

WORLD METEOROLOGICAL ORGANIZATION
COMMISSION FOR ATMOSPHERIC SCIENCES
(CAS)

**World Weather Research Programme (WWRP)
Polar Prediction Project (PPP)
Societal and Economic Research and
Applications (SERA) Meeting**

Christchurch, New Zealand (18-22 April 2016)

CAS/WWRP-PPP-SERA-
Meeting 2-report
(finalised 19-May 2016)

Report summarizing the
Second PPP-SERA Meeting

This report summarizes the items discussed and progress made during the second annual organizing meeting of the Societal and Economic Research and Applications (SERA) Subcommittee of the Polar Prediction Project (PPP), coordinated and managed through the World Weather Research Programme (WWRP), an Open Programme Area Group (OPAG) of the World Meteorological Organization (WMO). The meeting was held at Gateway Antarctica, at the University of Canterbury in Christchurch, New Zealand from April 18-22, 2016.



Top Row: Daniela Liggett; Jackie Dawson; Rick Thoman; Gita Ljubcic; Bottom Row: Winfried Hoke; Emma Stewart; Brian Mills; Machiel Lamers: Absent from the photo is Maaïke Knol

1. ORGANIZATION OF THE MEETING

Daniela Liggett (University of Canterbury) and Emma Stewart (Lincoln University) hosted and organized the meeting and Jackie Dawson and Brian Mills chaired and facilitated. The meeting was officially opened by Darryn Russell, the Assistant Vice-Chancellor Māori, who greeted the group with a mihi, which is a traditional Māori welcome. Further welcoming words were provided by Professor Bryan Storey, the Director of Gateway Antarctica.

The purpose of the proposed meeting was to advance and begin implementing the PPP-SERA Action Plan, including defining contributions to the Year of Polar Prediction (YOPP). Specific objectives of the meeting included:

- 1) Providing members with an update on the PPP, YOPP, and related WMO activities, events, and opportunities.
- 2) Introducing new members and invited guests and providing opportunities to share current and planned research activities related to PPP-SERA interests.
- 3) Creating a draft outline and initial text for the PPP-SERA scoping document, a key report in the Framing Phase of the Action Plan that includes:
 - a. Review of the current state of knowledge concerning the weather-sensitive actors in the polar regions and their (data/research) requirements;
 - b. Review of the available data sources and an inventory of data providers;
 - c. Discussion on the current weather and data challenges for stakeholders; and
 - d. Development of a tiered research agenda addressing, *inter alia*, long-term data gaps and needs as well as including shorter-term proposals, especially those that leverage on-going or planned projects.
- 4) Revisiting 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.).
- 5) Preparing and submitting a report to the PPP Steering Committee on the results of the meeting and emerging recommendations.

The majority of meeting time was spent working on the PPP-SERA scoping document (to be re-named before final submission). An integral component of this work included a series of informal discussions with stakeholders who use, produce, or interpret weather information for the Antarctic. A total of 5 discussions with 9 different stakeholders were conducted that lasted between 60-120 minutes. Stakeholders included both users of weather data (i.e. tourism and fishing operators, Antarctic logistics providers and planners, indigenous scholars) and producers/interpreters of weather data (i.e. researchers and meteorological forecasters). These interviews provided important context for the PPP-SERA team and will help to inform the scoping document.

The meeting also included three educational excursions aimed at enhancing the group's knowledge and understanding of Antarctica. The group toured:

- Canterbury Museum: with a special focus on their Antarctic Collection
- Antarctic campus: home to four different National Antarctic Programmes, the Antarctic Heritage Trust and the International Antarctic Centre.
- Lyttelton: with a tour of the historic polar port.

A list of workshop participants is provided as Appendix A. The original agenda is included as Appendix B. While all items on the draft agenda were addressed, the order of discussion was not followed as explicitly indicated. A list of stakeholder discussion questions is provided as Appendix C and a brief summary of key points raised during these discussions is included in Appendix D. These valuable insights may form the basis of future more formal interview questions and the selection of key informants, and new online sources, reports,

and articles shared by invited guests will be incorporated into the literature being gathered in support of the Scoping Document.

UPDATE ON POLAR PREDICTION PROJECT (PPP) and YEAR OF POLAR PREDICTION (YOPP)

