

WORLD METEOROLOGICAL ORGANIZATION  
**World Weather Research Program (WWRP)  
Polar Prediction Project (PPP)  
Societal and Economic Research and Applications  
(SERA) Meeting**

Wageningen University, Netherlands  
(16-20 April 2018)

WWRP-PPP-SERA-Meeting 4-  
report  
(Finalised 29 May 2018)

Report summarising the  
Fourth PPP-SERA Meeting

This report summarizes the items discussed and progress made during the fourth annual meeting of the Societal and Economic Research and Applications (SERA) Task Group of the Polar Prediction Project (PPP), coordinated and managed through the World Weather Research Programme (WWRP) of the World Meteorological Organization (WMO). The meeting was held at Wageningen University in Wageningen, the Netherlands, from 16 to 20 April 2018. The meeting was hosted and organized by Dr Machiel Lamers (Wageningen University and Research), with logistical and technical support by the Environmental Policy Group at Wageningen University in the Netherlands. A list of participants can be found in Appendix A.



**PPP-SERA Task Group meeting at Wageningen University, the Netherlands (April, 2018)**

*From left to right: Riina Haavisto, Gita Ljubicic, Rick Thoman, Machiel Lamers (co-chair), Emma Stewart, Jackie Dawson, Daniela Liggett (co-chair), Kirstin Werner (ICO), Jorge Carrasco.*

### **Organisation and highlights of the meeting**

Machiel Lamers officially opened the meeting at 09:00 CEST on Monday, 16 April 2018 and provided an overview of the organisational framework and support for the meeting. Professor Arthur Mol, Rector of Wageningen University, provided formal welcoming words at 1:30 pm.

### **Specific objectives of the meeting included:**

1. Provide members with an update from the Steering Group meeting, the International Coordination Office of PPP, related WMO activities, relevant and endorsed PPP projects, events and funding opportunities;
2. Respond to requests from the PPP Steering Group;
3. Host a PPP-SERA Open Session at the European Polar Board and the Netherlands Polar Programme (NWO-NPP) in The Hague to extend the PPP-SERA network within Northwest Europe (Netherlands, Germany, Belgium, etc.), to showcase current research, to generate awareness of relevant themes and approaches and to engage in discussions with researchers, service providers and end-users;
4. Advance joint publications based on the Scoping Document and interactions with stakeholders;
5. Prepare a major study on the global networks of researchers and service providers of weather and sea ice services for both the Arctic and the Antarctic. The study will be based on a survey and sets out to analyse key developments and issues in the user-provider interface, including the use, value, financing, governance and co-production of weather and sea ice services. The results will allow PPP-SERA to provide unique insights into the opportunities and challenges of this dynamic field as well as appropriate recommendations for actions;
6. Plan for the proposed 'Polar Weather and Society Workshops' as a PPP-SERA contribution to the YOPP Consolidation phase to be held in 2019/2020. At the 'Polar Weather and Society Workshops', we aim to bring together researchers (including relevant endorsed YOPP projects) and service providers working on cutting-edge approaches for understanding and improving the user-provider interface of weather and sea ice services in the Polar Regions, including challenges of value generation, co-design, and governance;
7. Revisit the draft Action Plan and timeline, identifying and confirming key activities and milestones for PPP and YOPP, and the resources or inputs necessary to achieve them (i.e., funding, expertise, data, meetings, etc.);

8. Prepare and submit a report to WMO on the results of the meeting and recommendations for next steps.

### Update from the ICO

Kirstin Werner gave an update on behalf of the PPP International Coordination Office (ICO), which covered the following points:

- The Year of Polar Prediction (YOPP) has been officially launched on 15 May 2017 during the 69<sup>th</sup> WMO Executive Council meeting at the WMO headquarters in Geneva, Switzerland. All WMO Permanent Representatives participated in the Executive Council meeting. A panel consisting of Paolo Ruti (Chief of WMO-WWRP), Thomas Jung (Chair of PPP Steering Group), David Grimes (WMO President), Petteri Taalas (WMO Secretary General) and Andrea Celeste Saulo (WMO Argentina Permanent Representative) introduced YOPP to the meeting participants and officially launched it. Prior to the official launch, the WMO media department held a press briefing. In addition to the press releases by the WMO and the Alfred Wegener Institute for Marine and Polar Research (AWI), there has been substantial positive media coverage of the YOPP launch in about 25 countries. Particularly the [Polar Prediction Project video animation](#) received wide attention in social media.
- The ICO has already published a few posts in an online blog called 'Polar Prediction Matters' (original name: User Feedback Forum), but more posts are needed as blog posts (articles) are envisaged to appear at least monthly. The articles should be less than 2000 words in length and tell the stories, experiences, needs and feedback in the context of weather, water and ice prediction. Contributions are invited from both users and providers of WWIC information (e.g. captains of ice-breaking ships, cruise tourism, and fishery operations; local community residents and hunters; sea ice or weather forecasters; among others). The style of the articles should be simple but also scientifically accurate: readers of the blog will have the opportunity to comment on articles to discuss relevant issues.

The PPP-SERA group was invited to participate in this project by reviewing the guideline document, connecting the ICO with potential authors, and being involved in possible follow-up interpretation and analysis of the input/results of the blog and its comments.

- The YOPP endorsement system has been online since October 2015. An overview of endorsed project highlighted that, while a handful of YOPP-endorsed projects are social-science projects, or contain strong social-science elements, the vast majority of the projects are natural-science projects. The latter are relatively evenly spread in the Arctic, but a gap exists in the Antarctic for projects focussed on the Southern Ocean. A couple of projects by PPP-SERA have yet to seek endorsement status. This will be addressed soon.

During PPP SG#09, it has been decided by the PPP Steering Group (PPP SG) that **YOPP endorsement** can also be requested past the YOPP Core Phase (mid 2017 to mid-2019), probably until the end of 2021. In addition, the endorsement process has

been opened for operational centres and other institutions that are contributing to the success of YOPP (see here for [more information](#) on the endorsement process). Results from YOPP-endorsed projects will be included in the YOPP Consolidation phase outcomes. Currently, about 75 projects are endorsed by YOPP. The [YOPP Explorer](#) is a useful tool to view information on the YOPP endorsed projects.

