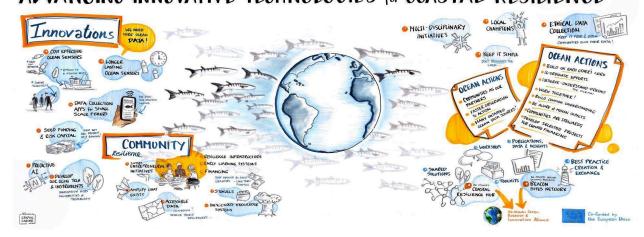# Workshop on 'Advancing Innovative Technologies for Coastal Resilience'

Cape Town, South Africa

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Graphic harvest of the workshop, by Sonja Niederhumer

science, technology & innovation
Department:
Science, Technology and Innovation
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Background

Coastal regions in developing countries are often disproportionately vulnerable to climate-induced changes such as rising sea levels, and extreme weather events, yet they face unique resource constraints that complicate efforts to build resilience. Limited financial resources, access to technology, and capacity for infrastructure development often hinder the ability to address and mitigate these challenges effectively.

The workshop on **"Advancing Innovative Technologies for Coastal Resilience"** explored how cutting-edge solutions can be tailored to meet these resource challenges. This included prioritising affordable and scalable technologies, leveraging indigenous knowledge systems and community-led approaches, and fostering international collaboration to share expertise and innovative funding solutions. It emphasised the importance of adaptive strategies that account for local contexts, balancing innovation with practicality to achieve sustainable results.

This workshop functioned as a feedback platform under the African region OKEANO Advisory Mechanism meeting as well as an action of the Ocean20 Engagement Group. The OKEANO Advisory Mechanism was established to ensure that the All-Atlantic Ocean Research and Innovation Alliance (AAORIA) activities align with the needs of Atlantic communities, emphasising ocean observation and modeling to understand marine ecosystems and biodiversity in a changing climate. The workshop focused on coastal resilience and partnerships in ocean research. The outcomes from the workshop will contribute to NRF-SAEON's Ocean20 Ocean Actions. The Ocean20 Engagement Group, under the G20, is co-convened by NRF-SAEON and the UN Global Compact along with several international partners.

The workshop, facilitated by Shannon Hampton (AfriSeas Solutions) and hosted by the NRF-SAEON, was held on the 3rd of April 2025 in Cape Town, South Africa alongside the 14th International Conference on Southern Hemisphere Meteorology and Oceanography (ICSHMO). Excluding the project team, the workshop was attended by approximately 38 in-person participants and 7 participants joining online.

Programme Agenda

Theme	Speaker	Organisation
Welcome	Tammy Morris	NRF-SAEON
Opening remarks	Jonathan Heimer	German Marine Research Consortium (KDM)
Ocean experts panel	Casha de Vos Odwa Mtati Patrick Gorringe Nico Willemse Lazarus Chapungu Yi Chao Yanga Malotana	ABALOBI South African International Maritime Institute Swedish Meteorology and Hydrology Institute Blue Nature Alliance University of South Africa (UNISA) SEATREC University of Pretoria
Closing and way forward	Tammy Morris	NRF-SAEON

Summary of Event

Welcome

Tammy Morris (NRF-SAEON) welcomed participants to the first workshop that will contribute towards the Ocean20[1] (O20) Ocean Actions. She encouraged everyone to get involved in and share ideas for Ocean Actions, therefore making sure that South Africa's contribution to the G20 puts the ocean on everyone's radar. She highlighted the importance of protecting and restoring the ocean while developing the ocean economy in a sustainable manner. Coastal resilience and adaptation was highlighted as a crucial aspect of ocean sustainability and economic growth, and innovative technology can help progress the ideas of coastal resilience.

Opening Remarks

Jonathan Heimer (KDM) introduced the work undertaken through the All Atlantic Research and Innovation Alliance (AAORIA) within the OKEANO Coordination and Support Action (CSA). The AAORIA research areas were selected to exchange solutions and promote an All Atlantic community of common interest to advance science and collaboration with a focus on two action areas: coastal resilience and ocean observation.

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[1] https://g20.org/track/ocean-o20/

The All Atlantic Network of Coastal Resilience Beacon sites is aiming to connect communities with concrete onsite action around the Atlantic, and encourage the exchange of existing solutions and best practices by highlighting success stories. The All Atlantic Coastal Resilience Hub[2] provides a platform to exchange solutions and provide visibility to the communities and decision makers by providing easily understood and accessible information. The hub is the home of the network and showcases the work being done; connects different user groups (technical and decision making); and facilitates co-design, exchange of needs, experiences and best practice.

Jonathan highlighted examples from the hub that ranged from plastic pollution solutions, combating erosion in Senegal, and nature based solutions in the Wadden Sea. Scientific publications, publicly available data, and interdisciplinary coastal resilience toolkits are also accessible through the hub. In addition to the wealth of online information and exchanges, in-person workshops with pilot site managers, scientists, and local communities have taken place over the last year to better understand what is needed to optimise the exchange of solution orientated science and actions among stakeholders.

