



Research Priority Team 2

Co-Chairs meeting, Akureyri, Iceland, October 21-24, 2024
Syndonia Bret-Harte, Margaret Rudolf, Robbie Mallett, Wilson
Cheung

Who are we?

- 39 members on the team
- 4 co-Chairs (Margaret, Syndonia, Robbie, Wilson)
- Disciplines represented include plant and ecosystem ecology, marine ecology and oceanography, sea ice, snow, glaciology and cryosphere processes, atmospheric circulation and deposition/cycling, co-production of knowledge and indigenous engagement
- Our theme: **Observing, Reconstructing, and Predicting Future Climate Dynamics and Ecosystem Responses**

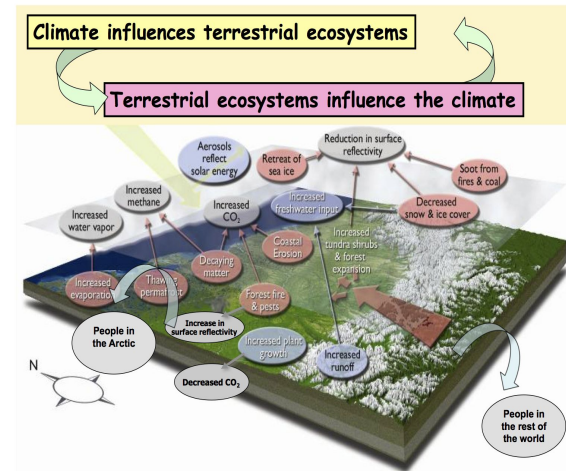
Syndonia Bret-Harte



RPT 2 Role: Co-Chair

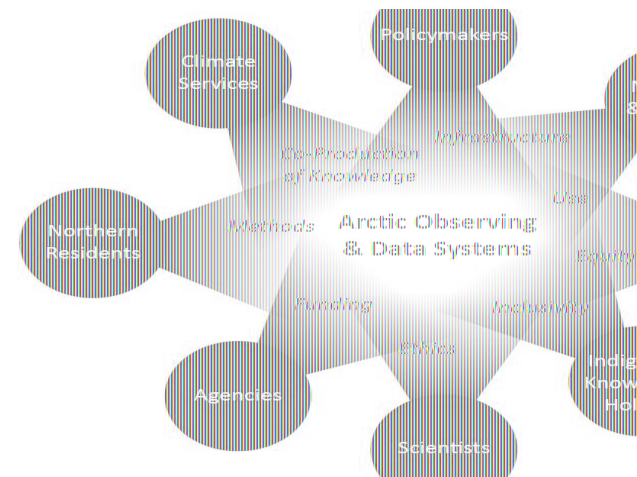


Affiliation: Professor, University of Alaska Fairbanks; Science co-Director, Toolik Field Station



Expertise: Long term observations, terrestrial vegetation and ecosystem ecology

Margaret Rudolf



RPT 2 Role: Co-Chair

Affiliation: Post-doc with RNA CoObs and Advisory Panel member on SAON's Arctic ROADS

Expertise: Co-production of knowledge, convergence, evaluation, Indigenous engagement, Arctic research and observing



Robbie Mallett



RPT 2 Role:

RPT2 Co-Chair



Affiliation:

Earth Observation Group,
Physics & Technology Dept,
UiT The Arctic University of Norway



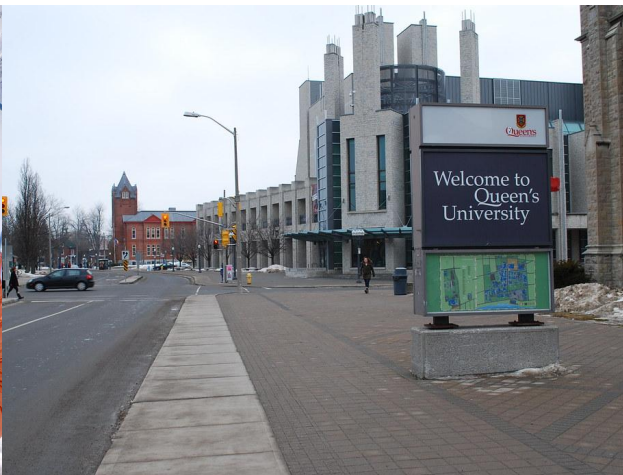
Expertise:

Satellite Monitoring of Sea ice
Snow science



UiT The Arctic
University of Norway

Wai Yin Cheung (Wilson)



