerships between observational and OceanPredict communities in order to evaluate and improve the effectiveness of the global and regional ocean observing networks for ocean and coupled atmosphere-ocean predictions. It aims to build a positive feedback cycle between ocean prediction systems operated in different nations and ocean observing networks underpinned by the strong partnership between the observational and OceanPredict communities.**
Contributes toward capacity development, including, but not limited to, beneficiaries in SIDS, LDCs and LLDCs.	**Observing system evaluations based on various and diverse prediction systems are necessary to get robust and reliable conclusions. Therefore, SynObs encourages people in every country and area, including SIDS, LDCs, and LLDCs, to participate in. We will offer the opportunity of intellectual capacity building to train an emerging generation of scientists from developing and developed nations to continue and expand observing system monitoring and design into the future beyond the UN Decade time horizon.**
Overcomes barriers to diversity and equity, including gender, generational and geographic diversity.	**For a reason same as the above, SynObs also encourages people with any characteristics to participate in. We will offer the opportunity of intellectual capacity building to anyone who wants to contribute to SynObs activities.**

Page 7: Supplementary Information

Q35

Please provide any supplementary information you would like reviewers to take into account as they review your Decade Action. This may include details of additional partners. There is a character limit of 5000.

The list of the partner institutions of SynObs is as follows: 1. Meteorological Research Institute, Japan Meteorological Agency, Japan. 2. Mercator Ocean International, France. 3. Met Office, UK. 4. NOAA Quantitatve Observing System Assessment Program, USA. 5. European Centre for Medium-Range Weather Forecasts, EU. 6. CNR ISMAR, Italy. 7. Nansen Environmental and Remote Sensing Center, Norway. 8. Ocean Data Network, Inc., Denmark. 9. CNRS, France. 10. Universidade Federal da Bahia (UFBA), Brazil.