HIGHER EDUCATION AND SDG 14: Integrating Ocean Research for the Global Goals

PUBLICATION/COLLECTION OF PAPERS NOVEMBER 2021 // UNIVERSITY OF BERGEN AND THE INTERNATIONAL ASSOCIATION OF UNIVERSITIES

14 LIFE BELOW WATER

INTERNATIONAL ASSOCIATION OF UNIVERSITIES
INTERNATIONAL UNIVERSITIES BUREAU

UNIVERSITAS BERGENSIS

Acknowledgements

Ocean Sustainability Bergen (OSB) and the International Association of Universities (IAU) are grateful to all those who dedicated time and effort to share their research and activities in support of the 2030 Agenda Sustainable Development Goal 14 (SDG 14: Life Below Water). Special thanks go to the IAU Members and IAU HESD Cluster Lead for SDG 14 for partnering with the University of Bergen (UiB) for this publication. We thank those involved in the editing and publishing process at both UiB and IAU. The editors give special thanks to the anonymous reviewers who provided feedback to the articles, and to Randy Bruin for editorial assistance.

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ISBN

978-82-93674-40-5

Graphic Design and Layout

Communication Division/UiB

FOREWORD

Universities for SDG 14
– *"The ocean we need for the future we want!"*

The United Nations has proclaimed a *Decade of Ocean Science for Sustainable Development* (2021–2030) to support efforts to reverse the cycle of decline in ocean health and gather ocean stakeholders worldwide behind a common framework that will that ensure ocean science can fully support countries in creating improved conditions for sustainable development of the Ocean. This comes at a time of global crisis and disruption, not only in the higher education sector; it impacts sectors and systems. Despite having to overcome several challenges, universities and other higher education institutions (HEIs), their leadership, academic and administrative staff and students, in all parts of the world, are becoming increasingly aware of and actively engaged in the United Nations Agenda 2030 and the related Sustainable Development Goals (SDGs). Research and teaching, campus life and community engagement within HEIs are of special importance to SDG 14: Life below Water, itself also strongly linked to SDG 13 – Climate Action, as well as the other SDGs in general.

The International Association of Universities (IAU) and its flagship initiative for Higher Education and Research for Sustainable Development (HESD), the IAU Global HESD Cluster, have been advocating for more engagement of higher education with the SDGs, resulting in projects, including this publication series.

The dual goal of the series of initiatives analysed in this publication aims is to:

- Network initiatives to build new synergies and increase capacity to act while informing higher education more broadly and inviting more HEIs to get involved;
- Provide evidence to policy and other decision makers in order to stress the important role of higher education for teaching, research and societal impact and to inform future policy making.

The previous publications in the series so far focus on: *SDG 13: Climate Action (2019) and SDG 5: Gender Equality (2020), and SDG 16: Peace, Justice and Strong Institutions.* Available online, they present IAU Member institutions' contributions, as well as individual research projects leading the way towards the achievement of Agenda 2030 and the SDGs.

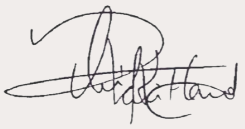
The publication attracted early-carrier researchers as well as established academics and teaching staff, all working on cross-cutting issues related to SDG 14. This unique publication now includes 11 papers with **concrete examples of meaningful research, strategies, initiatives and projects**

strengthening ocean science, education, and the links between SDG 14 and other SDGs. The authors are connected to higher education institutions and organizations from around the world, from Norway to South Africa, from Fiji to Canada, and the Netherlands.

The publication marks the launch of new initiatives and collaboration on projects to advance gender equality in HE and society. IAU welcomes submissions of examples of practice for this SDG and other SDG-related actions. These will be shared via the IAU Global Portal on HESD (www.iau-hesd.net).

With this series of publications, IAU aims to **inspire other universities and researchers to take action to transform the world for the better through higher education**. Together, we can help foster HE action for sustainable development and Agenda 2030.

Cordially,



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INTRODUCTION BY OCEAN SUSTAINABILITY BERGEN

Higher education engages with SDG 14: Life below water

In 2017, the United Nations (UN) General Assembly agreed the years 2021–2030 to be the UN Decade of Ocean Science for Sustainable Development (Ocean Science Decade), with the aim to stimulate and coordinate national and global education and research efforts so that the Sustainable Development Goals (SDGs) – and SDG 14 (Life Below Water) in particular – can be achieved by 2030.

The University of Bergen has established a virtual centre, Ocean Sustainability Bergen (OSB), to promote knowledge and understanding of a sustainable ocean. With this centre, the University of Bergen aims to make education, research, and science diplomacy a key part of Norway's contribution towards a sustainable ocean, as part of the United Nations 2030 Agenda for Sustainable Development. Since its inception, OSB has helped to enhance and share academic research on the laws of the ocean, food from the ocean, and sustainable technology. OSB also functions as a platform through which the University of Bergen fulfils its role as the Hub for SDG 14: Life Below Water, as appointed by the United Nations Academic Impact (UNAI). The University of Bergen is also the SDG 14 lead university with the International Association of Universities (IAU) global Higher Education and Research for Sustainable Development (HESD) Cluster.

The objective of the Ocean Science Decade is to increase ocean knowledge globally and ensure that society can use this knowledge, enabling us to achieve the SDGs. To coincide with the Ocean Science Decade, the IAU and the University of Bergen collaborated to produce this publication on SDG 14 and present examples of activities and best practices and demonstrate how universities are engaging in science and higher education for the SDGs while also building back from the COVID-19 pandemic.

By juxtaposing and interlinking SDG 14 with other SDGs in the 2030 Agenda, the aim of the publication is also to highlight research and higher education that create opportunities to connect and involve as many as possible in the work towards ocean sustainability. Current levels of misinformation in public debate show the dire need and enormous potential for science-based information and education. If we are to manage our ocean in an equitable and sustainable way, then this must be based on knowledge that emerges through science.

Universities and experts worldwide who are involved with the IAU-HESD Cluster on SDG 14 were invited to contribute to this publication, which shows a glimpse of the range of ongoing and planned ocean activities globally. The ocean remains the least-explored part of the planet and yet, it is clear from recent explorations that the ocean may hold more solutions to what we need, be it to supply sufficient food for growing populations or the medicine for diseases and pandemics. In this publication we cover a broad range of topics ranging from successful ship-based education programmes in South Africa, the status of implementing SDG 14 in the Netherlands, understanding the SDGs through social-ecological lenses, moving from policy to action on the SDGs, and advancing marine education to prepare future ocean leaders.

It is our wish that this publication will motivate other universities and researchers to take action to transform the world for the better through research and higher education. We need to act together to achieve the SDGs by 2030 and beyond and contribute to The Science We Need For The Ocean We Want.

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SOUTH AFRICA'S FLOATING UNIVERSITY SEAMESTER: AN EXAMPLE OF A SUCCESSFUL SHIP-BASED EDUCATION PROGRAMME

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Abstract

The United Nation's Decade of Ocean Science calls for programmes that improve scientific knowledge, develop research capacities, and transfer marine technological information and expertise across generations. In South Africa, the Department of Science and Innovation (DSI) has already taken a significant step forward in such training measures. The current DSI Global Change Grand Challenge programme calls for platforms that *"attract young researchers and retain them by exciting their interest in aspects of global change, while developing their capacity and professional skills in the relevant fields of investigation"*. To meet these challenges in the Ocean Sciences, "SEAmester" – South Africa's Floating University and a joint initiative between the Government and Universities – was started in 2016. The strength of SEAmester is that South African postgraduate students combine theoretical classroom learning with the application of this knowledge through ship-based, and more importantly, hands-on research through the Agulhas System Climate Array (ASCA) programme. Now into its 5th year, SEAmester has already made significant progress in ship-based training with over 176 students from 23 South African universities participating in these training cruises.

Introduction: The need for a more experienced-based approach to learning

Marine science is a highly competitive environment. The need to improve the cohort of postgraduates, who would be recognised both nationally and internationally for their scientific excellence, is crucial. It is possible to attract students early on in their careers to this discipline via cutting edge science, technology, and unique field experiences. Through the engagement of students with real-life experiences such SEAmester – South Africa's Floating University – tertiary institutes supporting marine science postgraduate degree programmes can attract a sustainable throughput of numerically proficient students. The South African Government's National Development Plan identifies education, training and innovation as being at the forefront of the country's long-term development, and specifically states: *"Inadequate capacity will constrain knowledge production and innovation unless effectively addressed"*. The long-term objective of SEAmester is to build critical mass within the marine sciences to ensure sustained growth of human capacity, while aligning closely with the nation's research and development strategies. SEAmester is a unique shipboard programme that integrates interdisciplinary coursework, hands-on ship-based experiences, and interaction between leading South African marine researchers. By aligning with core peer-reviewed scientific objectives through the Agulhas System Climate Array (ASCA) scientific programme, SEAmester also allows stu-

dents to collect data in an oceanic region of global importance and to be part of an international programme with data standards and protocols. SEAmester offers an unparalleled opportunity to live and work in the marine environment, and in doing so leaves a tangible and lasting impression that postgraduate students can make a meaningful contribution to the field of marine science.

A–Z of teaching during SEAmester

Our understanding of the ocean has become increasingly based on quantitative analysis, with observations being augmented by measurements of water properties and by a greater understanding of the physical processes. Modern numerical approaches emphasise the need for a sound understanding of the basic maths, physics, and chemistry. Today's marine scientists need to be highly numerate to analyse and interpret the huge observational and modelling data sets that now exist. Most students that graduate with a marine science degree have weak quantitative backgrounds and consequently battle with understanding core mathematical or physical dynamics behind ocean and coastal processes. Far from simply a lack of content knowledge, it is believed that the main area of concern for our marine science students is in mathematical process skills. Skilled marine students often have trouble relating the mathematical processes to a real-world context essential in quantitative science; students rarely think mathematically, relying on a more descriptive analysis. Students are driven by their curiosity and, understandably, mathematics studied in an environment that is independent of applied science often remains abstract and difficult. SEAmester mitigates this problem by introducing marine science as an applied and cross-disciplinary field to students who have shown an affinity for these core science disciplines. The strength of SEAmester is that postgraduate students from all over South Africa combine theoretical classroom learning with the application of this knowledge through ship-based hands-on research.