- The first of the **YOPP Special Observing Periods (SOPs)** has been concluded recently. The Arctic Winter Special Observing Period (SOP1) took place from 1 February to 31 March 2018. During these two months, more than 1,900 radiosondes were launched from 16 Arctic stations in addition to their routine operations. Also, different winter campaigns as carried out by YOPP-endorsed projects contributed to extra observations to feed into YOPP. More about the Arctic Winter Special Observing Period can be found [here](#). Activities during SOP1 but also for the upcoming SOPs can be viewed with the [YOPP Observations layer](#). Social media activities were increased during SOP1 (see [@polarprediction](#) twitter account) which was well received by station staff members.
- PPP-SG members Barbara Casati and Gunilla Svensson are working on the **YOPP Supersites and verification** efforts for YOPP. Model centres will provide model output for certain stations in the Arctic and Antarctic (the so-called YOPP Supersites) that can be compared to high-frequency observations at the sites. The model output and verification with observations will include the entire vertical column of the atmosphere and the ocean, including the sea ice.
- Various operational centers have offered **operational support** to YOPP-endorsed campaigns on request. A list of the centres and their support can be found [here](#).
- In cooperation with APECS and APPLICATE, the **second Polar Prediction School** started on 17 April 2018 at the Abisko research station in northern Sweden. It ran for ten days and provided training on various polar prediction and forecasting topics. The continuation of the Polar Prediction Schools (PPS, first one in 2016, second in 2018) has been recommended by PPP-SG, and another PPS is envisaged to be held in 2021. It might advantageous for PPP-SERA to become more involved with the PPS.
- **YOPP Communication** occurs on various channels such as the [PPP website](#), the [general mailing list](#), [social media](#) and via the [PolarPredictNews](#) newsletter. Also, many of the documents published during the last year (including the new Verification document, the Modelling Plan and the PPP-SERA Scoping document) can be found on the [website](#).
- There will be a **YOPP Arctic Science workshop** in cooperation with IASC from 14 to 16 January 2019. PPP-SERA is invited to join the workshop with a session. The tenth PPP Steering Group meeting will commence after the closure of the workshop at noon on 16 January 2019.
- The ninth PPP Steering Group meeting took place at the Icelandic Meteorological Office in Reykjavik, Iceland, from 13–15 March 2018. The PPP-SERA group has been represented by Machiel Lamers. The ICO and PPP Steering Group continue to

strongly support the work of the PPP-SERA group. PPP-SG#09 was preceded by a YOPP Open Session that allowed local IMO staff to learn about recent developments within YOPP. At PPP-SG#09, the following topics have been discussed with potential relevance to PPP-SERA:

- **Modelling and forecast data sets** that do not have a sustainable medium to long-term home are of concern as it is not yet clear where to archive those. PANGAEA may be a viable platform for storage, but does not have the OPeNDAP option so that parts of a dataset, or certain variables, cannot be downloaded. The YOPP Data Portal team (led by Øystein Godøy and SiriJodha Khalsa) need to be informed of new datasets that are in danger of being lost. The International Coordination Office for Polar Prediction (ICO) is currently looking into finding solutions.
- **Temporal and spatial sampling of data in the Southern Hemisphere** during YOPP in particular at **YOPP Supersites** should be the same as in the Arctic. If that is not possible, the temporal and spatial resolution of data should at least be sufficient to elaborate key processes as identified for the Southern Hemisphere in the [YOPP Modelling Plan](#).
- A **YOPP Data Portal** is up and running at <https://yopp.met.no/>. The YOPP Data Portal is a metadata base that harvests data from other data archives, for example from the German Earth database [PANGAEA](#). Øystein Godøy and Siri Jodha Khalsa are the persons to be contacted. Further developments are planned so that YOPP data becomes eventually available through the portal. Data providers need to tag their data as 'YOPP data' and data archives storing YOPP data should collaborate with the YOPP Data Portal so that the YOPP Data Portal is able to harvest data from other archives.
- It has been decided that there will be a **YOPP Consolidation Plan** in preparation of the **YOPP Consolidation Phase**. This plan is to feature work by the different YOPP Task Teams. The ICO has hired a consultant to coordinate work on a plan for the Consolidation Phase, which is envisaged to be similar to the YOPP Implementation Plan in structure and format.

A small dedicated workshop will be held at the beginning of the YOPP Consolidation Phase while YOPP will culminate in a larger YOPP Synthesis Summit (probably in 2022). In the YOPP Consolidation Plan, just like in all other YOPP publications, a standard acknowledgement is to be included with datasets and publications (to trace YOPP projects). The ICO will suggest a statement that can be used.

- During PPP-SG#09, PPP SG agreed on a **Statement on Gender Equality for YOPP** that is based on the WMO Gender Action Plan. The statement has been published on the [PPP website](#) in April 2018 and will be mentioned in the upcoming newsletter. YOPP endorsed scientists have been requested to align their activities within YOPP with the statement.

- The PPP SG decided that a **3<sup>rd</sup> Northern Hemisphere (NH) Special Observing Period (SOP3)** will take place to support the Arctic drift experiment MOSAiC during Northern Hemisphere winter 2019/2020. SOP3 will have the same timing as SOP1 (1 February to 31 March 2020).
- A range of requests have been made by the PPP SG to PPP-SERA, which were are discussed later in this report.

### **Update on member activities**

**Machiel Lamers**, associate professor at Wageningen University, Netherlands, updated the group about the SALIENSEAS project that is looking into marine shipping sectors in the European Arctic. Different meteorological services (Danish and Norwegian Meteorological Offices) and universities are collaborating within SALIENSEAS to improve sea ice and weather forecasts in the shipping sector. Involved are also AECO, the Greenland Ice Pilot Association, as well as the Greenland Fisheries and Hunting Association (KNAPK). In January, the first SALIENSEAS stakeholder meeting with ten representatives from different stakeholder groups took place. The SALIENSEAS website is now available at <http://salienseas.com/>. Four postdocs are currently working in the project. Also Machiel mentioned he attended the PPP Steering Group meeting earlier that year in Reykjavik, Iceland.

