

Tillaga að verkefni á nýjan vegvísi um rannsóknarinnviði 2025

Titill verkefnis: Marine Open Observation Network (MOON)

Heiti stofnunar: Háskóli Íslands & Hafrannsóknastofnun

Vinsamlegast hafið eftirfarandi atriði í huga við gerð tillögunnar

Umsækjandi þarf að svara öllum liðum hér að neðan. Þar sem stendur „Texti“ er hægt að skrifa texta, setja inn myndir eða töflur.

Tillögum að innviðum á vegvísi um rannsóknarinnviði skal skilað á þar til gerðu eyðublaði. Ekki er leyfilegt að eiga við uppsetningu eyðublaðsins.

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Festur til að skila inn tillögum er til 12. september 2024, kl. 15.00.

Nánari upplýsingar er að finna á heimasíðu Innviðasjóðs og hjá sérfræðingum Innviðasjóðs hjá Rannís í gegnum tölvupóstfangið innvidasjodur@rannis.is

Lýsing á tillögu til birtingar á heimasíðu Innviðasjóðs

1. Samantekt: Stutt lýsing innviðum

Adequate ocean observation and monitoring around Iceland is a challenging task that can be difficult for a small nation to support; it requires a well-defined, collaborative, and multidisciplinary strategy among the involved institutions. Despite these difficulties, this research is crucial. Healthy marine ecosystems are fundamental for ocean services that benefit society, including the sustainable use of fish stocks, a key pillar of the Icelandic economy. Marine ecosystems will undoubtedly face increased stress due to rising exploitation and the impacts of climate change. Iceland, situated in a highly dynamic convergence zone, holds significant international responsibility for ocean research in the Greenland-Iceland-Scotland ridge. This unique location is vital for monitoring shared fish stocks, whale migration, species distribution shifts and assessing oceanic effects of climate change, including shifts in the Atlantic Meridional Overturning Circulation (AMOC). The small size of the national institutions involved in ocean observation makes it imperative to develop robust research infrastructures capable of fulfilling this multifaceted role. This roadmap should be rooted in collaboration, cost analysis, automation and optimized data utilization. We propose a three-part structure to establish the necessary research infrastructure for ocean sciences in Iceland. The proposal is based on 1) automatic, multifunctional, multidisciplinary, ocean observatory hubs, 2) multifunctional surface and underwater autonomous vehicles (AUV's), and 3) efficient open-access databases and computational services.

2. Meginmarkmið með uppbyggingu innviða?

A group of ocean scientists at the University of Iceland (UI) and the Marine and Freshwater Research Institute (MFRI) has worked on this proposal through regular meetings and by systematically summarizing of infrastructure needs and existing strengths. Ocean research in Iceland is expensive due to its high latitude, vast geographical scope, ship costs and the specialized maintenance needs of high-tech equipment. Prioritizing projects at the MFRI suffers from the lack of manpower and high ship costs. For smaller groups and individual researchers in Iceland, it can be insurmountable to finance ocean observation and monitoring research, as national research grants rarely cover the costs of ship time and crews of research vessels. Therefore, improving ocean research in Iceland, without a significant increase in public funding, depends on advancing technical infrastructure with further automation and better utilization of existing and newly collected research data related to ocean observation and monitoring. The proposal was developed to meet the following criteria. 1) prioritize efficiency, automation, and minimization of maintenance, 2) enhance data management and expand computing capacity to support automatic analyses and computational models, 3) build the infrastructure on existing strengths in research fields and areas, 4) ensure that all data collected is open and accessible, 5) address and bridge regional data gaps, and 6) contribute to the global efforts established by the UN Ocean Decade Challenges (2020-2030).

3. Hvernig mun innviðaupbyggingin stuðla að nýliðun og leiða til aukins samstarfs og betri nýtingar innviða?

There is a recruitment problem in ocean science in Iceland. The issue is partly due to the universities' limited capacity for independent ocean research and teaching, the MFRI's limited possibilities to provide hands-on education for young marine scientists, and the lack of funding of research projects outside the routine marine resources monitoring. Despite the willingness of the respective institutions to collaborate, insufficient and expensive infrastructure hinders student projects and the training of young scientists. These are essential for achieving the objectives of the UN Ocean Decade program and for replacing the soon-to-retire generation of ocean scientists. Moreover, the sharing and full utilization of existing data is far from satisfactory. The proposed project will get to the root of the problem by developing shared, cost-effective, automated infrastructure for ocean research. This infrastructure will leverage on existing expertise and regional strengths, keeping maintenance and administration costs at a minimum. Simultaneously, it will enhance the capacity for open databases and computing, enabling more effective use of data and immediate opportunities for a wide range of training projects for young scientists. Increased possibilities for early-career researcher (ECR) projects will naturally result in the growth of existing research groups, and foster researcher development, preparing the next generation of ocean scientists. Increased data sharing will promote equal access to information, supporting diverse research projects. The implementation of computational models in oceanography will be as a basis for models in diverse fields of ocean research, for example, of fish movement, whale migrations and seabird foraging. This expansion of data sharing, align with existing ocean best practices, will inevitably strengthen the current collaborative network, create new collaborative opportunities, boost participation in large-scale international projects, and facilitate the training of the next generation of ocean scientists.