Since 2016, four SEAmester cruises have already tried and tested the optimal way to manage a floating classroom. The success of SEAmester is that it offers students modules to choose from: either Oceans in a Changing World, or Tools of the Trade (Figure 1). These are streams designed to benefit each student's own research requirements.

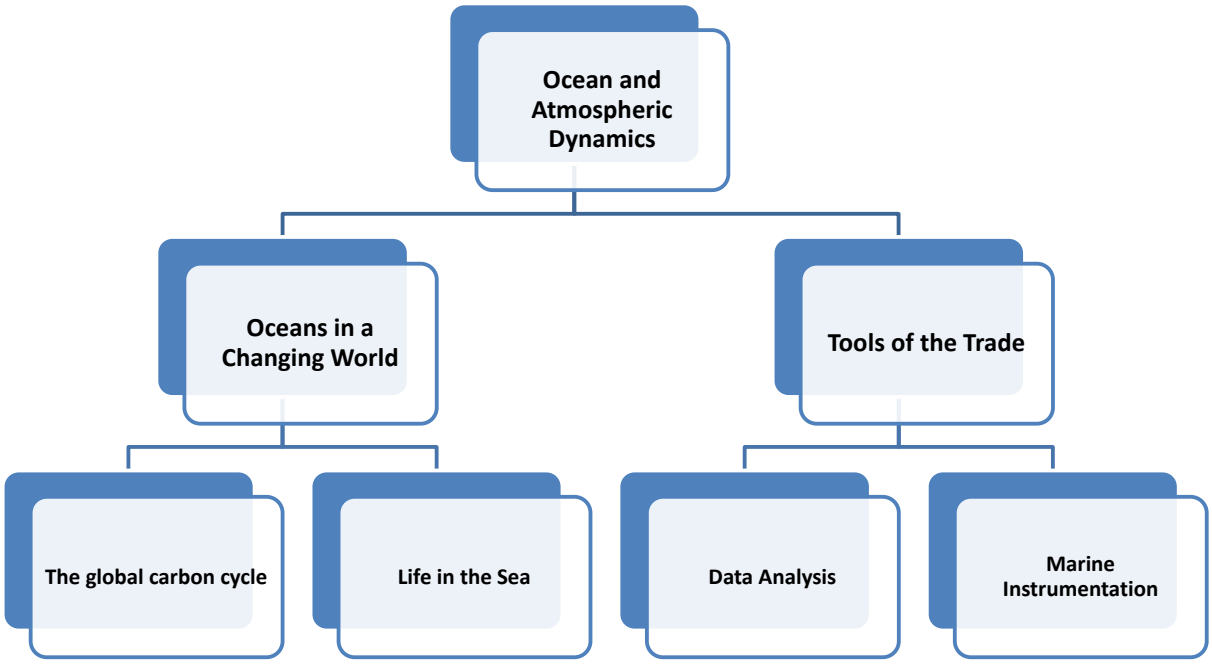

Figure 1: A dendogram highlighting the teaching curriculum given during the SEAmester programme and the options that are presented to all students participating.

STREAM 1 – OCEANS IN A CHANGING WORLD

The 4th report from the Intergovernmental Panel on Climate Change (IPCC) has identified studies addressing ocean change states, which demonstrate that the ocean has an important role in climate variability and change. "Oceans in a Changing World" is an interdisciplinary theme dealing with the study of the world's oceans. The stream combines a detailed study of life in the sea, from the smallest bacteria to the largest mammals with a specialised understanding of their physical and chemical constituents, the biogeochemical interactions within the atmosphere and ocean, and the influence and conservation of oceanic resources on human society.

STREAM 2 – TOOLS OF THE TRADE

Progress in oceanography has been and continues to be closely linked to technical advancements for making measurements in the oceans. "How do we study the oceans?" This course aims to introduce students to the rapidly advancing field of marine technology and theoretical aspects related to observations, operational monitoring platforms, numerical modelling and forecasting, and data quality control and management.

Underpinning these two streams is a compulsory course in Ocean and Atmospheric Dynamics (Figure 1), which provides a holistic view of the fundamental principles of ocean and atmospheric science: the chemistry of seawater; physical dynamics of ocean and atmospheric circulation, waves and tides; and a comparison between coastal and deep ocean processes. The goal of this course is to develop an understanding of the global ocean and atmospheric processes, and how the oceans contribute to the Earth's climate by storing and transporting heat and salt between ocean basins.

The success of a Floating University – 5 years on

In August 2019, every SEAmester student was contacted to provide an update on their academic careers. Out of 176 students, 132 responded with an overall 68% staying within Higher Education, either at their own institute or transferring to other universities. An additional 17% established 1- or 2-year internships at various private or government institutes (Figure 2).

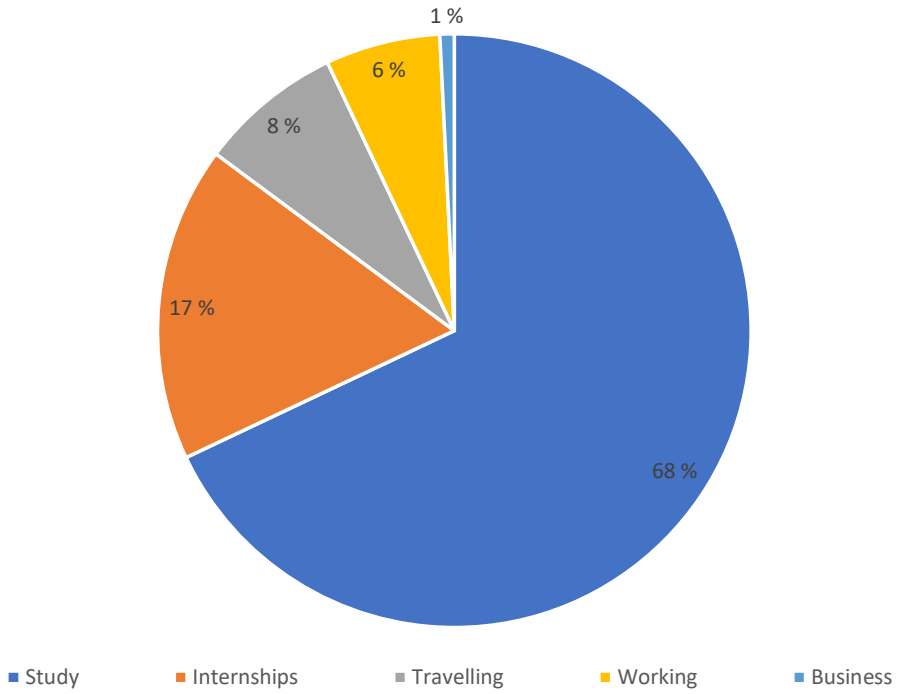

Figure 2: A pie-chart outlining the impact SEAmester has in the career pathways of each student. As can be seen most students continue with their education into a higher degree following their ship-based experience.

For many students SEAmester was a life changing experience, which inspired them to remain within academia. As former SEAmester student, Luthando Madonsela, explained: *"I met my current supervisor in 2017 during SEAmester and we stayed in contact during the course of my MSc. I am now a part of her research group in marine drug discovery – all thanks to SEAmester".* Fellow SEAmester students highlight the importance of cross-university and inter-disciplinary collaborations during the 10-day voyage, such as Mulivhuweni Mphaphuli - a 2018 participant - who stated: "*SEAmester also helped me find a new project for my MSc thesis. Before, SEAmester, I wasn't interested in studying microplastics but look at me now, busy with them and enjoying every minute of it. SEAmester made a huge impact in my life and I'm beyond grateful to have been part of it"*. The programme also builds on student research objectives and provides opportunities to work in other geographic regions, as Gerhard de Jager - a 2017 SEAmester student - points out: *"SEAmester opened incredible doors for me to study how parasite communities respond to differing ocean regions – from the sub-tropics off South Africa to the harsh Antarctic continent. If it had not been for SEAmester and meeting so many scientists none of this exciting and novel research would have been possible".*

SEAmester is an extremely rewarding programme, where young postgraduate students from all corners of South Africa become inspired to continue their postgraduate education and, in many cases, form lifelong friendships. The programme offers an unparalleled opportunity to live and work in the marine environment, and in doing so leaves a tangible and lasting impression that postgraduate students can make a meaningful contribution to the field of marine science. An email from Dinah Mukari - a student in 2018 - highlights this importance: *"I am writing to tell you about the positive role that SEAmester had in my career up to today. When I attended last year, I was doing my honours at Wits on microalgae and SEAmester exposed me to different fields in science such as the mini project I worked on involving acoustics. My interest on acoustics continued to grow even after the program and long story short I am actually doing my MSc in acoustics this year".*

The mid-term goal of SEAmester is to attract and establish a cohort of proficient marine and atmospheric science graduates who will contribute to filling the capacity needs of South African marine science. Furthermore, by involving researchers from across all the relevant disciplines and tertiary institutions in South Africa (Figure 3), SEAmester provides an opportunity to continue building a network of collaborative teaching within the marine field. In doing so, these researchers will foster and strengthen new and current collaborations between historically white and black universities. A core aim of SEAmester will be to transform the number of numerate postgraduate students entering the marine sciences. Within South Africa, there continues to be an urgent need to redress the demography of scientists involved in oceanographic research, which remains skewed towards white South Africans. SEAmester has already proven to be extremely effective in responding to these challenges. Since its inception in 2016, over 79 male and 97 female students from 23 tertiary institutes have been trained onboard the research vessel *S.A. Agulhas II*. With 64% of the enrolled students being black South African and from previously disadvantaged universities (Figure 3).

