Ocean Predict

COSS-TT strategy meeting:
The COSS-TT in the UN Ocean Decade

9-11 June 2021

Report

Prepared by

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Members and guests (screenshots) at the 1ˢᵗ COSS-TT online meeting (9-11 June 2021)

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1.   Introduction

1.1.   COSS-TT overview

Terms of Reference – OceanPredict (OP) (formerly known as GODAE OceanView) is an international research and development network to accelerate, strengthen and increase the science and impact of ocean prediction. Within OP, the Coastal Ocean and Shelf Seas Task Team - COSS-TT - aims to foster international collaboration to advance science and expertise in support of regional/coastal ocean forecasting.

Members and meetings – The task team has 33 core members and built a larger global COSS community of 200+ people who are regularly informed about COSS-TT progress and activities. In the past 9 years the COSS-TT organised six international coordination meetings, with active participation by the COSS community. The meetings help bridge several communities and subcultures by addressing their specific questions together:
- Global/regional ocean forecasters in OceanPredict (e.g. on model assessment and improvement in coastal regions)
- Coastal modellers and scientists (e.g. on best downscaling approaches)
- International ocean observing programs with a coastal component (e.g. on synergistic studies with coastal modellers and added value).

Priority areas – The meetings also helped define priority areas where science is needed for the development of Coastal Ocean Forecasting Systems:
- Monitoring of physical and biogeochemical parameters in coastal regions (in particular permanent/long-term)
- Development of fine-scale coastal ocean models
- Integration: Downscaling the ocean estimation problem from large-scale to coastal-scale models, data and forcings, coastal data assimilation and prediction, consistent validation metrics
- Coastal-scale atmosphere-waves-ocean couplings
- Ecosystem response to the physical drivers
- Probabilistic approaches and risk assessment in the coastal ocean, including extreme events.

1.2.   Meeting objectives and summary

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/COSS-TT-June-2021-meeting-slides-v11.pdf (also contains the presentation slides for the other topics covered below, unless a specific link is shown)

Since the last COSS-TT meeting in September 2018 (a meeting was planned in May, 2020 but had to be cancelled for sanitary reasons), the TT reached out to new partners and is now deeply involved in the UN Decade of Ocean Science for Sustainable Development (UNDOS, 2021-2030), through the decade *programmes* ForeSea (led by OceanPredict) and CoastPredict, which it coordinates together with partner organisations, and in some specific Decade *projects* such as SynObs.

This meeting chiefly intended to help clarify the Task Team's role in the Decade, and its involvement in the context of the programmes and projects such as the ones listed above. We revised our strategic objectives in the context of the Decade and discussed actions to be conducted towards those goals.

Four main science & expertise **themes** were introduced under the aspect of UNDOS involvement:

1. Observing infrastructure in the coastal seas, integration with models and with forecasting
2. Integration of coastal ocean and estuaries/inland waters/coastal cities
3. Seamless integration of coastal and larger-scale estimates
4. Climate projections, coastal vulnerability and resilience.

These themes were selected by the COSS-TT co-chairs to match (1) the COSS-TT Terms of Reference and relevance within OP/ForeSea, and (2) the active involvement of TT members in the launching of CoastPredict projects in those themes. Invited speakers presented the projects, and strategic discussions on the TT role in each theme followed.

The meeting was organised online in the form of 3 120-minute sessions. A total of 41 participants attended the meeting (all three meeting days combined): https://oceanpredict.org/archived-events/1st-coss-tt-online-meeting/#section-attendees .

A summary of this meeting's discussions was presented by the COSS-TT co-chairs at the OP Science Team 4 on 16-21 June 2021, along with some first strategic elements, namely:

- The COSS-TT, ForeSea and CoastPredict as parts of the same value chain
- The COSS-TT role within the OceanPredict-CoastPredict continuum.
- Some emerging COSS-TT R&D priorities

As was announced at the 9-11 June meeting, the COSS-TT co-chairs will elaborate a *strategy note* for the COSS-TT to set future priorities. The note will be discussed within the Task Team, and will be presented and discussed at the next general COSS-TT meeting.

The next general COSS-TT meeting is planned on 11-13 April 2022 (Mon- Wed) in Montréal, Canada. We currently aim to run that meeting in hybrid format (face-to-face and remote).

2.   UN Decade programmes

At the beginning of the meeting, two UN Decade programmes were introduced that provided the context of the COSS-TT role within the UN Decade:

- CoastPredict
- ForeSea

2.1   CoastPredict

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/Villy-COSSTT-CoastPredict.pdf

CoastPredict has been endorsed by the UNESCO/Intergovernmental Ocean Commission as a Programme under the United Nations Decade of Ocean Science for Sustainable Development. CoastPredict is one of the 3 Programmes co-designed with GOOS and its contribution is to "revolutionize" Global Coastal Ocean observing and forecasting.

The CoastPredict high level objectives are:

1. A predicted global coastal ocean;

2. Upgrade to a fit-for-purpose oceanographic information infrastructure;

3. Co-design and implementation of an integrated coastal ocean observing and forecasting system adhering to best practices and standards, designed as a global framework and implemented locally.

The transformative science in CoastPredict is:

- Re-defining the concept of the Global Coastal Ocean

- Innovative multidisciplinary observational technologies and fit for   purpose observing system in the Global Coastal Ocean,

- Innovative numerical modelling, data assimilation and data science tools (including Coastal Earth System Modelling);

- Coastal solutions/services

- A virtual information/digital infrastructure

- A new Global Coastal Ocean Network

CoastPredict is structured around 6 Focus Areas:

- **Focus Area 1**: Integrated observing and modelling for short term coastal forecasting and early warnings
- **Focus Area 2**: Earth system observing and modelling for coastal climate monitoring and downscaling
- **Focus Area 3**: Solutions for integrated coastal management
- **Focus Area 4**: Coastal Ocean and Human Health

- **Focus Area 5**: International open and free access to coastal information
- **Focus Area 6**: Equitable coastal ocean capacity.

