



## Report of the 2nd Meeting of the TPOS 2020 Resource Forum

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Honolulu, Hawaii

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### Additional Information

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# Roadmap and Response to the TPOS 2020 1st Report

## Contents

1	Introduction	2
2	The Response to the First Report	2
2.1	Responses by Theme	3
2.1.1	Subsurface backbone (temperature and salinity)	3
2.1.2	Surface Wind, temperature, salinity and surface height	4
2.1.3	Surface heat, radiative and freshwater fluxes	5
2.1.4	Biogeochemistry	6
2.1.5	New technology	6
2.1.6	Modelling	7
2.1.7	Pilot projects & process studies [action 14]	7
3	Work Program of TPOS 2020 SC	8
3.1	Work Program	8
3.2	Revised terms of reference for SC	9
4	Other Governance matters	12
4.1	TPOS 2020/JCOMM Transition and Implementation Task Team	12
4.2	TPOS 2020 17	
4.3	Summary Response (Statement)	16
	Appendix 1 – Recommendations and Actions	17
	RECOMMENDATIONS	17
	ACTIONS	19
	Appendix 2 –TPOS 2020 Project Terms of Reference	21
	TPOS 2020 Steering Committee Terms of Reference	21
	TPOS 2020 Resource Forum (TRF) Terms of Reference	22
	Appendix 3 – WIGOS TPOS 2020 Decision (draft)	23
	Appendix 4 – JCOMM MAN TPOS 2020 Decision	25
	Appendix 5 – Terms of Reference for TPOS 2020/JCOMM Transition and Implementation (Cross Cutting) Task Team	27

## 1 Introduction

The TPOS 2020 (Tropical Pacific Observing System 2020 project) 1<sup>st</sup> Report was published in December 2016 (see <http://tpos2020.org/> for the Executive Summary and full Report). The 1<sup>st</sup> Report contains 22 recommendations and 15 actions for consideration by TPOS stakeholders and the TPOS 2020 Resource Forum. The Recommendations and Actions are included in Appendix 1 for easy reference. Note that the order these were introduced in the Executive Summary differs from the order in Appendix 1.

The primary purpose of this document is to provide a response to those recommendations for consideration at the 2<sup>nd</sup> meeting of the TPOS 2020 Resource Forum (TRF-2)

Under the relevant agenda item, the Forum was asked to endorse a brief Summary Response Statement, the first draft of which is included at the end of section 4 of this document.

There is significant work underway beyond the 1<sup>st</sup> Report and the response provided here. Section 3 will provide an outline of this work and present draft Terms of Reference for the SC for the next TPOS 2020 period for approval by the Forum.

Finally, Section 4 will discuss some governance issues, including the future of the Resource Forum and the creation of a TPOS 2020/JCOMM Transition and Implementation Task Team. TPOS 2020 will be recognized as a WMO Integrated Global Observing System pre-operational pilot project, and the implications with respect to regional coordination will be discussed.

## 2 The Response to the First Report

*[Note: This Section served both as a script for the discussion of the 1<sup>st</sup> Report recommendations and actions, and as a way of bringing Forum participant initiatives into the list of activities. It will be supplemented by specific activities that are tabled at the Forum, but without trying to cover everything.]*

Given this draft is a response from the sponsors, the material is grouped in a way that aligns with sponsor perspectives rather than simply following the layout and structure of the scientific design in the 1<sup>st</sup> Report.

The response is broken up into themes, grouping recommendations and actions where convenient and appropriate, noting that the actions themselves are an initial part response to the 22 recommendations, focusing on high priority near-term activities. Some themes focus just on the tropical Pacific, whereas others address global networks. The order attempts to match the interests of Forum participants, while at the same time maintaining the Report scientific logic. Ultimately it is a choice for the Forum itself.

For each topic, the most relevant recommendations and actions are listed first, followed by the response from the Forum. Background to the response is provided as appropriate.

Additionally, responses are characterized as follow:

- “Agree” means they [the TRF-2 participants] are collectively willing to help make the activity happen, with the usual caveats of budget, time etc.
- “Endorse” means TRF-2 participants think the recommendation aligns with their own agency strategy and that it makes sense scientifically
- “Support” is the same as Endorse, except the TRF-2 participants are uncertain about certain aspects
- “Note” means the Response (from the Roadmap and Response Document) is sound but the TRF-2 participants are unsure or have not yet been able to consider the recommendation(s)

The response to the recommendation(s) is followed by a brief discussion outlining steps and activities the Resource Forum can support; unless stated otherwise, the outline should be considered as *indicative* rather than a *commitment*.

## 2.1 Responses by Theme

### 2.1.1 Subsurface backbone (temperature and salinity)

1 <sup>st</sup> Report Reference:	Recommendations <a href="#">16-21</a> ; Actions <a href="#">1-5</a>
TRF-2 Response	<ul style="list-style-type: none"> <li>a) Endorsed recommendations <a href="#">16-21</a></li> <li>b) Supports the staged approach to implementation;</li> <li>c) Notes initial priority should be assigned to the western Pacific, including increased Argo sampling;</li> <li>d) Notes the intent to improve meridional and upper ocean sampling;</li> <li>e) Noted and welcomed the plan to develop an inventory of current and future mooring deployments in the western Pacific; and</li> <li>f) Agrees to support a technical workshop to support mooring implementation in the western Pacific.</li> </ul>

The recommendations call for:

- A combination of in situ observing technologies to meet subsurface requirements, complemented by altimeter sampling (recommendations 5, 6) and model and data assimilation (recommendation 22) capabilities;
- Enhanced meridional sampling in the equatorial zone;
- Enhanced vertical sampling; and
- Doubled broadscale sampling density between 10S and 10N.
- Existing subsurface measurements from Argo, moorings and lines/sections from ships-of-opportunity and research vessels (e.g. GOSHIP) provide a global broadscale capability upon which TPOS can build.

The Resource Forum supports the initial, staged implementation as covered by Actions 1-5, and notes that initial priority should be given to the western Pacific. Implementation planning should build on lessons learned in the western Pacific and on studies and experience gained with the early phases of

change (Actions 4, 7 and 8).

The Resource Forum further noted that the “double Argo” action requires additional considerations in the Argo deployment strategy.

For the tropical moored buoy array, the Resource Forum noted that there are numerous research/experimental potential contributions to TPOS, in addition to those currently maintained on a sustained basis. The TPOS 2020 design considers a mix of shorter-term experimental sites as well as the longer-term sustained networks.

The Resource Forum noted and welcomed the plan to develop an inventory of current and future mooring deployments for the western Pacific, from all sources, and to reference this against the requirements of the 1<sup>st</sup> Report. Timely access to and exchange of such data is an essential element of those requirements.

The Resource Forum discussed interest in responding to Action 1, the six essential western Pacific mooring sites, as well as experimental extensions, particularly in the NW Pacific (in some cases extending beyond the TPOS domain). Further discussion on the details (near- and longer-term) are needed, and several Resources Forum representatives (W. Yu, K. Ando) agreed to contribute to these discussions and planning. The Forum supported the option of a small technical workshop (contingent upon budget decisions), during which technical aspects and implementation plans would be discussed. The workshop will be held in China in September 2017.

The Resource Forum noted and welcomed several technological initiatives (see section 2.1.5) that would inform future planning and implementation.

### 2.1.2 Surface Wind, temperature, salinity and surface height

1 <sup>st</sup> Report Reference:	<a href="#">Recommendations 1-7, 11</a> , and <a href="#">21</a> (part); Actions <a href="#">7</a> and <a href="#">11</a> (in part).
TRF-2 Response	<ul style="list-style-type: none"><li>a) Endorsed recommendations 1-7 and 11.</li><li>b) Agreed to facilitate dialogue around future scatterometer missions;</li><li>c) Supported Steering Committee plans to look at errors and uncertainties in wind products;</li><li>d) Noted that an additional source of passive microwave SST data is a priority.</li></ul>

The recommendations largely follow established strategy for these essential variables, but with specific attention to in situ requirements for calibration and for regions/regimes where remote sensing does not provide adequate coverage and/or accuracy.