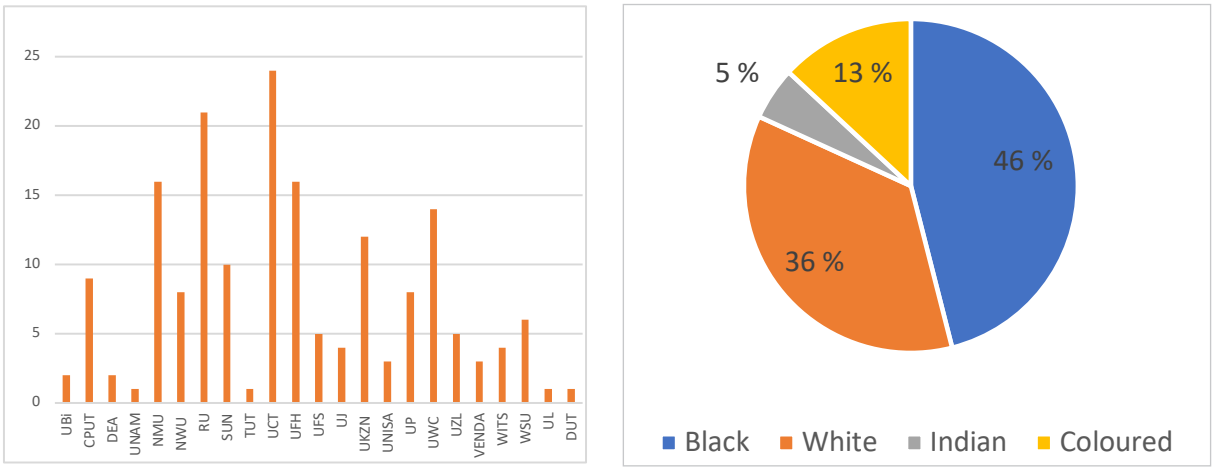

Figure 3: A graph highlighting the number of SEAmester students per institute since its inception in 2016. In addition, the pie-chart divides the total number of students by race. A key goal of SEAmester is to be diverse in race and culture and of the 176 students, 46% are black with 63% of this group female, 36% are white, 13% coloured and 5% Indian.

Greater awareness of the ocean's physical, biogeochemical, and ecological response to climate change, highlighted through ship-board experiences, has already started to inspire, and attract students into the marine sciences. This is a critical step if a new generation of marine scientists with a far higher calibre in the sciences are to be trained. Most importantly, SEAmester has already created opportunities for students from all social backgrounds to experience working life at sea. By achieving a more quantitative and experienced input into our postgraduate pipeline, we will, as a scientific community, greatly improve our long-term capabilities to accurately measure, model and predict the impacts of current climate change scenarios. We fully expect this to continue and to ensure that students who excel in numeracy – despite diverse economic, educational, ethnic, and social backgrounds – are aware of and have equal access to the benefits and opportunities afforded through this programme.

A long-term vision is to develop SEAmester into an international educational flagship programme, incorporating a wider participant and scientist list with the involvement of other Southern African Development Community (SADC) countries. The success of the past four cruises onboard the research vessel *S.A. Agulhas II* has confirmed to the scientific community that SEAmester – South Africa's Floating University – is able to achieve just that.

Acknowledgements

SEAmester is funded through the National Research Foundation of South Africa and DSI and is logistically supported by the Department of Environment, Forestry and Fisheries (DFFE). The Agulhas Systems Climate Array (ASCA) is funded through the DSI/SAEON/DFFE/NIOZ/RSMAS/NSF partnership. The successful completion of the survey would not have been possible without the invaluable assistance of the officers and crew of the research vessel *S.A. Agulhas II*. We also thank Dr Gilbert Siko and Tracy Klareenbeck from the South African National Antarctic Programme and Nish Devanunthan from Antarctica and Islands Logistics (DFFE) for his continued support. Finally, we thank all the cruise participants involved in past ASCA and SEAmester cruises for all their help over the past five years.

References

Ansorge, Isabelle J., Brundrit Geoff, Brundrit Jean, Dorrington Rosemary, Fawcett Sarah, Gammon David, Henry Tahlia, et al. "SEAmester – South Africa's first class afloat".2016. *South African Journal of Science* 112 (9-10): 1-4.

Morris, Tamaryn, Hermes, Juliet, Beal, Lisa, du Plessis, Marcel, Rae, Christopher Duncombe, Gulekana, Mthuthuzeli, Lamont, Tarron, Speich, Sabrina, Roberts, Michael, & Ansorge, Isabelle J.. 2017. "The importance of monitoring the Greater Agulhas Current and its inter-ocean exchanges using large mooring arrays". *South African Journal of Science* 113 (7-8): 1-7.

South African Department of Science and Technology (DST). The 10-year plan for science and technology (2008–2018). Pretoria: DST; 2008.

South African Government. National Development Plan 2030: Our future – make it work. Pretoria: The Presidency; 2012.

A REFLECTION ON THE INTERNATIONAL MARITIME ORGANIZATION'S ESSENTIAL ROLE IN ACHIEVING THE SUSTAINABLE DEVELOPMENT GOALS: THE SEAFARER'S CULTURAL HABITUS AS A KEY TO SAFE, EFFICIENT, AND SUSTAINABLE OPERATIONS AT SEA

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Abstract

For seafarers in the maritime sector on commercial vessels, the ocean is the stage where practices of everyday life are conducted. Every seafarer operating commercial vessels is trained in safety with respect to life, health, human labour, material values and the environment while ensuring different kinds of efficient operations on the ocean. The omnipresent International Convention for the Preventing of Pollution from Ships (MARPOL) convention does not only partake a ship-owners obligation on paper, but it is at the core of many responsibilities of a seafarer. In addition, the Standards of Training, Certification, and Watchkeeping (STCW) is an international requirement for all seafarers based on the construction of competence required of a seafarer. In fact, this training understands competence as a combination of skills, attitudes, and knowledge. The "seafarer competence" generates ideas, behaviours, habits, and social interactions in which a seafarer expresses cultural values, often in relation to the ocean. The United Nations Sustainable Development Goal (SDG) 14, "life below water", is one of the sustainable development goals which seafarers, at times inexplicitly, have a close relation to from a perspective of everyday life given how essential the interaction between ocean and vessel is. This article aims at analysing the "undiscovered links" embedded in seafarers' everyday practices at sea, namely the links between the SDG 8 (decent work and economic growth), SDG 9 (industry, innovation), SDG 12 (responsible consumption and production), and SDG 16 (peace, justice, and strong institutions) especially in the fast growing and changing maritime sector. Growth is understood here in the context of accelerated neoliberal market systems, and change refers to the pressing requests of the International Maritime Organization (IMO) and other regulatory institutions on the maritime sector, where SDGs play a central role. The paper therefore wants to theorize the often-paradoxical practices of labour in the maritime sector which must keep in balance: worker's rights, traditional practices and identity, and an interlinking of sustainable goals with the accelerated neoliberal market system. For instance, the development of autonomous vessels where the automation in the maritime sector brings forth several challenges in the everyday life for a seafarer that now has the goal to both serve a more efficient and sustainable organization.

Introduction

The International Maritime Organization (IMO) plays a major part in achieving several of the United Nations Sustainable Development Goals (SDGs) based on the Organization's central role in global shipping. This significant role can be demonstrated through a reflection on maritime training of seafarers and more particularly through an analysis of the focus of competence domains encountered in the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW). This article argues that a greater focus on the socio-cultural dynamics will strengthen the seafarer's competence, through a greater understanding of socio-cultural factors that affect human behaviour and social interaction, and essentially the practice for safer and more efficient operations at seas.

The ocean, covering around 70% of the Earth's surface is one of the world's most valuable environmental resources. Shipping is a key user of the ocean with seafarers carrying the greatest responsibility for the entire maritime industry as they conduct the practices of everyday life on the ocean. One of the major roles of the IMO is to conserve and sustain the use of the oceans, seas, and marine resources which reflect the mandate of SDG 14, "life below water". The seafarers, at times inexplicitly, have a close relation to SDG 14 from a perspective of everyday life given how essential the interaction between the ocean and a vessel is. This article is the first result of a new research collaboration between the Department of Social Anthropology at the University of Bergen, industry partners, and the Norwegian Maritime Authority. This research collaboration will continue through a larger research project - recently funded by the Norwegian Research Council – on automation in the maritime sector, titled "Automation shift in the maritime sector of the oil and gas industry: assessing risk and safety, protecting labor" (ASMOG). This paper aims at analysing a seafarer's competence-based training in relation to SDG 14 and introduces some undiscovered links between different SDGs relevant for shipping. These links are found between SDG 4 (quality education), SDG 8 (decent work and economic growth), SDG 9 (industry and innovation), and SDG 12 (responsible consumption and production), though the primary focus of this article is on SDG 14, as it is the most central to IMO's commitment. These links become more evident in the fast growing, changing and globalized maritime sector that firmly shapes the social interaction between seafarers, and is pushing for green fuel and digital/smart ships to create safer and more efficient operations at sea.

Maritime safety onboard and at sea

Sustainable Development Goal 8 is embedded in the practices of the IMO especially those related to safety: IMO has responsibility for over one million seafarers operating the global fleet. In fact, as a specialized agency of the United Nations, the IMO is responsible for improving the safety and security of international shipping and to prevent pollution from ships, operating under the slogan: "Safe, secure and efficient shipping on clean oceans". Nevertheless, at the core of the everyday practices on the ocean are the seafarers, who the IMO has highlighted, particularly during the COVID-19 pandemic (IMO 2020). Since the practice of international shipping is considered one of the most dangerous in the world, and to fulfil the obligation of safe and efficient international shipping *at all times*, the seafarer undergoes a highly complex training combining theory and practice, such as through full-scale simulator technology, where he/she is trained in safety with respect to life,

health, human labour, material values and the environment while ensuring different kinds of efficient operations on the ocean.