RPT 2 Role: Co-Chair

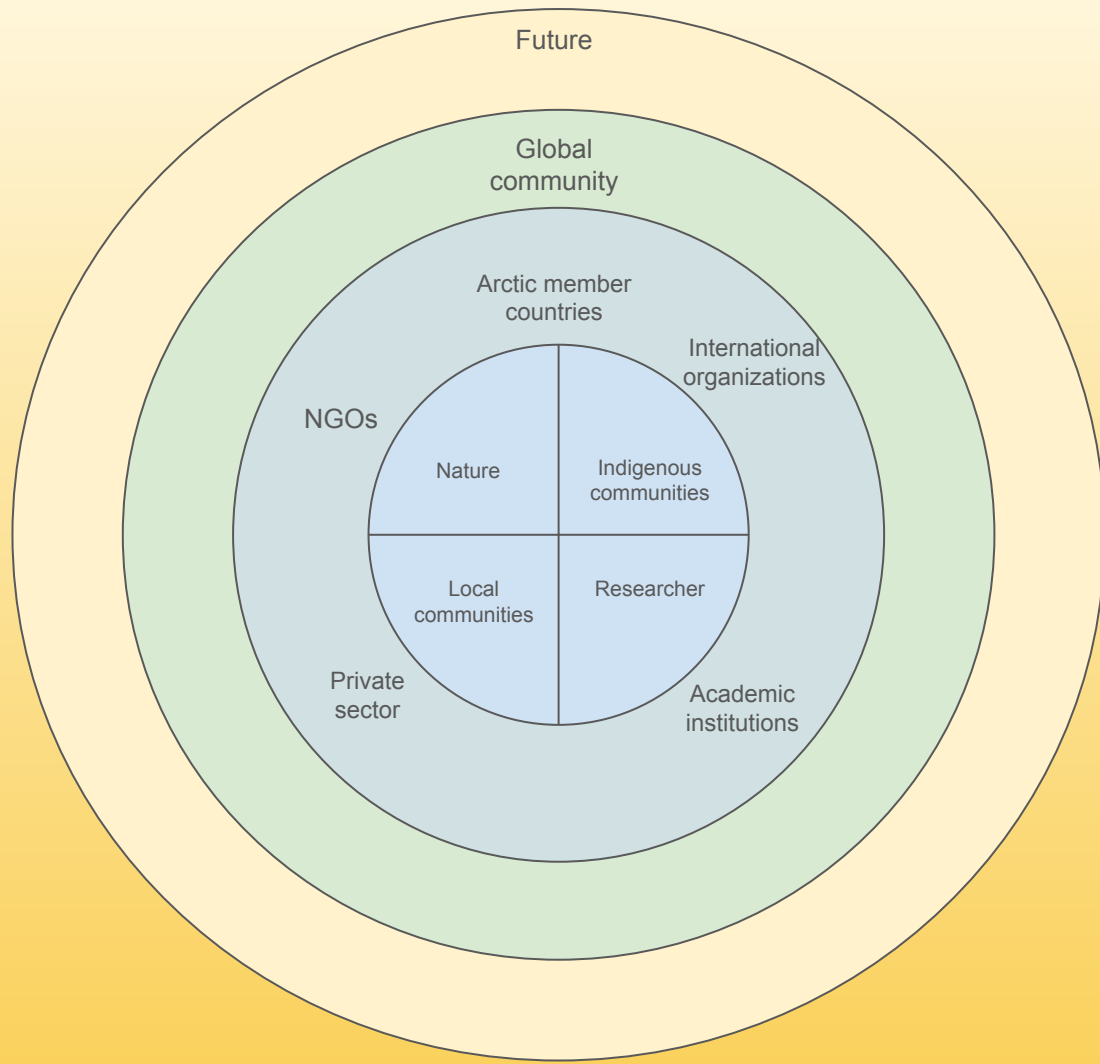
Affiliation: ICElab Queen's University

Expertise: Glaciology | Remote Sensing | Photogrammetry | Cross Cultural Studies | Citizen Science



How we have structured our work to date

- We identified a mental model for stakeholders/rightsholders at the ASSW meeting in Edinburgh
- **We organized ourselves into Subgroups:** Terrestrial (includes inland waters), Marine, Atmosphere, Cryosphere, Interactions, Indigenous
 - Self selection; some people joined more than one subgroup
 - Each subgroup reviewed relevant literature in their area, developed one to a few gaps and priorities
 - Based on literature review and expertise
 - Used AI to quickly summarize priorities from the literature (backed up by humans reading documents)
- Subgroups met on their own to produce statements of gaps, priorities, and background information
- The whole team had check-ins approximately monthly
- Co-Chairs facilitated meetings, took notes, produced a combined draft document of gaps and priorities
- Draft document at https://docs.google.com/document/d/1KUx-RzCdCv-jlV19NtfdiQUJLq7_3lpXpFAw6JuBqd0/edit?tab=t.0#heading=h.jr34hpf8dnzn



Second iteration

Notes:

- Global and local businesses - local and state control of businesses complexity
- Countries mostly in the Arctic are represented in the local communities
- Indigenous and local communities is inclusive of their local governance
- Policy makers are under Arctic member countries and local communities
- Climate services under research/government
- Other RPTs might be good to note somewhere (should the RPTs be denoted somewhere within the schematic or outside of the schematic but connected?)
- Iterative feedback that will help us determine the priorities