The Resource Forum notes the two actions that address points of risk in the design for wind and surface wind stress.

For surface wind and wind stress, the Resource Forum notes that there are potential scatterometer

missions that would meet the coverage and sampling target, including HY-2B and COMSAT of China. The Resource Forum agreed to facilitate SOA engagement in the International Ocean Vector Wind Science Team (IOVWST) and other international fora that will assist in developing effective data and product plans.

The Forum endorsed specific actions that the TPOS 2020 SC and the Ocean Observations Panel for Climate (among others) wished to undertake relevant to Action 7 and the recommendations. These include:

- Undertake studies to estimate the effect of small-scale convective cells on the discrepancy between satellite and in-situ wind measurements in rainy regions;
- Engage IOVWST to improve consistency of rain flagging;
- Engage NWP centers to conduct joint on the effect of ocean surface currents on wind stress and to analyse the impact of TPOS surface wind data (TMA winds, SCAT) on surface wind and wind stress products;
- Engage CEOS to raise awareness of TPOS 2020 requirements and to facilitate high-quality, real-time contributions from the China HY Series surface wind products;
- Scope and develop a project on wind synthesis products suitable for climate change detection.

The Forum supported such actions.

The Resource Forum noted the mix of platforms and providers needed to meet SST requirements and that by 2020, GMI will likely be the only operational passive microwave SST platform. The Resource Forum supported the priority to identify at least one other source of passive microwave SST data.

Sea surface salinity requirements are demanding in terms of both resolution (e.g., across fronts) and accuracy. The complementary qualities of in situ and satellite approaches offer the best path toward meeting the requirements.

High-precision sea surface height measurements have high impact across a broad range of global ocean and climate applications and the 1st Report emphasises that this high priority is also true for the tropical Pacific, for both altimetry and in situ sea level measurements. The TPOS 2020 Report also supports the development of wide-swath altimetry technology to sample surface topography at higher resolution.

### 2.1.3 Surface heat, radiative and freshwater fluxes

1 <sup>st</sup> Report Reference:	Recommendations <a href="#">8</a> , <a href="#">9</a> and <a href="#">15</a> (see also 1-4); Actions <a href="#">6</a> , <a href="#">8</a> , <a href="#">10</a> , <a href="#">11</a> and <a href="#">13</a> .
TRF-2 Response	<p>a) Endorsed recommendations 8, 9 and 15.</p> <p>b) Agreed with the regime-based approach with more capable flux moorings (Actions 6, 10, 11); and</p> <p>c) Supported Actions 8 and 13, led by the Steering Committee.</p>

The TPOS 2020 1<sup>st</sup> Report emphasises observing a range of weather, climate and ocean regimes to

improve our understanding of ocean-atmosphere exchanges and their estimation and evaluation in reanalyses, coupled data assimilation and other methods of surface flux analysis. The focus is on the state variables; the regimes include the west Pacific warm pool, along the equator, and along meridional lines from (a) the seasonal southern Intertropical Convergence Zone (ITCZ) across the equator, (b) the frontal zone and Northern Hemisphere ITCZ in the western Pacific, (c) the trade wind region of the central and eastern Pacific, and (d) the southerly regime of the eastern Pacific.

The staged reconfiguration of the tropical moored buoy array (Action 6) emphasises these regimes and more capable surface flux measurements. Wind, SST (see 2.1.2) and precipitation observations provide essential additional context. Precipitation measurements are particularly important in the convective and convergent regions and continuation and where possible, expansion of current sampling is needed to meet the requirements. The staged changes should be accompanied by additional studies (Actions 8, 13) that will refine the reconfiguration.

The Resource Forum noted the relationship to the Actions discussed in section 2.1.1 and emphasised the need for consultation and coordination through the stages of implementation, including through an initial workshop proposed under 2.1.1. The Forum also noted that the 2<sup>nd</sup> and 3<sup>rd</sup> Reports may provide additional refinements, in part based on the results from pilot projects and process studies (section 2.1.7) and the introduction of innovative technologies (section 2.1.5).

#### 2.1.4 Biogeochemistry

1 <sup>st</sup> Report Reference:	Recommendations <a href="#">12-14</a> ; actions <a href="#">12, 13</a> (in part).
TRF-2 Response	<ul style="list-style-type: none"> <li>a) Endorsed recommendations 12-14;</li> <li>b) Agreed that existing pCO<sub>2</sub> observations should be continued;</li> <li>c) Noted that important contributions result from opportunistic underway biogeochemical measurements;</li> <li>d) Noted that research and process studies are needed to guide the design of both the biogeochemical and ecosystem observing systems.</li> </ul>

The Resource Forum noted that biogeochemical and ecosystem requirements, recommendations and actions will be a major focus for subsequent Reports.

Broadscale surface ocean color measurements from satellite missions are required, with the resolution of combined products sufficient to resolve regime boundaries, and appropriate in situ measurements of chlorophyll-a and optical properties for validation.

Opportunistic use of existing platforms, such as moorings, floats, and research and servicing vessels is a key strategy. Service ships should continue and, where feasible, extend underway measurements for pCO<sub>2</sub>, to serve as validation for moored measurements and new technologies, and to provide context for spatial variability between moored observations. Mapping the extent of the eastern Pacific oxygen minimum zone is also an early action.

Several Resource Forum members (C. Sabine, O. Shirayama, others) noted that biogeochemistry and

ecosystem research and supporting observations, such as BGC Argo, are an emerging priority. Process studies that bring together intense sampling (for example, super sites and/or OceanSites-type biological reference stations) and high-end modelling are important. The Resource Forum agreed such developments were essential for the design and eventual implementation of the biogeochemical and ecosystem observing system backbone.

### 2.1.5 New technology

1 <sup>st</sup> Report Reference:	Recommendation 4-5, 11 and 15; Action <a href="#">13 (in part)</a> .
TRF-2 Response	<ul style="list-style-type: none"> <li>a) Endorsed recommendations 4-5, 11, and 15 in relation to technology development;</li> <li>b) Agreed in principle to support a small workshop to bring model developers and tropical observational specialists together;</li> <li>c) Noted that technology development should occur for both in-situ observations and satellite observations; and</li> <li>d) Agreed that continuing to advance technology for ocean and surface meteorological observations is important [Action 13].</li> </ul>

Several Forum members and their respective agencies are investing in new technology for both in situ and satellite observations. The Resource Forum emphasised the role of technology in achieving greater effectiveness and efficiency. The Forum also discussed whether further support is needed to enhance and promote technological transfer.

The Resource Forum noted the important roles of new technology in all aspects of TPOS 2020 and, in particular, for physical and biogeochemical fluxes.

The Resource Forum recommended the TPOS 2020 SC provide an evaluation of new technology options as part of its 2nd Report. This evaluation will be in the context of EOV/ECV requirements of the Backbone and other priorities established for TPOS.

TRF-2 also recommends that the TPOS 2020 SC, in conjunction with the TPOS 2020/JCOMM T&I TT, develop guidance (e.g. principles) for EOV/ECV data continuity through technology changes, building as appropriate on GCOS and WIGOS observing Principles.

### 2.1.6 Modelling

1 <sup>st</sup> Report Reference:	Recommendation <a href="#">22</a> ; Actions <a href="#">7</a> , <a href="#">8</a> and <a href="#">13</a> .
TRF-2 Response	<ul style="list-style-type: none"> <li>a) Endorsed recommendation 22;</li> <li>b) Agreed in principle to support a small workshop to bring model developers and tropical observational specialists together; and</li> <li>c) Supported actions 7, 8 and 13 (also see 2.1.2 and 2.1.3).</li> </ul>

The Resource Forum noted the importance of enhanced, and innovative, approaches in the use of models for observing system design and for the overall guidance of TPOS 2020. Systematic errors in some classes of model do compromise sensitivity studies and care is always required for interpretation and when providing advice to stakeholders. Nevertheless, the TPOS 2020 community supports and



strongly advocates for such experimentation.

