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# *The Atlantic – Shared Resource*
## Galway 23rd May 2013

## REPORT OF THE SCIENTIFIC WORKSHOP

On 23rd May 2013, marine scientists from the United States of America, Canada and Europe gathered in Galway (Ireland) to identify the key scientific and societal challenges that need to be addressed in order to deliver (by 2020) a predictive capacity [*both short term predictions and long term forecasts*] for the major risks and changes in the dynamics of the North Atlantic as outlined in the vision statement below.

In identifying key challenges, the participants support the view that a North Atlantic Ocean Observation and Forecasting Capacity is essential to address key scientific, environmental, governance, policy and societal challenges of mutual concern and that cooperation would result in mutual benefits including better ecosystem assessments and forecasts, a deeper understanding of vulnerabilities and risks including those related to global climate change and climate impacts (e.g. sea-level rise, shifts in biogeography of commercially important species, etc) and other anthropogenic impacts including those related to resource exploitation (e.g. fisheries, deep sea mining, etc). Furthermore these activities will create new opportunities for job creation and economic growth, referred to in Europe as blue growth.

**Vision Statement:** Through seamlessly integrating science and technology and improved collaboration between Canada, the European Union and the United States of America, our common objectives are to have by 2020:

An enhanced predictive capacity for the major risks and changes in the dynamics of the North Atlantic Ocean, its ecology, circulation system, interactions between the Atlantic and Arctic as well as ocean-atmosphere connections;

Based on existing and new capability, to have implemented a *fit for purpose* North Atlantic multi-platform ocean observing and forecasting system driven by science and societal needs and providing real time data and long term time series;

Mapped the Atlantic to underpin the accuracy of predictive models and forecasts and identified key tectonic /volcanic sites, as well as ecologically and economically important (and potentially undiscovered) seafloor and water column habitats;

Enabled the safest operational and risk management environment for operation at sea as well as for offshore and coastal users;

Forged greatly strengthened collaborative operational and scientific undertakings of mutual benefit and integrated these activates seamlessly across the North Atlantic between Europe and the North Americas;

Supported the development, through public, academic and private sector partnerships (e.g. clusters of innovation), of a range of new and innovative knowledge based and globally traded products and services, including novel observing technologies and innovation to promote new opportunities for sustainable socio-economic growth;

Revolutionised our understanding of the role of the North Atlantic in earth system dynamics, especially with respect to interactions with coastal zones and with the Arctic, Central Atlantic and Mediterranean;

Promoted ocean literacy, engaged with societal stakeholders (including citizen participation) and inspired and educated the next generation of trans-disciplinary scientists and engineers.

The Workshop, through presentations and discussion, identified a broad suite of challenges ranging through those related to the acquisition of the knowledge required to assess and respond to climate change impacts, implement an ecosystem approach, reduce uncertainty generated by observations and modelling, improve safety at sea, human health and well-being, the identification and use of new and emerging technologies, standardisation of sampling protocols, data access and use (and reuse) and the harmonisation of habitat classification systems. This wealth of data will be retained to support and inform the more in-depth studies and initiatives that must follow if we are to realise the vision of an integrated North Atlantic Ocean Observation and Forecasting System.

**Key Challenges:**

- The integration of historical and paleo data, ocean observing and forecasting systems to provide better indicators of past, current and future environmental status;
- Advance existing technologies (including approaches emerging from other disciplines), ecosystem and biogeochemical models, as well as developing empirical and modelling approaches to enable the quantification of evolutionary change in ocean systems;
- Quantify the effects of multiple stressors on biogeochemistry, organisms and ecosystems;
- Proactively translate knowledge, based on an ecosystem approach, to improve the stewardship of natural resources;
- Mainstreaming of cost effective chemical and biological (including genomic) sensors as well as robotic and autonomous systems for ocean observation;
- Evaluate the role of biodiversity in the health and functioning of ecosystems and the maintenance of ecosystem services;
- Determine the mechanisms initiating hazardous events and identify indicators to improve the forecast of the spatial-temporal occurrence of these events;
- Develop and maintain the capacity for rapid response to unanticipated and episodic events that require immediate scientific investigation to advance knowledge;
- Build an industry, academia and government cross sector vision of a shared data collection, management and information infrastructure;
- Engage with existing international networks (e.g. GEO – Blue Planet Initiative) to set the Atlantic in a global context;
- Standardisation of sampling and observation techniques, common data standards and harmonised habitat classification systems to facilitate open data access and the use and reuse of data.

