

Ottawa, Canada (12-13 March 2015)

This report summarizes the items discussed and presentations prepared for the inaugural 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 the Faculty of Arts, University of Ottawa, in Ottawa, Canada from 12-13 March 2015.



**Meeting participants, from left:** Emma Stewart, Brian Mills, Daniela Liggett, Gita Ljubicic, Peter Chen, Jackie Dawson, Machiel Lamers, Lindsay Matthews (not pictured).

## 1. ORGANIZATION OF THE MEETING

Jackie Dawson and Brian Mills opened the meeting, welcoming participants and inviting them to provide a brief introduction about their home institution and experience and interests related to polar social science. Several disciplines (human geography, meteorology, sociology, other natural or environmental sciences) and application or thematic study areas (Indigenous and local knowledge, shipping, tourism and recreation) were represented at the meeting, though it was acknowledged that there is a need to reach out further into the social sciences and the humanities to seek diverse input on the issues discussed and to potentially augment sub-committee membership in the future. A list of the participants and their contact information is provided in Appendix A.

The purpose of the meeting was to begin an important dialogue about the PPP with social and interdisciplinary scientists who are actively engaged in polar research. Specific objectives included to:

- 1) Inform people about the Polar Prediction Project (PPP) and opportunities for collaboration;
- 2) Present and discuss participants' current and planned research that may relate to PPP;
- 3) Review, critique and suggest improvements to elements of the PPP documented in the current Science and Implementation Plans;
- 4) Solicit interest in forming both a small, formal SERA sub-committee within the organizational structure of PPP, and a broader network that could contribute at the project level of activity; and
- 5) Prepare and submit a report to the PPP Steering Committee on the results of the meeting and recommendations.

The original agenda is included in Appendix B. While all items on the draft agenda were addressed, the order of discussion was not followed as explicitly indicated.

### **POLAR PREDICTION PROJECT (PPP) CONTEXT**

Brian Mills, with input from Peter Chen, provided an overview presentation on the PPP, based upon a generic slide deck developed by the International Coordination Office (ICO). The underlying rationale for PPP reduces to a few salient points:

- Our current ability to observe and predict polar weather, sea ice, waves, and related physical environmental phenomena is much less than that for other parts of the world;
- Understanding polar weather is critical to further improving predictions in other regions;
- Growth in resource development, transportation, tourism, other industries and research activities in polar regions mean that more people, economic activity, and infrastructure are becoming exposed to conditions that affect safety, health, mobility, and productivity; and
- Changes in the climate system have in some situations compromised the reliability of traditional and experiential knowledge used by members of Indigenous societies and polar communities to deal with weather-related hazards.

In short, the demand for better knowledge and improved services is increasing through greater exposure and sensitivity to changes in weather, climate, and associated hazards.

Several elements of the PPP were reviewed in the opening presentation, including: the project organizational structure; plans for its flagship program, the Year of Polar Prediction (YOPP); needs for PPP to include a strong social science dimension; and proposed activities listed in the Implementation Plan. The ensuing discussion touched on many topics, including the identification of relevant social or interdisciplinary science capacity, different ways to engage across disciplines and integrate knowledge from a variety of sources, approaches to involving users of weather information/services, and bolstering the Antarctic presence in the PPP. General support was expressed for the societal relevance and associated elements of the Science and Implementation Plans, especially their consideration in the early planning stages and placement at the forefront of a project largely framed by natural scientists. The PPP and YOPP were viewed as opportunities to integrate many disparate recently completed, on-going, and planned projects into a more cohesive and valuable 'program' of research and application.

Other matters that were raised included:

- The meeting participants agreed that the desire to include a larger role for the social sciences is evident within WMO, but the challenge is how to entrain this expertise, align it with WMO strategic priorities, and focus it on specific societal outcomes in projects like PPP.

- The WMO and PPP should be seen as an opportunity to bring expertise together in meetings, workshops, writing and training sessions, and to leverage national and other external resources for new research.
- There is a clear need for a social sciences component to both serve the needs of PPP but also push the boundaries of social sciences research.
- With respect to the PPP design and structure:
  - It would be preferable to identify and elaborate more fully the actors involved in managing risks and opportunities in polar regions, to examine the needs and demands for meteorological services/knowledge, and to use this information to inform the natural science goals, objectives, and research questions.
  - Participants questioned the placement of 'verification' in service-oriented research goals believing that it should be situated in the forecasting research section, while a broader 'evaluation' component could replace its current position.
  - It would be prudent to review the lessons from IPY.

## **PARTICIPANT PRESENTATIONS ON ONGOING RESEARCH AND IMPORTANT RESEARCH QUESTIONS/THEMES**

Participants were given roughly 40 minutes of time each to present aspects of their research deemed relevant to PPP and to foster discussion on one or more critical research questions or challenges. The slides were collected as a permanent part of the proceedings and, accordingly, only brief summaries and selected discussion points are emphasized below. A list of references cited in the various talks and this report is provided in Appendix C.

### ***Emma Stewart***

Emma presented findings from her work on *Understanding cruise tourism: Spatial and Regional Changes Patterns*, commenting on trends in the Arctic, the essential role of interdisciplinary research, and the value of working with and co-creating knowledge with local communities. In describing recent patterns in the Canadian Arctic, she noted the difficulty in even assembling a reasonably robust dataset of transits. While activity has been increasing in a relative sense, the absolute numbers remain small and the region is not as accessible as the Northeast Passage route north of Europe. More important than quantity has been the disproportionate increase of smaller vessels carrying less-experienced travellers (i.e., yachts) who may have little up-to-date passage weather information, may not speak the local language, whose vessels are not as easily tracked, and who are as a result more vulnerable to hazards. Interdisciplinary aspects of the research included incorporating sea ice science that reflected the complexity of climate warming in the Arctic and demystified if not shattered the popularized expectation of perennial ice-free navigable waters.