The Resource Forum noted that it would be interested in supporting a small workshop to bring model developers into discussion with observational specialists once more details are flushed out. Resource Forum members encouraged all TPOS stakeholders to consider enhanced investment in the fundamental science (process studies, parameterisation development, high-resolution eddy resolving models, etc.) to improve models and extract greater benefit from the observing system. Pilot studies 6.1.6 and 6.1.7 of the First Report are two examples.

Forum members also indicated it would be valuable to have a stronger presence of modellers at future meetings.

*[Note: Advocacy for TPOS from weather and seasonal prediction agencies/services is important. If possible, we should craft such a statement and have it endorsed by the Forum - hearing similar messages of support for TPOS 2020 plans helps build confidence.]*

### 2.1.7 Pilot projects & process studies [action 14]

1 <sup>st</sup> Report Reference:	Chapters 6 and 10; Action <a href="#">14</a> .
TRF-2 Response	a) Agreed the importance of pilot projects and process studies; and b) Agreed to advocate for and, as appropriate, support such initiatives.

The Resource Forum agreed to advocate for the pilot projects and process studies that will contribute to the refinement and evolution of the TPOS Backbone. The Western Boundary Current [6.1.1] and Eastern Pacific [6.1.2] Pilot programs were highlighted as priorities

There are multiple points of common interest with existing (e.g. NPOCE, SPICE, YMC) and planned activities. The Resource Forum members had strong support for these activities and the development of future Pilot Projects. TPOS 2020 will actively promote the value of such projects/studies for the long-term design and sustainability of the TPOS and may return to the idea of an overarching coordination in the 2<sup>nd</sup> Report.

Several of the represented organisations have ongoing projects that were noted at the Resource Forum. IRD (France) is working on a number of pilot projects and process studies that are relevant to TPOS 2020. A few of these include STEPPE, focused on addressing the dynamics and predictability of extreme Eastern Pacific El Nino events, and AOMP, which is working on determining the upwelling dynamics and Oxygen Minimum Zone in the eastern Tropical Pacific.

### 3 Work Program of TPOS 2020 SC

#### 3.1 Work Program

Task	Responsibility: Task Team, SC or T&I TT							
	BB	BGC	EP	M&DA	PBL	WP	TPOS SC	T&I TT
Action 1	●				○	●	○	○
Action 2	●					●		○
Action 3	●		○					○
Action 4	●							○
Action 5	●					○		○
Action 6		○	○		○	○	○	○
Action 7				○	●		○	○
Action 8				○	●		○	○
Action 9			○			○	●	●
Action 10					●	○		○
Action 11			○		●	○		○
Action 12		●			●			
Action 13					●			
Action 14	○	○	○	○	○	○		
Action 15							●	●
<b>Pilot projects</b>								
WBC closure	○				○			○
EP wave, upwell		○	●		○			○
BGC PP		●		○				
Direct flux					●			
Clipperton Is			●		○			
Impact studies	○			●				○
Compare anals/use	○		○	●				○
<b>Process studies</b>								
Pacific upwell/mixing	○	○			○			
Northern edge warm pool					○			
Eastern edge Warm Pool			○		○			
EP ITCZ/cold tongue/stratus		○	●		○			
<b>Task Team studies</b>								
Deep Obs	●							○
Wyrтки	●			○				
BGC model studies	○	●		○				
BGC Workshop		●						
Data exchange			●				●	○
EP regional planning			●					○
Model dev./process workshop				●				
YMC					○	●		
Technology projects					●			
WP cruise inventory						●		
WP mooring inventory						●		○

Figure 1. TPOS 2020 SC work program. Green dots indicate lead; circles contributions.

Figure 1 is a summary of the current work program of the Steering Committee and its Task Teams. For completeness, we have also indicated the interests of the Transition and Implementation Task Team.

At the top are actions that are being explicitly considered by TRF 2. The Pilot Projects and Process Studies are also part of the agenda (section 2.1.7) but are not discussed in detail. The last part includes a subset of the internal projects, some of which may be discussed at this Forum.

The Task Teams are an important part of TPOS 2020 and lead much of the engagement. The Forum will recognize the contributions of these groups and express thanks to those agencies who support involvement in the work of TPOS 2020.

**3.2 Revised terms of reference for SC**

Reference	<ul style="list-style-type: none"> <li>● Appendix 4 of La Jolla Workshop (copied here as <a href="#">Appendix 2</a>)</li> <li>● First report for Actions</li> <li>● Reports from the Steering Committee (at <a href="http://tpos2020.org/">//tpos2020.org/</a>)</li> </ul>
TRF-2 decision	<p>The Terms of Reference of the Steering Committee be changed:</p> <ul style="list-style-type: none"> <li>● to state “The membership of the Steering Committee shall not exceed 15, including the Co-Chairs ...” and that changes in membership be approved offline;</li> <li>● That the following be added to the first bullet point of the Terms of Reference: “in collaboration with the Transition and Implementation Task Team, as appropriate”;</li> <li>● That the scope and mandate of the Steering Committee is to include the points New scope (i)-(vi) as stated below; and</li> <li>● That the TPOS objectives in the preamble be replaced with the revised text as provided in Box 1.</li> </ul>

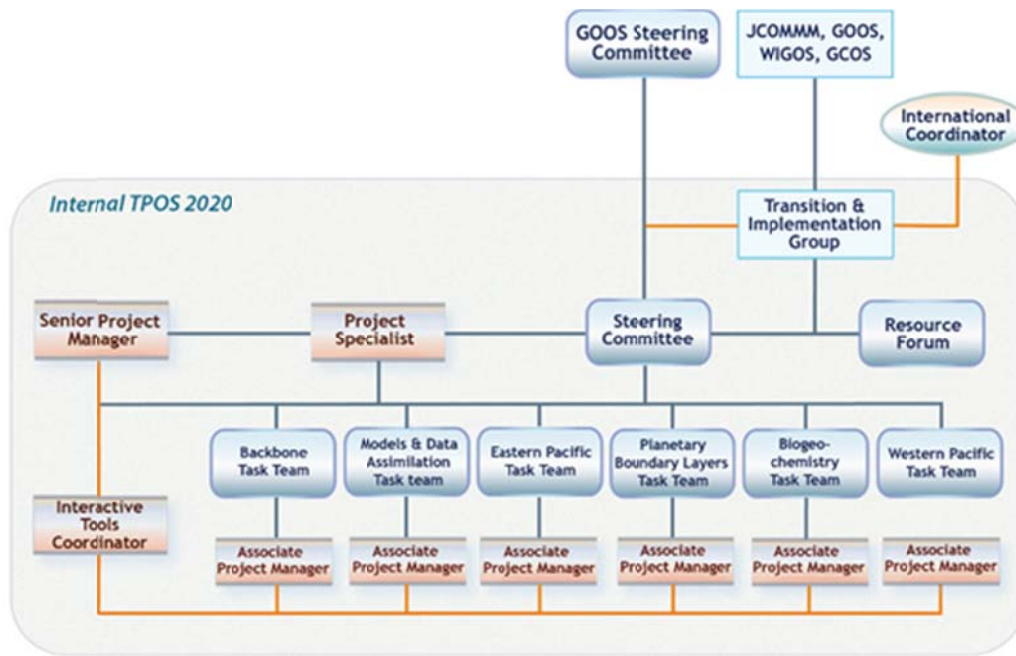


Figure 2. Current TPOS 2020 structure.