**Daniela Liggett** from the New Zealand University of Canterbury introduced herself to the new participants of the meeting. She is working on environmental management issues and tourism including values in relation to Antarctica. She currently carries out a social science project that includes field work in Antarctica. In her role as PPP-SERA co-chair, Daniela went to two of the PPP Steering Group meetings in 2016 and 2017 and will attend the upcoming YOPP in the Southern Hemisphere workshop to be held on July 19<sup>th</sup> in Madison, Wisconsin. She is currently in contact with the Australian Bureau of Meteorology who had pointed here to potential candidate for a PhD thesis that draws directly from the recently published PPP-SERA Scoping Document and who is keen to frame questions around the use of forecasting services that are available right now to influence decision-making.

**Jackie Dawson** is the Canada Research Chair in Environment, Society, and Policy and is an Associate Professor in the Department of Geography, Environment, and Geomatics at the University of Ottawa. She is an Applied Scientist working on the human and policy dimensions of environmental change in ocean and coastal regions. Jackie was a founding chair of the PPP-SERA task group and was instrumental in developing, conceptualizing and drafting the group's Scoping Document.

**Gita Ljubicic** from the Department of Geography at Carleton University in Ottawa, Canada has worked with indigenous communities, in particular focusing on Nunavut territory. Currently, she is preparing for a project to work with caribous on sea ice. Gita is interested in connecting Inuit with scientific knowledge.

**Riina Haavisto** works as an environmental economist at the Finnish Meteorological Institute (FMI). She has worked with end-users to understand what kind of services they need and how they use weather and climate information. Riina is involved with the YOPP-endorsed TWASE project which looks at future socio-economic scenarios in order to assess the benefits of improved forecasting services.

**Emma Stewart** is a polar social scientist working at Lincoln University in New Zealand. She has been on Ross Island in Antarctica but shifted her focus on research in the Canadian Arctic in the early 2000s. She currently works on both poles studying the human dimension of climate change with a focus on tourism. She conceptualised, designed and drafted the PPP-SERA poster (see Appendix F). Currently, she is working on a draft of a mobility paper that has been initiated at the end of last year's PPP-SERA meeting in Fairbanks, Alaska.

**Jorge Carrasco** was affiliated with the Chilean Weather Service for 31 years, being the Head of the Department of Climatology and Deputy Director of Climatology and Applied Meteorology from 1997 to 2013. He received his PhD in meteorology/atmospheric sciences in 1994 from the Ohio State University in Columbus, OH, USA working with David Bromwich on the topic of mesoscale cyclones and climate variability in Antarctica. He was the Chilean representative of the WMO EC-PHORS group until 2014. Jorge has also contributed to the Fourth and Fifth IPCC Reports (chapter 4). Currently, he has one project in Antarctica and two more in the Andes and teaches at the University of Universidad de Magallanes in Punta Arenas.

**Rick Thoman** works as a climate science and services manager at the US national weather service in Fairbanks, Alaska. He has been working in Alaska and the Arctic for thirty years, in particular with Alaskan indigenous communities in areas where environmental change is most rapidly occurring. He is still challenged by other meteorologists regarding the effective communication of weather and climate-related information. Rick (together with Jackie Dawson) will be attending the PARCOF meeting to be held in May in Ottawa, Canada.

**Kirstin Werner** is a project officer at the International Coordination Office for Polar Prediction (ICO). Her background is in paleoceanographic reconstructions from Fram Strait sediment cores. Kirstin gave a brief update of activities and developments over the past year from the ICO, including the ninth PPP Steering Group meeting (PPP SG#09) that was held recently in March at the Icelandic Meteorological Office (IMO) in Reykjavik, Iceland.

### **Requests by the SG**

A number of requests have been formulated by PPP SG for PPP-SERA to address. These requests were carefully considered and extensively discussed at the meeting in Wageningen and, while responses to points b, c, and d will be submitted to the PPP SG separately, the group's suggestions are appended to this document.

- a) PPP-SERA are to identify potential downstream users and uses of the YOPP data archive and provide the PPP-SG with information on how these groups could be targeted to access and use the datasets.

**Response:** [Some of this information is already contained in our scoping document. More detailed information will be contained in a series of publications PPP-SERA is currently working on and will be made available to the PPP SG in due course.](#)

- b) PPP-SERA should consider developing an integrated approach to assessing the economic and societal value of the PPP.  
**Response:** Please see Appendix B.
- c) The group is requested to consider how Indigenous peoples can be engaged in the PPP and YOPP.  
**Response:** Please see Appendix C.
- d) PPP-SERA are to identify what future support the group needs, including the types of activities this support is for, and to report back to the ICO/PPP-SG.  
**Response:** In principle, support is sought for the next PPP-SERA meeting in Punta Arenas, Chile, in April 2019, and for a series of 'Weather and Society' workshops (see Appendix D). Detailed proposals with estimated costs will follow.
- e) PPP- SERA/ ICO are requested to consider options for aligning the next PPP- SERA meeting with the next PPP SG scheduled for Finland in January 2019.  
**Response:** This has been discussed at considerable length, and while the group will ensure to have representation at both the PPP SG meeting at the affiliated conference in Helsinki, it was agreed that the PPP-SERA meeting had to be held at a time that enabled all PPP-SERA members, especially considering the small size of the group, to attend. This is impossible in the middle of the Antarctic summer season. Hence, the PPP-SERA meeting will have to be held at a different time. The Easter time period has been convenient for PPP-SERA members in the past, so future meetings are likely to be held at a similar time to ensure best possible attendance.
- f) PPP-SERA are invited to provide feedback to the YOPP data portal task team on the user friendliness of the user interface for the various user communities they have identified.  
**Response:** This will happen as needed and as appropriate.