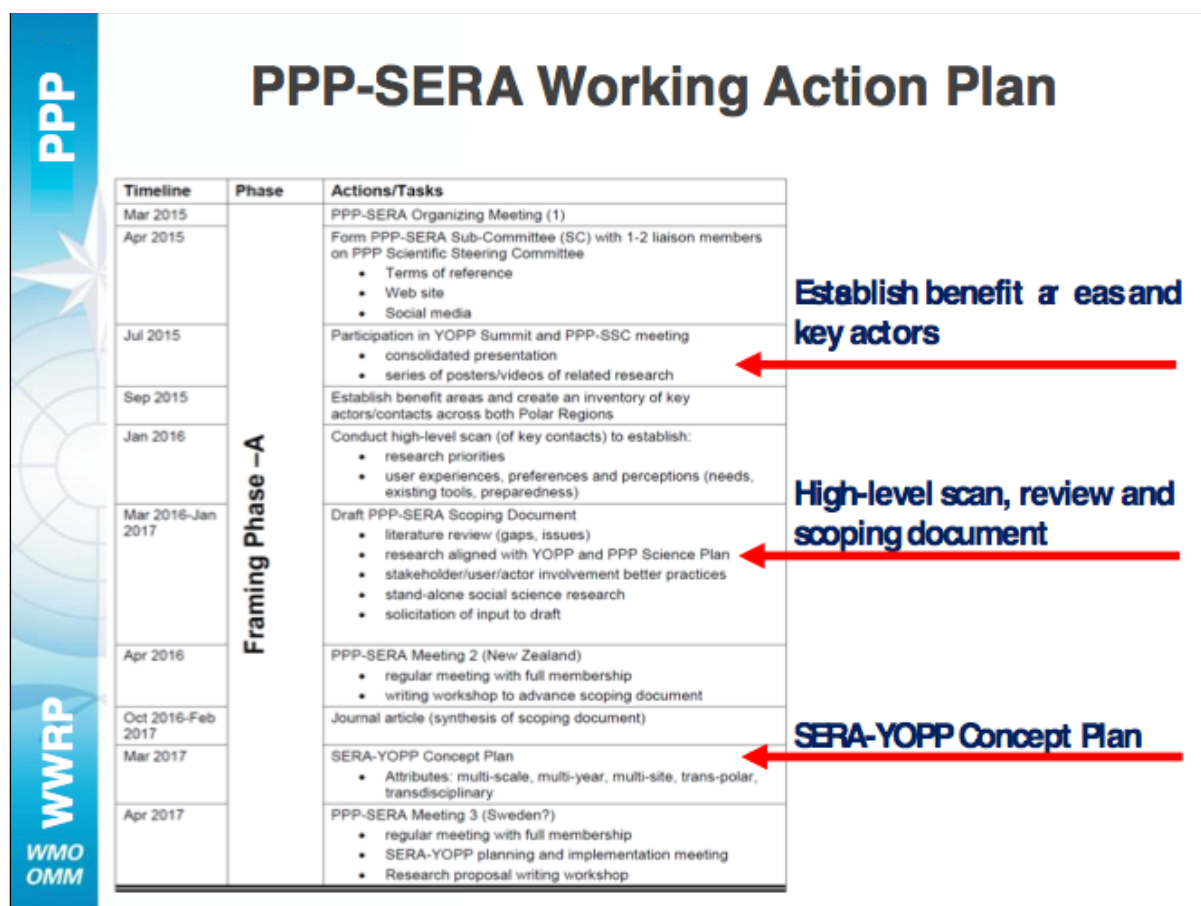
Brian Mills, with support from Winfried Hoke, provided an update on the PPP, YOPP, and related WMO activities, events, and opportunities. The WMO organizational and institutional context for the PPP was reviewed. Several programs within WMO in addition to the World Weather Research Program (WWRP) are active in polar regions. The Executive Council Committee on Polar and High Mountain Observations, Research and Services (EC-PHORS) is particularly relevant as its Services Task Team (TT) has been working on a white paper and integrating results from surveys of users of polar weather and climate information. It was suggested that SERA could benefit from seeking opportunities for collaboration and meeting with the Services TT. The Year of Polar Prediction (YOPP), an intense period of observation and research (2017-19), is the most visible activity within the PPP, and over 20 contributions have been endorsed to become part of the YOPP campaign. How SERA and social research more generally fit into YOPP was a subject for discussion during the Christchurch meeting and will likely flow out of the scoping document that is under preparation.

A general group discussion was facilitated on the role of the PPP-SERA including some of the challenges, perceptions, and research related to weather data and information in the Polar Regions. Some highlights from this discussion include the following observations:

- Improved modeling and more technology is sometimes assumed to be inherently 'better' but if end-users do not use the information or cannot access the information it is not better.
- Innovations in weather and climate services seem to be informed by dualistic thinking in terms of providers and end-users, while what exists seems to be much a value chain or network that includes (or excludes) numerous actors that all provide and use information. For example, information initiatives for understanding sea-ice dynamics occur both bottom up by communities and other sectors, as well as top down by satellite-based information services.
- Increasingly the data creators (modellers) are creating information for themselves, and the end users are also creating information for themselves. Consequently, there is an increasing division among modellers, information providers (operations) and end users.
- There has been an evolution of the information age – where the nation states (and by implication, National Weather and Hydrometeorological Services) are no longer the only holders of information. Rather, information is often provided by private actors and shared among the public who in turn create their own information. The forecasting and data systems needs to adapt to this new era.
- Different end users have very different data and information needs. It is very important to consider scale and resolution and whether higher performance data modeling is needed in all cases or whether energy would be better placed on effective communication and interpretation of available/existing weather information.