4. Hverju munu innviðirnir breyta miðað við stöðuna í dag?

Despite the economic and ecological importance of Icelandic oceans, public funding of ocean observation research is mostly directed towards the MFRI, that employs most ocean scientists, operates two research vessels and a variety of equipment. However, the largest part of the institution's budgets, and thus infrastructure use, goes to the regular monitoring of exploited stocks. The UI is the second largest governmental employer in the field of ocean research but significantly lacks infrastructure. The current situation may reflect a lack of national strategy for ocean monitoring and a lack of a collaborative vision for building infrastructure for ocean observation and monitoring. Within UI ocean research infrastructure has grown around the research focus of individuals and small research groups. For example, there are good, but usually highly specialized, facilities and small boats available at several of the UI Research Centres. Lacking a national ocean strategy and vision these local hubs are vastly underutilized for collaborative research.

Other major organizations maintaining ocean infrastructures are the Icelandic Meteorological Office, the Icelandic Road Construction Agency and the Coast Guard but others involved in ocean research are smaller, including the Institute of Natural History, Náttúrustofur, the University of Akureyri, the University Centre of the Westfjords. Infrastructure for ocean research is similarly fragmented at these units, and the integration of their research into the MFRI is rarely promoted. The reverse is also true, data from the MFRI are rarely shared with other institutions involved in ocean observation research. This

roadmap will promote a better utilization of data collected and collaboration in an open manner. The authors of this proposal have contacted some of the above-mentioned actors about the Marine Open Observation Network (MOON) and welcome all collaboration, including commercial partners. Improved ocean observation is also needed for many budding Blue Economy incentives.

Analysis of current infrastructure for ocean observation reveals that Icelandic scientists have a long way to go to meet the existing research needs to contribute effectively to the UN Ocean Decade, the Mission “Revive and restore our ocean” and the COP15 agreement (30x30). However, despite the limited infrastructure and opportunities for sharing structures and data, ocean scientists are a powerful part of the Icelandic scientific community. Web of Science shows that in 2023 there were 160 scientific articles published on ocean science related to Iceland, which is an increase from 101 in 2003. This growth shows that ocean science is an expanding field, and the proposed infrastructure roadmap would help fulfil Iceland’s potential to be a leader in this field. Research projects in the field of ocean science are a large part of international research in Iceland, e.g. through various European and American projects, highlighting the importance of this geographical region (e.g., there are 12 international projects currently managed within the MFRI). If the proposal is funded, the opportunities for Icelandic scientists in research, education, and cooperation in the field of ocean research will be dramatically improved, following established principles of the Ocean Decade: “the science we need for the ocean we want”.

5. Framtíðarsýn uppbyggingar og reksturs

The focus of this proposal is to build a shared, fully open access, ocean observation network. We will build on existing research strengths by developing 1) a network of mobile and regional observation supersites for benthic and oceanographic monitoring 2) an acoustic observatory network for marine mammals and fish movement 3) build autonomous vehicle capacities by focusing on manageable, multipurpose (oceanography, fish and marine mammal) vehicles, international collaboration and technical services. Finally, 4) we invest a significant amount for building fully open access data sharing and computational facilities in collaboration with the IREI project. For ease of long-term and future maintenance, we focus on site-specific strengths and technical training of existing staff during the funded period.

6. Áætluð fjármögnunarpörf næstu ár

MOON component	Short description	Cost (ikr)
Acoustic observatory network	Long-term acoustic observation for animal movement around Iceland coupled with key oceanographic measures	35000000
Observation supersites	Multiuse, long-term ocean observatories for benthic habitats and oceanography	64000000
Vessel capacity	Vessel time MFRI & HI. Multiuse small vessels.	99500000
Autonomous vehicle capacity	Open Ocean Robotics vehicle, technical services and links to existing international projects	76000000
Open data and computational capacity	Links to IREI project, technical services & computer	31000000
Total estimated cost		305500000