Figure 2 shows the current organisation of TPOS 2020, including the Distributed Project Office (DPO) and the newly-created TPOS 2020/JCOMM Transition and Implementation Task Team.

The Terms of Reference for the Steering Committee were agreed at the La Jolla TPOS Review meeting (copied to [Appendix 2](#)).

One of the first tasks of the Steering Committee was to consider its mandate and reach a shared understanding of what the Project and Steering Committee aimed to achieve. A short Prospectus was published<sup>1</sup>, based on a draft developed in conjunction with the publication of the La Jolla Workshop Report and updated to reflect the charge delivered by the Workshop. The Prospectus benefitted from the views of the Steering Committee and from additional editing that was not possible at the time the Workshop report was published. There were small but significant changes in the scientific goals of the Project and in the anticipated benefits (Box 1); it is these revised goals that were used for the First Report.

<sup>1</sup> See [http://tpos2020.org/wp-content/uploads/TPOS\\_Prospectus\\_FINAL.pdf](http://tpos2020.org/wp-content/uploads/TPOS_Prospectus_FINAL.pdf)

### **Box 1: Original and draft revised TPOS 2020 Project Goals**

#### ORIGINAL

The overarching goals of the Project are:

- To refine and adjust the TPOS to monitor, observe and predict the state of ENSO and advance scientific understanding of its causes.
- To determine the most efficient and effective method for sustained observations to support prediction systems for ocean, weather and climate services of high societal and economic utility, including underpinning research.
- To advance and refine the knowledge of the predictability horizon of the tropical Pacific variability (physical and biogeochemical), as well as its impacts in global climate.
- To determine how interannual to multidecadal variability and human activities impact the relation between marine biogeochemistry and biology to carbon budgets, food security and biodiversity.

#### REVISED

This Project has the following scientific objectives:

- (i) To redesign and refine the TPOS to observe ENSO and advance scientific understanding of its causes,
- (ii) To determine the most efficient and effective observational solutions to support prediction systems for ocean, weather and climate services, and
- (iii) To advance understanding of tropical Pacific physical and biogeochemical variability and predictability.

The Resource Forum agreed to the revised TPOS 2020 Project Goals.

In terms of scope, the original charge (Appendix 2) was intentionally not prescriptive. In the First Report, it was assumed that the mandate was solely for surface and subsurface observations and did not include the coupled ocean-atmosphere system as a whole. For the Task Teams this distinction was blurred so that both the atmospheric and oceanic boundary layers were included. However even this blurring turned out to be restrictive, for example in the eastern Pacific where consideration of the Intertropical Convergence Zone bias of models needs consideration of clouds and the cold tongue/stratus system. There was also no guidance with respect to the deep ocean.

Review and commentary on the First Report highlighted several shortcomings, particularly at sub-seasonal time scales and shorter, and with respect to Indo-Pacific connections.

The Resource Forum agreed the following be included in the scope for the TPOS SC for the next period through to the end of 2018:

- New scope (i). Further consideration of waves and sea state, including in the coupled ocean-atmosphere context;
- New scope (ii). Further consideration of deep measurements, in collaboration with the Deep Ocean Observing System initiative;
- New scope (iii). Provide greater specificity for requirements arising from monsoon and sub-seasonal time scales, and the implications for the observing system;
- New scope (iv). Consider (coupled) severe storms (typhoons/hurricanes/tropical cyclones) and their special ocean observing requirements;
- New scope (v). Through the Western Pacific Task Team or otherwise, provide updated advice for observations related to Indo-Pacific exchanges; and
- New scope (vi). Consider the new class of coupled ocean-atmosphere numerical weather prediction models, particularly in regions like the Maritime Continent, and implication for TPOS.

The Terms of Reference of the Steering Committee have generally been fit for purpose. It should be noted that the Steering Committee has not developed any advice around data and information systems (c.f. the discussion in La Jolla) and is now assuming such matters will be handled by the new Transition and Implementation Task Team. This new group should be mentioned explicitly in the Terms of Reference.

The current composition of the Steering Committee is 15, including the co-Chairs (c.f. the upper limit of 12 indicated in the Terms of Reference) and, in practice operates as an extended Steering Committee with Co-Chairs of Task Teams also invited to participate in Steering Committee discussions as required. All three Steering Committee meetings have been energetic and productive. However, funding and other constraints has typically reduced attendance by 2 or 3. The Steering Committee believes a member from Indonesia should be included for the next phase. The Co-Chairs are currently reviewing membership, taking account of the changed circumstances of some individuals and the need for expertise in some of the emerging areas.

The Resource Forum agreed that the Terms of Reference be updated:

- to state “The membership of the Steering Committee shall not exceed 15, including the Co-Chairs ...” and that changes in membership be approved offline;
- That the following be added to the first bullet point of the Terms of Reference: “in collaboration with the Transition and Implementation Task Team, as appropriate”;
- That the scope and mandate of the Steering Committee is to include the points New scope (i)-(vi) as stated above; and
- That the TPOS objectives in the preamble be replaced with the revised text as provided in Box 1.

## 4 Other Governance matters

### 4.1 TPOS 2020/JCOMM Transition and Implementation Task Team

References	<ul style="list-style-type: none"> <li>• Report of the 3<sup>rd</sup> TPOS 2020 SC meeting;</li> <li>• Section 7.7 of the 1<sup>st</sup> report; and</li> <li>• Background provide in this section 4.1.</li> </ul>
TRF-2 decision	<ul style="list-style-type: none"> <li>• Note the background on transition and implementation; and</li> <li>• Endorse the creation of a TPOS 2020/JCOMM Transition and Implementation Task Team, with Terms of Reference as given in Appendix 5.</li> </ul>

The TPOS 2020 SC plans to produce three Reports; the First Report was published in December 2016, and the second and third Reports will be published in December 2018 and late 2020/early 2021, respectively.

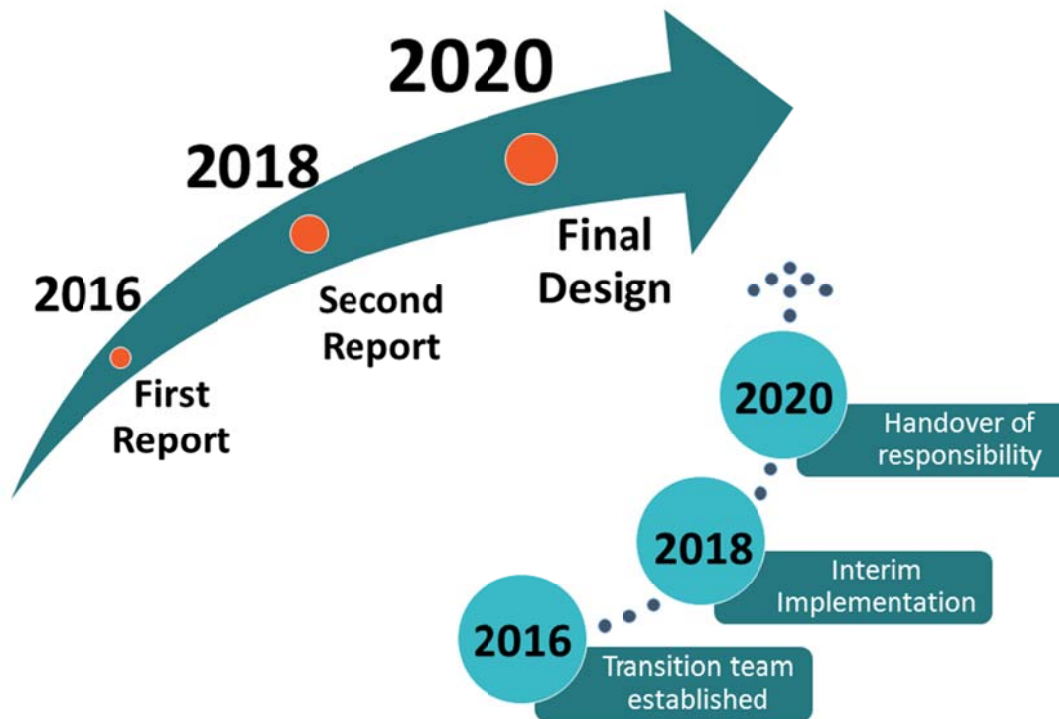


Figure 3. Schedule of TPOS 2020 Reports and implementation.