REVIEW AND REFINEMENT OF PPP-SERA WORKING ACTION PLAN

The PPP-SERA working Action Plan was also reviewed and discussed (see below).



Winfried Hoke, who is now playing a very important coordination role between PPP-SERA and the International Coordination Office (ICO), updated the group on various upcoming activities within the WMO and the PPP. The group discussed the role that the PPP-SERA would like to have during the 2017 YOPP launch event and in subsequent fora. The endorsement process was deliberated from a social science perspective, and it was determined that a second or supplementary form should be created that is more suitable for endorsing a wider range of research activities. The PPP-SERA committed to creating a draft endorsement form for discussion with the ICO.

Important points that ensued from the general discussion included:

- A desire to enhance the visibility/exposure of PPP-SERA. This could be done via the listserv, etc., and by making greater use of general phone calls, conference calls, and a larger presence in scheduled PPP and YOPP meetings.
- The need to create a more specific YOPP concept plan for PPP-SERA.
- The question: how do we deal with research ethics to engage in joint PPP-SERA research projects? Via individual university systems, which take very different approaches? Other?
- The need to have one or two PPP-SERA representatives at the YOPP launch event in 2017 and an expectation of being involved in pre-planning activities.
- The idea of making use of scheduled PPP events (workshops, meetings, etc.) to conduct PPP-SERA research and observations. The PPP itself represents an opportunity to engage in perceptions and values research by bringing together a larger number of scientists working on the issue of weather modeling, observation systems, and forecasting.
- The idea of creating a PPP-SERA brochure similar to the YOPP brochure that outlines the planned PPP-SERA activities and concept plans.

- Potential opportunities to work with a cruise operator in order to conduct research or a PPP-SERA meeting on board a vessel.

UPDATE ON COMMITTEE MEMBER PROJECTS

A number of PPP-SERA members have existing research projects relevant to PPP that can be leveraged and built upon for the benefit of PPP and YOPP. Each research team member outlined his or her funded and planned projects or other relevant activities.

Emma

- Emma and Daniela have been invited to be on the Antarctic Stakeholder Consultation Group for New Zealand's Ministry of Foreign Affairs and Trade to contribute to the development of a strategic approach to tourism regulation. Part of this work is to identify priority research questions and gaps, which will include weather and data needs and issues among stakeholders. Emma and Daniela will provide exposure to the PPP-SERA within this forum and will infuse PPP-SERA agenda wherever possible.
- A Summer Scholarship Student research project is currently examining human impacts (including the impact of climate change) on the New Zealand sub-Antarctic Islands, which are staging posts for Antarctic tourism.
- New Zealand has included a 'Deep South' research programme to focus Antarctic research that has relevance for New Zealand over the next 10 years. This could provide an avenue for PPP-SERA funding proposals to be developed over the next few years. Endorsement from an international project such as PPP would be viewed favourably.

Daniela

- DryVER project focusing on assessing sensitivity to change in the McMurdo Dry Valleys, Antarctica. Part of this project, which is a collaborative project between different New Zealand universities, looks at the scale and characteristics of human activities in the Dry Valleys and at landscape values using biophysical, and to some extent meteorological, data. It is an on-going project funded by the Ministry of Business, Innovation, and Employment.
- An interdisciplinary research project on the science-policy linkages, with a specific focus on Antarctic-related information. This project arose from perceived gap between the generation and availability of scientific information and policy-making, which fails to make use of the available scientific information. The project is currently in the early stages but will be able to contribute to SERA work by incorporating the consideration of meteorological and ice data. No specific funding has been obtained for this project yet.
- An STS (science and technologies study) on the production, communication and use of scientific knowledge in Antarctica (in collaboration with Richard Vokes, an anthropologist based at the University of Adelaide, Australia). This project is funded by the Australian Research Council.
- "Antarctic Gateways and the Global Commons: Rethinking Antarctic Gateways" project, which focuses on Antarctic connections, identity and information mobilities in the gateways to Antarctica. This project will also assess how Antarctic information is produced, communicated and (re-)imagined by different communities. The focus is on gateway cities, for which Antarctic connectedness indices and Antarctic-focused sustainability profiles will be produced. This project is funded by a linkage grant from the Australian Research Council, with financial support offered by three Antarctic gateway cities.
- Antarctic futures: An interdisciplinary project to identify a range of possible future scenarios with regard to human activities in the Antarctic, and decision-making,

geopolitics and research about the Antarctic. This project receives partial financial support from the Antarctic Office in Christchurch.