CoastPredict web site: https://www.coastpredict.org/

CoastPredict contact: Paraskevi Tsitsopoulou < paraskevi.tsitsopoulou@cmcc.it >

2.1. ForeSea

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/ForeSea-Ocean-Decade.pdf

ForeSea is an endorsed programme of the UN Decade of Ocean Science for Sustainable Development. Its vision is for strong international coordination and community building of an ocean prediction capacity for the future. The overarching goals are to (1) improve the science, capacity, efficacy, use, and impact of ocean prediction systems and to (2) build a seamless ocean information value chain, from observations to end users, for economic and societal benefit.

ForeSea activities will be separated into two themes:

1. "Catalyzing transformative ocean prediction science solutions for sustainable development, connecting people and ocean prediction" and
2. "Increasing impact and relevance: Improving science and science capacity for the ocean we want"

which will be implemented through UN Decade projects to make ocean prediction science impactful and relevant.

Theme 1 will cover:

- Integrated forecasts of ocean hazards with socioeconomic forecasts to quantify impacts and guide policy and management for preparedness, mitigation and restoration
- Community description of historical ocean conditions (i.e. reanalysis) at high resolution
- Improved forecasts for extreme events (tropical cyclones, harmful algal blooms, oil spills, etc.) to address "safety of life at sea" considerations
- Maximizing the impact and value of observations
- Guiding the evolution of ocean observing systems based on scientific assessment of their impacts and efficiency in ocean predictions
- Capacity building and training
- Contribution to a digital ocean.

Theme 2 will cover:

- Advancing use of ocean prediction technologies in weather and climate predictions, including use of earth system models (ESMs) and coupled data assimilation techniques
- Coupling of open ocean systems with coastal/land systems (in partnership with CoastPredict)
- Development of limited area ESMs with appropriate coupling between the meteorological, hydrological, ice, and ocean components, to serve as test-beds to address the above issues,

to improve model predictability and provide more reliable forecasts in the ocean component (in collaboration with CoastPredict)

- Extending the forecast range and ensemble approaches.

Activities covering Theme 1 and 2:

- Improved descriptions of surface and near-surface ocean conditions
- Development of an integrated description of the 4D biogeochemical state of the ocean based on satellite and in situ observations that informs society on key issues related to ocean health and the management of marine resources (to be carried out jointly with the development of a global BGC Argo array)
- Biogeochemical (BGC) nowcasts and ecological forecasting as area for transformative progress addressing from stakeholder needs ranging from carbon accounting to ecosystem health
- Integrated short-term and sub-seasonal to seasonal predictions in the coastal zones (including probabilistic products) that can assist institutional and private services towards sustainable management of marine resources, preparedness and response to hazards, marine safety and search and rescue operations (in collaboration with CoastPredict).

ForeSea web site: https://oceanpredict.org/foresea/

ForeSea contact: Eric Chassignet, Florida State University, echassignet@fsu.edu

3. UN Decade projects

The projects introduced in this paragraph were submitted to the UN Decade combined with the CoastPredict and/or ForeSea proposals. They are relevant for COSS-TT but are still not endorsed as UN Decade projects. The process of endorsement will take place over a period of weeks or months, and the guidelines of this process will be provided by CoastPredict and ForeSea respectively when ready. The projects presented here, are categorised using the four themes introduced in 1.2.

3.1 Topic 1: Observing infrastructure in the coastal seas, integration with models and with forecasting

This theme was motivated by three papers published in recent years as part of the OceanObs19 white paper initiative:

- Model-Observations Synergy in the Coastal Ocean
- Towards Comprehensive Observing and Modelling Systems for Monitoring and Predicting Regional to Coastal Sea Level
- Observing System Evaluation Based in Ocean Data Assimilation and Prediction systems: On-Going challenges and a future vision for designing and supporting ocean observational networks

The last paper was about large-scale observing system evaluation, but not only as it also included an evaluation of gliders in the Tasmanian Sea. One of the paper conclusions was to continue efforts in the coastal regions, so the project presented below is relevant to for CoastPredict.

3.1.1 Project 1: Synergistic Observing Network for Impactful and Relevant Ocean Predictions (SynObs)

by Yosuke Fujii (MRI-JMA)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/P1-COSS-TT202106_Fujii.pdf

Overview

SynObs is in the process of being endorsed as a common comprehensive UN Decade Project complementing three endorsed UN Decade Programmes → ForeSea, CoastPredict, and Observing System Co-Design.

SynObs aims to identify the optimal combination of different ocean observation platforms through observing system design and evaluation, and to develop assimilation methods which can enable drawing synergistic effects from these combinations. SynObs seeks to maximise benefit from combining the various observation platforms measurements, typically satellite and in-situ observation data, or combinations of coastal and open ocean platforms for ocean/coastal predictions. Target areas of SynObs include open-ocean, such as global, tropical, mid-latitude, arctic and subarctic oceans, as well as coastal-sea, and biogeochemical observing systems.

Objectives

SynObs seeks to extract the maximum benefit or synergy from the 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:

o 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.
o 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 characterised by an enhanced focus on observing the high frequencies and small scales.

Expected outcomes

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

requirement planed in this Decade Programme.

2. <u>Advance of data assimilation capacity</u>, 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. <u>Development of systematic mechanism to provide feedback from ocean prediction centres to observational communities</u> 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 centres.

4. <u>Intellectual capacity building to train an emerging generation of scientists</u> from developing and developed nations to continue observing system monitoring and design into the future beyond the UN Decade time horizon.

Questions/comments during meeting:

- (Fraser) Complementing @Pierre-Yves comment on end user impact evaluation of the observing system vis a vis SynObs: Yosuke mentions in his slide about feeding in to a WMO type RR (Rolling Review) activity which would address in part this end user impact eval. What will be required though for this RR is getting the full value chain framework for Operational Oceanography in place to enable these observation end user impact evaluations in an effective manner.

- (Yosuke) I agree that SynObs will contribute to enhance the value chain between observations and users and the enhancement is necessary for effective evaluation which contributes to the observational community.

3.1.2   Project 2: Brazilian Coastal Monitoring System (SiMCosta)

by Mauro Cirano (UFRJ, Brazil)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/coss_tt_2021_mauro_cirano_SiMCosta_MOVAR.pdf

The main goal of the project is to provide long-term and accurate Essential Climate Variables (ECVs) of the Brazilian coastal zone. Specifically, this will include:

(1) To provide continuous and free access to high-quality data

(2) To develop tools and educational material to be used by educators and end-users

(3) To contribute to the Brazilian government to establish climate-related policies.