Community involvement and engagement was a critical aspect of the project. This involved employing local residents to assist with translation and required that the research was 'solution-based' and reciprocal in terms of benefits. Interviews with elder residents and observations from other members of the community were essential elements of the research and served to build trust. Workshops with community members facilitated the application of the new knowledge into practical code of conduct for visiting tourists. A policy delphi exercise involving tourist operators and other decision-makers was used to define strategies and priorities, leading to recommendations to improve monitoring technologies (AIS - shore and ship based) and to require better soundings and marine mapping resources.

Emma raised several important questions and issues:

- What are the needs given more challenging routes/more diversified modes of transport; What is the knowledge-base of 'new-comers' and is language a barrier?

- Will “Fly-Cruise” options (where tourists fly into an Arctic community, then board a cruise) that are becoming prevalent in Antarctica add a new dimension?
- What are the best ways to collaborate effectively?
- Can we learn to work together quick enough given the urgency?
- What are the barriers to inter-disciplinary research?
- What are the most appropriate scientific collaborations?
- Who is the ‘community’, how is it represented in research, and how do you engage the ‘community’ effectively?
- Who are the key decision-makers, what is their knowledge base, and what are their needs and priorities?

Emma closed by recalling the essence of an impromptu and informal interview about weather-related decisions with an expedition leader from Heritage Expeditions (tour operator specialising in conservation-driven voyages to the Antarctic and Sub-Antarctic from Christchurch, New Zealand) in advance of the PPP meeting. The operator noted that wind, and its effects on swell and waves, is the most critical factor driving decisions—forecasts of precipitation or sunshine are nice to have but are not essential to the operations. Decision-making is focused along both spatial (e.g., landing sites) and temporal (e.g., departure times) dimensions which have implications for what types of information are useful at particular locations and times.

### **Gita Ljubicic**

Gita distilled findings from her community-based sea ice research and experience in Nunavut, Canada into a presentation on identifying and incorporating locally meaningful indicators into the Polar Prediction Project. She observed that language can be both a barrier and a source of new understanding. Characterizing the importance, uses, and changes of sea ice from Inuit expertise revealed that several important Inuktitut terms have no direct English language (and thus WMO technical standard) equivalent—most often these relate to the safety or strength of ice, such as *atuqsarutuq* which means “safe to walk upon”.

This incongruity extends to terms used in weather forecasts, warnings and advisories where criteria and variables important in more populated lower latitude regions are not as meaningful in informing the decisions and activities of Inuit, especially those related to travel and hunting. For example, hunters and elders interpreted ‘blizzard’ conditions as any situation where visibility is reduced such that you cannot see the skis on your snowmobile. Other cues, such as whether or not snow is falling and the specific wind direction are used in making decisions about when and where to travel. This means that conditions can be considered locally adequate for travel even in instances when Environment Canada issues a blizzard warning (i.e., steady winds of 40 km/h or more, blowing and/or falling snow giving visibility less than 400m; all sustained for at least 6 hours). So, forecast elements that are not deemed to be locally applicable are thus often ignored in favour of personal observation and experience, or guidance from other hunters about current travel conditions. Moreover, the important local indicator (visibility threshold <10m) provides an example of potential new challenges to scientific monitoring and weather prediction to address practical needs of residents in polar regions.

Other work has concentrated on linking local indicators (e.g., traditional knowledge of weather and ice) of changes in sea ice with data obtained from instrumented sites and remote sensing (SAR/Radarsat) applications. Work with community experts has defined recent and previous positions of the floe edge, timing of freeze-up and break-up, presence and movement of multi-year ice, and behaviour of and access to wildlife. In many cases local expertise identifies similar trends as from observations derived from instrumental sources and remote sensing techniques.

Specific features and nuances important to local hunters and community members at any given time, however, may not be reflected or detected in current instrumental or remotely

sensed observations, let alone ice and weather forecasts. How to take advantage of the various strengths of each data source, through triangulation, ground truthing, etc., remains an important area of investigation. Advancing this type of inquiry will demand treatments of many considerations, including: how to define relevant meteorological indicators and thresholds; community uses and decision-making related to available forecasting services; societal implications, costs, benefits, and values; role and opportunities for community-based monitoring; spatial scales and temporal coverage; data management and analysis; collaboration and future research planning; and key researchers to consult/involve.

Interesting points were raised in the discussion following Gita's talk, including:

- How long will local knowledge be sustained especially given rapidly changing social (e.g., influence of resource extraction industries) and environmental conditions (e.g., climatic change)?
- Younger generation may be more receptive to non-traditional or hybrid knowledge; issue of dwindling language and travel 'skills' remains though.
- Importance of language and terminology; reflected in some sociological thinking where routines are analysed in terms of meanings, competencies, and material elements—we tend to emphasize the latter which may explain why we never quite understand or solve some of these complex problems.

### ***Daniela Liggett***

Daniela provided an Antarctic perspective on tourism, drawing on research that examined the current regulatory regime and factors that may affect its evolution in the future; environmental risks; associations between behaviour and conflicting values towards the Antarctic, tourism, and conservation; geopolitics and environmental management; and the application of horizon scanning and other methods to anticipate and examine possible futures.

The presentation reminded everyone that the larger social, political, institutional, legal, and economic fabric must always be considered when focusing on the effects, hopefully beneficial, of a relatively narrow application of weather, climate or environmental knowledge or the attribution of impacts and behaviour to specific causes. For example, the dramatic increase in Antarctic ship-borne tourism in the early 1990s, from a few thousand to over 20,000 per year, was largely a response to the freeing-up of vessels for long-term charter in the Russian fleet as the country transitioned from the Soviet era. The increase in activity has prompted concerns about the potential for increased incidents/accidents as vessel operations in Antarctic waters are risky due to the inclement weather, variable and often dangerous ice conditions, and the remoteness and time required to respond/assist. Groundings are the most common type of ship-borne tourism incidents, reflecting as much the lack of, limited access to, unwillingness to share, or failure to update bathymetry charts. Daniela noted that their preliminary risk analysis, which combined findings from available literature, visitation data, and incident reports into a spatial GIS database, may provide a focus for targeting improved polar weather and sea ice information.