### **Special Services Periods and Evaluation and Services Phase**

Considerable time during the meeting was dedicated to discussing how YOPP could ensure to achieve the goals that were set out to be achieved regarding service provision and societal benefits achieved through PPP. Considering the emphasis placed on improved service provision, PPP-SERA discussed proposing Special Services Periods (SSPs) during the YOPP Consolidation Phase. These SSPs were inspired by the YOPP Special Observation Periods (SOPs) and put the focus on service provision and linking knowledge gained during the SOPs to service providers and end users (See also Appendix D).



## Review of PPP SERA Action Plan (see also WMO, 2015, 2016, 2017)

### a) **Short-term** (by June 2018):

- Prepare and present a proposal to the SG for **Special Services Periods** during the YOPP Consolidation Phase and a dedicated **Evaluation Phase** after the end of YOPP. The latter is to ensure that YOPP is properly assessed and that the link to service provision and societal benefits arising from the PPP are being considered. (Action: Machiel Lamers)
- Prepare a plan for a “Weather and society *hackathon*” to be held at the YOPP Arctic workshop in Helsinki in January 2019. (Action: Riina Haavisto)
- Develop a plan for the next PPP-SERA meeting in Punta Arenas, Chile, in April 2019. (Action: Jorge Carrasco)
- Continue developing the PPP-SERA research agenda, consulting for feedback from broader research and user group networks, and raising awareness amongst our international networks to encourage broader contributions to PPP-SERA goals, within the YOPP Core Phase and Consolidation Phase. Ensure that related projects apply for YOPP Endorsement. (Action: All)
- Craft responses to SG requests: (a) on indigenous involvement (Action: Gita Ljubicic), and (b) develop a plan for assessing the societal value of YOPP (Action: Jackie Dawson and Emma Stewart)
- Advance plans for a Special Issue (see separate item) in *Polar Geography* and liaise with the editorial office of *Polar Geography* in that regard (Action: Daniela Liggett)
- Formulate input for the YOPP Consolidation Plan, to be integrated into the plan as and when requested by the ICO (Action: co-chairs with the support of everyone).

### b) **Medium-term** (till the end of the YOPP Core Phase, 2019):

- Continue to work on publications related to the key themes identified in the Scoping Document (Action: All).
- Continue to facilitate the expansion of the PPP-SERA research agenda by supporting endorsed projects (helping to identify potential funding opportunities or collaborators as appropriate) (Action: All).
- Concretise the concept and planning of the ‘Weather and Society’ workshops. Instead of developing an independent meeting, it was considered to have smaller events targeting regional representation (Europe, North America, Russia, Antarctic) in conjunction with other conferences or meetings already planned, so as to reach a diverse audience and minimize costs.

c) **Long-term** (2019-YOPP Summit in 2022):

- Undertake a social network analysis of YOPP-endorsed projects.
- A broad analysis of PPP-SERA-related research (synthesis of research undertaken under the PPP-SERA umbrella) should be aligned with the research agenda of the Scoping Document.
- PPP-SERA to support YOPP *Special Services Periods* (SSPs) and the PPP Weather & Society Workshops.
- PPP-SERA to assist the WMO during the PPP *Evaluation and Services Phase*.

d) **Continuous**

- Identify other potential committee members or support network members who could be included into the group, also considering geographical balance. Jorge Carrasco and Riina Haavisto have been invited as subject-matter experts to the group recently and attended the Wageningen meeting. Jorge addresses the gap (a researcher with Antarctic focus, especially with regard to climate services) that was identified in the previous PPP-SERA meeting report. PPP-SERA recognises the importance of geographic and discipline diversity and is exploring the addition of experts in the Russian Arctic as well as in South America who work in the Antarctic context. The committee will reach out to the larger community to help compliment the current membership expertise.
- Further raise the profile of PPP-SERA-related research and enhance connections with modelling and forecasting research (**Action: All**).
- Develop focused collaborative projects within the committee, based on existing data and information (e.g. contribution to the Arctic resilience call through the Belmont Forum; shipping in Arctic Canada, international surveys of sea ice information providers, remote community and urban mobilities, all in relation to how they use weather and sea ice information in support of making decisions) and new projects within or outside of PPP-SERA (e.g. the SALIENSEAS project, see Lamers, 2017).
- Participate in YOPP meetings and continue having annual PPP-SERA meetings. The next PPP-SERA meeting is already in the early planning phase, to be hosted by Jorge Carrasco in Punta Arenas, Chile, in April 2019 (**Action: Co-chairs and Jorge Carrasco**).
- Contribute to YOPP education and outreach activities, which goes in hand with capacity building. PPP-SERA offers to provide input and feedback to the PPP community via the SG.

- Contribute and collaborate in the user feedback forum of the PPP ('Polar Prediction Matters').

### **Discussion of a Special Issue**

The Scoping Document has created an important overview of key issues, and an identification of a research agenda to address gaps. The PPP-SERA task team has also used this process to develop a more specific internal scope for future research. The three main themes throughout the document are *polar mobilities*, *user perspectives* and *provider perspectives*. These three themes are planned to represent the first three foundational topics to emerge as joint publications in a *Special Issue* in **Polar Geography**. The plan is to submit the papers to the journal by September 2018.

**Polar Mobilities:** led by Daniela, Emma and Gita (with all as authors). This publication will describe polar mobilities and related issues in depth. Short case studies (vignettes), will illustrate the theory applied to key sector cases, in the style of boxes (as used in the Scoping Document). A draft paper exists that needs to be refocused and narrowed.

**Perspectives of Users and Uses:** led by Rick, Jackie and Machiel (with all as authors). This paper will draw on interactions with stakeholders during our PPP-SERA meetings and will offer some critical perspectives that are often overlooked with regard to environmental forecasting services.

**Provider Perspectives:** led by Riina, Jorge and Machiel (with all as authors). This publication will further analyse providers and their interconnections, and also anticipates using vignettes (see above). The value chain will be a central concept in the paper. The basis for this paper has already been developed.

**Case Studies:** some possible case study papers include following topics: expedition cruising in the European Arctic, mobility-specific communities, WWIC indicators from Indigenous perspectives, mobilities of the Ross sea region, fishery and shipping in the European Arctic, shipping corridors in the Canadian Arctic, and possibly the regions Alaska, Russia, or the Antarctic Peninsula.