3.1.3   Project 3: Monitoring of Regional Variability of heat and volume transport in the

surface layer of the South Atlantic Ocean (MOVAR) – NOAA AX97

by Mauro Cirano (UFRJ, Brazil)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/coss_tt_2021_mauro_cirano_SiMCosta_MOVAR.pdf

The main goal of the project is to estimate the heat and volume transport of the Brazil Current (BC) based on long term high-density XBT transect from Rio de Janeiro to Trindade Island. Specifically, this will include:

(1) To increase our knowledge of the variability of the Brazil Current and the large-scale circulation of the South Atlantic Subtropical Gyre

(2) To allow comparison with other ocean basins

(3) To assist in the evaluation of models (high-resolution and climate) and satellite products in this region

3.1.4 Project 4: E-ICOOPS A European Integrated Coastal Ocean Observing and Predicting Systems

by Guillaume Charria (Ifremer)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/202106_E_ICOOPS_GCharria.pdf

CoastPredict will be improving short-term to seasonal predictions in the coastal zones through:

- a deeper understanding of the multiscale interactions and processes occurring at the coasts

- an innovative combination of observing and numerical prediction systems

- an appropriate coupling between the meteorological, hydrological and oceanographic compartments at the coast

E-ICOOPS intends to support this effort by bridging information between patchy observations (contrasts between highly sampled regions and lack of observations), sparse (but with a high spatial resolution) coastal numerical models and local applications (e.g. multi-hazard early warning systems). The project will build on the Joint European Research Infrastructure for Coastal Observatories, JERICO-RI, an integrated pan European multidisciplinary observing system of European coastal seas.

3.1.5 Project 5: Advancing global coastal ocean observing and prediction systems

by Rafael Schiller (Fugro)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/P5-Fugro_presentation.pdf

This project plans to

(1) To expand infrastructure and coverage of metocean observations

(2) To broaden uptake by prediction systems

(3) To improve delivery and accessibility of metocean data

Under the UN Decade, Fugro plans to leverage existent worldwide reach, capacity and partnerships in the Geo-Data space to support local solutions, regional partnerships, and global knowledge exchange.

3.1.6 Next generation of satellite technologies for coastal observations

by Fabien Lefevre (CLS group)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/20210610_CLS_COSS_TT.pdf

SWOT (Surface Water Ocean Topography) to be launched end of 2022, measuring SSH

- Difference to other altimetry mission is the use of a swath, not tracks
- Essential for coastal applications, will provide a good representation of tides
- High-resolution global ocean altimetry

Argos offers ocean data telemetry services for a broad spectrum of applications including ocean modeling, moored buoy monitoring and more.

- Collaboration with NASA, CNES, EUMETSAT, ..
- Boosting the ARGOS system through 25 nanosatellites to tackle current Argo issues.

3.2 Topic 2: Integration of coastal ocean and estuaries/inland water/coastal cities

This theme is motivated by the opportunities of reaching from the open ocean, shelf seas, coastal areas into the estuaries, inland waters, and coastal cities. This contributes strongly to the transformative aspect of the value chain by connecting the open ocean to the urban ocean, exploring environmental, socioeconomic and health interfaces covering marine and terrestrial influences. This includes use of ocean and coastal modelling and can provide shoreline-urban mapping in support of trans-disciplinary infrastructure, broad stakeholder engagement, coastal management/policy, etc.

3.2.1 Towards a global PRediction of ESTuarine HAbitat changes under climatic and human pressures [PRESTHA]

by Guillaume Charria (Ifremer)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/CoastPredict_PRESTHA-NETFLUX_2021-06-10_lowmem.pdf (slides 1-3)

Estuaries are among the most productive habitats in the world, comprising intertidal areas, salt marches, organic matter, brackish water, animal nurseries, etc. They buffer particulate matters between continental and marine sources and vulnerable to global changes (climatic + anthropogenic pressures).

This project aims to predict estuarine habitat changes taking into account global changes and to support interdisciplinary studies on estuarine ecosystems with regard to morphology (hypsometry), hydrodynamics, hydrology, turbidity, physics, sedimentary, biology, biogeochemistry and ecology. It is planned to calculate potential trajectories of estuary

morphologies applying a conceptual function derived from multi-site modelling.

3.2.2 Towards a global prediction of particulate NET FLUXes between estuaries and coastal oceans under climatic and human pressures [NETFLUX]

by Guillaume Charria (Ifremer)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/CoastPredict_PRESTHA-NETFLUX_2021-06-10_lowmem.pdf (slides 4-5)

This project aims to predict the net export of terrigenous particulate matters toward coastal seas and to provide a global concept for worldwide tidal estuaries (key estuarian forcing metrics). It is planned to estimate the mud and sand export to the seas using multi-site approaches.

3.2.3 FullContinuum: Next-generation of models for a full coupling of the river-estuary ocean-atmosphere continuum. (2021-2025)

by Marilaure Grégoire (University of Liege)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/P8-FullContinuum_MarilaureGregoire.pdf

This project aims to set up next-generation models to couple the coastal ocean with the river/estuary region, including coupling with the atmosphere. The project uses models with structured grid (ocean) and unstructured grid (estuary/river). Applications includes exploration of local impact of offshore wind farms on sediment transport to rivers, and forecasts of water quality / clarity, hypoxia and habitat mapping.

3.3 Topic 3: Seamless integration with larger-scale estimates within OceanPredict

This theme was motivated by the question of how to coordinate coastal and large-scale modelling efforts for mutual benefit. Several aspects of pro and con points were raised, and a communicative approach suggested, with specific focus on:
-   Model nesting (coastal datasets, DA, verification)
-   Downscaling
-   Initial/boundary conditions
-   Operational/service-based added value of coastal system

The presented projects covered some of the points raised above.