Gita

- Although Gita is not currently leading projects that would be directly relevant to PPP-SERA, she is a co-investigator and collaborator on several highly relevant initiatives.
- The first of these is work that she is engaged in with Trevor Bell of Memorial University of Newfoundland in Canada. He is leading the development of SMARTice, a sea ice monitoring and assessment approach combining community-based monitoring and mobile instrumentation with Inuit knowledge of collaborators in Pond Inlet, Nunavut, Canada. This work is funded by diverse sources, but most recently from Polar Knowledge Canada (formerly the Canadian High Arctic Research Station) and ArcticNet (a Canadian Network Centre of Excellence). Trevor and Gita are also co-supervising a PhD student, Katherine Wilson, who works for the Canadian Ice Service along with pursuing her doctorate at Memorial University part-time. Both Trevor and Katherine have valuable experience and were suggested as good people to approach to be part of our periphery PPP-SERA team.
- Second, Gita is working with Joel Heath, President of the Arctic Eider Society and Research Associate at Carleton University, in support of linking participatory mapping and greater incorporating of traditional knowledge into examining indicators and cumulative impact assessment of the influences of climatic change and hydro-electric development on eastern Hudson Bay Inuit and Cree communities.
- Third, Gita is involved with the work Jackie is leading on AMUT (see Jackie's update below).
- Fourth, Gita is a long-time member of the Geomatics and Cartographic Research Centre (GCRC) at Carleton University, which is directed by Fraser Taylor. Through the development of the Inuit siku (sea ice) Atlas (sikuatlas.ca) and subsequent projects, she has also worked closely with Peter Pulsifer, now at the National Snow and Ice Data Centre in Boulder, Colorado, USA. Peter is highly engaged and an important leader of Arctic data and interoperability initiatives, and he was also suggested as an important person to invite to be a part of the larger PPP-SERA support network. Through this work with the GCRC, Gita is also involved in a new proposal to develop the CCADI (Canadian Consortium for Arctic Data Interoperability), led by Maribeth Murray, Director of the Arctic Institute of North America, based at the University of Calgary, Alberta, Canada. An important part of ongoing discussions would be assessing the potential links between PPP-SERA efforts to identify important uses and needs related to weather and climate information, and these broader data management efforts.
- Lastly, Gita suggested the consideration of reaching out to the Inuit Circumpolar Council (representing Inuit internationally) or Inuit Tapiriit Kanatami (representing Inuit in Canada) to inquire about their priorities for user needs for weather information with regards to information needs. She offered to initiate this dialogue if it is of interest to the group.

Winfried

- Winfried is developing a comprehensive table / inventory of actors and information users (connection to WMO, formal / informal) (This is part of the scoping).
- International coordination office would like to help to coordinate the PPP-related applications to conduct expeditions via icebreaking vessels (e.g., Arctia Ltd., Machiel and Jackie noted similar opportunities with Norwegian and Canadian vessels).
- Connecting the interests of the SERA-committee with the day-to-day operations of the PPP-ICO and also the Outreach activities of the PPP.

Rick

- Rick is the US National Weather Service Alaska Region Climate Science and Services Manager, a position created in 2013 to enhance climate-related information delivery in Alaska. The position entails working as an interpreter for a wide variety of climate information. Some work is operational, i.e. set products at set times, some work is event-driven, and some strategically focused, engaging with organizations that can help improve climate services on both the science side and the social science side.
- Tailoring of climate scale information to specific users, e.g. Sea Ice for Walrus Outlook, developed specifically for walrus hunting communities in the Bering Strait region (partnership with hunters and science). Hunters want to know ice movement and ice quality; concentration is less relevant (it does not matter if its 7/10ths or 9/10ths).
- Leveraging extensive social science work done by the Alaska Centre for Climate Assessment and Policy (ACCAP) – PIs Sarah Trainer and John Walsh. Helpful in the area of Traditional Ecological Knowledge (TEK) and communications with users. It is clear that each user group is different and has different needs, which often are not addressed in products and services historically produced by Federal agencies.
- Serious concern in Alaska that increasing demands on community expertise may be leading to fatigue/saturation, especially after repeatedly not getting anything back in return for sharing their knowledge.
- In many cases the climate forecast data is there but needs to be mined: it's not sexy research topic to do data processing. But some of the most useful activities we can do with the data we have. But scientists don't always want to do this. i.e. storminess – the model data is already there: it's "merely" a big data problem.
- NWS has "Test Beds" to help bring research to operations. Typically these have been focused around a weather type, e.g. severe weather test bed. The Arctic Test Bed now being spun up is uniquely defined by a geographic area, and can potentially be a conduit to apply polar-specific social science research into weather and climate services delivery.

Machiel

- ArcticInfo - Funded project (Fram Centre) (Maaïke and Machiel) – Arctic Information Systems: drivers and effects on the development of marine economic activities. Initial focus on mapping the provider scope of Arctic information systems in the European Arctic. At a later stage the project will also focus on user relevant aspects and risk-related work packages. The project involves relevant partners, such as NPI and the Norwegian Met Service, and funds some staff time and meeting costs. It is expected that from ArcticInfo more projects will be launched and submitted to other Norwegian funding opportunities. ArcticInfo will soon seek endorsement by PPP-YOPP.
- LIAISE - Making Arctic information systems more salient and legitimate (WUF, Wageningen University Fund). LIAISE stands for Legitimacy Index for Arctic Information Systems on the Environment. It seeks to understand the impacts and effects of environmental information systems in the dynamic, remote and resource-rich Arctic for the sustainability and empowerment of stakeholder groups. It also seeks to improve the salience of information systems by developing co-production methodologies. Finally it seeks to provide a more level playing field by developing an index (information system) to inform stakeholder groups of potential environmental information systems. The concept of this project has been written up and has been selected for promotion by the WUF among philanthropy networks. The plan is to work out these ideas further and to submit for a personal grant in the Netherlands or European funding context.

