# Working Group report

**WG number : 5**

**Targeted Societal Outcome : A safe ocean where life and livelihoods are protected from ocean-related hazards**

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**Ocean Decade Definition of the Outcome :**
Hydro-meteorological, geophysical, biological and human induced hazards create devastating, cascading and unsustainable impacts for coastal communities, ocean users, ecosystems, and economies. The changing frequency and/or intensity of weather- and climate- related hazards is exacerbating these risks. Mechanisms and processes for assessing priority risks, mitigating, forecasting and warning of these hazards and formulating adaptive responses are required to reduce short- and longer-term risks on land and at sea. Higher density ocean data and improved forecast systems - including those related to sea level, marine weather and climate are needed from near real time through decadal scales. When these enhancements are linked to education, outreach, and communication, they will empower policy and decision-making, and they will mainstream individual and community resilience. How these enhancements can be realised forms the focal point of the working group

**Identify regional challenges that need to be overcome to achieve Southern Ocean priorities (*cfr* report) over the next 10 years in the context of your appointed Societal Outcome.**

- *Research challenges (purely scientific)*
    - *R1 Understand how physical changes, and resulting biological effects ultimately cascade and lead to unpredictable, compounded contingencies, risks and impacts for economic and societal actors*
    - *R2 Assess which communities, economic sectors and activities that base their livelihoods in/around the Southern Ocean are most vulnerable in the face of emergencies, and why (e.g. is it due to a policy issue, systemic injustices, etc.)*
    - *R3 Understand how the changing conditions and changing dimensions of human activities in the Southern Ocean impact the type and level of risk and vulnerability, as well as determine where these risks and vulnerabilities are*
    - *R4 Understanding user needs and human behaviour. Through co-production of knowledge, information services, trans-disciplinary projects, and research that empirically examines user perceptions, decisions, and responses to forecasts (environmental predictions) and hazard warning messages we can enhance services and increase human safety and resilience.*
    - *R5 Develop the techniques that will allow downscaling from global to regional and local-scale environmental forecasts*
    - *R6 Understand how extreme events affect the Antarctic cryosphere and Southern Ocean*

- *R7 Develop more detailed risk maps of storm surges*
- *R8 Understand how the probability of extreme events (thermal, hydrological etc.) changes under global warming and natural low-frequency variability and how this affects our ability to predict such events*
- *R9 Identify risks and vulnerabilities in the Southern Ocean in order to define adaptation and mitigation actions in response to climate change*
- *R10 Quantify, forecast and of severe space weather events*
- *R11 Identify the processes controlling the stability and equilibrium of glaciers and ice sheets and how they will affect future global sea level*
- *R12 Understand how the characteristics of the ice sheet bed, such as geothermal heat flux and sediment distribution, affect ice flow and ice sheet stability*
- *R13 Estimate $CO_2$ equivalent thresholds that may foretell collapse of all or part of the Antarctic Ice Sheet*
- *R14 Understand how communities and southern ocean operators perceive the risks of a changing environment, how they may be impacted, how they may adapt and their future environmental information needs. Develop trans-disciplinary projects to: communicate research findings around changing environmental conditions and impacts to Southern Ocean*
- *R15 Understand how Antarctic processes affect mid-latitude weather and extreme events*
- *R16 Understand the tsunami hazard resulting from instability on Antarctic continental margins*
- *R17 Understand the extensive dissociation of gas hydrates in submarine and subglacial sediments*
- *R18 Improve environmental prediction resolution, accuracy, reliability and accessibility, across different timescales, and in line with stakeholder and user (consumer) needs.*
- *R19 Understand Antarctica as a workplace, including workers' perceptions of safety, workforce makeup, and the training and capabilities needed for the future polar workforce*

- *Logistical and technical challenges (funding, infrastructure, data accessibility, etc.)*
  - *L1 Develop appropriate responses in case of accidents to protect life, the environment and community values. There is a need to develop emergency response capacities to mitigate consequences of accidents, natural hazards, and disasters*
  - *L2 Improve the safety of all ship operations, depending on the performance and navigation capabilities of ships in ice infested waters, and linked to environmental hazards. Emergency response operations require assessment on the accessibility of the area in concern, especially on what ships are capable of accessing the area. The operations require real time environmental information.*
  - *L3 Investigate how search and rescue operations can be enhanced*
  - *L4 Manage the risk of severe space weather events*
  - *L5 Underpin the development of technologies as well as institutional mechanisms and operational competences to meet the challenges associated with increasing and changing risks and vulnerabilities*