3.3.1 NAVIgating in the COASTal ocean

by Ivan Federico (CMCC)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/P9-10-COSS-TT_IFederico_2021_V5.pdf (slides 1-5)

This project aims to provide navigation information for Short Sea Shipping near the coast

(various coastal areas around the globe), by providing

- advanced meteo-oceanographic routing
- information for safe navigation in busy waterways
- monitoring of emissions into air and water

3.3.2 Support for marine pollution in coastal zones

by Ivan Federico (CMCC)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/P9-10-COSS-TT_IFederico_2021_V5.pdf (slides 6-11)

The project aims to provide a solution to tackle marine pollution in coastal seas by

- Providing model/obs base tool for tracking pollutants in coastal zones
- Developing a unified method for hazard/risk mapping
- Identifying and quantifying of uncertainties in the predictions of transport and fate of marine pollution in coastal zones
- Developing a mobile app to report coastal pollution

3.3.3 Intercomparison and verification in operational oceanography: concepts, state-of-the-art methods and seamless approach considerations

by Gregory Smith (ECCC) and Fabrice Hernandez (LEGOS), IV-TT co-chairs

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/IV-TT_for_COSS-TT_10Juin2021_v2.pdf

The presentation provided information of the current work of the OceanPredict Intercomparison and Validation Task team (IV-TT), covering

- Evaluating and monitoring performance of operational systems
- Evaluating accuracy of products
- Measuring strength and weaknesses of operational system for further improvements

Furthermore, the presentation provided details about the importance of metrics as a tool to quality assessment of operational oceanography, provided class-4 metric example, highlighted the challenges of verification, and information of future plans.

IV-TT could approach joint efforts with COSS-TT, e.g.

- Propose to evaluate a set of endorsed metrics (associated with reference obs), both in global and regional systems (in particular in OOF centres running both)

- Establish a common synthesis by focusing on specific assessment: for example:

  o Non-constrained processes and scales on the targeted OOFS?

  o Verification against a particular dataset? e.g., Sentinel-3 for SSH, toward SWOT

3.4 Topic 4: Climate projections, coastal vulnerability and resilience

Motivation for this topic include:

- Possible partnerships: Current programmes that are relevant to CoastPredict (e.g. Ocean Cities, Deltas,..). Updates are necessary as new Programs are being endorsed. In addition, Decadal Collaborative Centers are emerging (eg., "Coastal resilience and Climate")

- Consider widening capacity going beyond environmental forecasting, connecting to socioeconomic and health aspects of resilience (eg. engaging projections on societal and economic impacts related to coastal hazards and climate risks)

- Building on recent efforts, e.g. recommendations for coastal sea-level observing and forecasting systems (OceanObs community paper/Frontiers).

3.4.1 Reliable climate projections in the Global Coastal Ocean

by Jason Holt (NOC)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/Reliable-Climate-Projections-JHolt.pdf

The project aims to develop reliable climate projections in the global coastal ocean. Current global models (CMIP) are not sufficient to provide detailed information. Solutions to this issue will involve working on better understanding the behaviour of the global model in the global coastal models and downscaling approaches. The expected outcomes include:

– Understanding the performance of coastal ocean future climate projections
– Protocols for using global models in the coastal ocean
– An engaged community of coastal-ocean future climate model practitioners

3.4.2 Operational early-warning prediction system

by Yannis Androulidakis (University of Thessaloniki)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/Presentation-Androulidakis-COSS-TT.pdf

The project aims to develop of a worldwide operational early-warning prediction system related to sea level increases due to storm surges or tsunamis, using submarine telecommunication cables to estimate sea-level and combine it with tide-gauge data as input for nested numerical hydrodynamic models (downscaled at the coastal zone) producing short-term forecasts and warning alerts. Expected outcome include:

– Protection of coastal population and infrastructure
– Coastal erosion studies
– Long-tern sea level observations for climatic studies
– Improvement of integrated management of the coastal zone

3.4.3 Coastal urban resilience in a changing climate

by Alan Blumberg (Jupiter Inc)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/P13-COSS-TT-blumberg-talk.pdf

This project aims to apply multidisciplinary research and educational initiative to support safety of life and property for those who live on the urban coasts of the world, using an Urban Ocean Modelling approach, specifically focusing on

- Improvement of the science dynamics of flooding by linking to surface and groundwater, wetlands, estuaries, surf zone, geomorphology and sediment transport.
- Reduction/quantification of boundary condition errors associated with DEM/bathymetry/bedforms/sediment properties
- Employment of higher grid resolution
- Development of numerical methods for improved treatment of the vertical coordinate to reduce spurious numerical mixing.
- Use AI/ML along with assimilation techniques with in-situ and remote-sensing measurements
- Improvement of parameterizations for horizontal diffusion and bottom drag

3.4.4 ROTATE - Redefining the concept of the global coastal ocean

by Joanna Hopkins (NOC)

Link to presentation: https://oceanpredict.org/docs/Documents/Task%20Teams/COSS-TT/Meetings/June-2021/Presentations/P14-ROTATE_Project_Concept_COSS_TT_Jun21.pdf

This project aims to redefine the concept of the coastal global ocean to develop a new, flexible and dynamically based approach to identifying coastal ocean typologies and behaviours in order to allow:

- Upscaling budgets (e.g. carbon and nutrient fluxes...)
- Identifying downscaling priorities (e.g. identification of processes missing in coarse-res global models)
- Global scale quantification of a resource or function (e.g. energy, habitat niche, water mass formation...)
- Wider assessment of risks and vulnerability (e.g. hypoxia, coastal erosion, pollutant dispersal...)
- Wider implementation of locally developed technology, solutions or observation design (e.g. renewable energy devices, mariculture, CCS schemes, coastal observatories...)
- Wider adoption of policy and governance approaches.

4. Strategic goals and TT role

This meeting focused on aspects which are potentially new for the TT, especially those stemming from its recent involvement in the UN Decade of Ocean Science, and in particular as an initiator of one of its programmes: CoastPredict. The meeting also included the introduction of the ForeSea programme and the common project SynObs. To support this new engagement, the TT reviewed its strategic objectives over the upcoming decade.

4.1. The TT role within the coastal ocean science value chain

The UN Decade is an opportunity to advance coastal ocean science, operations and services for the benefit of society. OceanPredict, ForeSea, CoastPredict and the COSS-TT all have the potential to have important and specific contributions to the "coastal ocean science value chain".

