[NTNU_IBI] [Case number 4]

Institution: Norwegian University of Science and Technology (NTNU)
Administrative unit: Department of Biology (IBI)
Title of case study: **Improved interaction between business, upper secondary school, university, and public administration in aquaculture – "Bridgehead Aquaculture - 2050"**
Period when the underpinning research was undertaken: 2012- Ongoing
Period when staff involved in the underpinning research were employed by the submitting institution: 2018 - Ongoing
Period when the impact occurred: 2012 - 2022

1. Summary of the impact (indicative maximum 100 words)

"Bridgehead Aquaculture" (Brohode Havbruk in Norwegian) is a multi-stakeholder regional knowledge platform for efficient and mutual exchange of theoretical and practical knowledge within the aquaculture sector. It assembles key resources from aquaculture producing and supplying companies and the public sector, professors, students and researchers, teachers and pupils from secondary schools. The vision is to enhance the aquaculture sector's capacity to implement resilience, sustainability and competitiveness.

Based on the platform activity new study programs have been developed, key competence resources from the aquaculture industry have been used in teaching activity in regular university courses and in supervision of students' theses. In addition, mobility between academia and industry has been promoted to increase mutual understanding between stakeholders.

2. Underpinning research (indicative maximum 500 words)

The goal of Bridgehead Aquaculture is to enhance the aquaculture sector's capacity to implement resilience, sustainability, and competitiveness, with regional stakeholders as key enablers. A knowledge gap analysis undertaken in 2018 showed the sector's challenge to recruit technology and engineering competence. The aquaculture sector also misses opportunities by not maximizing the potential of high-tech solutions as steppingstones towards the above-mentioned goals. An understanding of the impact of new methods for sustainable farming of aquaculture species and its environment is hereby critical. Bridgehead Aquaculture 2050 has contributed to the capacity of the aquaculture businesses to apply new technologies, whilst setting biology in the centre, leading to smarter, greener and more efficient processes.

Since the signing of cooperation agreement between NTNU Oceans and the secondary "blue" school of Guri Kunna (Hitra/Frøya) in 2012, an annual Bridgehead conference has been organized at Frøya. This has become a unique meeting place for aquaculture stakeholders and academia, where students fulfill a key role as representatives of their capacity building abilities. The agreement was renewed in 2021.

In addition to the annual conference, a series of Bridgehead events are organized throughout the year. These vary in form, ranging from experience exchange seminars, company site visits, business presentations, workshops, student competitions and/or speed date sessions. The events stimulate stakeholders in the region to increase their network and to implement student and/or research interactions into their business strategies. The project specifically accentuates the underexploited capacity of interdisciplinarity across engineering and technology, biology and other natural and social sciences, and humanities. By stimulating interactions between

stakeholders, a common understanding of the various processes along the aquaculture value chain is established.
The Bridgehead aquaculture 2050 toolbox helps introducing research-based competence through different pathways. It has introduced a considerable number of companies to the opportunities provided by an industry PhD and has assisted many of them in applying. It has also engaged industry stakeholders in part-time positions at the university, promoted mobility of professors through short-term stays in a company and organized visits for researchers to different types of aquaculture businesses. These interactions have additionally contributed to increase the societal relevance of education and research among academic partners, and to attract candidates towards a sector where Norway has a global responsibility.

Finally, Bridgehead aquaculture 2050 adds value to regional and international aquaculture industry meeting places, such as:

- AquaNor and Nor-Fishing
- TEKSET and TEMAR
- NCE Aquatech Cluster

In these meeting places interactive student related events are organized.

The Norwegian Research Council's mid-term evaluation in 2021 highlighted the progress that had already been made in the creation of a knowledge capacity-building legacy in the region of Mid-Norway.

Key researchers (positions) joined:

- Alexandra Neyts, Project leader - Bridgehead aquaculture 2050
- Yngvar Olsen, project collaborator and head of the Bridgehead conference programme committee
- Anna Solvang Båtnes, project collaborator - Bridgehead aquaculture 2050
- Rolf Erik Olsen, programme leader of bachelor aquaculture engineering programme
- Bjørn Egil Asbjørnslett, leader of “minor in aquaculture” programme
- Martin Føre, project collaborator - Bridgehead aquaculture 2050
- Kjell Olav Skjølsvik, project collaborator - Bridgehead aquaculture 2050