The International Safety Management Code (ISM Code) requires a Safety Management System (SMS), a formal documented system that must ensure safe operations and activities onboard a ship and the safe management and operation of ships, along with the prevention of pollution of the oceans. The International Convention for the Safety of Life at Sea (SOLAS) is an important treaty that deals with maritime safety and includes international collision regulations and global standards for seafarers, as well as conventions and codes regarding search and rescue. The Maritime Safety Committee is the IMO's senior technical body on safety-related matters under which the sub-committee on Human Element, Training and Watchkeeping (HTW) is concerned with the human side of the shipping. Training and certification of seafarers are interconnected with the entire organization's goal of safe, secure, and efficient international shipping. A seafarer's training *is essential*, as it is *complex*, because of the entanglement of numerous national and international requirements as well as those pertaining to specific industry demands and maritime operations. Furthermore, "seafarer competence" generates ideas, behaviours, habits, and social interactions in which a seafarer expresses cultural values, often in relation to the ocean.

Holistic perspectives for maritime safety onboard and at sea

We argue that this highly efficient model from the IMO lacks a holistic perspective in which historical and socio-cultural aspects are taken into consideration. In fact, the broad 'behavioural' approach of the IMO has been already criticized as being insufficiently specific and over-rationalizing. Though the levels of competence focusing on attitude and skills have some resemblance to anthropological perspectives of understanding human behaviour and social interaction in connection to *habitus*, which is the historically constituted and embodied habits and dispositions that structure an individual's perception of the world and their reaction to it (Bourdieu 1977), there is however a lack of further holistic understanding of the dynamics of social interactions bound to historical, political and socio-cultural factors in this training. This approach is problematic as, for instance, it simplifies the complex dynamics concerning human interaction with practices with the ocean in a globalized frame. These complex practices are highly visible during seafarer's training aimed at optimizing maritime operations. The STCW correctly has an explicit focus on attitude, however, not enough or too little attention is devoted to gaining a clear understanding of *habitus*.

However, depending on the specifics of the training and certifications, different aspects of the seafarer's competence is developed. One example of training which combines different competencies for a seafarer is the Bridge Resource Management (BRM) course which aims to increase the understanding of navigation for a more effective resource management for officers on the bridge, under various difficult conditions. Thus, even though situational awareness is central to the use of ECDIS, combining this psychomotor "technical" competence with human factors that affect the situation (the fourth level of situation awareness such as the sharing of information) is a complementary and important part of the training in safe navigation and would be strengthened with anthropological perspectives on human interaction. For instance, it has been proved that preventing collision and drifting requires good teamwork and communication and that these are highly contingent on the

socio-cultural context in which they are happening. This additional socio-cultural context supplements the traditional situational awareness in using the ECDIS correctly through the systematic use of scales, monitoring the information, cross-checking with visual information, and other systems, such as the radar. "High standards of navigation are crucial for the safety of crew members, protection of the marine environment and to safeguard vessels and cargos" (OCIMF 2020).

A seafarer's training is related directly to SDG 14 and indirectly to life below water, based on the protocols of safety laws and regulations the seafarer must abide. However, the more indirect connection is less accessible or measurable as it uses a "the silent language" (Hall 1956): it is *connected to the culture of safety which reaches beyond rules and regulations,* and which includes the seafarer's life-long acquired knowledge, skills, unique life and professional experiences, and personal attitude deeply embedded in cultural *habitus***.** A seafarer may not be consciously aware of his or her responsibility to SDG 14, however, it can be alleged that a seafarer both contributes to and has a responsibility for life below water through the practices of everyday life on a vessel. These practices are firmly shaped, not only by complex training that aims to influence behavioural responses, but also by life experiences and *habitus* which dictates hierarchical models, roles, and expectations.

The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers

Despite the complexity of maritime safety, the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), seeks to provide the basic requirements for training, certification and watchkeeping for seafarers on an international level. The IMO explicitly states - in relation to the SDG 4 - that in the maritime world, education and training are vital and that security of life at sea and protection of the marine environment depends on the professionalism and competence of seafarers. The STCW is the embodiment of this responsibility, which IMO is committed to fulfilling with SDG 4 on quality of education. The convention, first established in 1978, underwent major revisions in 2010 with the latest revision called the "2010 Manila Amendments". Importantly, this revision ensures that the global needs for safety and environmental policy and standards of training and certification operate with the advanced digitalized and automated technology that is increasingly prominent in the industry.

This "automation shift", referring to the increased digitalization and automation of functions and systems in the maritime sector, brings forth several changes in the practice of everyday life for a seafarer that now has the goal to both serve a more secure and more efficient and sustainable organization. This reasons with the mandate of SDG 9 and SDG 12, but its complexity is not well addressed. For instance, the Manila amendment of the STCW includes new training on how to operate modern technology, such as the Electronic Chart Display and Information System (ECDIS) navigational tool. However, the use of this tool reveals challenges, solutions for which stretch far beyond what is covered in the basic maritime training on the balance of human-machine interaction.

Although the IMO, through a focus on SDG 9, continuously promotes technological advances and innovation, must also acknowledge the existing challenges of balancing safety, security, and efficiency while promoting these technological advances. The increasingly pervasive role that au-

tomated technology plays in maritime operations makes it *imperative* to pay greater attention to *human factors,* as stipulated by the International Convention for the Prevention of Pollution from Ships (MARPOL Convention). Sustainable Development Goal 12 is embedded in practices of the IMO, especially those related to operational waste from ships and other related systems, such as the ballast systems, and more generally in terms of preventing groundings or other accidents, which cause pollution in the line of production. Thus, leadership and team training, attention to human interactions, and individual factors are gaining more relevance in an accelerated globalized maritime industry (Hylland Eriksen and Schober 2018). This comes at a time affected by digitalization and automation where both human interaction and human-machine interaction can potentially challenge the balance of safety and efficiency.

The STCW specifies minimum standards of competence for knowledge, understanding, and proficiency, and criteria for evaluating competence. These specifications are based on the definition of competence by the psychologist Benjamin Bloom in "Taxonomy of Educational Objectives" (1956), according to which the seafarer's training and assessment ought to be understood in relation to competence which again is constituted by three elements: knowledge, skills, and attitude (IMO 2012). In addition, the seafarer's training is conducted in a highly complex system that takes into consideration different aspects of a seafarer such as the cognitive, psychomotor, and affective levels.

The *Nova Cura* example

The relationship with the sea is much more complex than that proposed by STCW and its definition of competence inspired by Bloom's taxonomic model. We shall illustrate this point with a case training on the use of the Electronic Chart Display and Information System (ECDIS).

According to the standard of competence represented in the STCW code table A-II/1 (IMO 2011) on "Navigation at the operational level", a seafarer must master the use of ECDIS to ensure safe navigation. Bloom's taxonomic model easily achieves an understanding of the system, as well as a proficiency in operation and analysis of information obtained from ECDIS: the training generates an understanding of the ECDIS as a supplementary navigational tool to be used in relation to other systems, such as the radar and visual control. To demonstrate this acquired competence, seafarers must obtain either approved training on-ship experience, or approved ECDIS simulator training.

It has been claimed that operational challenges such as changing plans for more efficient operations followed by inattention to verifying new routes on ECDIS have been a major factor in the grounding of the ship *Nova Cura* on 20 April 2016 (Dutch Safety Board 2017). Arguably, this is an exemplary case of how safety and efficiency were hard to balance. Preparations had been made onboard the *Nova Cura* for a voyage to İzmir, Turkey, but when the destination was changed to Aliağa, Turkey, insufficient new voyage preparations were made. The seafarers on the *Nova Cura*, pressed by land-based management, found themselves hurrying to reach Aliağa and load the containers on the vessel as soon as possible (Dutch Safety Board 2017). In addition, and equally important, the crew of the *Nova Cura* did not have any understanding of the cultural-historical context in the disputed area between Turkey and Greece (the Aegean dispute) which had generated unreliable maps over time. In this case, digitalization has been a challenge and resulted in an overreliance on the ECDIS.

This incident resulted in a combination of many factors, primarily a poor judgment of not verifying a new route, combined with a lack of knowledge of the use of the ECDIS. Nevertheless, this incident is a case that points to the challenges of interactions between a seafarer and a land organization, in which different operational considerations are conducted. Sampson et al (2019) draws attention to the dysfunctional effects of mistrust in a maritime organization in which there is an alleged loss of autonomy and trust for professionals at sea. The seafarer interacts with different resources and equipment at seas, which must be simultaneously with an increasingly present land organization because of digitalization and a changing management. Therefore, a pressing question is how do these frames of responsibility in safe and efficient operations at seas, and rapidly changing organization both in terms of globalization as well as automation, affect a seafarer's capacity to assure "Safe, secure and efficient shipping on clean oceans"? To answer this question, there is a pressing need for a more holistic methodological approach to the analysis of seafarers' training that takes into consideration not only standard behavioural and psychological responses but increasingly important engagements and entanglements with the political and socio-cultural context in which maritime operations take place today.

Conclusion

The underlying ambiguity, rarely discussed, in a seafarers training is related to the omnipresent slogan used by the IMO: "Safe, secure and efficient shipping on clean oceans". Here *safe* and *secure* is often connected to the *unlikeliness of danger or risk*, and this formula, contextualized in an international industry performing highly complex operations which include risk factors at different operational levels, can place the seafarer in a delicate situation that obliges them to *maintain safety while assuring efficiency*. Contamination and pollution deriving from navigational accidents, collisions, mistakes in ship-to-ship operations or ship-groundings for instance, pose a serious threat to life below water. We have argued that today's competence-based training lacks a holistic perspective in which historical and socio-cultural aspects are taken into consideration. With greater attention to historical and socio-cultural specificities in the seafarers training, competence-based training would be even more so efficient in compliance and its care and commitment for the Sustainable Development Goals. Undeniably, safe navigation and protection of the marine environment go together, and seafarer training is crucial in this dynamic. Again, we argue that more training and a greater focus on the socio-cultural dynamics will strengthen the seafarer's competence, through a greater understanding of socio-cultural factors that affect human behaviour and social interaction and enhance the practice for safer and more efficient operations at seas.

References

Bourdieu, Pierre. 1977. *Outline of a Theory of Practice*. Translated by Nice, R. Cambridge: Cambridge University Press.