- PhD researcher Linde van Bets is currently working on an article on the creation, sharing and use of information in the European Arctic expedition cruise sector and the way information and databases are deployed to obtain legitimacy along several lines. The resulting article could provide valuable input for further PPP-SERA related work.
- Masters thesis on expedition cruise operators and their information system use in the European Arctic, by Paula Duske. The idea is to develop a case study that can inform us about climate information services by a particular user group. The plan would be to write up an article based on the thesis results. Results could also be compared with experiences in other regions by other SERA members at a later stage.
- Master student Yanniek Huisman is working on a Capita Selecta project, reviewing, summarising and analysing the current literature on climate information services in the Arctic. This work can be used by the SERA group in drafting the Scoping document. The work will result in an annotated bibliography of the literature and summary of main points within in literature.

Brian

- Works in the meteorological research division of Environment and Climate Change Canada's Science and Technology Branch.
- Primary role within PPP has been to facilitate the development of a new SERA team (this group) drawn from areas outside of traditional applied meteorology with experience and on-going social or interdisciplinary research programs in polar regions.
- Greg Smith/Gilbert Brunet coordinating efforts for YOPP in Canada, identifying Government of Canada interests (will be a contribution to YOPP). Focus to date has been on modelling and observing activities; user and service-oriented aspects will likely be better defined in coming months.
- Long-term role in PPP-SERA will be related to understanding how improved understanding/prediction in polar regions translates to benefits in mid-latitude and other areas.

Jackie

- Jackie is involved in the SMARTice project (funded by Canadian High Arctic Research Station and Polar Knowledge Canada) outlined above by Gita.
- Shipping in the Canadian Arctic (funded by Transport Canada) – with Transport Canada, a survey has been conducted of ship operators in the Canadian Arctic including their weather data needs, where they access data, and what they need for the future. Results are now available and can be used by the PPP-SERA team.
- A database of ship traffic (funded by Social Sciences and Humanities Council of Canada, MEOPAR, and Transport Canada) from 1990-present has been created and can be used to better understand the actor-scape in Arctic Canada.
- A series of community case studies are on-going (funded by MEOPAR) (Pond Inlet, Ulukhaktok, others) to collect data on information needs and concerns related to shipping and environmental change in Arctic Canada. This includes questions related to community safety when transiting sea ice and local information needs to enhance safety.
- Two funded projects by MEOPAR NCE (Marine Environmental Observation Prediction and Response Network Centres of Excellence): both focused on climate change and shipping in Arctic Canada. One project will involve outfitting an icebreaker as a SMARTship to measure ice thickness and other ice and weather data. The other project is focused on governance for shipping.
- Arctic Marine Use and Transportation (AMUT) Partnership Project currently under review with SSHRC.

DISCUSSION OF FUTURE RESEARCH PLANS

The group had a general discussion research plans, funding options and publication plans. Some ideas generated included:

Publication Possibilities:

- Scoping Document
- Publication derived from the scoping document to be submitted to the Bulletin of the American Meteorological Society.
- Journal Paper: summarizing our scoping document
- Journal Paper: analysis of existing surveys of users and their weather needs including commentary on the approaches used, results, and future needs (based on existing surveys)
- Journal Papers: outlining the weather and data uses and needs of ship operators in the European (based on Master thesis by Paula Duske) and the Canadian Arctic (based on Transport Canada project led by Jackie Dawson).
- Journal Paper: on the differences in user groups and their various/differing information needs.

Funding Options:

- New Zealand's 'Deep South' National Science Challenge
- Canada's Social Sciences and Humanities Research Council (SSHRC) Partnership Grants program
- Canada's Digging into Data Challenge (Tri-Council)
- Belmont Forum
- New Zealand Antarctic Research Institute (NZARI) funding
- The Tinker Foundation's Environmental Grant
- Prince Albert II of Monaco Foundation
- Netherlands Polar Programme (NWO-NPP), policy relevant research
- Personal grants from NWO Innovation Impulse, or ERC grant
- Norwegian Research Council calls on climate and polar research.
- Exploring other funds from various national programs that specifically support international collaboration.

PREPARATION FOR DRAFTING THE SCOPING DOCUMENT

Prior to drafting text for the scoping document, a group discussion took place focused on: 1) refining the draft outline including section titles and general content; 2) identifying key concepts and messages for the document; and 3) assigning certain sections to individual PPP-SERA members.

It was agreed by the PPP-SERA that the scoping document (to be renamed at a later date) will represent a strategic document for communicating the 'big picture' including challenges, opportunities, and needs with respect to weather data and stakeholders in the polar regions. The document is meant to serve a function similar to the PPP Science or Implementation plans and will provide a foundation and a plan for the PPP-SERA moving forward. The document will be produced professionally and designed in a similar manner to previous PPP plans.