Daniela elaborated on her work exploring the social context of Antarctic tourism, with particular emphasis on understanding and appreciating the various and sometimes conflicting values people have towards the Antarctic, nature, and society's role there. Within the sphere of tourism, dominionistic values, where the Antarctic is viewed as a challenge and something to master or conquer, seem to be most critical and at odds with environmental conservation. Concomitantly, such values will drive people into activities and situations which may leave them prone to weather-related hazards or damage and degrade the environment.

While Daniela highlighted a range of qualitative and quantitative research methods, she suggested that the PPP might utilize a "horizon scan" as employed by one of the

International Council for Science's (ICSU) organizations, the Scientific Committee on Antarctic Research (SCAR), to identify and focus future research activities. Combining comprehensive on-line consultations and an in-person retreat, the exercise was inclusive, bottom-up, multi-disciplinary, and integrative, and could be used by the PPP-SERA group as part of any research inventorying activity.

### ***Machiel Lamers***

Machiel positioned the PPP within the context of adaptation research he has completed or initiated with graduate students, post-docs, and colleagues. As with Daniela's presentation, improvements to weather-related knowledge are viewed as part of a much broader picture in which social, political, economic, institutional, and other forces may facilitate or confound the intended application and use of weather information.

One focus of his research on institutional arrangements for tourism, conservation and development examines the durability of private-community partnerships. Understanding the features of such innovative arrangements that promote resilience in the face of considerable political or economic turmoil might translate well to polar communities, especially given the emerging complexity in the number and character of weather information providers (private sector, non-government, traditional national government, community-based, academic, etc.). This would be a particularly important issue in the context of weather warnings for meteorological hazards.

Efforts to understand the dynamic nature of vulnerability is another research activity that could be applied within a rapidly shifting polar environment. Developing scenarios and applying constraints and resources to actors within an agent-based modelling framework would be useful in testing current, often static, assumptions about vulnerability. Machiel noted that his PhD student is applying a variant to the approach in their Caribbean case study, coined companion modelling, which adds co-development and co-production elements by working closely with local citizens and decision-makers.

Working with PhD and post-doctoral students, Machiel is actively researching informational governance and its effect on natural resource management in the Barents Sea region of Russia. Viewed as a 'currency' or source of power, information (or knowledge more generally) can both empower through processes of trust-building, legitimacy, and participation, and, through privileged access, incite controversy, conflict, and privacy concerns. It would be interesting to understand weather-related information through such a lens.

Machiel also identified work he's conducting on practice theory for sustainable tourism as something that might be applicable in the PPP. Practice theory, based in sociology, poses that any given 'practice' or 'routine' is composed of three dynamically inter-related elements: material, competencies (or procedures), and meanings. This framework offers alternative explanations and ways to understand behaviour to traditional social-psychological models (e.g., Theory of Planned Behaviour, dual process models) which focus on individual traits and characteristics. Since it is the physical environment that is literally changing in the Arctic (e.g., sea ice, permafrost)—in other words, an important part of the material element—it is interesting to see what is happening, or would need to happen, in other elements, for instance equipment, double hulled ships, satellites (materials), adaptive capacities, navigational experience (competencies), as well as weather-related information and interpretation (meanings).

### ***Jackie Dawson***

Jackie opened her presentation by discussing the importance of knowledge dissemination and the value of video productions for communication and promotion of the PPP. Videos can

be made relatively cheaply today and are a good means for reaching broad audiences. Jackie noted that it would be worthwhile to make a video for the PPP and in particular for SERA. The cost would be nominal compared to the value (estimated cost CA\$4000).

Several research projects were outlined by Jackie that are relevant to PPP. The research outlined focuses on the human and policy dimensions of environmental and economic change in the Arctic region. Thematic areas of Jackie's research include: shipping, economic development, and coastal community adaptation.

Efforts have been made to establish a comprehensive geospatial database of historic shipping trends across the arctic but with a focus on Canada. This data base also includes sea ice information and will over time include other relevant data such as climate change projections, hazard areas, accident data, marine mammal migration patterns, traditional use areas, etc. Development of the database is part of a collaborative multi-partner ( $n=23$ ) research project titled 'Arctic Marine Use and Transportation' project (AMUT). Partners include federal and territorial government agencies, universities, shipping companies and private sector industries, and relevant non-governmental organizations. It was noted that the database of ship traffic could be useful in the PPP in order to understand marine vessel user needs and trends. The database can be used to project future shipping trends and regions of high use, which could provide an indication of where and when specific weather and climate forecasting data may be particularly useful.

Jackie also highlighted an on-going project being led by her team in partnership with an industrial shipping company and National Research council of Canada. The research uses satellite imagery to identify historic patterns of pressured ice (i.e., ridging) that causing ship besetting events and other mishaps. Besetting events can cause ship operators as much as CA\$60,000 per day. We are currently unable to predict or accurately identify ridges and therefore cannot forecast regions of pressured ice to ships navigating in the Arctic region. The research being conducted by Jackie's team involves creating time series analysis of ridges within established shipping corridors and further analysing historic besetting events in order to better understand the factors that seem to lead to ridges and besetting. It was noted that this project may be relevant for the YOPP and further discussion and consideration should occur.

## **SYNTHESIS OF DISCUSSIONS**

A number of discussion sessions held during the meeting are synthesized below into the following categories and practical points relevant to further developing the SERA component of PPP: Key research questions; Brainstorming actorscape exercise; Research connections to PPP-SERA; Upcoming meetings; and Key resources.

### ***Key Research Questions and Topics***

- How do we measure the societal value and societal (costs) and benefits of the polar regions in general, as well as specific types of human activities in these regions, use vs. non-use of certain areas, and more specifically relevant to the PPP, the value vs. cost of improved forecasting capacity and weather information?
- Who are the key stakeholders, and how do they differ across the Polar Regions?
- What are the potential benefit areas; and how might they differ across the Polar Regions?
- How do we utilize existing international collaborations including partners where English might not be the first language?
- How do we develop research relationships/collaborations with (other) scientists, industry, government and polar communities and overcome issues associated with working in trans-disciplinary teams or across application fields?
- What might a societal companion of YOPP look like?