Coastal resilience is a global topic and many of the toolkits and solutions can be applied all over the world. Jonathan invited those who are interested to showcase their stories on the network. The hub continues to evolve to meet the needs of the community and encourages feedback and participation from all interested stakeholders.

Q&A

What is a beacon site? Sites are where on the ground work is taking place and actions are being implemented, including implementing solutions or monitoring coastal hazards.

Ocean Experts Panel

The panel included global and national experts with diverse backgrounds. **Odwa Mtati** is the CEO of SAIMI, an organisation that was established to advance maritime education and capacity enhancement, maritime advocacy and maritime research and innovation. **Yi Chao** is an oceanographer and the founder and CEO of SEATREC, a company that makes the next generation ARGO floats and commercial products to deliver more ocean data. **Yanga Malotana**, is from ESI Press at the University of Pretoria which works to keep academic work accessible and free. **Lazarus Chapungu** is from the Institute for Corporate Citizenship at the University of South Africa (UNISA) and he is the editor of a book in progress on climate change and coastal resilience in Africa. **Casha de Vos** from ABALOBI described how it is a social enterprise that works with small scale fisheries communities to build technical tools to improve their governance and manage their data and access markets. **Patrick Gorringe** leads the international programmes for the Swedish Meteorology and Hydrology Institute, including working with partners to make ocean data more available and

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[2] https://coastalresilience.allatlanticocean.org/

accessible. **Nico Willemse** is the Africa lead from the Blue Nature Alliance and highlighted his passion for understanding the impacts on climate change and its influence on livelihoods. He has previously worked on climate finance - working on projects that attract funding for climate solutions.

Panel of experts from the left: Nico Willemse, Patrick Gorringe, Casha de Vos, Lazarus Chapungu, Yanga Malotana, Yi Chao and Odwa Mtati.

Yi described how expensive collecting data in the ocean can be, and more so as you go farther offshore. Offshore ARGO floats are effective, but expensive to maintain. He highlighted how the costs of data decrease if the instruments used to collect it have a longer lifespan. He has been exploring ways to develop technology that lasts. Patrick, noted he has been working on developing cost-efficient ocean sensors, which can then be used in large numbers across large geographic areas. He shared examples of how fishing boats or surfers can use technology to collect data using these cost-efficient sensors. Odwa explained how SAIMI is working with South African universities to assess capacity and skills within the country for monitoring illegal fishing, understanding climate change, and fish stock identification. Technological development needs to go hand-in-hand with skills development.

Casha described how ABALOBI has developed digital data collection tools that fishers can use to collect and analyse data in real time. This facilitates knowledge-based decision making for the fishing community. Lazarus highlighted how coastal communities are at the frontline of climate change - experiencing the impact that is not always understood in academia, and thus the local context needs to be better understood. Where communities have been affected by climate change, it is important that when rebuilding occurs, the local coastal engineers design infrastructure that is resilient to the impacts of climate change, and that local communities are assisted in accessing climate finance. Local communities need access to weather information and early warning systems. There is a need to co-create solutions to climate events and plans for how communities are able to adapt and respond. Localised governance systems need to be strengthened so that communities are able to adapt to the impacts of climate change.

Climate finance can be a complex issue for commercial businesses to tackle, and in many cases there is not always a solid business case for financing climate resilience for coastal communities. Finance innovation includes exploring mechanisms for value addition for natural resources. Nico highlighted that this is when you would bring in different sources of finance, including grant mechanisms (for example, the Global Environment Facility and Green Climate Fund), to unlock project potential through seed financing. This money can be used as risk finance. Supporting climate resilience requires financiers, innovators and governments working together in multidisciplinary approaches.

Yanga highlighted how coastal resilience efforts face major challenges, including technology access, policy gaps, and short-term funding models that fail to support long-term sustainability. Projects often overlook community needs, leading to disconnection and a lack of lasting impact once funding ends. To address this, communities must be included in decision-making from the start, with a focus on entrepreneurial, locally driven initiatives. Existing grassroots systems, like stokvels[3] in KZN, demonstrate the power of strong social networks and local knowledge. True resilience requires a bottom-up approach, breaking down language barriers and valuing community-led solutions over top-down interventions. Rather than aiming to restore a previous "normal", efforts should embrace long-term, transformative change. This requires a meaningful co-design strategy.

Discussion

It was recognised that the varied challenges brought about by climate change require adaptable policy and a variety of approaches. The discussion highlighted critical issues surrounding access to data and information, emphasising that simply making data freely available is not enough. Barriers persist in data interpretation, visualisation, and communication, particularly at the community level. Co-design with communities, tailored communication strategies, and translating scientific knowledge into local languages are essential to ensure data is meaningful and actionable.