Through collective and breakout group brainstorming activities, the planned sections were refined and the initial document structure was outlined. During these focused work sessions

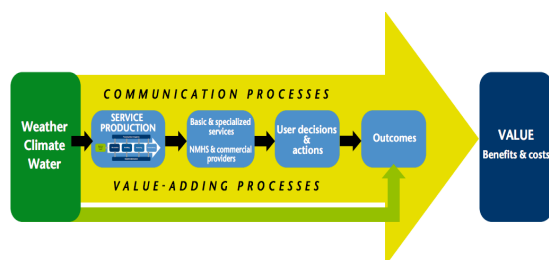
we were able to begin drafting text, gathering additional data and resources, and conceptualizing the main concepts for each section. The document outline was updated to reflect these discussions. Below is a basic outline of the scoping document as agreed upon by the PPP-SERA.

- Front Cover
- Publication Information
- Executive Summary
- Introduction
- Human Activity Trends in the Polar Regions
- Weather and Climate Information Providers and Trends in the Polar Regions
- Analysis of the Weather Data Information-User System
- PPP-SERA Research Response Plan
- Conclusions and Recommendations
- References
- Glossary
- Appendices with supplementary material as needed

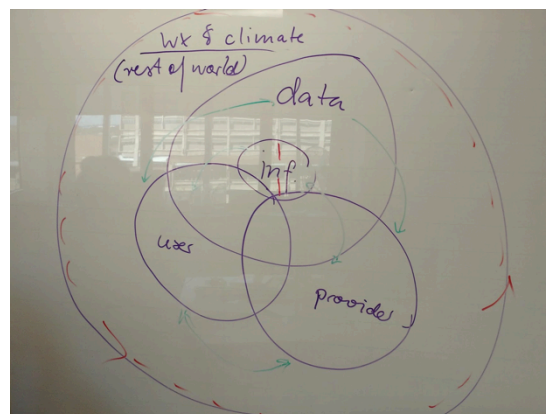
Considerable time was then spent in breakout groups of 3-5 people in order to work collaboratively on the various document sections.

BRAINSTORMING VALUE CHAIN DIAGRAM

The group spent time brainstorming a conceptual diagram for the scoping report that would capture the weather-stakeholder system operating in Polar Regions at a high level. Innovations in weather and climate services seems to be informed by dualistic thinking in terms of providers and end-users, while what exists seems to be much a value chain or network that includes (or excludes) numerous actors that all provide and use information. The basis for a 'value chain' was established and will be refined during the final drafting of the scoping document. For example, information initiatives for understanding sea-ice dynamics occur both bottom up by communities and other sectors, as well as top down by satellite-based information services. Key elements include: conceptualizing weather-related decision-making and information within a much larger perspective; recognizing that information comes from a multitude of formal and information sources (not just national government agencies); and that all aspects of the system—human and physical—are dynamic (moving parts), but that the human elements have agency. Another insight that was stressed during the workshop concerned the importance of communications, interpretation, operational experience and accessibility of information by end-users in the field. This means that improving climate services in the Polar Regions not just depends on the amount of data or sophistication of modelling, but is part of a wider suite of informational processes.



Example of a Value Chain Diagram



Draft Value Chain for PPP-SERA Scoping Document

COMMITTEE DECISIONS AND IMMEDIATE NEXT STEPS

Election of PPP-SERA Co-Chairs

After serving as the Chair and then Co-Chair of the PPP-SERA for the past three years Brian Mills stepped down from his position but will continue to be part of the sub-committee and provide historic and institutional knowledge to the group. Jackie Dawson will remain a Co-Chair and Machiel Lamers and Daniela Liggett volunteered to also act as new co-chairs moving forward. The adjustments give the subcommittee a much stronger presence in both poles and permit us to cover expected absences due to academic teaching and research schedules – ideally we expect to send (and have places for) two of the co-chairs to each PP-SG meeting (starting in 2017; Daniela will attend May 2016) as well as any other large project/YOPP meetings. Having three co-chairs also allows for seamless and overlapping transition as membership and leadership change over the course of the 10-year project. The co-chairs will have regular conference calls in addition to the wider PPP-SERA conference calls that will occur regularly throughout the PPP.

Membership and Network

The group noted some existing gaps in expertise on the subcommittee, most notably social psychology and economics, and in the representation of South America and its Antarctic interests. The subcommittee (core members) will maintain roughly its current size, but continue to work on building and formalizing a broader network (advisory members) of social and interdisciplinary scientists whose knowledge and programs may be tapped into as needed to supplement the work of members.

WWRP PPP Steering Group Meeting 7 (SG7) – Beijing, China May 23-25

Daniela Liggett will be attending the SG7 as a co-chair and representative of PPP-SERA. She will be giving a presentation during the event and facilitating a group discussion around the contributions that SERA could make, interactions with other PPP projects and groups, the potential for holding focus group discussions and interviews with key stakeholders and PPP-related meetings/conferences and the YOPP launch event.