- How can we better identify and incorporate locally meaningful indicators into the Polar Prediction Project?
- How can we explore new ways of analysing the dynamic character of vulnerability of Polar communities and actor groups?
- How are information flows affecting governance processes and outcomes?
- (How) Are local actor groups benefiting from resource use in the Arctic?
- What are the weather and climate implications for industrial shipping companies and tour operators, and how can we provide input to ensure physical science research is focusing in geographic regions that are more relevant for society?
- How do communities and stakeholders take advantage of socio-economic opportunities associated with climate change?

### ***Brainstorming “actorscape” exercise***

Participants acknowledged the importance of clearly identifying in detail the many actors involved in the polar regions as an important contribution to the PPP and a basic step in any social science research activity. Actors is a preferred term in some social science research in order to include groups of weather forecast/information users and stakeholders but also the many groups directly or indirectly affected by weather-related hazards and actions taken by others to address them. Creating an “actorscape” involves going into much greater specificity than currently defined in the PPP Science Plan (specifically Figure 2: Benefit Areas). To explore how this exercise may potentially support future SERA contributions to PPP, we selected **polar shipping and marine transportation** as a focus of brainstorming activities to attempt to identify a detailed list of relevant actors in various related sectors. What emerged were initial lists of actors categorized into the following groupings: civil society; the private sector; the government sector; inter-governmental organizations; the research sector; Indigenous organizations; and, non-governmental organizations. This preliminary actorscape characterization was helpful in highlighting the diversity of actor perspectives involved. Several additional iterations will be required to consider even this one case example to be comprehensive. Such exercises may also be useful in future meetings to eventually conduct more focused social network analyses to better understand connections within and between the actors identified, and how these relate to PPP deliverables.

#### Civil Society

- social movements
- local residents
- households
- individuals
- recreationalists
- tourists
- adventurers
- education
- subsistence hunters

#### Private sector

- Industrial shipping
- Transport
- Resource exploration
- Tourism
  - Tour operators
  - IAATO
  - AECO
- Fisheries
- Insurance

- Finance and investment
- Weather prediction/forecasting/observation producers
- Commercial hunters
- Telecommunications providers
- Media/social media

#### Government sector

- military
  - civil protection
- politicians, legislative assemblies, etc. intent on protecting/extending sovereign claims
- search and rescue
- surveillance/enforcement
- parks and conservation
- environment
  - weather forecasters
  - sea ice forecasters
- natural resources and development



- transport
- international relations and foreign affairs
- aboriginal affairs
- economic affairs and trade
- international organizations
- environmental organizations
- development organizations
- religious organizations
- humanitarian organizations

Inter-governmental organizations

- Arctic Council
- IMO
- ATS
- UNCLOS
- CCAMLR
- CPC
- IPCC
- COMNAP

Indigenous organizations

- ICC
- ITK
- Saami groups
- Nenets groups

Non-governmental organizations

- heritage organizations

Research sector

- research programs
- research field work
- equipment suppliers
- logistics
  - infrastructure
  - equipment
  - stations
  - vessels
- research vessels
- funding bodies
- research institutions (including universities, think tanks, research institutes, etc.)
- IASC
- SCAR

---

***Research connections to PPP-SERA***

The key research questions and topics identified during the meeting will require further elaboration and deliberation with an expanded network of people and organizations. Towards this end, participants began developing a working list of research connections that could support future PPP-SERA efforts through collaboration on specific projects, knowledge exchange, or by simply keeping informed of PPP-SERA initiatives. Many of the organizations/associations noted in the preliminary listing below have overlapping goals and interests at national and international scales. Potential funding organizations or sources that could be targeted when seeking financial support for future PPP-SERA research projects were also identified. As a follow-up to the meeting, participants were tasked with providing further input to the working list, including the identification of individual researchers or research programs that might be approached to become involved in future projects/proposals or considered as possible new sub-committee members to diversify expertise within the SERA sub-committee.

Organizations/associations:

- Scientific Committee on Antarctic Research (SCAR)
- Association of Polar Early Career Scientists (APECS) who have a social sciences working group
- International Arctic Science Committee (IASC) Human and Social Sciences Working Group
  - contacts: Gail Fondahl or Peter Schweitzer
- International Arctic Social Sciences Association (IASSA)
- GRID Arendal (<http://www.grida.no/>)
  - offices in Ottawa, Canada and Arendal, Norway
  - specialize in environmental information management with a focus on the Arctic
- Arctic Net
- Sustaining Arctic Observing Networks (SAON)
- Southern Ocean Observing System (SOOS)

- National Institute of Water and Atmospheric Research (NIWA) a Crown Research Institute in New Zealand (<https://www.niwa.co.nz/climate>)
- Aurecon - Engineering Meteorology (<http://www.aurecongroup.com/en/thinking/current-articles/engineering-meteorology-making-informed-decisions-to-deliver-project-solutions.aspx>)
- Linking Tourism and Conservation (LT&C; <http://www.ltandc.org>)

Funding-related:

- The Belmont Forum
- The Tinker Foundation – for funding and support?
- Horizon 2020 (European Community)
- Tides Canada
- World Meteorological Organization (WMO) for workshops and expert meetings
- NZARI – New Zealand Antarctic Research Institute (<http://nzari.aq/>)

***Upcoming meetings***

A number of upcoming conferences, workshops, or events were noted throughout discussions. Listed below, they were identified as potential opportunities to maximize participants' time and funding to support future PPP-SERA meetings. They were also discussed as potential venues to share preliminary ideas from this report and to gain feedback to advance some of the proposed research directions with relevant organizations and researchers.