Within such a value chain, CoastPredict would benefit from being anchored to the COSS-TT science and expertise in coastal ocean modelling, observation and forecasting, and, beyond the COSS-TT, to global ocean forecasting science, expertise and services covered by OceanPredict and ForeSea. More specifically, OceanPredict and the COSS-TT have the potential to strengthen CoastPredict in the areas of:

- An existing pool of working global/regional/coastal ocean forecasting systems for test cases
- A systems-based "engineering" approach, in real-time or scenario-mode operation
- Advanced verification/validation approaches
- Links with national ocean prediction services
- "Seamless" coastal integration with large-scale prediction, nesting, downscaling
- Dedicated Task Team with successful international coordination meetings and a rich community
- The promotion of synergistic model/data approaches in the coastal ocean (OceanObs19 paper).

In return, CoastPredict has the potential to strengthen OceanPredict, ForeSea and the COSS-TT in the areas of:

- Links with other world countries, in particular within UN capacity building/sustainability programs (in particular regarding the pursuit of UN Sustainable Development Goals)
- Scientific expertise in the Coastal Ocean (it is already present in the COSS-TT but can be complemented in some areas – gap analysis needed)
- Farther reach via "global coastal ocean" concept and Coastal Ocean typology (JoAnne's presentation)
- Coastal solutions and services provide an opportunity to validate science options
- Fit-for-purpose information infrastructure.

4.2. General COSS-TT contributions to Decade objectives

General COSS-TT contributions to Decade objectives might include:

- The promotion of good coastal ocean forecasting practices: e.g. in the form of our participation in the ET-OOFS guide
- We could follow and monitor relevant Decade projects at TT meetings.

4.3. Areas where the COSS-TT should set strategic objectives – Feedback on the meeting topics

4.3.1. Topic 1: Observing infrastructure in the coastal seas, integration with models and

with forecasting

Meeting recording day 3 [13:25 - 29:00 min]

Introduction by Pierre De Mey-Frémaux:

- Advance and promote good COF practices within an integrated downscaling-modelling-observation framework, including:
  - Definition of suitable <u>coastal *in situ* observing systems</u> (OSE/OSSEs with OSEval-TT & SynObs?)
    - Combinations of coastal observations? Check in some assimilating COSS-TT systems (voluntary). Several types.
  - Good practices for using <u>future altimetry data</u> in coastal regions (with SWOTST?)
    - Any experimental products that the COSS-TT could review?
    - OC
    - Currents
- Role of Machine Learning, Deep Learning & obviously Data Assimilation approaches for sparsely observed coastal regions
- Need for validated observational error estimates
- Possible contributions to SynObs
  - Showcase coastal observational impact (we could for instance do this in some of our assimilating COSS-TT systems)
  - Establish best practice coastal observational strateges (see above)
  - Will need to be further discussed as the SynObs project nears submission to the UN Decade process.

Discussion notes:

- Introduction topics seem to provide a useful base
- (Nadia) CoastPredict co-design w/GOOS – legacy at end of decade – new sensors -- standards (Real-Time Quality Control, especially gliders, getting some inspiration from ARGO) – COSS-TT can contribute with some of its systems with Real-Time assimilation
  - (Chris) Quality Control is carried out in Real-Time for gliders in California
- (Joanna) Integration with land models, hydrology, wave models *(cross-topic)*

4.3.2. Topic 2: Integration of coastal ocean and estuaries/inland waters/coastal cities

Meeting recording day 3 [29:30 - 47:30 min]

Introduction by Villy Kourafalou:

- Integration of estuarine, coastal and open ocean observing and modelling systems
- Extend COFS to include estuaries/deltas as an integrated system (up to catchment area); intercomparison of coastal systems at different areas of river influence
- Advance the concept of "urban ocean" and methodologies to make COFS relevant for coastal cities

Discussion notes:

- (Paolo) (a) There are still pending challenges on our current turf; (b) Relaxation of some classic hypotheses for modelling (Bq, hydrostatic, …)
- (Ivan) 2-way nesting: need for design benchmark (at very high resolution: 1km→100m)
- (Jason) Upscaling. Non-traditional approaches: Machine Learning. Role of estuaries in Earth system.
- (Marcos) (a) Bathymetry morphohydrodynamics. (b) Atmospheric forcing, digital terrain models (for surface wind?). (c) ML for improving the wind.
- (Emil) Bathymetric changes. Coherence btw. models and observations. 2-way interactions between open ocean, coastal ocean and estuaries.
- (Fraser) For Machine Learning and AI, these can be used to improve (not necessarily replace) prediction systems ocean models: i.e. identifying correcting model bias, model parameter estimation, model process estimation …. [chat→10/06 14:39]

- (Mike) Head of estuary fluxes are so important for driving hydro & BGC in estuaries. Hydrological catchment models that predict water quantity and quality can fill this role but may require a different area of expertise. …. [chat→10/06 14:42]
- (Alex) Numerics (e.g. structured/unstructured-grid models) are key in estuaries and on the shelf (cross-topic)
- (Jeffrey) Interaction w/Land Service modellers – requirements needed about frequencies of information (e.g. freshwater fluxes: instantaneous, daily averages, etc.)
- (Alan) Especially for flood events, try to bring in some landside modellers?
  - (Enda) Saline groundwater an issue [chat→11/06 15:30]

4.3.3. Topic 3: Seamless integration of coastal and larger-scale estimates

Meeting recording day 3 [47:45- 1:00:30 min]

Introduction by Pierre De Mey-Frémaux :

- Advance and promote good COF practices within an integrated downscaling/modelling/observation framework, including:
  - Several examples of nesting/downscaling at COSS-TT general meetings
  - Participation in the ET-OOFS guide in 2021
  - Still many open questions
- Actively participate in the assessment of some global/basin-/regional-scale/coastal ocean forecasting systems in coastal regions, with our own quality criteria (probably with IV-TT)
  - Many very relevant points in Greg Smith's IV-TT presentation
  - Consistency between parent/basin-scale and coastal systems (Greg's slide)
    - Remote effects can have important impacts
    - Inconsistencies between atmospheric forcings at both scales
    - OBC forcing frequency often a hinderence
    - Products need consistency as well!
  - Evaluate set of endorsed metrics

– Establish common syntheses
– Dependency on/Need for measurement error estimates (verified!)
– Still many open questions

Discussion:

- Introduction topics seem to provide a useful base
- (Fabrice for IV-TT) Ready to work with volunteer coastal groups. Existing structure in EU.
  – (Marcos) importance of regional services to promote global/regional/coastal model intercomparisons exercises (as proposed by Fabrice).
- (Marcos) Also important to share well-established operational model validation tools (usually with subregional capabilities) to assess added value of dynamical downscaling
- (Marcos) For multi-model comparisons at coastal scales, it is important to go further than the classic point-to-point statistic metrics. Inclusion of spatial validation methods to avoid double penalty (as in Greg's presentation) is critical to compare different resolution models at coastal scales.
- (Alex) Assess the accuracy of coastal ocean models using multi-year in-situ data. Quality checking with long time series for long time scales.
- (Jeffrey) Building a software infrastructure for verification and validation is expensive and runs the risk of not being very versatile for new models/observations/regions. A common Validation/Assessment framework for both larger and coastal scales seem essential and fundamental. (Greg) This is an area for which the JWGFVR has been quite successful. But as metrics become more sophisticated the technical implementation can have a larger effect. Use of common tools can significantly improve efficiency.
- (Pierre) It is essential for both science and applications to assess the quality of surface current estimates in regional/coastal systems and develop better estimation approaches for surface EOVs.
- (Alex, Emil) Numerics (e.g. structured/unstructured-grid models) are key in estuaries and on the shelf *(cross-topic)*
- (Youyu) Offer to build project to bring pieces together for topics 3&4. Project info through COSS-TT/COSS community email list.

4.3.4. Topic 4: Climate projections, coastal vulnerability and resilience

Meeting recording day 3 [1:00:40 - 1:10:30 min]

Introduction by Villy Kourafalou:

- Improved, multidisciplinary and extended range predictive capabilities for the coastal zone (from events to climate) – test atmospheric forcing capabilities for coastal/shelf
- ICOFS: Integrated Coastal Ocean Forecast Systems for coastal hazards (environmental, ocean & human health, socioeconomic forecasts…) to address preparedness (risk scenarios…), resilience, sustainability

Discussion:

- (Jason) Coastal MIP? (along CMIP's lines) → (Marilaure) Ongoing efforts with ESM simulations, set up toolbox (to be completed from [chat→10/06 15:39]
    - Set protocol, min set of experiments; to be further elaborated
    - Biogeochemistry & waves… 40 years very challenging… make priorities = on which basis?
- (Rafael) User-driven verification is an important metric (transverse) Plans for open data management and delivery (to users).
    - (Greg) Coastguards. S&R, emergency response. Need for uncertainty estimates (validated!). Build confidence in the systems. A good topic for the "global coastal ocean" concept.
- (Pierre) Coastal vulnerability, esp. in least advanced countries.
- (Rafael) Gap analysis based on feedback from user requirements. (transverse comment)
- (Alan) A changing climate – climatic changes in the coastal ocean
- (Enda) *see* [chat day3 →11/06 15:30] – saline intrusions are critical issues
- (Chris) Fisheries. Confused about time scales: variety of ts for forecasting.
- (Ivan) Vulnerability: advance on coastal relocatable models for emergency situations
- (Alan) "Why do we evolve our systems?"
- (Youyu) see chat-day 3→ [11/06 15:46]

4.3.5. Other topic suggestions

Given the cross-topic, technical contributions above, we might need an additional technical/technological transverse topic.

4.4. A few emerging priorities for the COSS-TT in the next years

For completeness, we include here a first list of emerging priorities as it was presented at OPST-4 by the TT co-chairs. The list was prepared after this strategy meeting, and was therefore not presented at the meeting. It should be viewed as an early form of "distillation" of the COSS-TT strategy meeting outcomes. The list is of course preliminary, probably incomplete, obviously open to debate, and bears no specific order. Such priorities will be further discussed before and at the 2022 COSS-TT general meeting in Montréal.

First list of emerging priority topics for the COSS-TT:

- Need for closer interaction with OceanPredict (OP) "national systems"
- Need for fit-for-purpose OP large-scale estimates for coastal systems (COSS-TT) and CoastPredict (CP) uses
- Farther reach via "global coastal ocean" concept and Coastal Ocean (CO) typology

- Advance and promote good Coastal Ocean Forecasting (COF) practices within an integrated downscaling/modelling/observation framework (OceanObs paper; promotion via ET-OOFS)
- Definition of suitable coastal in situ observing systems (probably with: OSEval-TT, SynObs, in co-design with GOOS)
- Good practices for assessment in coastal regions, added value of downscaling (probably with IV-TT)
- Good practices for using future altimetry data in coastal regions (possibly with the SWOTST and Coastal Altimetry Workshops (CAW))
- Role of Machine/Deep Learning (ML/DL) in the CO, esp. given our sparse obs. networks (and perhaps Artificial Intelligence (AI) for digital twins)
- Extend Coastal Ocean Forecasting Systems (COFS) to include estuaries/deltas as an integrated system (up to catchment area)
- Assess the quality of surface current estimates in regional/coastal systems, and develop better approaches
- Coastal vulnerability: advances on coastal relocatable models for emergency situations
- Assess multidisciplinary extended range predictive capabilities for the coastal zone (from events to climate) – test atmospheric forcing capabilities in CO – "Coastal CMIP" (possibly with CP-TT).

5. COSS-TT business meeting

5.1. Meeting actions

Meeting actions	Update as of Nov 2021
1 Ensure representation of TT in decision-making circles in Decade programmes	– Pierre is a member of the ForeSea Steering Committee – Pierre co-chairs the CoastPredict Focus group 1 – FG 1 "Integrated observing and modelling for short term coastal forecasting and early warnings" – with Guimei Liu, another COSS-TT member – Villy is a co-chair of CoastPredict
2 Help make projects more concrete	Still to be done via Action 1 involvements
3 Elaborate Strategy Note for TT, with priorities set	– Very preliminary list presented at OPST-4 – Still to be done, on the basis of this report. To be elaborated within the TT and discussed in Montréal with the broader community. – Inputs from all TT members (even not attending this meeting) – Opportunity to revise Task Team's ToRs and scientific objectives
4 Report at OPST-4	Done
5 Prepare 2022 COSS-TT meeting	Ongoing (hybrid: Montréal f2f/online)

