Enhancing Coastal and Ocean Observing and Innovation: OAR and IOOS

Image: NOAA and partner scientists are working to restore corals in this coral reef nursery; Source

Technology Development and Transition

OVERVIEW

The development of modern tools and technology has established new data streams that require innovative approaches to more effectively transition new or improved technology to stakeholders. However, many challenges exist with developing and transitioning technologies, including the unpredictability of funding; disparate lexicons across Line Offices and organizations; intellectual property rights; and navigating the non-linear, complex technology transition process.

Oceanic and Atmospheric Research (OAR) and Integrated Ocean Observing System (IOOS) can enhance collaborative efforts to more effectively and efficiently develop and transition technologies that capture the rapidly changing oceanic ecosystem, climate, and atmospheric conditions and meet key user needs. Improving technology transition efforts will benefit the understanding of the climate, weather, ocean, and coasts as well as also enhance our Nation's Blue Economy.

Enhancing technology development and transition requires a shift in culture and planning to:

- Create value quickly and agilely to maximize momentum by developing minimum viable products.
- Expand the use of lean project management.
- Develop a business-oriented strategy to harness public-private partnerships.
- Embrace continuous improvement of developed technologies.
- Leverage NOAA's cross-agency strategies of artificial intelligence (AI), cloud computing, uncrewed systems, 'omics, data, and citizen science.

Technology Development and Transition: OAR and IOOS

Image: A researcher calibrates instrumentation; Source

OPPORTUNITY

Key areas for IOOS-OAR technology development and transition:

- Power and persistence of uncrewed system vehicles for multi-discipline observations.
- Develop a feedback loop between engineering development, scientists and operators for engineering advances (e.g., battery life, data transmission, etc.).
- Carbon dioxide removal technologies and methods.
- AI and cloud system development (data stream, data dissemination, communications, data infrastructure, use of AI to determine patterns).
- Automated 'omics (eDNA) samplers.
- Harmful Algal Bloom (HAB) research to support a larger vision (e.g., reliable full-scale HAB network for forecasting).
- Data management to ensure OAR's involvement is carried down to the local level.
- Improve efficiency and accuracy of water quality testing (e.g., toxin substances, microplastics, phycotoxins, water quality).

Outcomes:

- Identify existing and new data streams (e.g. Using capabilities developed for the Global Tropical Moored Buoy Array project).
- Establish data management and infrastructure procedures, including data transmission, quality assurance and quality control protocols, and standardization of data/tech/sensor formats.
- Develop a Research to Operations (R2O) Community Of Practice that will develop best practices and consistent terminology for use across Line Offices and organizations.
- Identify and pursue sustained funding mechanisms for priority topics to complete research- and stakeholder-driven development.

NEXT

Near-term (0-1 years):

- Identify IOOS and OAR roles and responsibilities: Who, what, and when?
- Identify existing data streams for integration into the IOOS Regional Associations discovery visualization portals.
- Enhance IOOS and OAR communication around technology transition.
- Enhance IOOS and OAR collaboration and synchronization on data management and infrastructure.

Mid-term (2-5 years)

- Develop clear language for Research to Operations (R2O) outside of the National Weather Service (NWS)
- Address cultural barriers between IOOS and OAR to enhance R2O.
- Work to develop lower-cost, accurate sensors.

Long-term (5+ years)

- Develop and transition carbon dioxide removal sequestration technology.
- Enhancing data assimilation of Biogeochemical (BGC) and bioecological data into Ecological Forecasting.
- Address technology and data needs for the wind, solar, and wave energy sectors.

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