3. References to the research (indicative maximum of six references

1. Olavsen T, Winther U, Skjermo J Olsen Y .
   DKNVS and NTVA Report: Value created from productive oceans in 2050 2012
   ISBN 978-82-7719-074-3
   The report makes prediction of future development of the seafood sector in Norway and conclude that the value created in 2050 can be 550 billion NOK, five times higher in 2050 than in 2010. The report has had a tremendous impact on society and policy formation in the seafood sector, but also on the scientific community. The report is generally simply mentioned as the “2050 report” and is very frequently sited. It is still after 10 years among the planning documents used by Government, and an implementation plan is worked out after request of the Department responsible for fishery. if requested by RCN or the evaluation secretariate.
2. Neyts, A.
   Which professional profiles does the aquaculture industry need and which educational paths are missing or need to be improved?.
   2022
   Aquaculture Europe '22; 2022-09-27 - 2022-09-30

3. Neyts, Al., Vedal, T.,
Årsrapport Brohode havbruk 2050 - fjerde år.
2022
4. Neyts, A., Heggstad, T., Fallmyr, J.,
2018
Kartlegging av kompetansebehov i Midt-Norge.
5. Akslen Emblem, H. L., Halstenrud, K. B.
NTNU Brohode Havbruk. En kvalitativ analyse av kommunikasjon og forventninger i et samarbeid mellom havbruksnæringen og akademia. Prosjektoppgave i MV3010 Forskningsoppdrag for bedrift.
2021

4. Details of the impact (indicative maximum 750 words)

In 2018, a consortium of academia (NTNU, SINTEF Ocean), industry (NCE Aquatech Cluster, Blue Competence Centre), and public sector (Trøndelag County Authority) was formed and the Norwegian Research Council granted a 6-year collaborative capacity building project "Bridgehead Aquaculture 2050". Its goals are to increase business relevance in higher education, strengthen recruitment to the marine sector, and reinforcing research-based expertise in the seafood industry. Through this Bridgehead Aquaculture 2050 project, a toolbox is developed to close the gap between students, researchers and aquaculture stakeholders. New study programs have been developed (see below), aquaculture relevant student cases and assignments have been promoted, and mobility efforts between academia and industry have contributed to a larger mutual understanding. The annual Bridgehead conferences strengthen the collaborative culture in aquaculture across stakeholder groups with a specific emphasis on students and their knowledge building capacity.

Recommendations by and dialogue with the sector resulted in the generation of a unique aquaculture engineering bachelor programme in 2020. It prepares the students for a professional career in the producing and supplying industry, providing them with knowledge and insights on how technology and operational choices impact the efficiency and sustainability in aquaculture. A pilot programme package for civil engineers, called "Minor in aquaculture" was established in 2021. This allows the students to combine their technological expertise with a basic understanding of biology and aquaculture operations, thus introducing new types of knowledge into the sector. An increasing share of students is performing bachelor and master assignments and PhD theses in aquaculture related topics.

In 2022, more than 150 student publications were delivered, across more than 20 different study programmes. Upskilling of existing staff was also targeted by developing and offering continued education courses at Master level. So far, three courses have been established: on recirculating aquaculture systems, on safety management and risk analysis and on project management and engineering in aquaculture.

In 2016 the project *"Taskforce salmon lice" – cooperation between university and aquaculture industry to solve salmon lice challenges"* – was established as a direct result of this impact case. "Taskforce salmon lice" is a research platform that was established as a project at NTNU, mainly funded by the aquaculture industry. Through cooperation with the industry, the research group (researchers, PhD students, master students and supervisors) are investigating topics related to the parasitic salmon louse, that are currently relevant to the industry. The results from the research are used by the industry to handle the sea lice challenges more efficiently and thus in

a more environment friendly way. The platform also enables students to work with highly relevant research in cooperation with companies, and to make an impact after ending their education.

"Bridgehead Aquaculture" is at the core of several United Nations sustainable development goals (SDGs), particularly;

- Goal 3 - Ensure healthy lives and promote well-being for all at all ages
- Goal 4 – Quality education, ensuring inclusive and equitable quality education and promote lifelong learning opportunities for all
- Goal 8 - Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
- Goal 9 - Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation
- Goal 11 - Make cities and human settlements inclusive, safe, resilient, and sustainable
- Goal 14 - Life below water. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- Goal 17 - Strengthen the means of implementation and revitalize the global partnership for sustainable development

5. Sources to corroborate the impact (indicative maximum of ten references)

Brohode Havbruk - NTNU
Studentoppgaver: Projects | Bridge NTNU
NTNU Brohode – Minor i havbruk – NTNU
Bachelor i ingeniørfag, havbruk - NTNU
NTNU Brohode - Brohodekonferansen - NTNU
Taskforce sea lice - NTNU Oceans - NTNU