Details

- Create separate word document with more detail and categorize more detailed representatives into these broader categories
- Record why certain groups are left out

Initial suggestions for gaps and priorities

- Three **general gaps** and three **general priorities** that span across all subgroups
- One gap and one priority for each of the terrestrial, marine, and cryosphere subgroups, and three gaps/recommendations from the atmospheric subgroup
- The interactions subgroup is still working on their gaps and recommendations

General gaps and Priorities

- **Gap:** The status of data collection across the Arctic: geographic, temporal, and subject matter coverage is inadequate. Data collection is often performed in an *ad hoc* manner, resulting in geographic and temporal gaps. Community-wide repositories exist, but data are not always publicly shared, risking duplicated efforts
 - a) **Priority:** Fund long-term data collection programs and emphasize cross-boundary data sharing
- **Gap:** Modeling capabilities for hindcasting and future projections of ecosystem responses need improvement. Current models contain limitations, especially in interactions between the terrestrial environment, permafrost thaw, and other factors. There is also a need for more hindcasting under previous paleoclimates.
 - a) **Priority:** Improve modeling capabilities for Arctic ecosystems through a multinational effort for model development and coordination across groups

General gaps and priorities

- **Gap:** Indigenous participation in Arctic research from project to research policy level is not yet sufficient.
 - How Arctic observations, reconstructing, and predicting are actionable for Indigenous self-determination and supporting Indigenous rights and sovereignty.
 - **Priority :** Researchers and funders should prioritize and advocate for research projects that meet guidance put forth by local and regional Indigenous groups, including (co-)developing new equitable and ethical methods and practices.
 - Consideration of ethics and actions for past environmental data collection without free, prior, and informed consent, and lack of support for Indigenous data sovereignty
 - **Priority:** This implementation of ethics and actions is needed for both future and past environmental data collection.

General gaps and priorities

- **Priority:** Co-developing integrated monitoring and management frameworks
 - Key Actions:
 - Co-produce research agendas and projects
 - Establish training programs to build capacity for Indigenous researchers
 - Implement long-term, pluralistic, inclusive monitoring networks
 - Support Indigenous communities/groups to develop and implement their own research protocols and ethics

More specific gaps & priorities

- 1) **Terrestrial gap:** Lack of understanding of effects of increased disturbances and controls over ecosystem stability under current global warming. Long-term data on disturbances like wildfires and permafrost thaw are lacking. There are also knowledge gaps in the impacts of climate change on carbon cycles and species-specific responses.
 - a) **Priority:** focus on comprehensive, long-term monitoring of ecosystems and disturbances, to identify potential ecological tipping points, which is crucial for predicting and potentially mitigating irreversible ecosystem transformations.
- 2) **Marine gap:** Arctic Ocean knowledge gap regarding ongoing climate change on the Arctic land-shelf-basin continuum. There is a lack of sustained observations in the central Arctic Ocean, and nearshore marine knowledge is also lacking. Polar amplification in the ocean is likely to cause environmental changes affecting global climate, as well as arctic climate.
 - a) **Priority:** Observe and reconstruct the Arctic Ocean circulation and its interaction with marine ecosystems and biogeochemical cycles

More specific gaps and priorities

3) **Cryosphere gap:** nonlinear feedbacks of cryospheric change and their implications for local, regional, and global climate systems are not well understood. The implications of changes such as sea ice reduction and permafrost thaw, and feedbacks involving greenhouse gas and nutrient releases need further research

Priority: Enhance integrated cryosphere monitoring networks by collecting data for glaciers, permafrost, and sea ice, incorporating Indigenous Knowledge and fostering collaboration to predict the impacts of cryosphere changes.

4) **Atmosphere gap:** Changes in atmospheric circulation patterns are not well understood. Observing changes in atmospheric circulation and the transport of moisture is crucial for understanding climate dynamics and predicting ecosystem impacts.

Priority: Strengthen observation systems through international collaboration, integrating remote sensing and modeling activities to improve understanding of atmospheric changes and their linkages.

More specific gaps and Priorities

5) Atmosphere gap: Uncertainties in relation to regionally differentiated atmospheric circulation patterns and biogeochemical cycling/deposition patterns.

Priority: Use models to guide systematic observations across different Arctic regions and seasons, addressing regional and seasonal differences effectively.

6) Atmosphere gap (but could be more general): Synthesizing model output and smaller scale observations to provide better predictions. There are enormous challenges to combine both big data (models, satellites, long-term observations) to small data (fieldwork, limited in time and space)

Priority: Develop an open-source platform to maintain Arctic knowledge graphs, enabling researchers and stakeholders to easily identify knowledge gaps and input their knowledge.

What we need to do before the ICARP summit

- Refine gaps and priorities with input from the other RPTs
 - Some narrowing down will likely occur
- Recommend implementations plans for the next 10 years
 - This will likely be a fairly big job
 - Gaps and priorities are fairly general, because they come from the literature