6 Adjust membership	Following Meeting 2022
7 KWB to add the guest emails addresses to the COSS-TT community mailing list	
8 TT contribution to ET-OOFS Guide	Done (P. De Mey-Frémaux, N. Ayoub, M. Cirano, V. Vervatis)
9 Topical Collection 3	Following Meeting 2022
10 Update coastal Systems Information Table	Mostly done (KWB, M. Cirano, P. De Mey-Frémaux). A short selection was included in the ET-OOFS Guide. Still requires to be put online (KWB).
11 Make generic presentation for the COSS-TT	Following Meeting 2022

5.2. Starting Decade projects – discussion points and pending questions

– Funding of UN programmes: use of UN Decade label/ logo
– Funding needs to be broken down in smaller activity support, i.e. projects
– Projects will be the mechanism to realise programmes
– Efforts have already started to find funding for programme coordination (fundraising), also coordinated funding proposals are considered (with GOOS, GEO BP, etc.)
– It seems that countries are more inclined to support UN decade related projects, and specifically projects which fill gaps or link to stakeholders, coastal communities, socio-economic areas etc., so project might be more successful if their proposals include this links.
– Have a look out for call of proposal for projects
– Alternatively, seek direct funding with specific sponsors, needs dialogue with the funders
– Needs a lot of activities/effort to find financial support
– CoastPredict has already an office agreed to be set up in Bologna incl. funding (Nadia)

5.3. Misc points

– Jennifer Veitch would like to see more African nations (and other developing nations) involved in CoastPredict (e.g. via projects)
– One overarching role to be considered for COSS-TT/CoastPredict could be knowledge transfer
– Mauro is proposing to set up a generic presentation on CoastPredict to promote The UN Decade and the COSS-TT involvement (see actions above)

Appendix

Appendix A: Meeting agenda

Welcome

Welcome to the first COSS-TT virtual meeting. We are pleased to take this opportunity to invite **all COSS-TT members** and **invitation-only guests** to discuss how the COSS-TT would contribute to the "United Nations Decade of Ocean Science for Sustainable Development" and specifically the Task Team's potential involvement in "CoastPredict" and "ForeSea" that have been submitted for consideration to be endorsed as official UN Decade programmes. In addition to programmes, the UN Ocean Decade will endorse "Communities of Practice", where several programmes will contribute. The COSS-TT co-chairs have been actively involved in these activities (and also with the SynObs project that has been submitted from the OS-Eval TT) and are eager to share outcomes with all COSS-TT members and to determine actions going forward.

Meeting times

The meeting will take place over three meeting slots @ 2 hours (14:00 – 16:00 BST) on three consecutive days: This translates into the following meeting starting times for the various time-zones (selection):

West Coast US (PDT):	6:00 am
Washington DC (EST):	9:00 am
Montreal/Ottawa (EDT, Canada):	9:00 am
Brazil (BRT):	10:00 am
St John's (NDT, Canada):	10:30 am
UK (BST, Europe):	14:00 pm
Europe (CEST, continent):	15:00 pm
India (IST):	18:30 pm
China (Beijing):	21:00 pm
South Korea	22:00 pm
Japan (Tokyo):	22:00 pm
Australia (Sydney, Hobart, ..)	23:00 pm

Provisional outline

1. **Presentations** of the status of relevant UN Ocean Decade programmes (focus on CoastPredict and ForeSea, including SynObs). Q/A on programmes, including possible funding aspects.
2. **Presentations** of specific science topics supporting COSS-TT/UN Decade engagement
3. **Round-table discussions** where each participant speaks in turn of their vision of the UN Ocean Decade, of the role of the TT, of any current or potential involvement, on any programmatic and funding opportunities. **In particular, Task Team members should be prepared to inform the TT about any national or international actions already planned or ongoing within the Decade in their parts of the world (please be ready for that).**
4. **Discussions on specific questions** (see below).
5. **Summary/vision by the TT co-chairs, with general discussion**

Discussion questions

Preliminary list of specific questions:

- The COSS-TT is a natural steering and executive part of the ForeSea UN Ocean Decade programme, proposed by OceanPredict as a whole. On the other hand, the Task Team is well represented in the coordination (co-chair) and Steering Committee of the CoastPredict proposed programme. How can we (as an OceanPredict Task Team) seize this opportunity of playing a very active role at connecting the large-scale and coastal efforts over the next decade?
- Should we expand our Terms of Reference, for instance towards more societal aspects? (sustainable development, coastal resilience, coastal vulnerability, etc.)
- Should we expand our scientific objectives?
- How can we engage TT members and affiliates (including COSS community members) for developing international projects/activities during the Decade?
- What are the opportunities for funding? What will have the highest chance of getting funded?
- Could we come up with a short list of Strategic Objectives (= what we do to fulfil our mission) for the TT, and a very approximate calendar of what would be feasible?

Agenda

Note: Given the tight schedule and online format, speakers are requested to stay strictly within their allotted time. Thanks!

Day 1 – Wednesday 9th June (MS Teams meeting) – 120 min

Participants can join up to 15 min before the meeting and chat is open to everyone.

Accuml. Time (120 min max)	Time	Description	Meeting chair and presenters	Shared material, comments
20 min	20 min (15+5)	**Welcome and meeting objectives with brief overview of UN Decade (incl. Q&A)**	**Co-Chairs**	**Link to Decade documents** (participants are invited to get familiar with description at link prior to the meeting)
40 min	20 min (15+5)	**Introduction** of UN programmes → **CoastPredict** (including what the programme expects from the COSS-TT)	**Villy Kourafalou**	**Link to Decade documents** (participants are invited to get familiar with description at link prior to the meeting)
55 min	15 min (10+5)	**Introduction** of UN programmes → **ForeSea** (including what the programme expects from the COSS-TT)	**Eric Chassignet (OceanPredict co-chair)**	**Link to Decade documents** (participants are invited to get familiar with description at link prior to the meeting)
Topic block 1: Observing infrastructure in the coastal seas, integration with models and with forecasting				
60 min	5 min	**Introduction to the topic** (incl. OceanObs'19 Task Team contributions)	**Chair: Pierre De Mey-Frémaux**	**Links to OceanObs'19 Frontiers papers PDFs** **COSS (de Mey et al)** **OS-Eval (Fujii et al)** (participants are