Further, a generic poster has been created to represent the research activities of the PPP-SERA committee at conferences and other workshops (See Appendix F).

The analysis of the YOPP-endorsed projects is planned to serve as a source for research activities and collaboration.

Most of the research efforts and publications proposed above will likely be supported as in-kind contributions; however, external funding additional to the WMO funding will be sought and would be beneficial for the success of PPP-SERA.

### **Members, committee decisions and next steps**

Machiel Lamers informed the meeting participants about changes in the PPP-SERA task group. Jackie Dawson is going to step down as a co-chair. Maaïke Knol and Winfried Hoke have left the group. Replacing Winfried Hoke from the International Coordination Office for Polar Prediction (ICO), Kirstin Werner joined the group. Jorge Carrasco from the Universidad de Magallanes, Chile, and Riina Haavisto from the Finnish Meteorological Institute (FMI) have joined the group recently.

- Jorge Carrasco from the Universidad de Magallanes in Chile has been invited to join the group, and has accepted that invitation. Jorge has a forecasting and meteorology background and is now working in the field of climate-change research and services with a focus on the Andean mountains and Antarctica.
- Riina Haavisto from the Finnish Meteorological Institute (FMI) has also been invited to join PPP-SERA, and has accepted that invitation. Riina is an environmental economist, who is engaged in research related to end-user needs for forecasting services in Finland and also in the Arctic (via a YOPP-endorsed project).
- Maaïke Knol (not attending this meeting) has taken the decision to step down from the group and the PPP-SERA task group accepted her decision.
- Jackie Dawson is stepping down as a co-chair but remains as an active member of the PPP-SERA task group. The remaining co-chairs, Machiel Lamers and Daniela Liggett, and the entire PPP-SERA committee want to thank Jackie Dawson for her enthusiasm, support and incredible efforts over the past four years, including during the initialisation of the committee. She has been instrumental in bringing the Scoping document to success.

### **External Activities**

A PPP-SERA Open Session has been held at the premises of the European Polar Board (EPB) in The Hague, the Netherlands. A separate report, as well as a PPM blog post (see Appendix E), have been prepared and will accompany the meeting report.

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## **List of Abbreviations**

AWI	Alfred Wegener Institute for Marine and Polar Research
EPB	European Polar Board
FMI	Finnish Meteorological Institute
NOAA	National Oceanic and Atmospheric Administration (USA)
PI	Principal Investigator
PPM	Polar Prediction Matters
PPP	Polar Prediction Project
PPS	Polar Prediction School
SERA	Societal and Economic Research and Applications
SG	Steering Group (of the Polar Prediction Project)
SOP	Special Observation Period
SSP	Special Service Period
WMO	World Meteorological Organisation
WWIC	Weather, water, ice and climate
WWRP	World Weather Research Programme (WMO)
YOPP	Year of Polar Prediction

## Appendix A — Participants

Invitee	Organization and Address
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## **Appendix B — PPP-SERA Societal Values Research Plan**

### **Introduction**

There is a need to understand the societal value/benefit of improved forecasting of WWIC information and to also identify what further efforts may be required (i.e. Special Services and Evaluation Phase).

### **Overarching Aim**

To establish a baseline of intended societal benefits for improving forecasting and prediction of WWIC information arising from YOPP initiatives to enable a future evaluation of actual value.

### **Research Objectives**

1. To identify the intended societal goals of a) YOPP, b) YOPP task groups/working groups, and c) YOPP endorsed projects
2. To identify the specific forecasting needs of different user groups
3. To undertake a societal value network analysis
4. To assess any mismatch or congruence between intended societal goals, user needs and actual outcomes

### **Approach**

#### Part 1: Content Analysis of Key Documents (Core Phase) (Lead – Machiel)

- Review and analyse content of the intended societal benefits identified in the; a) YOPP Science Plan, b) YOPP Implementation Plan, and c) YOPP Consolidation Plan, and d) existing task team documentation, and d) YOPP Endorsed project submissions
- Identify themes and summarize results

#### Part 2: Societal Value Survey of Selected End Users (Late Core Phase)

- Create and disseminate a generic questionnaire focused on identifying intended societal benefits for selected end users:
  - Indigenous communities (Lead – Gita)
  - Shipping industry (Machiel – Europe; Jackie - Canada)
  - Forecasters (Machiel – Europe; Jackie – Canada)(with Rick and Riina)
  - Southern Hemisphere (group TBD) (Emma, Daniela, Jorge et al.)

#### Part 3: Societal Value/Benefit Network Analysis of YOPP (Consolidation Phase)

- Network survey of YOPP Endorsed Projects and YOPP Task Teams



## **Appendix C — Engagement of Indigenous Peoples**

### **Regarding the PPP Steering Group request to consider: “how to engage Indigenous peoples in PPP/YOPP contexts:**

As the PPP-SERA Task Team, we consider meaningful engagement with Indigenous peoples to be of critical importance and that it should be woven through all PPP-YOPP contexts.

Our PPP-SERA members have considerable experience working with Indigenous peoples, communities and organizations through our past and current research projects. As such, Indigenous perspectives and needs are considered throughout our Task Team activities based on our experiences in different regions, along with other diverse societal and economic sector needs. To date, we have done this through:

- Invited presentations and cultural visits during our annual meetings, which are summarized in our annual meeting reports;
- A recognition of Indigenous knowledge contributions to, and Indigenous community uses and needs for, weather, water, ice and climate (WWIC) information within our Scoping Document (WWRP/PPP No. 5 - 2017) as well as in academic papers currently under preparation or planned; and,
- The organization of special conference sessions at the ICASS IX (Sweden) and ArcticNet (Canada) conferences in 2017 when diverse contributions were invited including on Indigenous knowledge research and community experiences.