As outlined in section 7.7. of the First Report, for the last twelve months, an informal group has been meeting to discuss implementation of TPOS 2020 recommendations and actions insofar as they involve the TPOS Backbone Observing System. This informal transition team now needs to be established as

part of the TPOS 2020 organisational structure, in partnership with those groups currently responsible for coordinating ocean observations.

The WMO/IOC Joint Technical Commission for Oceanography and Marine Meteorology was established nearly twenty years ago, specifically to coordinate sustained ocean and marine observations (see [http://www.wmo.int/pages/prog/amp/mmop/jcomm\\_partnership\\_en.html](http://www.wmo.int/pages/prog/amp/mmop/jcomm_partnership_en.html)). JCOMM, through its Observations Programme Area, coordinates (sometimes directly, sometimes indirectly) many of the networks considered in the First Report, including tropical moorings and Argo. It is logical then to partner with JCOMM as TPOS 2020 refines the design and takes action to reconfigure the observing system.

One of the risks identified at the Workshop in La Jolla in 2014 was that arising from inadequate coordination and communication. JCOMM works globally and does not at this time have a regional mechanism that can be used for TPOS. Through the Resource Forum and other initiatives, we envisage strengthened cooperation and coordination among TPOS partners and that this will be one of the enduring legacies of the Project. It makes sense to start looking for an appropriate permanent structure to support such a regional legacy. The WMO Integrated Global Observing System (WIGOS) is one such body, as are the GOOS Regional Alliances, but at present neither have a mechanism that can be applied to TPOS.

In January, after consultation within the informal Transition Team, presentations were made to both Intersessional Coordination Group for WIGOS and the JCOMM Management Committee (JCOMM MAN). ICG WIGOS agreed to recognize TPOS 2020 as a pre-operational pilot, with a view to developing and testing a different type of regional coordination, one not based on the WMO regional Associations, but on shared and mutually beneficial observing system outcomes (see [Appendix 3](#)).

A presentation was made to JCOMM MAN, focusing on regional coordination and the need to transition responsibility for agreed changes in TPOS to JCOMM. JCOMM MAN welcomed the initiative and agreed to co-sponsor the Transition and Implementation group, to be known as the TPOS 2020/JCOMM Transition and Implementation Task Team (see [Appendix 4](#); in JCOMM it is formally recognized as a cross-cutting Task Team). JCOMM MAN suggested some changes to the proposed Terms of Reference, including a Chair and Vice-Chair arrangement rather than Co-Chairs. These were agreed by the TPOS 2020 SC Co-Chair, subject to endorsement at the TRF-2. Note that the Steering Committee had previously endorsed the creation of such a group at its third meeting. The draft Terms of Reference are included at [Appendix 5](#). The organisational structure of TPOS 2020 would be as given in Figure 1.

TRF-2 is asked to note the background to the creation of a transition and implementation group (this section) and to endorse the Terms of Reference at [Appendix 5](#).



## 4.2 TPOS 2020 Resource Forum

Reference	<ul style="list-style-type: none"> <li>● Report from La Jolla TPOS Review Workshop</li> <li>● Section 4.2 of this paper</li> </ul>
TRF-2 decision	<ul style="list-style-type: none"> <li>● TRF-2 discussed replacing the TPOS 2020 Resources Forum with a TPOS 2020 Board that would provide high-level oversight,</li> <li>● The Forum members decided to retain the Forum organizational structure but would consider a Board format in the future, and</li> <li>● Note that a Forum should be convened whenever there are significant recommendations and/or decisions to be considered.</li> </ul>

The context for, and Terms of Reference of, the TPOS 2020 Resource Forum are given in [Appendix 2](#). This is the first face-to-face meeting of TPOS 2020 sponsors since the TPOS Review Workshop in La Jolla in January 2014. The Resource Forum held a teleconference immediately following the 1<sup>st</sup> meeting of the Steering Committee in October 2016 but has not been able to come together again until TRF-2.

Resource forums and/or boards have been used previously, most notably for Indian Ocean GOOS and to support the Tropical Ocean – Global Atmosphere Experiment (TOGA, 1985-1994). The TOGA Board role was like that envisaged for the Resource Forum, specifically to facilitate and coordinate the effort and resources needed to implement TOGA. However, unlike the TRF, the TOGA Board was sponsored directly by WMO and IOC and thus able to bring the weight of the Members/Member States of those organisations behind its recommendations and actions (typically around 14 Members/Member States participated in TOGA Board meetings). The TPOS 2020 Project was created with a foundation of established observing networks, several of which were established by TOGA, and thus is fundamentally different from TOGA. TOGA established a TPOS; TPOS 2020 aims to redesign and refine the TPOS, building from established structures. JCOMM is in part a legacy of the TOGA Board, and so whatever mechanism TPOS 2020 uses it needs to operate in what is already a busy place. The TRF does not have an intergovernmental mandate for national resource commitments.

Whether it is a Resources Forum, Board, or some other device, good governance requires a top-down sponsor-led group to reflect the will of investors in TPOS 2020 and users of TPOS resources, and to provide a reference and decision group for the (scientific) Steering Committee. Good Project governance also demands a Board or equivalent device to represent those who are the intended beneficiaries of the Project, beneficiaries of the change (efficiency, effectiveness, relevance) and of the products.

Given the difficulty of operating a standing (regular) open-ended mechanism in the form of a Forum, an alternative is to focus on Project governance and establish a TPOS 2020 Board, of limited membership, but broadly representing the stakeholders of TPOS 2020. The Board would meet by video/teleconference and conduct its business by correspondence. Key responsibilities would be to (i)

represent the “owners” of the TPOS 2020 Project, (ii) receive, and provide feedback to, reports from both the Steering Committee and Transition and Implementation Task Team, (iii) manage exceptional issues and/or risks identified by the Steering Committee and/or Transition and Implementation Task Team (e.g., changes in scope), (iv) approve Reports and plans, and (v) convene fora, as appropriate, for the wider stakeholder to discuss significant recommendations and request for action.

The original organisational structure also foreshadowed a TPOS 2020 Executive, comprising the Co-Chairs of the Resource Forum and Steering Committee. While in practice the interim Chair of the TRF and the Co-Chairs of the Steering Committee have met regularly, the TPOS 2020 Executive has never been convened.

The Resource Forum will continue as is, but will focus more effort on providing high-level guidance. Further consideration of transitioning the Forum to a Board format will be given at future meetings. The Forum members were also encouraged to engage more regularly with the SC.

The current Resource Forum Chair, Craig McLean (NOAA), expressed his desire to turn over his leadership role to a person or persons who are more intimate to the TPOS community. As of July 2017, discussions of the next Resource Forum Chair(s) are underway.

### 4.3 Summary Response (Statement)

The Resource Forum recognized and reaffirmed the importance of the tropical Pacific observing system in underpinning climate, weather, ocean and ecosystem services and its key role in GOOS, GCOS, WIGOS and JCOMM. The Forum recognized many important agency contributions over recent decades and, specifically, the NOAA and JAMSTEC contributions to the tropical moored buoy network.

The Resources Forum endorsed all of the Recommendations from the First Report of TPOS 2020. The Forum thanked Lead Authors and others who contributed to the Report and to its publication. The Forum specifically wished to thank the experts and stakeholders who contributed reviews of the first and second drafts of the Report.