Dutch Safety Board. "Digital navigation: old skills in new technology. Lessons from the grounding of the Nova Cura". The Hague: Dutch Safety Board, 2017. https://www.onderzoeksraad.nl/en/page/4871/digital-navigation-old-skills-in-new-technology-20-april-2016

Eriksen, Thomas Hylland & Elisabeth Schober. 2018. "Economies of Growth or Ecologies of Survival?". *Ethnos* 83(3): 415-422.

International Maritime Organization (IMO), "About IMO", International Maritime Organization, 2019, https://www.imo.org/en/About/Pages/FAQs.aspx

International Maritime Organization (IMO)."STCW (Standards of Training, Certification, & Watchkeeping for Seafarers) including 2021 Manila amendments". International Maritime Organization, 2021.

International Maritime Organization (IMO). "Model Course 6.10. Train the simulator trainer and assessor". London: International Maritime Organization, 2012.

International Maritime Organization (IMO), "More States join IMO call to designate seafarers as key workers", International Maritime Organization, December 15, 2020, https://www.imo.org/en/MediaCentre/Pages/WhatsNew-1573.aspx

International Maritime Organization (IMO) "IMO and the Sustainable Development Goals", International Maritime Organization, 2019, https://www.imo.org/en/MediaCentre/HotTopics/Pages/SustainableDevelopmentGoals.aspx#number14

International Maritime Organization (IMO), "The International Safety Management (ISM) Code", International Maritime Organization, 2019, https://www.imo.org/en/OurWork/HumanElement/Pages/ISMCode.aspx

International Maritime Organization (IMO), "International Convention for the Safety of Life at Sea (SOLAS), 1974", International Maritime Organization, 2019.

International Maritime Organization (IMO), "Maritime Safety Committee (MSC)", International Maritime Organization, 2019, https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/MSC-Default.aspx

International Maritime Organization (IMO), "International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW)", International Maritime Organization, 2019, https://www.imo.org/en/OurWork/HumanElement/Pages/STCW-Conv-LINK.aspx

International Maritime Organization (IMO), "International Convention for the Prevention of Pollution from Ships (MARPOL)", International Maritime Organization, 2019, https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx

OCIMF. "Recommendations on Usage of ECDIS and Preventing Incidents". London: Oil Companies International Marine Forum, 2020. https://www.ocimf.org/publications/information-papers/recommendations-on-usage-of-ecdis-and-preventing-incidents

Sampson, Helen, Turgo Nelson, Acejo Iris, Ellis Neil & Tang Lijun. 2019. " 'Between a rock and a hard place': the implications of lost autonomy and trust for professionals at sea". *Work, Employment and Society* 33(4): 648-665. DOI: 10.1177/0950017018821284.

TRACING THE RELEVANCE OF THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS THROUGH THEIR TARGETS WITH LOCAL BUSINESSES IN COASTAL NORWAY

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Abstract

Concrete work between policy, science and all involved stakeholders is required for a successful implementation of the United Nations 2030 Agenda. Especially inter- and transdisciplinary cooperation are needed for an adequate localization, and to find synergies and create trade-offs among different stakeholders. An important role for universities in the 2030 Agenda is understanding how the diversity of the Sustainable Development Goal (SDG) Targets can be harnessed in ongoing and future business activities. In this paper, we develop our hypothesis that a focus on the SDG Targets will bring tangible progress for the 2030 Agenda. We present a practical method we call "SDG Target Relevance-Tracing" to emphasize interdisciplinary links among different SDG Targets, understand synergies, and look for solutions to help businesses integrate and implement the SDGs in a transdisciplinary (science-society collaborative) approach. To do this, we have identified business case studies and apply the SDG Target Relevance-Tracing method in digital workshop settings. These engagement workshops produce a cluster of inter-related SDG targets that the stakeholder considered to be relevant for their business. Connecting stakeholders with their relevant SDG Targets reveals the potential for synergy effects among common targets for a community. We suggest that the SDG Target Relevance-Tracing method be practised in communities to identify the SDG Targets that are relevant for municipalities to report on annually.

Introduction

Due to Anthropogenic climate change, we have overshot our economic, social, and ecological limits (Rockström 2009). To find sustainable and long-term solutions in all three areas, the United Nations (UN) delivered the 2030 Agenda on 17 Sustainable Development Goals (SDGs) (Gratzer 2017). The 17 ambitious goals with the associated 169 targets represent both hope for the future and an enormous challenge for governments at national and local levels. Which Targets are relevant for a community? What data exist to report on these Targets? Are there conflicts between certain Goals or Targets? Can stakeholders work together, even across sectors, to achieve the Goals?

Most municipalities in Norway are struggling with their responsibility to initiate these SDGs in the public and private sector, especially since the government of Norway has yet to indicate any na-

tional prioritization of the 169 targets. The Municipality of Bergen (Bergen Kommune) recently responded to a national public hearing on ideas relating to a Norwegian SDG Plan of Action. They described their struggles with the lack of local prioritization of the SDG Targets, the same issues facing many other governing bodies and businesses.

> *"All 169 sub-goals are not relevant at the local level. This may be because they are clearly aimed at developing countries, aimed at academia or nationally. It would have been useful if the action plan had made visible which sub-goals are most relevant for the various actors."* (Bergen Kommune, 2020)

This shows that there is still a lot of translating and transitioning required with localizing the SDGs. Research and expertise are necessary to figure out how the different sectors and institutional levels can apply the SDGs. In addition, it is increasingly obvious that collaborations among different sectors are crucial, especially for sustainability.

The above quote also illustrates that prioritization of the individual SDG Targets is an acute issue. At the local level, municipalities are challenged to prioritize and implement relevant SDG Targets due to their lack of expertise, resources, and workforce (Fisher 2019). This was our motivation to develop a method to collaboratively review the 169 targets together with stakeholders.

In this article, we describe the developments of the workshop-based method to understand the relevance of the SDGs for certain businesses with active stakeholder engagement.

Developing the "SDG Target Relevance-Tracing" Method

We developed this method as part of the LoVeSeSDG project funded by the Research Council of Norway. Field work data from the PhD student associated with the LoVeSeSDG project (Fuller et al., *this issue*) allowed us to identify three important stakeholders in the case study of the municipality of Andøy, which includes the island of Andøya in the Vesterålen archipelago, in the north of Norway. The island of Andøya is known for its natural beauty and as a tourist destination for seabird and whale-watching safaris. The island is also home to a centre for space research, a new museum of whale ecology and coastal history, and a new high-technology land-based salmon farm. In other words, there are a lot of current investments in this small municipality of about 5,000 residents.

The SDG Target Relevance-Tracing methods are separated into two main parts: first, single stakeholder workshops to identify business-specific SDG Targets; and second, multi-stakeholder workshops to identify synergies among common SDG Targets. Knowing that many of the Targets are not relevant to Norway as a highly developed country, we pre-screened the 169 Targets down to 41 Targets (Figure 1).

Since we were in the middle of the COVID-19 pandemic, we organized all our workshops in digital format, making use of the interactive web-based whiteboard *Miro* and *Zoom* for video meetings. We arranged the pre-screened SDG Targets in a straight line, clustered by their associated Goals in *Miro*. Above this row of Targets was a red line (Figure 1). We then, one by one, asked each stakeholder to reflect on the relevance of this Target to their business activity. If the stakeholder thought it was relevant, they moved the Target above the red line. If not, the Target remained below the red

line. After each individual stakeholder workshop (three stakeholders were selected), the individual stakeholder was presented with their "cluster" of relevant Targets.

Next, we wanted our stakeholders to interact with their SDG Target clusters to see if any synergies could be made. We designed a multi-stakeholder workshop using the "Backcasting" method (Poli 2019). First, the three stakeholders discussed their ideal future of Andøya in 2030. After visualizing that future, they had to go back to the present (2021) to identify the steps and initiatives that would be required to reach that ideal future in 2030. This activity helped them make collaborative decisions. It was also effective for raising awareness among the stakeholders that they *do* have similar interests related to their common SDG Targets.

Discussion

The first single-stakeholder workshop proved that the stakeholders were new to the SDGs as a practical and strategic tool. Even though they felt accustomed to the Goals, it was a new experience for them to work with the SDG Targets. Many businesses currently just select certain SDGs when working with them, because they only pick those which would suit their company well, rather than ensuring that as many SDGs as possible can be implemented and the business can be adjusted according to the SDGs (Forestier 2020).

> *"…I have to say the first goals … so far we've focused the most on 12 and up. Yes, because they're the ones that we've sort of identified as the ones we impact the most so I'm not too familiar with these goals [referring to Goals 1–11]…" (Stakeholder A, single-stakeholder workshop).*

We became aware in the multi-stakeholder invitation process that this would be the very first meeting of these three stakeholders. Their collective power was recognized in the multi-stakeholder workshop by a stakeholder:

> *"…us three here. We will impact the future of Andøya in a big way…" (Stakeholder A, multi-stakeholder workshop).*

Stakeholder B echoed the sentiment of the power of their collective action:

> *"I don't think we should underestimate the possibilities of sitting down together and say what we need in the near and far future…"* (Stakeholder B, multi-stakeholder workshop).

It took some time to change their mindset, thinking together, rather than thinking only about their business. But you could really see a change in their mindset compared to the beginning of the workshop: ***"…I need this…"*** changed to:

> *"…common analysis and joint approach…"* (Stakeholder A, multi-stakeholder workshop).

Stakeholder A also mentioned the importance of the role of holism and the role of municipal planning:

> *"…I would like to see the municipality in a holistic plan that would enable this because right now, we are allowing everything to develop wherever it wants its spot… but right now it is more a coincidence where I put things so a more better planning situation for the municipality, I think would make these things easier for us."* (Stakeholder A, multi-stakeholder workshop).

The awareness that SDG Targets are interlinked was enhanced by the stakeholders during these workshops. In this way, the SDG Target Relevance-Tracing workshops can support businesses to consider sustainable alternatives for multiple domains, something that could prove very useful for municipal planning (Bergen Kommune 2020).