Drafting the PPP-SERA Scoping Document

The scoping document will be finalized, designed, and printed in time for the 2017 PPP YOPP launch event. In accordance with the PPP-SERA action plan the sub-committee will continue to draft and finalize the text for the document over the next six-months. Committee members are all assigned different sections of the document and its overall structure will be overseen by Jackie Dawson.

PPP-SERA Action Plan Development

The draft Action Plan will continue to be refined. Progress on our initial commitments to generate a scoping document are well underway. Future plans also include annual sub-committee meetings, an international “Weather and Society” workshop in 2018 (TBD and depending on permissions and funding), collaborative grant proposals, and publications.

Organizing 2017 Annual PPP-SERA Working Group Meeting

Contingent on finalization of terms of reference and confirmation of resourcing (travel support) from the WMO-WWRP and PPP-ICO, the PPP-SERA will hold its 3rd meeting prior to the YOPP launch event in 2017 in order to finalize the scoping document and plan for the YOPP launch event and the Core Phase of YOPP. The meeting is currently proposed to be held in either Fairbanks, Alaska, or Geneva, Switzerland, during the first week of April 2017.

CLOSURE OF MEETING

The meeting closed on Friday April 22 at 1pm and was followed by an off-site tour of Lyttelton Harbour guided by a local Antarctic historian.

APPENDIX “A” - PARTICIPANTS**PARTICIPANTS**

INVITEE	ORGANIZATION AND ADDRESS
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APPENDIX B

Meeting Plan for Christchurch Workshop of WMO PPP-SERA Committee Gateway Antarctica, University of Canterbury 18-22 April 2016

Venue: Gateway Antarctica Meeting Room

7th floor of the Biology Building on the University of Canterbury campus

Purpose and objectives: The purpose of the proposed meeting is to advance and begin implementing the PPP-SERA Action Plan, including defining contributions to the Year of Polar Prediction (YOPP).

Specific objectives:

1. Provide members with an update on the PPP, YOPP, and related WMO activities, events, and opportunities.
2. Introduce new members and invited guests and provide opportunities to share current and planned research activities related to PPP-SERA interests.
3. Table, discuss, and complete an initial draft of the PPP-SERA Scoping Document, a key report in the Framing Phase of the Action Plan.
4. 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.).
5. Prepare and submit a report to WMO on the results of the meeting and outline recommendations and next steps.

Draft Meeting Plan:

Sunday, 17th April

- Welcome BBQ evening gathering

Monday, 18th April – Gateway Antarctica, University of Canterbury

Facilitators: Co-Chairs BM & JD

Hosts: DL & ES

- Welcome – Darryn Russell (AVC Māori)
- Welcome [BM/JD]
- Introductions – new and existing members [All]
- Plan for the workshop; tasks, outputs, working arrangements, expected guests, social programme [BM/JD & DL/ES]
- Update on PPP, YOPP, and related WMO activities, events, and opportunities [WH/BM]
- Update on WMO endorsement process for projects [WH/BM]
- Updates on current/planned research projects – 10-15mins round table discussion [All]
- Lunchtime Guest Speaker – Jack Fenaughty (Polar fish scientist; science advisor for Sanford and Marine Stewardship Council)
- Scoping Document (review of state of art; data gaps and research needs; PPP-SERA research response plan) – assignment of breakout groups and tasks [BM/JD]

- Early Dinner – Misceo's, Christchurch City (5.30)

Tuesday, 19th April – Gateway Antarctica, University of Canterbury

Facilitators: Co-Chairs BM & JD

Hosts: DL & ES

- Breakout groups – to focus on key tasks related to the Scoping Document (Review of State of the Art) [All]
- Breakout groups – reporting back [All]
- Guest Morning tea – Toni Wi (Indigenous scholar; Maori – Antarctic connections)
- Lunch with Nathan Russ and Dave Bowen from Christchurch-based 'Heritage Expeditions' (Antarctic tour operator)
- Breakout groups – to focus on key tasks related to the Scoping Document (Review of State of the Art) [All]
- Social programme – Tour of Antarctic Collection at Canterbury Museum (3.30-5.00pm) [Anthony – Education Officer of Antarctic Collection]
- Dinner – Fiddlesticks Restaurant & Bar, Worcester Boulevard, (6pm)

Wednesday, 20th April – Gateway Antarctica, University of Canterbury

Facilitators: Co-Chairs BM & JD

Hosts: DL & ES

- Collation of *Review of State of the Art* from breakout groups [All]
- Breakout groups – reconvene if necessary [All]
- Lunch with Kerry Chuck (US Antarctic Program) and Wolfgang Rack (Gateway Antarctica)
- Identification of *Data Gaps and Research Needs* [BM/JD]
- Social programme – Tour of 'International Antarctic Centre' (3.00-5.30pm) [Ruth Guy, Education Officer]
- Dinner – Japanese Teppanyaki, Spitfire Square (next to IAC) (6pm)