- International Conference on Arctic Research Planning (ICARP III)
- Joint SCAR Antarctic Humanities and Social Sciences Conference (Fort Collins, Colorado, May 20-23 2015)
- Polar Climate and Environmental Change in the Last Millenium (Toruń, Poland, August 24-26, 2015)
- Polar Law Symposium (Fairbanks & Anchorage, Alaska, September 2015)
- SCAR Open Science Conference (Kuala Lumpur, Malaysia, 2016)
- International Polar Tourism Research Network Conference (Iceland, 2016)
- International Congress of Arctic Social Sciences IX (Umeå University, Sweden, 2017)

***Key resources***

A working list of resources relevant to PPP-SERA was compiled based on participant suggestions at various points during the meeting. The list included journals where results of PPP-SERA activities could potentially be published, as well as relevant reports or other project-specific reports or online data sources that could provide important material for SERA discussions.

Journals

Polar Record  
Polar Geography  
The Polar Journal  
Arctic  
Polar Research  
Antarctic Science  
Environmental Science and Policy  
Global Environmental Change

Journals in languages other than English:

- Revista Estudios Hemisfericos y Polares (in Spanish; see <http://www.revistaestudioshemisfericosypolares.cl>)
- Polarforschung (in German; see <http://www.polarforschung.de>)
- ПРОБЛЕМЫ АРКТИКИ И АНТАРКТИКИ (translates as “the Problems of the Arctic and Antarctic”, or “Arctic and Antarctic issues”, in Russian; see <http://www.aari.ru/misc/publicat/paa.php>)

Reports

ISSC and UNESCO (2013), World Social Science Report 2013, Changing Global Environments, OECD Publishing and UNESCO Publishing, Paris

United Nations Environment Program (UNEP) Global Environment Outlook (GEO) reports (often feature the polar regions to some extent).

Other Information Resources

- Cape Dorset Atlas of Inuit Sea Ice Knowledge and Use (<http://sikuatlas.ca>)
- Polar Data Catalogue (<https://www.polardata.ca/>)
- Straight Up North portal for publicly funded research conducted by Gita Ljubicic ([http://straightupnorth.ca/Sikuliriji/SUN\\_Home.html](http://straightupnorth.ca/Sikuliriji/SUN_Home.html))

**A DRAFT ACTION PLAN FOR PPP-SERA**

Following the ‘digestion’ of Day 1 presentations and deliberations, Emma Stewart offered to provide and lead discussion on a skeleton outline for PPP-SERA. The original outline, as amended with input from other participants, is presented below and represents the beginnings of an action plan that charts the next year or two of activity. Note that many of the early activities and tasks defined in the Framing Phase will serve to identify and prioritize specific SERA elements for YOPP.

<b>Timeline</b>	<b>Phase</b>	<b>Actions/Tasks</b>	<b>Contributors</b>
Mar 2015	<b>Framing Phase –A</b>	PPP-SERA Organizing Meeting (1)	PPP-SERA-SC
Apr 2015		Form PPP-SERA Sub-Committee (SC) with 1-2 liaison members on PPP Scientific Steering Committee <ul style="list-style-type: none"> <li>• Terms of reference</li> <li>• Web site</li> <li>• Social media</li> </ul>	PPP-SERA-SC
Jul 2015		Participation in YOPP Summit and PPP-SSC meeting <ul style="list-style-type: none"> <li>• consolidated presentation</li> <li>• series of posters/videos of related research</li> </ul>	PPP-SERA-SC
Sep 2015		Establish benefit areas and create an inventory of key actors/contacts across both Polar Regions	PPP-SERA-SC
Jan 2016		Conduct high-level scan (of key contacts) to establish: <ul style="list-style-type: none"> <li>• research priorities</li> <li>• user experiences, preferences and perceptions (needs, existing tools,</li> </ul>	PPP-SERA-SC

Timeline	Phase	Actions/Tasks	Contributors
		preparedness)	
Mar 2016-Jan 2017		Draft PPP-SERA Scoping Document <ul style="list-style-type: none"> <li>• literature review (gaps, issues)</li> <li>• research aligned with YOPP and PPP Science Plan</li> <li>• stakeholder/user/actor involvement better practices</li> <li>• stand-alone social science research</li> <li>• solicitation of input to draft</li> </ul>	PPP-SERA-SC
Apr 2016		PPP-SERA Meeting 2 (New Zealand) <ul style="list-style-type: none"> <li>• regular meeting with full membership</li> <li>• writing workshop to advance scoping document</li> </ul>	PPP-SERA-SC
Oct 2016-Feb 2017		Journal article (synthesis of scoping document)	PPP-SERA-SC
Mar 2017		SERA-YOPP Concept Plan <ul style="list-style-type: none"> <li>• Attributes: multi-scale, multi-year, multi-site, trans-polar, transdisciplinary</li> </ul>	PPP-SERA-SC
Apr 2017		PPP-SERA Meeting 3 (Sweden?) <ul style="list-style-type: none"> <li>• regular meeting with full membership</li> <li>• SERA-YOPP planning and implementation meeting</li> <li>• Research proposal writing workshop</li> </ul>	PPP-SERA-SC
Jan 2018	<b>Co-creation Phase B</b>	To be determined	
Dec202X			
Jan 202X		<b>Integration Phase C</b>	
Dec 202X			

## **IMMEDIATE NEXT STEPS**

### PPP-SERA Sub-Committee

All participants present (Appendix A) committed to becoming the inaugural members of the PPP-SERA SC, pending finalization of terms of reference and confirmation of resourcing (travel support) from the WMO-WWRP and PPP-ICO. It is proposed that two members will serve as formal liaisons with the PPP-SSC, initially Jackie Dawson and Brian Mills. Rotation of members and liaisons are proposed to occur every 2 (minimum) to 4 years with extensions requiring SERA-SC and PPP-SSC approval.

### Preparation for the YOPP Summit and PPP-SSC meeting (Geneva, July 2015)

The timing prevents most SC members from participating due to previous commitments, however, the SC will be represented by Brian Mills and Machiel Lamers. A joint PPP-SERA presentation will be developed and members will examine other ways of demonstrating some of their research, potentially through posters or via webinar or video feeds.