The stakeholders gave positive feedback in the multi-stakeholder workshop follow-up questionnaire. They thought our academic initiative using the workshops to engage a localizing process was significant for the right implementation of their knowledge and sustainable business aspirations. This verifies the observation that J.R. Ravetz has stated in his book on scientific knowledge and its social problems:

> *"Another limitation to scientific knowledge as we conceive it in modern European civilization can be shown by a discussion of other possible sorts of knowledge. As a bridge between these different sorts, we may first consider the contrast between scientific knowledge and personal understanding… The first can be taught and demonstrated the second understanding is private and largely tacit"* (Ravetz, 1971).

The private sector plays a major role in the implementation of the SDGs on a local level and a transparent, open decision-making process is necessary to engage all key parties in sustainable system thinking. The private sector can be the engine of sustainable thinking because, for example, they can have more financial capacity in a certain area than a municipality. But the municipality must act as a neutral partner to ensure that companies are not only interested in profitable deals because social development is just as much a part of it as economic and ecological development. Scheyvens (2016) puts emphasis on the importance that community and people support each other in the process. At the regional and local level, it is necessary to conduct more research and make the SDG implementation process and network visible, so the private and public sectors can benefit from synergies to achieve more effective implementation of the SDGs (Fisher 2019).

Conclusion

The SDGs are guidelines that help companies to make a good transition to sustainability. Innovative and sustainable ideas and technologies can increase efficient production, improve the working climate, and create more future-oriented solutions. A completely new niche can be created, with long-lasting self-sustaining duration - with new jobs, more health opportunities, etc. (UN Global Compact 2015).

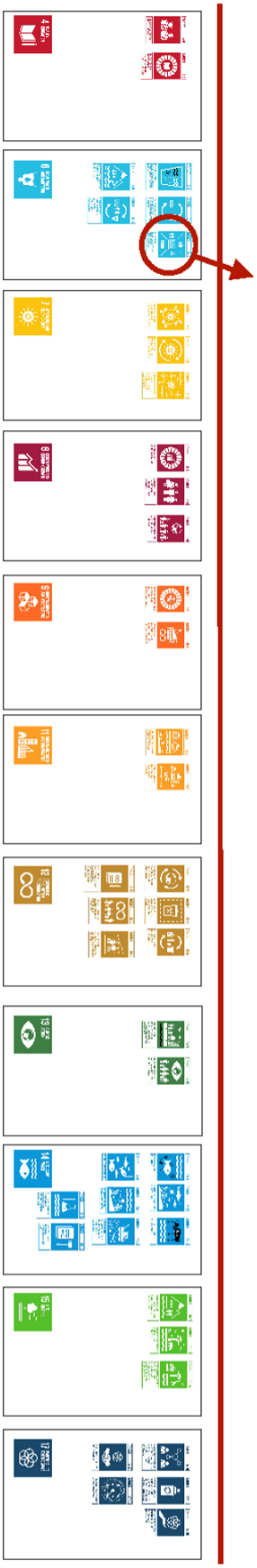

Figure 1: A generic single-stakeholder "SDG Target Relevance-Tracing" workshop set-up with pre-screened SDG Targets. We organized each SDG Target by uniform-sized boxes corresponding to its Sustainable Development Goal in the lower left-hand corner of each box. The thick red line at the top is a visual cue (demarcation) for the stakeholder during the workshop: the stakeholder signifies the relevance of a specific Target by moving each relevant SDG Target from the box to the top of the red line (Screenshot from the technique developed by Dorothy J. Dankel and Anna S. Blome).

Can communities develop multi-sector synergies to support the implementation of the SDGs? We've shown how the SDG Target Relevance-Tracing method creates "Target clusters" from the various stakeholders. The multi-stakeholder workshop makes it possible to identify interests across businesses. The stakeholders can use this knowledge to establish collaborations and municipalities and regional authorities can then report on local implementation to national authorities.

So, were we successful in raising awareness of common SDG Targets across sectors in the community of Andøya? The post-workshop feedback questionnaire shows that the three stakeholders are strongly interested in the SDGs and would like to incorporate them into their work. However, it was also clear during the workshops that their understanding of how to incorporate the SDGs directly in their business is still limited, despite the two rounds of workshops (single stakeholder and multi-stakeholder workshops).

This means that stakeholder engagement, as exemplified here in this paper, is crucial to implement the SDGs and to achieve local progress; it seems evident to us that these stakeholders would not have self-initiated a strategic dialogue framed by the SDG Targets without our academic interventions. The involved stakeholders also expressed the wish for more workshops as described in this project. They further stated that this pilot project should be enlarged and that more stakeholders should be invited into the process. These three significant stakeholders on the island of Andøya are aware of their responsibility towards the community of the island. However, it seems to us that the process needs to be promoted further and the municipality should take a supporting role at least structurally and organisationally as soon as possible. The LoVeSeSDG project will be focusing on including more stakeholders in the Relevance-Tracing methodology and multi-stakeholder workshops in the remaining two years of the project until late 2023.

We feel that, *especially* when there is an absence of national prioritization of the 169 targets, regional and local authorities need to make the SDG implementation process

more visible with the help of such techniques like our SDG Target Relevance-Tracing workshop series. In this way, stakeholders can learn to use the SDGs as a trackable tool within their own business, and as a collaborative tool to establish synergies to support and learn from other local businesses.

Acknowledgements

We thank the consortium of the #LoVeSeSDG project (https://sdg.w.uib.no) and Karin Berentsen (ARCT) and Brita Staal (SALT) for their support and ideas that contributed to the design of the workshops. We thank PhD candidate Jessica Fuller from the University of Bergen for aiding in stakeholder contacts and field work in Andøya that aided the workshop design. This work was conducted during the ERASMUS+ internship of Anna S. Blome, supervised by Dorothy Jane Dankel, in the Research Council of Norway project "Localizing the 2030 Agenda for Sustainable Development for the Barents Sea-Lofoten ecosystem in a changing climate" project number 295088.

References

Bergen Kommune. *Innspill til nasjonal handlingsplan for bærekraftsarbeidet*. Oslo: Departementenes sikkerhets- og serviceorganisasjon (DSS), 2020. Accessed November, 2020.

Fisher, Angelina & Fukuda-Parr, Sakiko. 2019. "Introduction—Data, Knowledge, Politics and Localizing the SDGs". *Journal of Human Development and Capabilities* 20(4): 375-385.

Forestier, Oana & Kim, Rakhyun, E. 2020. "Cherry-picking the Sustainable Development Goals: Goal prioritization by national governments and implications for global governance". *Sustainable Development* 28: 1269-1278.

Gratzer, George & Keeton, William, S. 2017. "Mountain Forests and Sustainable Development: The Potential for Achieving the United Nations' 2030 Agenda". *Mountain Research and Development* 37(3): 246-253. https://doi.org/10.1659/MRD-JOURNAL-D-17-00093.1.

UN Global Compact & the WBCSD and GRI. *SDG compass: The guide for business action on the SDGs*. United Nations, 2015.

Poli, Roberto. 2019. *Working with the future: Ideas and Tools to Govern Uncertainty*. Milano: EGEA Spa - Bocconi University Press. ISBN 978-8885486911.

Ravetz, Jerome R.,. 1971. *Scientific Knowledge and Its Social Problems*. Oxford: University Press. ISBN 1-56000-851-2.

Rockström, Johan, Steffen Will, Noone Kevin, Persson Åsa, Stuart III Chapin, F., Lambin Eric, Lenton Timothy M. et al. 2009. "Planetary Boundaries: Exploring the Safe Operating Space for Humanity". *Ecology and Society* 14(2): 32.

Scheyvens, Regina, Banks Glenn & Hughes Emma. 2016. "The Private Sector and the SDGs: The Need to Move Beyond 'Business as Usual'". *Sustainable Development* 24(6): 371-382.

THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION'S CONTRIBUTIONS TO OCEAN SCIENCE AND HIGHER EDUCATION FOR SUSTAINABLE DEVELOPMENT

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Abstract

The Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO) holds a mandate for ocean science and capacity development in support of the 2030 Agenda and its sustainable development goals (SDGs). The IOC contributes to many areas of the 2030 Agenda, including to SDG 14 (Life Below Water), by providing expertise, and coordinating ocean-related efforts of its Member States to conserve and sustainably manage the ocean resources. As part of this effort, the IOC has been mandated by the United Nations General Assembly (UNGA) to lead the preparation of the UN Decade of Ocean Science for Sustainable Development 2021–2030 (the 'Ocean Decade').

This paper aims to provide an overview of how the IOC supports its Member States, the scientific community and other ocean stakeholders in increasing scientific knowledge and developing research capacity toward the achievement of SDG 14 (see IOC Capacity Development Strategy 2015-2021 and IOC Criteria and Guidelines for the Transfer of Marine Technology). The IOC is the custodian agency for two SDG 14 indicators (Targets 14.3 and 14.a). In that capacity, the IOC developed the methodology to measure and report on Indicator 14.3.1 and Indicator 14.a.1 at the global scale.

This paper elaborates on some of the IOC's activities, relevant for research and higher education, including the Regional Training and Research Centres (RTRCs), OceanTeacher Global Academy, and the Ocean Best Practices System. Finally, it explores how the UN Ocean Decade can support higher education in the field of ocean science.

Introduction

In many countries where ocean science capacity is still low, improving ocean health and enhancing the potential of marine biodiversity to contribute to their national development remains a challenge. A lack of resources and low priority given to ocean research in these countries limits their access and opportunities to effectively participate in and benefit from global programmes and actions, such as to make the best use of transfer of marine technology.

Capacity development is an essential tenet of IOC's mission. It enables all Member States to participate in and benefit from ocean research and services that are vital to sustainable development and

human welfare on the planet. The IOC Criteria and Guidelines for the Transfer of Marine Technology (CGTMT) outlines the necessary components to make a significant contribution to capacity development for countries to access the benefits of the oceans and seas in a sustainable manner. The CGTMT is relevant to the 2030 Agenda, in particular SDG 14, with regards to increasing scientific knowledge and developing research capacity and transfer of marine technology. Altogether, the IOC aims to improve ocean health and to enhance the contribution of marine biodiversity to the development of countries, in particular Small Island Developing States and Least Developed Countries.