Throughout the remainder of the YOPP Core and Consolidation Phases, we will continue with similar efforts at our annual meetings and in organizing special conference sessions. We also plan to:

- Undertake a systematic scan of YOPP-endorsed projects to better understand stakeholder engagement in 2018/19, including Indigenous organizations or communities, which can be used to inform the Consolidation Phase;
- Develop a literature analysis of Indigenous uses and needs of specific WWIC information or services in the North American Arctic in 2019/20;
- Organize several regional polar Weather and Society workshops between 2019-2021, with Indigenous-focused sessions as an important part of these workshops; and,
- Organize a polar Weather and Society stream at the YOPP Summit in 2022, with Indigenous-focused sessions as an important part of this stream.

In terms of broader PPP Steering Group efforts during the remainder of the YOPP Core and Consolidation Phases, we recommend that:

- All Task Teams and Projects are encouraged to consider how current WWIC information, along with improved observations and models developed through YOPP, can be made more relevant and accessible for Indigenous communities and organizations; and,
- Project members consult and work according to established protocols for engagement with Indigenous peoples in the regions or communities where they are working. Our PPP-SERA members are well positioned to recommend relevant protocols or organizations to consult or work with, for any project teams seeking to engage directly with Indigenous communities.
- There be particular emphasis on considering Indigenous knowledge and addressing specific Indigenous needs as part of a potential YOPP extension to include a Special Services Phase.

## **Appendix D — PPP-SERA during the Consolidation Phase**

### **Special Services Period**

A key aim of the Polar Prediction Project (PPP) is to advance its mission in the “...development of improved weather and environmental prediction services for the polar regions, on time scales from hourly to seasonal”. The role of the Societal and Economic Research Applications (PPP-SERA) Task Group is to bring social science expertise to understand the complex web of how people throughout the polar regions make use of such services, how such services can be improved or tailored to meet key end-user needs, and how the value of PPP can be optimized for communities and economic sectors. With the Consolidation Phase of YOPP coming up, the PPP-SERA Task Team proposes to generate attention to the establishment of new or the improvement of existing WWIC services for end-users in the Polar Regions. The increased observations during the Special Observing Periods (SOPs) and the modelling efforts undertaken during YOPP could form the basis for these improved services. In this light, PPP-SERA proposes to promote a so-called Special Services Period as part of the YOPP Consolidation Phase.

A Special Services Period (SSP) represents a period in which investments are made to stimulate researchers and operational forecasting centres to tailor environmental forecasting services closer to end-user needs, to exchange and promote key lessons from projects that focus on providing improved services delivery, and to learn how environmental forecasting services can be effectively improved in consultation with diverse groups of end-users.

A Special Services Period would assist in assuring relevance for society and the overall legacy of the Polar Prediction Project. The SSP can be organised as follows:

1. By identifying YOPP-endorsed projects with a clear aim to improve polar forecasting services for diverse groups of end-users (e.g. BlueAction, SALIENSEAS, TWASE, etc.);
2. By calling and stimulating operational forecasting centres and research institutes to identify or invest in additional projects with the aim to improve polar forecasting services;
3. By mapping these projects and initiatives;
4. By facilitating exchange and learning between researchers and stakeholder representatives in the identified projects.

Together with the PPP-Steering Group, the PPP-SERA Task Group would be willing to play a leading role in organising the SSP as part of their contribution towards the Consolidation Phase.

## Weather & Society Workshops

Over the years, PPP-SERA has created dialogue at their annual meetings between social science researchers, environmental forecasters and end-user groups in so called PPP-SERA Open Sessions. To scale up these Open Sessions and to organise point 4 (facilitating exchange and learning), the PPP-SERA Task Group proposes to organise a series of Weather & Society Workshops (W&S) as part of the YOPP Consolidation Phase.

These polar W&S Workshops aim:

- To create dialogue between environmental forecasters, researchers and end-users from relevant projects and processes;
- To understand the role and relevance of WWIC services in decision-making of diverse end-user groups operating in the Polar Regions;
- To engage and learn from various YOPP-endorsed and other projects regarding the tailoring or co-production of services; and
- To assess the societal effects and implications of contributions made by PPP.

We envision a multi-staged approach with W&S Workshops taking place in different regions (see Figure 1). The IASC-YOPP meeting in January 2019 in Helsinki will function as an important stepping stone in this process, to test out participatory approaches which will be carried out in at least five regional workshops from 2020 onwards. During these regional W&S Workshops representatives of relevant ongoing or finished projects can, on the one hand, exchange project outcomes and discuss key lessons, while, on the other hand, opportunities can be created for in-depth dialogue with stakeholder and end-user groups, for example in the form of interactive sessions or hackathons (see Box 1). The regional workshops will be organised by members of the PPP-SERA committee in collaboration with key project leaders and in conjunction with relevant meetings and events (see below for initial ideas). Ultimately, the outcomes and insights of the regional workshops will culminate in a Weather & Society thread during the YOPP Synthesis workshop to be held in Canada in 2022.