In response to the question posed to the Workshop "*Are current Ocean Observation Systems fit for purpose to address key societal challenges*? The consensus opinion was that the current patchwork of ocean and coastal observing capabilities, though providing a basis for a *fit for purpose* ocean and coastal observation and forecasting infrastructure, lacks the required spatial and temporal coverage, inter-operability and the full range of chemical and biological sensors needed to realise and deliver the shared vision.

**Recommendations**

Rapid progress towards this vision can be achieved by integrating current programmes and infrastructures on a trans-Atlantic basis. In this context, we recommend a series of **Trans-Atlantic Workshops** to:

- elaborate and distil the many suggestions put forward at the Conference and further refine a set of key Atlantic / Arctic scientific challenges that would benefit from a joint approach;
- evaluate the basis for and feasibility of a jointly funded and competitive research programme to address North Atlantic research issues of mutual interest;
- undertake a more detailed review of existing North Atlantic ocean observation capacities, address identified gaps and challenges and deliver the required predictive capacity by 2020;
- establish mechanisms to promote trans-Atlantic data sharing, using as a test case seabed mapping;
- make recommendations on the optimum approach to habitat mapping such that mapping initiatives, carried out separately or jointly, can be seamlessly merged. This will include a review of existing and emerging mapping techniques, common standards and habitat classification systems;
- examine options for trans-Atlantic joint actions on ocean literacy and engagement with societal stakeholders.

## Session Reports:

**Session 3.1. Sea and Seabed Habitat Mapping**

- Establish a mechanism to examine and expand communications to bring together existing seabed and seabed habitat mapping groups and develop procedures to (a) map national territories and (b) the high seas, possibly on a cost shared basis.
- Complete a preliminary phase of mapping the Atlantic seafloor (multibeam, backscatter and bathymetry). This mapping will underpin the accuracy of prediction models and forecasts, the accuracy of their outputs and identify areas requiring secondary phase (follow-up) mapping to include key tectonic / volcanic sites, critical habitats, seabed and water column habitats and time series mapping.
- Establish universal standards/classification systems for seabed and seabed habitat mapping.

**Session 3.2: Atlantic-Arctic trans boundary issues**

- Identify and quantify two - way Arctic-Atlantic physical, chemical and biological interactions.
- Enhance capacity for year round multidisciplinary observations.
- Incorporate key Arctic processes, such as sea ice in N. Atlantic/Arctic prediction systems.

**Session 3.3: Operational Oceanography /Forecasting**

- Operations are continually evolving so maintaining existing observation networks and associated modelling capacity (system) is critical – do not allow decline to creep in. New observational technologies should not lead to a decline in existing capabilities but should be continually assessed for their fitness for purpose.
- Operational oceanography needs to develop and evolve – research and innovation are continually needed to improve output, improve efficiency and lower costs of 'input' and extend capacity to new domains, for example ecosystem services.
- A mechanism to co-develop and design future operational oceanographic services is needed. Collaboration using established fora has proven valuable in the global context (e.g. climate).
- An Alliance of operational oceanographic services would ensure more coherent and effective monitoring and forecasting of the North Atlantic.
- A goal over the next ten years is to improve the responsive capability (e.g. ability to deal with crises such as Deep Water Horizon).

**Session 3.4. Current Ocean Observing Systems**

- Improved deployment of human resources: While our technological resources are considerable and rapidly improving, we need to improve our abilities to work across disciplines and with the aid of local/user communities. Our improved ability to make observational data rapidly available has been an important step forward, but to take synthesis and understanding to the next level, we also need better integration across disciplines.
- Adaptive Rapid Response: Responding rapidly to disasters or other episodic events requires flexible funding opportunities (e.g., the U.S. National Science Foundation's RAPID awards program) and also networks of responders ready to deploy quickly. Planning for the unexpected should include considering how models could be quickly converted to apply to systems other than the ones for which they were developed.
- Prioritization: The observing community as a whole needs to better confront the difficult task of prioritizing observations to ensure that—in the long term—the most critical observations are made. A baseline structure should be established for the most critical observations. Designed properly, the structure could serve as a magnet for process studies.