The vision contained in the IOC CD Strategy 2015-2021 identifies capacity development as the primary catalyst through which ocean science capacity can be augmented through strengthening and enabling human potential, infrastructure, cooperation, resources and adequate social conditions of successful research and development. Furthermore, the IOC's holistic approach and participatory processes in identifying and addressing capacity development needs; and promoting cooperation through "partnerships" and "collaborations" that leverage expertise, platforms, data, funding opportunities, etc. to meet capacity development and technological support in an integrated manner. The IOC contributes to equitable benefit distribution across regions through its tools and resources that aim to achieve long-term and sustained capacity in a country or region.

The Intergovernmental Oceanographic Commission's contributions to the 2030 Agenda and the sustainable development goals

The IOC holds a mandate from the United Nations for ocean science and capacity development in support of the 2030 Agenda and its SDGs. The IOC contributes to many areas of the 2030 Agenda, focusing on SDG 14, by providing expertise, and coordinating ocean-related efforts of its Member States to conserve and sustainably manage the ocean resources. The IOC was identified as the custodian agency for two SDG 14 Targets: Target 14.3 (ocean acidification) and Target 14.a (marine scientific research), and related Indicators:

- Indicator 14.3.1: Average marine acidity (pH) measured at agreed suite of representative sampling stations.
- Indicator 14.a.1: Proportion of total research budget allocated to research in the field of marine technology.

The technical support provided by the IOC includes the development of an agreed methodology to provide data on the respective SDG indicators, as well as underpinning data standards to collect data from Member States and report these to the UN Statistical Division. Providing countries and their scientists with the agreed indicators and methodology, however, is only a first step. Increasing the capacity of all nations to report towards the goals requires the establishment of reporting mechanisms and training to measure and report on the indicators.

The IOC has developed an online portal[1] based on the SDG 14.3.1 Indicator methodology and the associated data and metadata files, in cooperation with the International Oceanographic Data and Information Exchange (IODE). This facilitates the reporting on Indicator 14.3.1. In support of the

1 https://oa.iode.org

data collection request to Member States, the SDG Indicator 14.3.1 methodology and the associated data and metadata files for data collection are being disseminated and introduced to researchers and data managers during capacity development workshops.

Data for the Indicator 14.a.1 are reported in the Global Ocean Science Report (GOSR) [2]. An online GOSR portal[3] and an improved questionnaire for the GOSR 2020 (IOC-UNESCO 2020) was developed based on consultations with Member States and their representatives, facilitating the contributions to questions related to the SDG Indicator 14.a.1.

Equitable and Global Access to Capacity Development: tools and resources

The IOC Capacity Development Strategy serves as a key mechanism contributing to targeted results[4] where improved scientific knowledge and capacity to understand and observe the ocean climate and ecosystems needs are made available equitably to all Member States. Aligned to IOC Criteria and Guidelines on the Transfer of Marine Technology, capacity development interventions benefit from developments in marine science-related activities, and in particular those activities that aim at stimulating the social and economic benefits from ocean- and sea-related activities in a sustainable manner.

The IOC contributes to the development of human resources and institutional capacities needed to underpin these plans as laid out in the Capacity Development Strategy, through enabling Continuous Professional Development providing short-term specialized courses, training opportunities, fostering collaboration and knowledge sharing, workshops, internships, fellowships, exchange programmes, and other activities relevant to the IOC mandate to help ocean researchers acquire necessary knowledge and skills.

Collaboration among universities and research institutions through international inter-university cooperation and networking also contributes to enhancing institutional capacities through knowledge sharing and collaborative work. Joint capacity development and technology transfer provide equitable and global access to capacity development tools and resource and contribute to pooling resources, establishing new teaching initiatives, generating innovation through research, informing policy decisions, and enhancing science and cooperation.

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2 The GOSR2020 is a resource for policymakers, academics and other stakeholders seeking to assess progress towards the SDGs of the UN 2030 Agenda, in particular SDG target 14.a on scientific knowledge, research capacity and transfer of marine technology. The GOSR provides the information for the indicator for target 14.a as the proportion of total research budget allocated to research in the field of ocean science. GOSR2020 not only provides consistent reference information at the start of the UN Decade for Ocean Science for Sustainable Development 2021–2030, it evolves as a living product. The global community is given the online facility to submit and update data on the GOSR portal and consult data to regularly assess progress on the efficiency and impact of policies to develop ocean science capacity.

3 http://gosr.ioc-unesco.org

4 The IOC Capacity Development Strategy (2015–2021) targets six major outputs that include 1) Development of human resources, 2) Established or improved access to physical infrastructure, 3) Strengthening of global, regional and sub-regional mechanisms, 4) Promotion of development of ocean research policies in support of sustainable development objectives, 5) Increased visibility and awareness, and 6) Reinforced sustained (long-term) resource mobilization.

Regional Training and Research Centres (RTRCs)

Since capacity development needs vary from one region to another, the IOC regional sub-commissions and regional committees take an adaptive approach to capacity development for their respective regions by sharing essential human and infrastructure resources. Recognizing the importance of equal and accessible capacity development, the IOC promotes continuous strengthening of global programmes and regional subsidiary bodies[5] to expand and integrate training courses in their programmes and agree on regional cooperative activities. Through the IOC Sub-Commission for the Western Pacific (IOC-WESTPAC) and the establishment of Regional Training and Research Centres (RTRCs) in national oceanographic institutes or universities, the IOC contributes to improving regional capability in a sustainable and systematic manner. IOC-WESTPAC RTRCs provide training and research opportunities to young scientists and early career ocean professionals through combined modes of face-to-face training, hands-on exercises, and training-through-research.

The OceanTeacher Global Academy (OTGA)

Building on the legacy of OTGA (2015–2020) and decades of training delivered by IODE and its predecessor project, the OceanTeacher Academy, the second OceanTeacher Global Academy Project (OTGA-2), which started on 1 April 2020, aims to further develop the collaborative network of training centres that share education and training materials, staff and technical expertise, and provide cost-effective education and training services for the needs of IOC Member States. The new OTGA-2 includes new initiatives and challenges on, for example, the 2030 Agenda and the UN Ocean Decade.

Besides the various international processes that OTGA-2 supports[6], it also contributes to the implementation of the IOC Capacity Development Strategy by addressing key outputs identified in the strategy through increased support[7] in the training activities of all IOC programmes. With increased involvement by the IOC Regional Sub-Commissions and Regional Committees, these regional bodies ensure that the capacity development needs of the regions are being met by supporting the OTGA Regional and Specialized Training Centres. This network of Training Centres includes Regional (region-focused) and Specialized (topic-focused) Training Centres. Training topics also include tools that can help Member States achieve the SDGs, and research emerging topics such as ocean acidification and blue carbon, among others.

New, ready to deliver course topics are being made available online. The e-Learning Platform is an essential component of OTGA-2. As a fully-fledged Learning Management System, it facilitates face-to-face classroom learning, blended learning, and online learning. All training course contents are hosted on the OT e-Learning Platform[8]. Setting up of video conferencing sessions between RTCs

5 IOC Sub-Commission for Africa and the Adjacent States (IOCAFRICA); IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE); and the IOC Sub-Commission for the Western Pacific (IOC-WESTPAC).

6 The 2030 Agenda and six of its 17 SDGs, the UN Ocean Decade, the Samoa Pathway (2014), the Sendai Framework for Disaster Risk Reduction, the Qingdao Declaration (2015), and the GOOS 2030 Strategy.

7 This support includes the Tsunami Unit, Ocean Literacy, Harmful Algal Bloom programme, IODE, Ocean Sciences and the Ocean Decade, amongst others.

8 It also allows the use of different languages for training: currently OTGA-2 has courses in 4 different languages (English, Spanish, French, Portuguese). Content is freely available during and after courses (Creative Commons Attribution 4.0 license), although registration on the OT platform is mandatory.

allows processes that are more cost and time efficient as well as allowing multiple lecturers to provide short lectures without costly travel. For example, the lecturer in RTC1 at his/her RTC can be streamlined simultaneously to RTC2, as well as recording the lecture sessions for re-use or sharing of displays among lecturers and students with other students and lecturers in other RTCs.

The quality of the courses delivered is central to OTGA. In April 2018, the IOC Project Office for IODE, host of the OceanTeacher Global Academy, achieved ISO 29990 certification as a Learning Services Provider for non-formal education and training. The certification process validates the quality of learning opportunities offered by OTGA-2, through the IOC Project Office for IODE, and the high standard of quality learning services delivered that can support all IOC programmes in providing specialized training.

OTGA-2 is seeking the establishment of partnerships and collaborations with key players at the global, regional, and local levels that will enable increased impact of training and better use of resources. It does so, namely, by promoting the use of its e-Learning Platform for ocean-related training, thus contributing to the UN Delivering as One (DaO) motto, and continuous monitoring and evaluation by the Project Office.

Ocean Best Practices System

Much of the ocean community does not maintain its methodological knowhow in open access, secure archives of up-to-date ocean best practices. This is particularly important for capacity development and retention within local communities. Capacity development hinges on the transfer of marine technology, and retention occurs if that technology is shaped and fit for purpose into locally relevant best practices. Increasing the training and use of commonly accepted practices by new or expert ocean research and application interests is a priority for the Ocean Best Practices System.

The IOC Ocean Best Practices System (OBPS) comprises technological solutions and community approaches to enhance management of methods/practices, as well as support the development of ocean best practices[9]. The OBPS is a growing platform that provides open access to a persistent repository of common practices with enhanced discovery and access capabilities and a peer-reviewed journal research topic. It assists capacity development by harmonizing the training content, providing access, and building a suite of training courses (e.g., facilitated by the IOC OTGA and POGO Summer Schools, etc.) in collaboration with provider experts.