### PPP-SERA Action Plan Development

The draft Action Plan tabled in this report will be vetted by SC members and additional social science colleagues with a new draft available for discussion at the PPP-SSC. Progress will be made on individual elements in the PPP-SERA Action Plan as indicated in the current draft.

## **CLOSURE OF MEETING**

The meeting closed at 15:30 following an off-site lunch and informal discussion.

## APPENDIX “A” - PARTICIPANTS PARTICIPANTS

INVITEE	ORGANIZATION AND ADDRESS
Peter Chen	Senior Advisor Polar Prediction Project International Coordination Office World Weather Research Programme World Meteorological Organization Geneva, Switzerland <a href="mailto:peterchen1974@gmail.com">peterchen1974@gmail.com</a>
Jackie Dawson	Canada Research Chair in Environment, Society and Policy & Assistant Professor Department of Geography, University of Ottawa 60 University Avenue Ottawa, Ontario, Canada K1N 6N5 +1 613 562-5800 ext. 1051 Jackie.Dawson@uottawa.ca
Machiel Lamers	Assistant Professor Environmental Policy Group Department of Social Sciences Wageningen University Hollandseweg 1 6706KN Wageningen The Netherlands *31 (0)317484274 <a href="mailto:machiel.lamers@wur.nl">machiel.lamers@wur.nl</a>
Daniela Liggett	Lecturer University of Canterbury & Gateway Antarctica Private Bag 4800, Christchurch 8020, NZ +64 3 364 2987 ext. 6367 <a href="mailto:daniela.liggett@canterbury.ac.nz">daniela.liggett@canterbury.ac.nz</a>
Gita Ljubicic	Associate Professor Department of Geography & Environmental Studies Carleton University 1125 Colonel By Dr., B349 Loeb Building Ottawa, Ontario K1S 5B6 +1 613 520 2600 ext. 2566 <a href="mailto:Gita.Ljubicic@carleton.ca">Gita.Ljubicic@carleton.ca</a>
Lindsay Matthews	Graduate Student Department of Geography, University of Ottawa 60 University Avenue Ottawa, Ontario, Canada K1N 6N5 lmatt082@uottawa.ca
Brian Mills	Meteorological Research Division Environment Canada c/o Faculty of Environment, University of Waterloo 200 University Avenue West Waterloo, Ontario, Canada N2L 3G1 +1 519 888 4567 ext. 35496 E-mail: <a href="mailto:Brian.Mills@ec.gc.ca">Brian.Mills@ec.gc.ca</a> or <a href="mailto:bmills@uwaterloo.ca">bmills@uwaterloo.ca</a>
Emma Stewart	Senior Lecturer, Faculty of Environment, Society & Design Lincoln University Lincoln 7647, Canterbury, New Zealand +64 3 4230500 <a href="mailto:Emma.Stewart@Lincoln.ac.nz">Emma.Stewart@Lincoln.ac.nz</a>

## APPENDIX B

<p>WORLD METEOROLOGICAL ORGANIZATION COMMISSION FOR ATMOSPHERIC SCIENCES (CAS) <b>World Weather Research Program (WWRP) Polar Prediction Project (PPP) Societal and Economic Research and Applications Meeting</b></p> <p>Ottawa, Canada (12-13 March 2015)</p>	<p>CAS/WWRP-PPP-SERA-Meeting 1/DOC1.1 (updated 11-February 2015)</p> <p>Item: Draft Agenda, Documentation Plan, Participants list</p>
---	---

## LOCATION

University of Ottawa  
Faculty of Social Sciences Room 5028  
Ottawa, Canada

---

### BACKGROUND DOCUMENT REFERENCE LIST *(attached to e-mail and indicated in RED alongside appropriate agenda item)*

- 1.1 PPP-SERA-Mtg1-Ottawa\_Doc1.1\_AGENDA.pdf
- 2.1 PPP Science Plan
- 2.2 PPP Implementation Plan
- 3.X Participant papers/reports?

---

## DRAFT AGENDA

### WEDNESDAY, MARCH 11

Arrival and check-in at Lord Elgin Hotel. Informal dinner plans pending people's schedules and energy levels--Brian Mills to coordinate based on e-mail input from participants (default is to meet people wishing to have dinner together in lobby at 19:00).

### THURSDAY, MARCH 12

*\*Meet at the Lord Elgin lobby entrance at 08:30 for walk over to University of Ottawa*

#### **2. ORGANIZATION OF THE MEETING AND INTRODUCTIONS (09:00-09:30)**

- Opening of the meeting and welcome (Jackie and Brian)
- Round table introductions
- Overview of meeting objectives
- Review of the agenda and working arrangements *(Doc1.1)*

#### **3. POLAR PREDICTION PROJECT (PPP) CONTEXT (09:30-11:15)**

- Overview presentation on PPP (Brian and/or Peter) *(Doc2.1, 2.2)*
- Open discussion about PPP and constructive critique of social science elements

**Break (10:30-10:45)**

- Brainstorm session to map out an “actor-scape” of polar regions: Who or what is at risk from weather- or climate-related hazards and who or what organizations are involved in managing such risks?

#### **4. PARTICIPANT PRESENTATIONS ON ONGOING RESEARCH AND IMPORTANT RESEARCH QUESTIONS/THEMES (11:15-16:00)**

Each presenter will be given roughly 40 minutes of time. A computer with PowerPoint and Adobe software and projection unit will be available, however, participants are welcome to use alternative formats (e.g., oral account, handouts, interactive discussion, etc.) that suit them best.

Participants are asked to discuss aspects of their research, either in-depth focused on a particular study or perhaps a broader overview, and relate important questions, methods, findings and observations from their work to the PPP and/or general theme of knowledge production, communication, and utilization in polar regions (i.e., among individuals, households and families; communities; social or cultural groups/organizations; academic/research institutions; governing bodies; businesses and industries).