The Resource Forum noted that the recommendations related to satellite and other global broadscale observation networks were well aligned with existing strategy. The Forum members showed strong support for an implementation workshop to begin redesigning the array in the Western Pacific and for the continued progress and development of pilot studies. The Forum also noted several recommendations that called for specific strategies to respond to the assessed requirements. These included (i) enhanced scatterometer and other remote and in situ measurements of surface wind; (ii) increased observations in the equatorial region and upper ocean, including for ocean currents; (iii) a doubling of broadscale subsurface sampling in the tropics, principally through Argo; (iv) a reconfigured tropical moored buoy array, with more focus on key regimes and more capable surface and subsurface measurements systems; (v) support for existing biogeochemical observations and strong encouragement to seek enhancements, including through research studies; (vi) enhanced modelling and data assimilation, to better assess the impact of observations, and to better exploit the rich capability of TPOS; and (vii) promoting studies and new technologies to enhance the effectiveness and efficiency of the TPOS.

The Forum agreed to several specific short-term and near term actions to achieve the recommended strategy and offered support to the TPOS community in working toward those goals.

## Appendix 1 – Recommendations and Actions

### RECOMMENDATIONS

**Recommendation 1.** A constellation of multi-frequency scatterometer missions and complementary wind speed measurements from microwave sensors to ensure broad-scale, all-weather wind retrievals over 90% of the tropical Pacific Ocean every 6 hours for the next decade and beyond with different equatorial crossing times to capture the diurnal cycle.

**Recommendation 2.** In situ vector wind measurements, with particular emphasis on extending the in situ based climate data records, and intercalibrating different satellite wind sensors especially in the equatorial Pacific and in tropical rainy areas.

**Recommendation 3.** Sustaining satellite measurements of SST, using infrared sensors for higher spatiotemporal sampling; passive microwave sensors filling gaps under clouds; and the diversity of satellite and in situ platforms contributing to intercalibration.

**Recommendation 4.** Maintenance of the current level of in situ SST observations and improvement of drifter SST quality. Both will contribute to satellite SST calibration and validation, as well as providing an independent reference dataset for the SST climate record. Specifically target convective and rainy areas for SST ground truth, while keeping SST in situ measurements on moorings in the equatorial region.

**Recommendation 5.** Continuation of the high-precision SSH measurements via the Jason series of satellite altimeters for monitoring large-scale SSH, and the continuing development of wide-swath altimetry technology to measure meso- and submesoscale SSH variations that are particularly energetic in crucial regions including the western boundary;

**Recommendation 6.** Maintenance of in situ tide gauge measurements for the calibration and validation of satellite SSH, upgraded with global navigation satellite system referencing and complemented by sustained temperature and salinity profile measurements; and

**Recommendation 7.** Continuation of ocean mass measurements to complement satellite SSH and Argo-derived steric height measurements, and in situ bottom pressure sensors to help calibrate and validate satellite-derived estimates.

**Recommendation 8.** Continuation and enhancement of international collaboration for precipitation measuring satellite constellations to sustain the spatiotemporal sampling of precipitation measurements in the tropics.

**Recommendation 9.** Continuation and expansion of open-ocean in situ precipitation measurements for the evaluation and improvement of satellite-derived products, especially for

providing a long-term climate record.

**Recommendation 10.** Continuity of complementary satellite and in situ SSS measurement networks, with a focus on improved satellite accuracy.

**Recommendation 11.** Continuation of technological developments to measure ocean surface currents remotely, and of in situ measurements of surface and near-surface currents, particularly near the equator. Provide collocated measurements of wind and surface currents.

**Recommendation 12.** Continuation of high-frequency, moored time series and broad spatial scale underway surface ocean pCO<sub>2</sub> observations across the Pacific from 10°S to 10°N.

**Recommendation 13.** Continuation of advocacy for ocean color satellite missions with appropriate overlap to facilitate inter-calibration for measurement consistency. In situ measurements of chlorophyll-a and optical properties for the validation of satellite ocean color measurements are required.

**Recommendation 14.** From 10°S to 10°N, observations of subsurface biogeochemical properties are required, including chlorophyll concentration, particulate backscatter, oxygen and nutrients. Enhanced focus is needed for the eastern edge of the Warm Pool and the east Pacific cold tongue.

**Recommendation 15.** Enhancing in situ observations of state variables needed to estimate surface heat and freshwater fluxes in the west Pacific warm pool, along the equator, and along meridional lines from the seasonal southern ITCZ across the equator, the frontal zone and Northern Hemisphere ITCZ in the western Pacific, the trade wind region of the central and eastern Pacific and the southerly regime of the eastern Pacific.

**Recommendation 16.** A combination of fixed-point moorings, profiling floats and lines/sections from ships to meet the sustained requirement for subsurface temperature and salinity observations. Integration through data assimilation and synthesis is needed to produce the required gridded fields.

**Recommendation 17.** Enhancing meridional resolution of temperature and salinity in the equatorial zone through a mix of (a) additional moorings near the equator and (b) targeted enhancement of Argo profiles in the equatorial zone (approximately doubling density); and

**Recommendation 18.** Enhancing vertical temperature and salinity resolution from the TMA via additional upper ocean sensors on moorings from the top of the thermocline to the surface, and returning Argo profiles at 1 dbar resolution from 100 dbar to the surface (or as close as is practical).

**Recommendation 19.** Maintenance and, potentially, augmentation of the sampling depth range of

current profiles on the existing equatorial moorings, and enhancement of the meridional resolution of velocity along targeted meridians by additional moorings near the equator.

**Recommendation 20.** Doubling the density of Argo temperature and salinity profile observations through the tropics (10°N–10°S), to deliver improved signal-to-noise ratios (better than 4:1) at weekly timescales, starting with the western Pacific and the equatorial zone.

**Recommendation 21.** Continued support for in situ observations from drifters, ships, tide gauges and reference mooring sites.

**Recommendation 22.** A coordinated program of (a) data assimilation studies to assess the effectiveness of the TPOS 2020 Backbone design; and (b) studies on the utilization and influence of observational data among an appropriate subset of ocean analysis systems.

## ACTIONS

- Action 1.** Six TMA sites in the western Pacific within 2°S to 2°N should be maintained or reoccupied.
- Action 2.** Argo deployments should immediately be doubled equatorward of 10° in the west (especially outside the TMA-occupied region) to maintain subsurface temperature and salinity sampling and compensate for the declining TMA.
- Action 3.** Argo float deployments should be doubled over the entire tropical region 10°S–10°N, and return increased upper ocean vertical resolution.
- Action 4.** Through the TPOS 2020 Backbone Task Team and the Argo Steering Team, further explore how to optimize float deployments and missions to better deliver to TPOS goals.
- Action 5.** Moorings at 1°S and 1°N at selected longitudes should be added to enhance the resolution of near-equatorial dynamics. Enhancement of instrumentation on all moorings spanning 2°S and 2°N at these longitudes should be targeted, including velocity profiles as feasible.
- Action 6.** A staged reconfiguration of the TMA should emphasize enhancement in key regimes.
- Action 7.** Promote and support sensitivity and impact studies of wind and wind vector data inputs on operational analysis and reanalysis and specialized wind stress products, including their application to climate change detection. The effectiveness of rain metadata flags and various approaches to cross-calibration of scatterometers should also be considered.