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				invited to get familiar with the 2 papers at links prior to the meeting)
75 min	**15 min (10+5)**	**Introduction** of relevant projects within CoastPredict → • Project 1: Synergistic Observing Network for Impactful and Relevant Ocean Predictions (SynObs); including what the project expects from the COSS-TT in coordination w/OS-Eval TT)	**Yosuke Fujii (MRI, Japan)**	Link to **SynObs** (participants are invited to get familiar with description at link prior to the meeting)
	<td colspan="4">**CoastPredict project presentations – 4 min + 1 min questions/handover**</td>
85 min	**10 min (4+1 min for each project)**	**Introduction** of relevant projects within CoastPredict: • Project 2: Brazilian Coast Monitoring System (SiMCosta); • Project 3: NOAA AX97 High Density XBT Line	**Mauro Cirano (UFRJ, Brazil)**	
90 min	**5 min (4+1)**	**Introduction** of relevant projects within CoastPredict: • Project 4: A European Integrated Coastal Ocean Observing and Predicting System – E-ICOOPS	**Guillaume Charria (Ifremer, France)**	
95 min	**5 min (4+1)**	**Introduction** of relevant projects within CoastPredict: • Project 5: Advancing global coastal observing and prediction systems	**Rafael Schiller (Fugro, USA - Invited)**	
100 min	**5 min (4+1)**	**Introduction** of relevant projects within CoastPredict: • Next generation of satellite technologies for coastal observation	**Fabien Lefevre (CLS group - Invited)**	
115 min	**15 min**	**Discussion on strategic goals for the TT within this Topic,** and on possible modes of TT support to Decade projects in all relevant programmes (CoastPredict and ForeSea)	**All (chair: Pierre)**	
120 min	**5 min**	**Adjourn / feedback (via chat) / next day's meeting**	**Co-Chairs**	

Day 2 – Thursday 10th June (MS Teams meeting) – 120 min

Participants can join up to 15 min before the meeting. Chat is open to everyone and the meeting will be recorded.

Accumul. Time (120 min max)	Time	Description	Meeting chair and presenters	Shared material, comments
5 min	5 min	**Brief intro**	**Co-Chairs**	
		Topic block 2: Integration of coastal ocean and estuaries/inland waters/coastal cities		
10 min	5 min	**Introduction to the topic**	**Villy Kourafalou**	
		CoastPredict project presentations – 4 min + 1 min questions/handover		
20 min	**10 min (4+1 min for each project)**	**Introduction** of relevant projects within CoastPredict: • Project 6: PRESTHA [Towards a global PRediction of ESTuarineHAbitat changes under climatic and human pressures] • Project 7: NETFLUX [Towards a global prediction of particulate NET FLUXes between estuaries and coastal oceans under climatic and human pressures]	**Guillaume Charria (Ifremer, France)**	
25 min	**5 min (4+1)**	**Introduction** of relevant projects within CoastPredict: • Project 8: FullContinuum: Next generation of models for a full coupling of the river-estuary ocean-atmosphere continuum (2021-2025)	**Marilaure Grégoire (University of Liege, Belgium - Invited)**	
40 min	**15 min**	**Discussion on strategic goals for the TT within this Topic,** and on possible modes of TT support to	**All (chair: Villy)**	

		Decade projects in all relevant programmes (CoastPredict and ForeSea)		

	Topic block 3: seamless integration with larger-scale estimates within OceanPredict			
45 min	5 min	Introduction to the topic	**Pierre De Mey**	
55 min	10 min (4+1 min for each project)	**Introduction** of relevant projects within CoastPredict: • Project 9: "NAVIgating in the COASTal ocean" (NAVICOAST) (G. Mannarini); • Project 10: support for marine pollution hotspots' screening in coastal zones (G. Coppini)	**Ivan Federico (CMCC, Italy)**	
65 min	10 min	**Large-scale model verification in the coastal seas**	**IV-TT co-chair (Fabrice Hernandez or Greg Smith)**	
80 min	15 min	**Discussion on strategic goals for the TT within this Topic,** and on possible modes of TT support to Decade projects in all relevant programmes (CoastPredict and ForeSea)	**All (chair: Pierre)**	

	Topic block 4: Climate projections, coastal vulnerability and resilience			
85 min	5 min	Introduction to the topic	**Villy Kourafalou**	
90 min	5 min (4+1)	**Introduction** of relevant projects within CoastPredict: • Project 11: Reliable Climate Projections in the Global Coastal Ocean	**Jason Holt (National Oceanography Center, UK - Invited)**	
95 min	5 min (4+1)	**Introduction** of relevant projects within CoastPredict: • Project 12: Operational	**Yannis Androulidakis (Univ. of Thessaloniki,**	

		early-warning prediction system	**Greece - <u>Invited)</u>**	
115 min	**20 min**	**Discussion on strategic goals for the TT within this Topic,** and on possible modes of TT support to Decade projects in all relevant programmes (CoastPredict and ForeSea)	**All (chair: Villy)**	
120 min	**5 min**	**Adjourn/ feedback (via chat) / next day's meeting**	**Co-chairs**	

Day 3 – Friday 11th June (MS Teams meeting) – 120 min

Participants can join up to 15 min before the meeting. Chat is open to everyone and the meeting will be recorded.

Accumul. Time (120 min max)	Time	Description	Meeting chair and presenters	Shared material, comments
5 min	5 min	Intro to day 3	**Villy and Pierre**	
10 min	5 min (4+1)	**Introduction** of relevant projects within CoastPredict: • Project 13: Coastal Urban Resilience in a Changing Climate	**Alan Blumberg (Jupiter Inc, USA - Invited)**	
20 min	10 min (7+3)	**Introduction** of relevant projects within CoastPredict: • Project 14: ROTATE- Redefining the concept of the global coastal ocean	**Joanne Hopkins (NOC - Invited)**	
45 min	25 min	**Strategic goals and TT role:** Within the OceanPredict-CoastPredict continuum	**Villy and Pierre**	
90 min	45 min	**Round table discussion on strategic goals and TT role**	**All participants**	
120 min	30 min	**COSS-TT housekeeping:** OPST-4 preparation questionnaire Next steps with discussion	**Villy and Pierre**	
125 min	5 min	**Final words and close of meeting**	**Villy and Pierre**	**Co-chairs will summarize and present to OPST. TT will further advance at the face-to-face meeting next spring.**

Appendix B: Participant's list (MS Teams meeting, 9-11 June 2021)

	First name	Surname	Affiliation	Country	Email address
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