Thursday, 21st April – Gateway Antarctica, University of Canterbury

Facilitators: Co-Chairs BM & JD

Hosts: DL & ES

- PPP-SERA Research Response Plan – documenting *potential projects (a) leveraged (b) proposals and (c) new joint SERA research projects* [BM/JD]
- Breakout groups - PPP-SERA Research Response Plan [All]
- Finalise Scoping Document [All]
- Lunch with Peyman Zawar-Reza and Marwan Katurji (Department of Geography) as well as Mike Green (Aurecon)
- Draft meeting summary report for WMO [BM/JD]
- Revisit draft action plan/timeline and outline next actions/timeline [BM/JD]
- Dinner – Emma's place

Friday, 22nd April – Fieldtrip to Lyttelton and Viewing Quail Island**Hosts:** DL & ES

- Morning - work on Scoping Document
- Work on YOPP Implementation Plan
- Afternoon optional excursion to Lyttelton
- Farewells

Arrival and Departures

Name	Arrival Day/Time	Flight #	Departure Day/Time
Gita Ljubicic	Sun 17 Apr, 08:15	NZ501 from Auckland	Sat 23 Apr, 16:30
Rick Thoman	Sun 17 Apr, 10:25	NZ509 from Auckland	Sun 24 Apr, 15:00
Machiel Lamers	Sun 17 Apr, 14:20	EK418 from Dubai	Sat 23 Apr, 15:55
Winfried Hoke	Sun 17 Apr, 14:20	EK418 from Dubai	Tue 26 Apr, 15:55
Jackie Dawson	Sun 17 Apr, 20:05	NZ557 from Auckland	Thu 28 Apr, 17:30
Brian Mills	Sun 17 Apr,		

APPENDIX C – Stakeholder Informal Interview Questions

Questions for End-Users and Key Experts

Current:

- What information about weather and environmental conditions (including sea ice) do you currently use for operating in Antarctica? (technical devices/tools/data sources)
- What type of data (character, resolution, spatial and temporal parameters) do you need for your operations/research (if applicable)?
- How do you currently access environmental information for your operations in the Antarctic?

Future:

- In an ideal world, what additional environmental data would be of use to you in the future, and in what ways should it be made available?
- In an ideal world, what additional environmental information/data should be provided to end users to improve the safety of operations in polar waters, and to ensure the environmental impact of operations in polar waters are minimised?

Challenges:

- What are the most significant barriers to efficient and safe Antarctic operations?
- What key challenges do you see with regard to making environmental data and information about operational hazards (e.g. sea ice) available to end users?

APPENDIX D – Summary of Key Concepts from Stakeholder Discussions

- Operators of fishing and tourism businesses in the Antarctic need real time data. The season is so short forecasted data too far into the future is no useful. It's too variable and the needs of different users are also very different.
- Some operators just need an indication of directionality when it comes to weather information. i.e. is the wind increasing or decreasing, is it from the west or the east.
- Operators rely most heavily on past experience. Weather data is just used as one of many inputs in their decision making process.
- Users of weather data stressed the importance of data interpretation stating that you can have all the more sophisticated and technical weather data available in the world but if you can't understand it – it's useless.
- Users of weather data noted the importance of and lack of good information on wind. Wind is very important as it moves ice quickly.
- Many users of weather data interpret it themselves either via a main office or right on board the vessel. Furthermore they create their own data in addition to referencing other available data sources
- Data users noted the challenge of keeping up to date on the new weather data portals and products. They tend to stick with what they know and what they have used reliably before
- Data users indicated that the products they use are generally reliable and have found them to be fairly accurate to a certain resolution (i.e. indication of general trends).
- Some users of data indicated that they do not need better information but rather the need better communication and interpretation of the data that already exists.
- Data users all indicated that experience was most important when making decisions – not state of the art weather prediction models and technology.
- Users of data indicated that information on ice in the Antarctic is very lacking but that it is pretty good in the Arctic.
- Users of data all noted communicating challenges related to limited bandwidth and other challenges operating in polar regions related to communication infrastructure
- Some users of data question the amount of funding and commitment to modeling ice motion in the winter in Antarctic for example when nobody is really there. They felt more effort should be spent on interpreting and communicating information during the operational summer months.
- Real time data is the ultimate goal for all end users but many data users indicated that they are very resilient and are used to making decisions in the absence of perfect information.
- Some data users noted that giving a captain too much weather information could take him/her away from the job they should be doing which is monitoring thousands of variables for the purpose of navigational decision making etc.
- Data creators noted the challenge in getting funding to create platforms to provide data. Funding is more readily provided for creating or manipulating data.
- Data creators noted the poor sharing culture of weather data – and the need for more open source and sharing portals.
- Data creators acknowledged the complete lack of understanding of other disciplines and the 'silo effect' that occurs within research communities (and other communities).
- Data creators acknowledged the sites for getting weather data are not very user friendly.

- Data creators noted that users of data only need/want what's relevant to them and this is challenging because each user is so different.