As part of the final 10 minutes of their presentation, participants are asked to pose and lead a discussion regarding one particularly important research question or issue that may be relevant for social scientific inquiry in the PPP.

- Emma Stewart
- Tristan Pearce

#### ***Lunch (12:45-13:30)***

A buffet lunch will be provided in the meeting room on the first day.

- Gita Lubjicic
- Daniela Liggett
- Machiel Lamers
- Jackie Dawson

#### ***Break (16:00-16:15)***

#### **5. IMPORTANT QUESTIONS AND CHALLENGES (16:15-17:00)**

- Based on previous presentations and discussion, brainstorm session to identify and prioritize the important challenges and questions that intersect weather, climate and society in polar regions.

---

### **FRIDAY, MARCH 13**

#### **4. DAY 1 REVIEW (0900-0930)**

- Reflections on Day 1 discussions (epiphanies, reconsidered opinions, and new thoughts)

#### **5. SCOPING, REFINING, AND ORGANIZING A PPP-SERA INITIATIVE (0930-1300)**



- Discussion 1: Role of the researcher; ways of “knowing”; and the sharing, exchanging, and building of knowledge in projects like PPP.
- Discussion 2: Cooperation, coordination, and sharing among social scientists and their research programs/projects
  - identification of completed, on-going, and planned projects related to PPP and recommendations for soliciting involvement
  - potential for an “intensive observation and study period within PPP (i.e., Year of Polar Prediction, YOPP-SERA)
  - advice on working within multi- or inter-disciplinary projects

***Break (11:00-11:15)***

- Discussion 3: Encouraging broader interaction, participation and communication among all PPP researchers and those that may benefit from the project
- Discussion 4: Next steps toward building a PPP-SERA research network
  - project sub-committee
  - review paper
  - joint proposal writing workshop
  - PPP YOPP workshop and Steering committee meeting (Geneva)

**6. INFORMAL DISCUSSIONS AND CLOSURE OF MEETING (13:45-15:00)**

The final session of the meeting will be held informally over lunch at a restaurant to encourage and foster one-on-one discussions.

---

## APPENDIX C - References

- Amelung, B. & Lamers, M. (2007). "Estimating the Greenhouse Gas Emissions from Antarctic Tourism". *Tourism in the Marine Environment* 4(2): 121-133.
- Chown, S., Lee, J., Hughes, K., Barnes, J., Barrett, P., Bergstrom, D., Convey, P., Cowan, D., Crosbie, K., Dyer, G., Frenot, Y., Grant, S., Herr, D., Kennicutt, M., Lamers, M., Murray, A., Possingham, H., Reid, K., Riddle, M., Ryan, P., Sanson, L., Shaw, J., Sparrow, M., Summerhayes, C., Terauds, A., Wall, D. (2012). Challenges to the Future Conservation of the Antarctic. *Science* 337 (13 July 2012): 158-159.
- Dawson, J., Johnston, M.E., and Stewart, E.J., "Governance of Arctic expedition cruise ships in a time of rapid environmental and economic change.", *Ocean and Coastal Management*, 89(1), 88-99, 2014.
- Dawson, J., Johnston, M.E., Stewart, E.J., and Lemieux, C.J., *Cruise Tourism in Arctic Canada: summary of adaptation strategies.*, SSHRC, 2013.
- Dawson, J., Stewart, E.J., Lemelin, R.H., and Scott, D., "The carbon cost of polar bear viewing in Churchill, Canada.", *Journal of Sustainable Tourism*, 18(3), 319-336, 2010.
- Dawson, J., and Scott, D., "Climate change and tourism in the Great Lakes region: a summary of risks and opportunities.", *Tourism in Marine Environments*, 6(2-3), 119-132, 2010.
- Dawson, J., Maher, P.T., and Slocombe, D. S., "Climate change, marine tourism and sustainability in the Canadian Arctic: contributions from systems and complexity approaches.", *Tourism in Marine Environments*, 4(2-3), 69-83, 2007.
- Farreny, R., Oliver-Solà, J. Lamers, M., Amelung, B., Gabarrell, X., Rieradevall, J., Boada, M. & Benayas, J. (2011). Carbon dioxide emissions of Antarctic tourism. *Antarctic Science* 23: 556-566
- Furgal, C., Laidler, G., and Piekarz, D. 2009. Community-based Inuit Qaujimagatunqangit (IQ) Weather and Sea Ice Forecasting Workshop. Workshop hosted by Environment Canada, Indian and Northern Affairs Canada, and Nunavut Tunngavik Incorporated, Iqaluit, Nunavut. (March 5 - 6, 2007).
- Haase, D., Lamers, M. & Amelung, B. (2009). Self-regulation of tourism in Antarctica: Exploring the conditions for success and failure. *Journal of Sustainable Tourism*, Vol. 17(4): 411-430.
- Hegger, D., Lamers, M., Van Zeijl-Rozema, A. & Dieperink, C. (2012). Conceptualising knowledge co-production in climate change adaptation projects: success conditions and levers for action. *Environmental Science & Policy* 18: 52-65
- ISSC and UNESCO (2013), *World Social Science Report 2013, Changing Global Environments*, OECD Publishing and UNESCO Publishing, Paris
- Johnston, A., Johnston, M.E., Dawson, J., and Stewart, E.J., "Challenges of changes in Arctic Cruise tourism: perspectives of federal government stakeholders.", *Journal of Maritime Law and Commerce*, 43(3), 335-347, 2012.
- Johnston, A., Johnston, M.E., Stewart, E.J., Dawson, J., and Lemelin, R.H. "Perspectives of decision makers and regulators on climate change and adaptation in expedition cruise ship tourism in Nunavut.", *Northern Review*, (35), 69-95, 2012.
- Johnston, M.E., Dawson, J., Stewart, E.J., and De Souza, E., *Strategies for managing Arctic pleasure craft tourism: A scoping study. A report prepared for Transport Canada.*, Thunder Bay, Ontario, 2013.