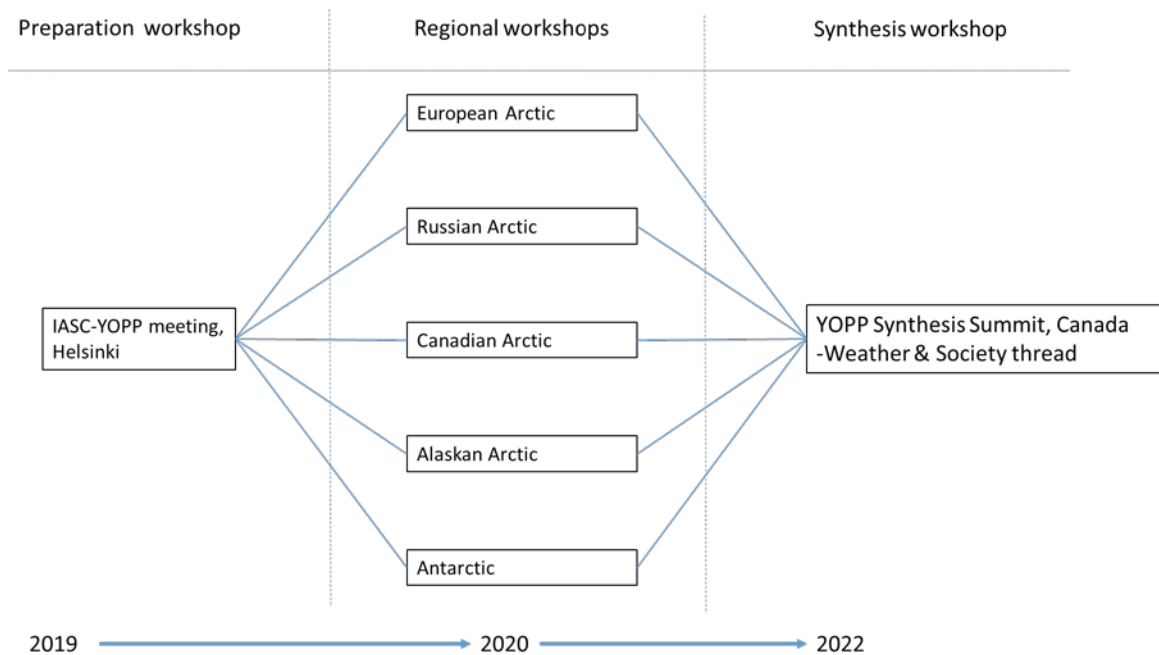


Figure 1: Multi-staged approach to W&S Workshops for PPP

### IASC-YOPP Meeting, Helsinki

The IASC-YOPP meeting in Helsinki would provide an important stepping stone towards preparing for the regional W&S Workshops to be held from 2020 onwards. At the Helsinki meeting, we will present and discuss the aims and plans for the regional meetings, as well as test out interactive methodologies to be used at the regional meetings. Key outcome of the Helsinki meeting would be a common approach for the W&S Regional Workshops. One of the ideas would be to explore possibilities for organising a Hackathon (see Box 1 below) around a YOPP-related services challenge, for example related to navigating the icy waters (Lead: Riina Haavisto, Machiel Lamers, Kirstin Werner).

At the annual PPP-SERA meeting (proposed in Punta Arenas in April 2019), the results of the Helsinki meeting will be evaluated, and plans for the W&S Workshop stream will be updated.

### BOX 1: Hackathon in a nutshell

Hackathon is a structured approach to co-create new data driven solutions for a specific challenge. It is an event where researchers, programmers, data visualization experts, designers and end-users meet, learn and co-create. The hackathon participants are teamed up in teams that have a wide variety of expertise. The challenge is presented by the organizers, but it should not prescribe the likely solutions. Usually, hackathons last several days, and the output is a prototype of a process, product or service.

Key steps in hackathon:

- 1) Present the challenge
- 2) Support team building and nourish creativity
- 3) Create understanding of the specific end-user
- 4) Prototype and test quickly
- 5) Expand the best ideas

### **European Arctic**

A W&S Workshop for the European Arctic can probably be organised based on existing YOPP-endorsed and other relevant services-oriented projects (e.g. BlueAction, SALIENSEAS, TWASE). Of course, the Helsinki meeting will already provide an important step in the process. It is further anticipated that by collaborating with, and pooling resources from, these projects, the European component can be organised without additional funding needed (Lead: Machiel Lamers, Kirstin Werner, Riina Haavisto).

### **Russian Arctic**

A Russian Arctic regional W&S Workshop will have to be organised in conjunction with the 2020 ICASS meeting in Archangelsk, Russia. This conference of the International Arctic Social Science Association seems like an excellent platform to bring Russian social science, metocean expertise and end-users together in a fruitful dialogue. This workshop would probably need some funding (€20,000) to bring relevant end-users and researchers together (Lead: SG members/Machiel Lamers, possibly Igor Krupnik, Andrey Petrov (to be confirmed)).

### **Canadian Arctic**

A Canadian W&S Workshop is best organised in conjunction with the annual Arctic-Net conference in 2020. It is anticipated that by collaborating with, and pooling resources from, several projects, the Canadian component can be organised without additional funding needed (Lead: Gita Ljubicic, Jackie Dawson).

### **Alaskan Arctic**

An Alaskan W&S Workshop can probably be based on a wealth of expertise and projects as part of the Alaska Climate Change and Policy centre at University of Alaska Fairbanks. It is

anticipated that this could be done without additional funding (Lead: Rick Thoman, possibly Hajo Eicken).

### **Antarctic**

The Antarctic W&S Workshop will have to be organised in conjunction with the SCAR Open Science conference in Hobart in 2019. This workshop would probably need some funding (€20,000) to bring relevant end-users and researchers together (Lead: Daniela Liggett, Emma Stewart, Jorge Carrasco).

The coming Months we will further specify these regional plans and, if needed, come up with budgets.

## **Appendix E — Polar Prediction Matters post on Open Session**

PPP-SERA Open Session with the European Polar Board,

The Hague, Netherlands, April 18, 2018

Rick Thoman

Machiel Lamers

Improved polar prediction requires much more than additional observations, improved process understanding, or higher resolution or more accurate numerical models. Such advances in the physical sciences must be accessible to potential users in a form and fashion appropriate to their needs and resources. Across the polar regions, these users range from small Indigenous communities scattered across the circumpolar Arctic, to regional industries and governmental activities relying on public weather services or private providers for information, to multi-national commercial ventures that may fund their own extremely specialized weather or sea ice products for their own uses.

The Polar Prediction Project's Societal and Economic Research Applications (PPP-SERA) Task Group has been working to understand the user needs for weather, water, ice and climate (WWIC) information for the polar regions in order to feed their decision making processes. This has been done through ongoing YOPP endorsed projects and by taking advance of access to practitioners during their annual SERA meetings. In conjunction with the 2018 SERA annual meeting, an open session was held with the European Polar Board (EPB) in The Hague, Netherlands on April 18th, 2018. About 30 people attended the meeting, representing a variety of organizations and interests.