- Action 8.** Renew and help coordinate efforts to understand the sensitivity and diagnose the impact of TMA air-sea flux variables in weather prediction, atmospheric reanalyses and coupled models, including through existing activities focused on the impact of observations.
- Action 9.** The Transition and Implementation Group (see section 7.7) should initiate discussion with TPOS stakeholders on sustainable solutions for the distinct implementation problems of the western and eastern Pacific regions, especially for the needed TMA contributions.
- Action 10.** All equatorial mooring sites should be upgraded to flux moorings.
- Action 11.** Meridional lines of flux sites should be extended from the equator to intersect both the SPCZ and ITCZ in the west, and across the ITCZ, the cold tongue and the seasonal southern ITCZ in the east.
- Action 12.** Underway pCO<sub>2</sub> observations should be continued or reinstated on all mooring servicing vessels, and the present network of moored pCO<sub>2</sub> measurements should be maintained and possibly extended. Measurements of dissolved oxygen from the surface to about 1500 m should be made on ships where practical, and oxygen sensors should be considered on each mooring.
- Action 13.** To mitigate risks in meeting surface flux requirements associated with changes in the TMA, TPOS 2020 seeks (a) enhanced sampling by VOSCLIM and other in situ systems for flux variables, (b) support for relevant new technology developments and (c) encourages efforts to improve the realism of reanalysis and possibly real-time NWP flux products through output correction/flux adjustment techniques.
- Action 14.** Through the TPOS 2020 Resource Forum, the TPOS 2020 Transition and Implementation Group and links to research programs and funders, support should be advocated for Pilot and Process Studies that will contribute to the refinement and evolution of the TPOS Backbone.
- Action 15.** In consultation with key stakeholders, including GOOS, JCOMM, WMO/WIGOS and GCOS, a transition process should be initiated, including the creation of a TPOS 2020 Transition and Implementation Group, for overseeing implementation of TPOS 2020 Recommendations and Actions.

## Appendix 2 –TPOS 2020 Project Terms of Reference

The TPOS 2020 Workshop and Review has recommended the creation of a TPOS 2020 Project to achieve the major change from a loosely coordinated set of ocean observing activities in the tropical Pacific to a systematic, sustained TPOS by 2020.

The Project will:

- Achieve a significant change for sustained observing and leave a legacy for GOOS of a robust, efficient and effective contribution in the tropical Pacific.
- Focus on the tropical Pacific Ocean but embrace partnerships with the meteorological and adjacent coastal/regional ocean communities, as appropriate.
- Embrace contributions from multiple agencies and countries through a coordinated portfolio of resources and high-level oversight of the scientific and technical design, sub- projects and interfaces to the user community.
- Operate within the context of the Framework for Ocean Observation and build on existing activities while at the same leading needed change.

The TPOS 2020 Project will be autonomous and self-supporting but will coordinate with relevant existing intergovernmental bodies through the GOOS Steering Committee.

The overarching goals of the Project are:

- To refine and adjust the TPOS to monitor, observe and predict the state of ENSO and advance scientific understanding of its causes.
- To determine the most efficient and effective method for sustained observations to support prediction systems for ocean, weather and climate services of high societal and economic utility, including underpinning research.
- To advance and refine the knowledge of the predictability horizon of the tropical Pacific variability (physical and biogeochemical), as well as its impacts in global climate.
- To determine how interannual to multidecadal variability and human activities impact the relation between marine biogeochemistry and biology to carbon budgets, food security and biodiversity.

A resources panel/forum broadly representative of the sponsors of TPOS 2020 will be responsible for coordinating the variety of resources needed for the Project to succeed and support a TPOS 2020 Project.

### **TPOS 2020 Steering Committee Terms of Reference**

The Steering Committee will:

- Provide scientific and technical oversight for the planning, system design, and implementation of the TPOS.



- Assess the evolving set of requirements through dialogue with relevant users and stakeholders.
- Coordinate a set of (pilot) projects designed to test and evaluate options, which initially may include:
  - Studies of potential broad-scale sampling strategies.
  - Investigation of potential sustained requirements for air-sea interaction and circulations and interactions in the upper ocean.
  - Studies of potential approaches in the tropical Pacific boundary current regions and the equatorial wave guide.
- Assess potential technology options for delivering a more effective and efficient TPOS; Coordinate with other relevant scientific/expert panels and bodies, including those responsible for GOOS information systems and services.
- Together with the Resource Forum, manage communication and reporting.

The TPOS 2020 Project will report to the GOOS SC.

It will meet at least once per year but may meet more frequently if required.

The membership of the Steering Committee shall not exceed 10 (or 12) and should include expertise broadly representative of the scientific and technical elements of the observing system, as well as expertise in the use and application of TPOS products.

#### **TPOS 2020 Resource Forum (TRF) Terms of Reference**

The TPOS Resources Forum will:

1. Facilitate and coordinate the provision of resources by member institutions required to advance TPOS 2020 activities based on recommendations from, and in consultation with, the TPOS Steering Committee (TSC, figure 1).
2. Promote and encourage contributions from institutions in non-participating countries and expand membership of the TRF as necessary.
3. Facilitate and coordinate resources that may be applied to the system, including ship time for developing and maintaining the TPOS, necessary research, and deployment of TPOS observing platforms.
4. Explore the potential for international resources from Official Development Assistance (ODA) agencies to develop and sustain the TPOS.
5. Explore bilateral and multi-lateral partnerships (e.g., PANGEA Framework resource sharing) as a means to complement national resources.
6. Coordinate with the CLIVAR Pacific Panel, Indian Ocean Observing System (IndOOS) Resource Forum (IRF), Pacific Islands GOOS, DBCP TAO Implementation Panel (TIP), PIRATA Resource Board and other relevant resourcing bodies.

## Appendix 3 – WIGOS TPOS 2020 Decision (draft)

### **TPOS 2020: Proposed WIGOS Pre-operational Pilot.**

Dr Neville Smith, co-chair of TPOS 2020 presented an overview of the Tropical Pacific Observing System 2020 Project, its status, and issues specific to WMO and WIGOS.

The Tropical Pacific covers 25% of the ocean observing system, and one of the first places in the ocean towards systematic sustained observations; so timely to review and redesign.

The Tropical Pacific Observing System cuts across many organisational constructs. It has a broad constituency. Sustained observations, experimental systems, meets requirements for research and operational systems as well as considering needed process studies. Its clients include weather, seasonal, climate and ocean prediction, monitoring and climate change understanding. The stakeholders include NHMSs but also many others. It also touches on many WMO Regions. Hence, TPOS 2020 would like to engage through WIGOS to aid in building these connections across constructs.

Specifically, Dr Smith posed three questions, which were discussed by the ICG:

- **Is there a fit between ICG WIGOS pre-operational phase objectives, timeline and implementation pathway of TPOS 2020?**

The ICG enthusiastically responded yes. WIGOS is focussed on integration, and integration has so many meanings. Observations, partners, regions, end to end, top to bottom.

- **Is there a regional coordination mechanism for TPOS noting the broad constituency?**

The ICG Co-Chair noted that the proposed TPOS 2020 activity posed a challenge, as there is no mechanism in WMO to look at inter-regional mechanisms other than those established bilaterally. The involvement of players beyond WMO and the need for partnerships is a good opportunity for WIGOS to test out such partnership building. It was noted that while JCOMM most logical home for TPOS 2020 activities, there is a need to have a conversation with other WMO and partner constructs such as CBS, CEOS, CBS.

- **Can TPOS 2020 be a useful pilot for WIGOS during its pre-operational phase?**

The ICG enthusiastically approved the proposal for TPOS 2020 to be a WIGOS Pre-Operational Pilot. Discussions focussed then on how TPOS 2020 should be raised with WMO members, and particularly how it can be raised at EC69, and with the relevant upcoming regional sessions.

**DECISION: TPOS 2020 recognised as a pre-operational pilot.**

**Action: develop a pilot, through pre-operational phase by the T&I Group (now JCOMM/TPOS 2020 Transition and Implementation Cross Cutting Task Team, and present update at next ICG WIGOS:**

**ACTION: WIGOS Secretariat to consider opportunities to raise TPOS 2020 plans with members such as EC-69, and upcoming regional sessions.**

**ACTION: Secretariat to lead the organisation of a Side event at EC-69 focussed on WIGOS Ocean**

issues, including JCOMMOPS.