Laidler, G. J. and Elee, P. 2006. Sea ice processes and change: exposure and risk in Cape Dorset, Nunavut. In: Riewe, R. and Oakes, J. (eds.) *Climate Change: Linking Traditional and Scientific Knowledge*. Winnipeg and Québec City: University of Manitoba Aboriginal Issues Press and ArcticNet. pp. 155-175.

Laidler, G. J. and Elee, P. 2008. Human geographies of sea ice: freeze/thaw processes around Cape Dorset, Nunavut, Canada. *Polar Record*, 44, 228: 51-76.

Laidler, G. J. and Ikummaq, T. 2008. Human geographies of sea ice: freeze/thaw processes around Igloodik, Nunavut, Canada. *Polar Record*, 44, 229: 127-153.

Laidler, G. J., Dialla, A., and Joamie, E. 2008. Human geographies of sea ice: freeze/thaw processes around Pangnirtung, Nunavut, Canada. *Polar Record*, 44, 231: 335-361.

Laidler, G. J., Elee, P., Ikummaq, T., Joamie, E., and Aporta, C. 2010. Mapping Sea-Ice Knowledge, Use, and Change in Nunavut, Canada (Cape Dorset, Igloodik, Pangnirtung). In:

Krupnik, I., Aporta, C., Gearheard, S., Laidler, G. J., and Kielsen-Holm, L. (eds.). *SIKU: Knowing Our Ice, Documenting Inuit Sea-Ice Knowledge and Use*. Dordrecht: Springer. pp. 45-80.

Laidler, G. J., Ford, J., Gough, W. A., Ikummaq, I., Gagnon, A., Kowal, S., Qrunnut, K., and Irgaut, C. 2009. Travelling and hunting in a changing arctic: Assessing Inuit vulnerability to sea ice change in Igloodik, Nunavut. *Climatic Change*, 94: 363-397.

Laidler, G. J., Hirose, T., Kapfer, M., Ikummaq, T., Joamie, E., and Elee, P. 2011. Evaluating the Floe Edge Service: How well can SAR imagery address Inuit community concerns around sea ice change and travel safety? *The Canadian Geographer*, 55, 1: 91-107.

Lamers, M., Liggett, D., Tin, T. (2013). Strategic thinking for the Antarctic environment: the use of assessment tools in governance. In: Tin, T., Liggett, D., Maher, P. & Lamers, M. (editors). *Antarctic futures: Human engagement with the Antarctic environment*. Dordrecht: Springer.

Lamers, M., Eijgelaar, E. & Amelung, B. (2011). Last chance tourism in Antarctica – Cruising for change? In: Lemelin, H., Dawson, J., Stewart, E. (eds.) *Last-Chance Tourism: Adapting Tourism Opportunities in a Changing World*. London: Routledge. (pp. 25-41)

Lamers, M. & Amelung, B. (2010). Climate change and its implications for cruise tourism in the Polar Regions. In: Lueck, M., Maher, P. & Stewart, E. (Eds.) *Cruise Tourism in the Polar Regions: Promoting Environmental and Social Sustainability*. London: Routledge. (pp. 147-163)

Lamers, M., Haase, D. & Amelung, B. (2008). Facing the Elements: Analysing trends in Antarctic Tourism. *Tourism Review* 63(1): 15-27.

Lang, D. J., et al (2011) *Transdisciplinary Research in Sustainability Science: Practice, Principles and Challenges*. Sustainability Science DOI 10.1007/s11625-011-0149-x

Lemelin, R.H., Dawson, J., and Stewart, E. J., *Last Chance Tourism: adapting tourism opportunities in a changing world.*, London, Routledge, 2012, pp.237.

Lemelin, R.H., Dawson, J., Stewart, E.J., Maher, P.T., and Lueck, M., "Last chance tourism: the doom, the gloom and the boom of visiting vanishing destinations.", *Current Issues in Tourism*, 13(5), 477-493, 2010.

Liggett, D. & Engelbertz, S. (2013). Values and political decision-making: The case of Antarctic Tourism. In Lemelin, H., Maher, P. & Liggett, D. (Eds.). From talk to action: How tourism is changing the Polar Regions. Proceedings of the 3rd International Polar Tourism Research Network conference.

Pashkevich, A., Dawson, J., Stewart, E.J. (in press). "Governance of expedition cruise ship tourism in the Arctic: a comparison of the Canadian and Russian Arctic.", *Tourism in Marine Environments*.

Pizzolato, L., Howell, S.E.L., Derksen, C., Dawson, J., and Copland, L., "Changing sea ice conditions and marine transportation activity in Canadian Arctic waters between 1990 and 2012.", *Climatic Change*, 123(2), 161-173, 2014.

Pizzolato, L., Howell, S.E.L., Dawson, J., Copland, L., Dereckson, C., and Johnston, M.E., Climate change adaptation assessment for transportation in Arctic waters (CATAW) scoping study. A report prepared For Transport Canada., Thunder Bay, Ontario, 2013.

Pulsifer, P. L., Laidler, G. J., Taylor, D. R. F., and Hayes, A. 2011. Towards an Indigenist Data Management Program: Reflections on Experiences Developing an Atlas of Sea Ice Knowledge and Use. *The Canadian Geographer*, 55, 1: 108-124.

Stewart, E.J., Dawson, J., Howell, S.E.L., Johnston, M.E., Peare, T., and Lemelin, R.H. "Local-level responses to sea ice change and cruise tourism in Arctic Canada's Northwest Passage.", *Polar Geography*, 36(1), 142-162, 2012.

Stewart E.J., and Dawson, J., "A matter of good fortune? The grounding of the "Clipper Adventurer" in the Northwest Passage, Arctic Canada.", *Arctic*, 64(2), 263-267, 2011.

Stewart, E.J., Tivy, A., Howell, S.E.L., Dawson, J., and Draper, D., "Cruise tourism and sea ice in Canada's Hudson Bay region.", *Arctic*, 63(1), 57-66, 2010.