Participants stressed the importance of dynamic, adaptive approaches to data use across different scales and contexts, and advocated for stronger collaboration between scientists and social scientists to better translate findings for communities and policymakers. Citizen science initiatives have demonstrated the power of local engagement in data generation and application, especially in regions with sparse data coverage like Southern Africa. A transdisciplinary approach to research and communication approaches is required to make sure that questions are co-designed and results are communicated effectively and timeously.

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[3] *Stokvels are informal savings clubs or rotating credit associations commonly found in South Africa. A group of people agree to contribute a fixed amount of money regularly into a shared fund. This pooled money is then distributed to one member of the group on a rotating basis, or used collectively for agreed-upon purposes.*

Artificial Intelligence (AI) was recognised as a valuable tool in both traditional meteorological forecasting and emerging applications such as safety at sea, data interpolation, and sensor-level data collection. AI capability has been included in the design of underwater drones. Science, engineering, manufacturing, and the users of these technologies drive the science and technology based on questions that need to be answered. The role of universities was underscored in building local capacity, fostering innovation, and enabling the development of homegrown technologies. This includes shifting from importing instruments to building them locally, supporting sustainability and economic and capacity development. New technologies should be developed in-country with a profit-generating business model in mind.

There was a query around the "data as a service" business model. This is not seen as a viable way to generate a profit, but rather showcases the effectiveness of the equipment that can be sold for a profit. There are also ethical concerns around data use and community ownership, with the example that publicly funded research should include a requirement for open access data. Oceanographers are still evaluating the value of data produced and whether data alone can be a financially viable business model. The need for neutral data repositories and coordination mechanisms was highlighted to avoid duplication and improve collaboration. Data lies at the core of everything - we need robust, accessible data systems. Where traditional data is lacking, creative thinking can incorporate valuable data from citizens, divers, surfers, and fishers.

To make meaningful progress, we must first build on existing work and methodologies, remaining aware of ongoing efforts to avoid duplication. A coordinating mechanism for data and research activities would be instrumental in streamlining our collective work and fostering greater synergy. We must enhance our in-country capacity for innovation and empower local actors and institutions to drive solutions that ensure sustainability and relevance. Ocean observation is critical, because to predict the ocean, we must first understand it, and to understand it, we must observe it. This cycle to observe, understand, and predict requires powerful collaboration across disciplines: including scientists, engineers, and social scientists. Collaboration is not enough on its own. We need a common understanding of what we're collectively working towards. The question of impact must remain at the forefront: how are people affected by our work? We should not lose sight of the people behind the numbers.

The depth of knowledge already present is inspiring, but it is time to move beyond conversations and into action. Are we progressing, or are we caught in discussion loops? Communities must be seen not as passive beneficiaries but as active partners - stewards of ecosystems and holders of invaluable local knowledge. In many cases, this is not a matter of charity; it is a matter of survival. We must move beyond pledges and toward real partnerships - beyond sympathy and into solidarity with the communities. There is no such thing as coastal resilience without acknowledging and addressing the people living near the coast. We need to move from observation to action more quickly and learn from regions that are already demonstrating effective models.

Finally, when it comes to implementation, we need to start small but, importantly, start now. The Nationally Determined Contributions (NDC) documents outline mitigation and adaptation projects with cost estimates. By taking one project, securing financing, and implementing it we can build momentum from small wins toward larger-scale transformation. This is how we move forward: with action grounded in knowledge, partnerships rooted in mutual respect, and a shared commitment to both people and planet.

Final remarks from participants centered on the need for tangible actions, not recurring discussions. Speakers urged the need for practical, scalable projects, greater cooperation, and a recognition of communities as stewards of ecosystems, not merely as vulnerable populations. Ultimately, coastal resilience must be community-driven, supported by interdisciplinary approaches, and built upon shared goals with a lasting legacy in mind.

Key Action Points

- **Community-centric approaches**: Co-design solutions with local communities to ensure relevance, ownership, and sustainability. Support capacity building for communities to access and use data, weather information, and early warning systems.
- **Data accessibility and usability:** Go beyond open access by improving data visualisation, interpretation, and translation for diverse users and increase visibility of existing data.
- **Technology innovation & local development:** Invest in cost-efficient, scalable, and locally produced ocean technologies. Promote the role of universities in developing instruments and building local technical capacity.
- **Climate finance & investment strategies:** Align funding mechanisms with long-term coastal resilience needs rather than short-term grants. Blend financing sources (e.g., seed funding, climate funds) to de-risk projects and attract further investment. Develop business cases around value addition to natural resources for sustained economic benefit.
- **Artificial intelligence & emerging tools:** Leverage AI for applications such as ocean safety, forecasting, sensor integration, and filling data gaps. Ensure ethical use of AI, especially with regard to community data.
- **Partnerships & coordination:** Foster multidisciplinary collaboration among academia, government, private sector, and civil society - building on the strengths of different specialities to maximise impact. Recognise communities not just as vulnerable populations, but as ecosystem stewards and key partners.