## Appendix 4 – JCOMM MAN TPOS 2020 Decision

### 3.1.1.2 Special Item: Tropical Pacific Observing System (TPOS)

TPOS 2020 Steering Committee Co-Chair Neville Smith presented an overview of the Tropical Pacific Observing System project, its progress and status. The First Report was published at the end of 2016. Neville noted that the report follows the Framework for Ocean Observing, and distinguishes sustained and experimental observation contributions but within a single design, distinguishes variable requirements from solutions, and integrates R&D into the design. There is seamless consideration of satellite and in situ approaches, and their evolving roles. Key recommendations are on satellite contributions and in situ calibration, reconfiguring the mooring array, and doubling Argo in the tropical Pacific region.

Neville outlined the transition process and timeline through 2020, noting that 2019 is a key year for seeking community endorsement through WMO Congress, the IOC Assembly, and OceanOb19. Now that the 1<sup>st</sup> Report is released, it is timely to formalize aspects of TPOS 2020 in a Transition and Implementation Task Team, reporting to JCOMM MAN (the TPOS 2020 SC reports to GOOS).

The terms of reference of the Transition and Implementation Task Team were presented for consideration by the MAN. Many of the actions identified in the first report will be implemented by JCOMM observation networks; TPOS 2020 is interested in feedback on engaging with the Satellite community (through CBS, CEOS and/or CGMS). Advice needed on how to keep informed of work of other relevant international programmes.

Membership. Currently Neville chairs the informal group and a co-chair from JCOMM is an option. Currently reps from the OCG, GRAs, etc. participate; perhaps some additional experts but not particularly representing a programme could be included. The forward timeline for the transition and implementation was presented, and 3 key recommendations

- (1) Support the creation of a TPOS 2020 Transition and Implementation Group
- (2) Endorse TPOS 2020 Transition and Implementation Group Terms of Reference
- (3) Endorse governance arrangements

In the discussion, the Co-Presidents then congratulated the TPOS 2020 project on the progress taken, and particularly the integrated approach taken.

The Legal aspects of forming a regional construct within JCOMM were raised. The Transition and Implementation Task Team will be visible in JCOMM 5; however, it is not known what this group will recommend re. a permanent structure. In 2020, the task team could recommend and establish an ongoing, which is then formalized at JCOMM 6 (2021). It was noted that while JCOMM doesn't have existing regional constructs, but WMO and IOC are both familiar with regional mechanisms. Neville noted the lack of coordination in the region as a contributing factor to the challenges faced for the OS in the tropical Pacific; hence some kind of ongoing regional coordination mechanism will be important and Nadia the global nature of the atmosphere/climate impacts of the region.

Progress in integrating ocean-atmosphere observations has been made at this meeting, including a plan for including Oceanographic Centres as part of WIS (through TT-MOWIS), and the development of a

Marine Climate Data System. The JCOMM connection to satellite programmes has been discussed at this meeting, and are willing to consider liaison of TPOS requirements to satellite programmes through JCOMM.

Ahead of JCOMM-5, JCOMM Services Programme Area has been asked to scope whether their mandate should be expanded to cover Seasonal forecasting systems, and it was requested that TPOS 2020 engaged in this discussion. The connection to JCOMMOPS for tracking the system and the need for a focus also on Data Management systems underlines that TPOS 2020 should clearly be a cross cutting activity within the JCOMM structure, involving and linking all 3 JCOMM program areas.

Neville confirmed that TPOS 2020, mostly likely through its Modelling and Data Assimilation Task Team, would be happy to engage on seasonal forecasting issues.

DECISION: JCOMM MAN (a) approves formation of the cross Cutting Task Team; (b) agreed in principle to the Terms Reference, but subject to some additional changes as a result of this session and final sign-off by the JCOMM MAN Co-Chairs; and (c) supports the proposed governance and membership, but with a Chair and Vice-Chair instead of Co-Chairs

<u>Item</u>	<u>Action</u>	<u>Responsible</u>	<u>End Date</u>
3.1.2 <i>Observations Programme Area (OPA) – 3.1.2.5</i>	TPOS Implementation Team to provide updated TORs and Membership to co-Presidents, and recommends the appointment of a vice chair.	Neville Smith, Katy Hill	
3.1.2 <i>Observations Programme Area (OPA) – 3.1.2.5 TPOS</i>	TPOS Implementation Team Chair to work with co-presidents, secretariat to consider what sort of structures would be effective for regional activities within JCOMM ahead of JCOMM 5.	Neville Smith, WMO/IOC Secretariat, Co Presidents.	
3.1.2 <i>Observations Programme Area (OPA) – 3.1.2.5 TPOS</i>	TPOS 2020 to be considered in the context of the scoping of a potential expansion of the Services Programme Area to include seasonal forecasting systems.	Nick Ashton, Neville Smith, Katy Hill	

## Appendix 5 – Terms of Reference for TPOS 2020/JCOMM Transition and Implementation (Cross Cutting) Task Team

### Terms of Reference for a TPOS 2020/JCOMM Transition and Implementation Task Team

#### PREAMBLE

The TPOS 2020/JCOMM Transition and Implementation Task Team (T&I TT) exists and operates as a sub-project of the TPOS 2020 Project and is supported by the Distributed Project Office of TPOS 2020. JCOMM MAN is the primary external sponsor. The Task Team provides advice and recommendations on implementation and transition arrangements for governance to its sponsors and partners. Initially the TPOS 2020 SC will be a key partner but, over time, as action and responsibility becomes focused in intergovernmental and other standing processes, this role will diminish and sponsors like JCOMM (and its Observations Coordination Group) will take greater responsibility.

#### TERMS OF REFERENCE

The TPOS 2020/JCOMM Transition and Implementation Task Team will act as an open-ended group with the following Terms of Reference:

1. To serve as the advisory group within the TPOS 2020 Project to the Steering Committee and Resource Forum, and to JCOMM, on implementation and associated transition arrangements for contributions to the TPOS;
2. To act as the focal point within the TPOS 2020 Project for matters related to implementation, including reconfiguration of the tropical mooring network; enhanced Argo profiling; improved monitoring of key surface variables; consideration of implications for data management, capacity building and services; and coordination with other parts of the global observing systems;
3. To keep informed of, and as appropriate, review potential new technologies that might contribute to the Backbone of the TPOS;
4. To keep informed of, and as appropriate, review the progress and outcomes of relevant TPOS 2020 Pilot Projects, particularly those targeting the Backbone of the TPOS;
5. To consider governance options for maintenance and implementation of the TPOS, both during and beyond the TPOS 2020 Project with focus on regional mechanisms, taking into account strategies and plans of JCOMM, WIGOS and GOOS;
6. To develop implementation plans in responses to the First and subsequent TPOS 2020 Reports;
7. To collaborate in, as appropriate, the work of the Steering Committee and other relevant Task Teams of TPOS 2020;
8. To consult and work with other Groups and expert teams of the T&I TT Sponsors, as appropriate;
9. To keep informed of the work of other relevant international organizations and programmes and to advise the TPOS 2020 Steering Committee and Resources Forum, as required; and
10. Provide reports to the annual sessions of the JCOMM MAN and TPOS 2020 Steering

Committee.

#### MEMBERSHIP

WIGOS, GOOS and GCOS are recognized as key bodies for implementation and transition and should participate as necessary in an *ex officio* capacity. The TPOS 2020 Resource Forum and Steering Committee will participate initially through the TPOS 2020 SC Co-Chair.

The T&I TT will initially have a single Chair and Vice-Chair but this may be varied as the activity matures. They will be nominated by the TPOS 2020 sponsors and JCOMM MAN.

Membership should be limited to around 10, with a balance between scientific and technical advice (TPOS 2020 Project advice) and implementation expertise, but shifting more toward the latter as we approach 2020.

The TPOS 2020 Distributed Project Office will support Task Team activity.