The meeting was opened and facilitated by Machiel Lamers, co-chair of the PPP-SERA Task Group. The first speaker, Renuka Badhe, Executive Secretary of the European Polar Board (EPB), gave an overview of the EPB's work, followed by a short presentation of Kirstin Werner of the Polar Prediction Project's International Coordination Office about the activities during the Year of Polar Prediction (YOPP), and an overview of the SERA Task Group's work by Daniela Liggett.



After these introductory presentations SERA members Gita Ljubic and Rick Thoman discussed the relevance of WWIC information for Indigenous communities in Alaska and the Canadian Arctic. They stressed the incongruence between the micro-scaled spatial and temporal experience of Indigenous



communities traveling across the sea ice and the resolution of weather and sea ice projection currently available.

Several invited stakeholders from the Netherlands and Belgium followed with presentations on their view of polar prediction and operational or strategic decision making. First, Jet Sluijk of Tecla Sailing, a family owned and operated sailing venture, outlined their operations and use of weather and ice information in Greenland waters and the kinds of information they will require as they look to potentially crossing the Northwest Passage next year.



Ship Master Johan Buysse (pictured at the left) provided the group with an overview of maritime operations in first year sea ice in the Baltic Sea region, how the realities of ice navigation require specific information to feed what are often rapid decisions. These kinds of information needs for ice operation decisions can be expected to be applicable to larger areas in the Arctic during the coming decades as the Arctic increasingly becomes a first year ice regime.

Hans Hederström, Director of Carnival Corporation's Center for Simulator Maritime Training (CSMART) Academy, gave the group a thought provoking overview of the importance of human interpersonal dynamics in the decision making process and how critical this is when environmental information needs to be included.

The presentations were followed by an open discussion, providing an opportunity for input of other attendees and allowed for sharing of a wide breath of experience. Discussion topics ranged from key information needs experienced by various user groups, critical environmental conditions or decision making contexts in which this information becomes indispensable, the fragmented way in which relevant WWIC is currently provided to end-users, and potential improvements in environmental forecast delivery. Several important commonalities emerged during the course of the session. These included access to information for the appropriate spatial and temporal scale. Additionally, observations, analyses and forecasts, of whatever type or format, are only parts of a richer decision matrix, with personal experience and non-environmental factors playing varying but important roles in the ultimate outcomes.

The SERA Task Group's job is to help PPP advance it's mission in the "...development of improved weather and environmental prediction services for the polar regions, on time scales from hourly to seasonal", by bringing social science expertise to the complex web of how people throughout the polar regions make use of this information, and how enterprises can maximize value to society of improved science.

## Appendix F — PPP-SERA Poster

(created by Emma J. Stewart in conjunction with all task group members)

# Navigating Weather, Water, Ice and Climate (WWIC) Information for Safe Polar Mobilities

### Polar Prediction Project

Initiated in 2012 by the World Meteorological Organization (WMO) the Polar Prediction Project (PPP) aims at advancing scientific knowledge for polar weather and climate services, not only to improve forecasting for the Polar Regions but also for the lower latitudes.

This work explores how weather, water, ice and climate (WWIC) information is currently being used and produced in the Polar Regions, by whom, and for what reasons.

Two key concepts – the value chain and mobilities – can be used to conceptualise the complex interactions between the production and use of environmental predictions.

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Daniela Liggett<sup>3</sup>, Gita Lubjicic<sup>4</sup>, Brian Mills<sup>5</sup>,  
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### Gaps in knowledge

WWIC information is provided by a range of actors, from formal state institutions to community groups, and is used in support of different activities, from fishing and tourism to government activities in the Polar Regions.

The boundaries between users and producers of WWIC information are becoming increasingly blurred, and some users provide environmental information or modify data to suit their needs.

However, knowledge of the interactions between users and providers of WWIC information, and the contexts within which what kind of information is used, is woefully inadequate.



Drawing on the foundational work of the World Meteorological Organization's (WMO) Polar Prediction Project's (PPP) 'Societal and Economic Research and Applications' (SERA) Subcommittee, this poster identifies, frames and articulates important areas of research related to the use and provision of environmental prediction services that could be developed during, and beyond, the Year of Polar Prediction (YOPP, 2017-19).

### Polar Mobilities

We draw on the concept of mobilities following Sheller & Urry (2006) who define mobilities broadly as the movement or flow of people, objects or information and knowledge. Our analysis indicates that mobility sectors in the Polar Regions (such as commercial transportation, including shipping and aviation; tourism; fishing; resource extraction and development; community activities; government activities and scientific research) vary widely in size and scope, and are diverse in terms of operational contexts and practices. Most of these activities in the Polar Regions are increasing in scale and scope and are diversifying. Expert local knowledge remains important, but users appear to be increasingly dependent on specialised WWIC information services.





### Research Agenda

**More specialised and near-real-time weather, water, ice and climate services are required to provide relevant information for a diversity of practices. While higher-quality WWIC information and greater resolution of data is necessary for some, it is insufficient for all. The existence of information alone does not necessarily mean that it will be used.**

**There is a need for systematic documentation regarding particular uses of existing WWIC information services, and thus more work is needed to collect data necessary to situate human activities and their mobilities within their spatial-temporal contexts and decision-making practices.**

**To respond to these knowledge gaps, we identify that research is needed which explores:**

- User information needs, behaviours and preferences;
- The relationship between users and providers of WWIC information, including the co-production of WWIC data and information services;
- Factors that enable or constrain access to, or provision of, WWIC information services; and,
- Infrastructure and communication needs.

### Value Chain

The WWIC information value chain recognises the value of activities required in the use of information. It represents the cycle of a common information product, with the activities undertaken by different actors and organisations in the chain. A value chain perspective to WWIC is useful as it provides a context to understanding the complex array of information provision. Most WWIC information providers function as one piece of a larger network of information producers, providers and users. Thus, there is a need to better appreciate some of the complex interactions and interlinkages such entities have with each other and the users they serve.







The Polar Regions are undergoing dramatic changes while seeing a general growth and diversification of human activity. These changes imply that weather, water, ice and climate (WWIC) services ought to be salient in the diverse contexts in which users engage with them.

WWIC information is considered as significant for reducing the risks related to human activities in dynamic polar environments.



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