- *L6 Ensure vessels are designed for use in, not just transit through, Southern Ocean*

- *Uptake challenges (effective communication between stakeholders, engaging the public)*
  - *U1 Engage iteratively with policy-makers to develop a focus on the existing and likely future threats to Southern Ocean ecosystems and communities.*
  - *U2 Identify which and how various measures can reduce safety risks, for example by enhancing information and communication infrastructures, safety standards, competence training and education, search and rescue capabilities, and collective action.*
  - *U3 Increase policy-makers awareness around thresholds of changes and hazards*
  - *U4 Develop proactive engagement with all bodies responsible for vessels operating in the Southern Ocean, from National operators to individuals, to communicate and develop common safety tools.*
  - *U5 Develop engagement strategies to help understand user needs and human behaviour as it relates to forecasting.*
  - *U6 To promote understanding of the importance and benefits of this research, ongoing investment and resourcing needs, and communicate findings, outcomes and recommendations.*
  - *U7 Connecting across a range of scales (local experiences working with Southern Ocean, including nearshore), vessels for conditions en route to Antarctica, ice conditions*

**Identify tangible actions that would be able to address these challenges. Delineate the scope of suggested actions (leading organisation, involved stakeholders, funding, timeline, implementation).**

Action 1

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| **Name of Action** | Workshop on outputs from relevant research efforts |
| **Related challenge** | R1 through R19 |
| **Short description** | Convene a workshop to gather the most relevant recent research on each of the identified research challenges including e.g. Year Of Polar Prediction (YOPP), Coupled Model Intercomparison Project (CMIP6), SCAR Covid19 Impacts survey etc. |
| **Key stakeholders to consider** | SCAR, SOOS, WMO, UNESCO + |
| **Timeline** | Mid 2022 (before SCAR OSC 2022) |
| **Potential resources** | Scientific Workshop specific online platform |
| **Other comments** | |

Action 2

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|---|---|
| **Name of Action** | Safely operating in the Southern Ocean meeting |
| **Related challenge** | L1 through L5; U2 |
| **Short description** | Bring together the relevant bodies representing vessels that operate in the Southern Ocean to focus on common issues of safety |
| **Key stakeholders to consider** | COMNAP, IMO, SOOS, Polar Citizen Science Collective, IAATO, Governments / Defence (Navy), Border Security, Research Organisations Vessels, Polar Logistics Support Commercial IHOs Hydrographic Commission on Antarctica. |
| **Timeline** | 2022 |
| **Potential resources** | TBD as decided by organisations |
| **Other comments** | |

Action 3

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| Name of Action | Transdisciplinary projects |
| Related challenge | R1 through R19, L1 through L5, U1 through U6 |
| Short description | Trans-disciplinary projects to: communicate research findings around changing environmental conditions and impacts to Southern Ocean stakeholders and communities; enhance engagement, education and services; and investigate ways to build resilience and adaptability and reduce risks to human safety. |
| Key stakeholders to consider | COMNAP, IMO, SOOS, SCAR, Polar Citizen Science Collective, IAATO, Governments / Defence (Navy), Border Security, Research Organisations Vessels, Polar Logistics Support Commercial Operators, WMO, UNESCO+ |
| Timeline | 2022 |
| Potential resources | TBD as decided by organisations |
| Other comments | |

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**Describe already-existing activities and stakeholders who are presently working towards resolving these challenges.**

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| **Name of Action** | SCAR Strategic Plan 2023-2028 development |
| **Related challenge** | U1 through U6 |
| **Short description** | SCAR will be drafting and developing its next Strategic Plan to cover 2023 to 2028 over the next year. Ensuring the SOdecade project is included in planning will allow SCAR to engage partners and policy fora across this period. |
| **Leading organisation** | SCAR |
| **Key stakeholders** | COMNAP, Antarctic Treaty System, CCAMLR, IAATO |
| **Timeline** | Present to July 2022 |
| **Resources** | |
| **Other comments** | |

**Rank suggested actions in order of priority while taking into account feasibility and timeline. The highest ranking actions will be included in the Southern Ocean Action Plan and will most likely require additional notes.**

| **Order of priority** | Action number & name |
|---|---|
| **1** | Action 2 |
| **2** | Action 1 |
| **3** | **Action 3** |
| **...** | |

**If you have any further comments/suggestions, please describe them below.**

****** Don't forget to have a look and comment on the reports of other Working Groups. ******