The IOC Ocean Best Practices System facilitates and serves as a window for capacity development resources that enable knowledge transfer on ocean best practices across the ocean value chain. To support the SDGs, each community collects metadata and records its contribution to the SDGs Goals, Targets, and Indicators, to enable searches on best practices supporting individual SDGs. The training content in OBPS includes not only documents like manuals, guidelines and standard operating procedures but also training videos held on OBPS and YouTube. In pursuit of the 2030 Agenda, the OBPS training component is seeking innovative solutions to being a global resource for ocean best practices dissemination and adoption.

9 A best practice is a methodology that has repeatedly produced superior results relative to other methodologies with the same objective.

Capacity Development for the UN Decade of Ocean Science for Sustainable Development

The UN Decade of Ocean Science for Sustainable Development began on 1 January 2021 and will be coordinated by IOC-UNESCO[10]. Capacity development - with a focus on Least Developed Countries and Small Island Developing States - is a cross-cutting theme of the Ocean Decade and has been highlighted by partners throughout the preparation phase as a priority element of all actions carried out during the Ocean Decade.

The Capacity Development Chapter of the Ocean Decade's Implementation Plan underlines the vital role of capacity development in achieving evenly distributed capacity across the globe, across generations, and across genders and thus reverse asymmetry in knowledge, skills and access to technology. More importantly, capacity development efforts will focus not only on capacity to do the science, but also on capacity to understand the societal relevance of the science, and to use the science to support decisions for sustainable development. In this sense, the targets of capacity development as part of the Decade include not only scientists, but also the end-users of knowledge such as governments and policymakers in member states, especially from Small Island Developing States and Least Developed Countries.

The Implementation Plan documents a series of principles and a strategic framework to guide capacity development during the Decade. Notably, this includes ensuring that capacity development should be demand driven, be based on sustained and long-term efforts, build on existing networks and tools, and include capacity exchange as an underlying theme. The Implementation Plan also recognizes the need to ensure that indigenous and local knowledge holders are both beneficiaries of, and providers of, capacity development.

As the coordinating body of the Decade, IOC will contribute to the Decade objectives through its capacity development tools and resources as platforms for sustained long-term impact and access to specialized courses and best practices. The OceanTeacher Global Academy will be able to contribute to the UN Ocean Decade by developing training packages[11] that will support all member states addressing the challenges of implementing SDG 14, amongst others. The Ocean Best Practices System, within their capacity development and training activities, will provide access to best practice methodology and to methods and guidelines that are recommended for use in training and education activities.

References

IOC-UNESCO. "Global Ocean Science Report 2020: Charting Capacity for Ocean Sustainability". (K. Isensee, Ed.), Paris: UNESCO Publishing, 2020.

10 The Ocean Decade will provide an enabling framework for diverse actors across the globe to generate and use ocean science and ocean knowledge for sustainable and equitable development. It will do so by facilitating the transformation of existing or new knowledge and understanding into effective action supporting improved ocean management, stewardship, and sustainable development.

11 With a special focus on topics such as Ocean Literacy, Co-Design of Ocean Science, Working at the Science-Policy Interface, Ocean Acidification and Blue Carbon, Marine Biodiversity, TMT, Marine Spatial Planning, use of ocean standards and best practices, *inter alia*.

ENGAGING STUDENTS IN SDG 14 BY PLACING THEM AT THE CENTRE OF THEIR OWN LEARNING: SDG214 AT THE UNIVERSITY OF BERGEN AS AN EXAMPLE

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Abstract

Educating students on the sustainable development goals (SDGs) calls for teaching where students are at the centre of their own learning. Sustainability questions are 'wicked problems', where no single, correct answer exists, but the answers depend on the values of those who answer, and require innovative pedagogy and active, action-oriented learning to allow the learners to think critically and engage in exploring sustainable futures. In line with the other SDGs, SDG 14 (Life Below Water) provides an excellent focus area for teaching and learning. The course, SDG 214, at the Department of Biological Sciences at the University of Bergen is a 10 ECTS credit interdisciplinary course where the students work in teams, and the portfolio assessment includes essays, presentations, a debate, a poster and a short paper, but no exam. The assessment is formative, and the students get feedback on their individual and group assignments and are allowed to resubmit. The course culminates in a poster session organised together with three other courses. In the two years the course has been running, 85% (2019) and 94% (2020) of the students have been satisfied with the course, even though they consider the required workload and expectations high. The student evaluations also suggest that the assignments function very well to develop students' critical thinking skills, which is essential for education on sustainable development.

Sustainability education

Educating students to respond to the sustainable development goals (SDGs) calls for teaching where students are at the centre of their own learning, through learning methods such as problem-based learning, role plays and simulations, group discussions, debates, and case studies (Byrne 2000; Cotton and Winter 2010; Tilbury 2011; UNESCO 2018; Wiek et al. 2011). Sustainability questions are often 'wicked problems' (Rittel and Webber 1973), where no single, correct answer exists, but the answers depend on the values of those who are asked. Education that is centred on such questions requires innovative pedagogy and active, action-oriented learning allowing the learners to think critically and engage in exploring sustainable futures (UNESCO 2018; SDSN 2020).

Motivation for the University of Bergen course on Sustainable Development Goal 14: Life Below Water

The University of Bergen has a strong marine profile and was, in 2018, announced as both the official United Nations Academic Impact (UNAI) Hub for SDG 14, and as the leader of the SDG 14 Cluster for the International Association of Universities (IAU). However, as often happens, the establishment of a course on this topic at the University, identified as the SDG 214, course was strongly

based on a combination of knowledge and my personal motivation as the teacher of the course to teach on a subject of high relevance for students and society at large.

Course design and development

GENERAL PRINCIPLES

Active learning

Active learning implies that students are learning by engaging in (cognitive) activity, and constructing rather than receiving knowledge (Bransford, Brown and Cocking 2000; Chickering and Gamson 1987; Johnson, Johnson and Smith 1998; Prince 2004), leading to a deep approach to learning (Bevan et al. 2014). Active learning methods have clear learning benefits (e.g., Freeman et al. 2014), and transforming students into active players in their learning is particularly well suited for education for sustainable development (UNESCO 2018; SDSN 2020). It was therefore clear from the outset that the SDG 214 course would be based on highly student-active learning methods.

Constructive alignment

One of the benefits of designing a completely new course is the freedom it provides to pay attention to the really important issues, such as constructive alignment (Biggs 1996). Constructive alignment means that the intended learning outcomes, learning activities, assignments, and assessment need to be linked to each other. Starting from the end – "what do I want my students to learn?" – allows for the intended learning outcomes to articulate the teacher's intentions for the whole course (Biggs 1996; Boulton-Lewis 1995). In designing this course, I started by stating the intended learning outcomes (**what** do I want the students to learn?), then drew the alignment through learning activities (**how** is the students supposed to learn it?) to assessment (**how** am I going to assess how well the students have reached the intended learning outcome?). The intended learning outcomes and the associated assignments are listed in Table 1 and Table 2.

Authentic assessment

Authenticity in assessment means that the assessment method allows for testing the intended learning (Kearney et al. 2013). For example, it would feel quite meaningless if, for getting a driver's license, one would only write an essay or perform a multiple-choice test about driving a car, and not actually demonstrate that one can drive a car. Traditionally, assessment in higher education is often somewhat like this, with a written exam or a multiple-choice test at the end of the course, with potentially weak connections along the axis from learning outcomes via activities to assessment. When developing the SDG 214 course, I paid special attention to making sure that the assessment was as authentic as possible, for example by using assignments such as presentations, debates, peer-reviews, and reflective essays (see Table 1 and Table 2 for more details).

Formative feedback and assessment

Formative feedback provides information which intends to change the student's behaviour or thinking with the goal of improved learning (Shute 2008), while formative assessment implies that assessment is seen as part of the learning process (Sadler 1989; Nicol and Macfarlane-Dick 2006), not just a measuring tool for students' acquirement of intended learning goals (so called summative assessment, Taras 2005). Both methods are integral elements of the SDG 214 course. Feedback

is provided by both the teachers and teaching assistants as well as by peers (i.e., the fellow students). Peer feedback has positive effects on both the students providing the feedback and the ones receiving it (e.g., Boud et al. 1999), and the ability to give critical but constructive peer feedback is a central transferable skill for almost any thinkable career choice. Formative feedback and assessment, particularly when done throughout the whole course and not only at the end, give the students a realistic view of the level of their knowledge and skills and provides them with a clear view of what they still need to work on. This is an element that the student evaluations have shown the students to appreciate highly.

Learning outcomes, activities, and assessment

The United Nations Educational, Scientific and Cultural Organization (UNESCO) has drafted general learning outcomes for SDG 14 (UNESCO 2017), but for the SDG 214 course an independent set of learning outcomes was designed (Table 1). Table 2 lists the assignments associated with the different learning outcomes and shortly describes the learning activities associated with a given learning outcome. The course is graded as pass/fail, but all assignments have in the first years been graded with points, and Table 2 lists the maximum points for each assignment.

Table 1: Intended learning outcomes, and which assignments are assessing students' achievement of them. The bold X shows the main assignment for a given learning outcome.

		ASSIGNMENTS *(SEE TABLE 2)*					
INTENDED LEARNING OUTCOMES		**1**	**2**	**3**	**4**	**5**	**6**
Knowledge	1. Explain physical and biological ocean processes that contribute to making the problems under SDG14 global		x				x
	2. Explain the history and contents of the most important international agreements and conventions relevant for SDG14		**X**				
	3. Describe the roles of key governmental and intergovernmental arenas for decision-making relevant for SDG14		x			x	
Skills	4. Analyse and interrelate SDG14 targets considering other SDG targets	**X**			x		x
	5. Find, navigate, and make connections between scientific literature and the literature of reports, conventions, and policy documents		x	x			x
	6. Identify stakeholders and analyse their motives			x	**X**		x
	7. Evaluate existing research and suggest research needs related to SDG14	x					**X**
General competences	8. Be able to compose and use scientifically grounded arguments for societally relevant debates			x		x	x
	9. Be able to provide peer feedback while balancing critical and constructive views		x	x	x		
	10. Identify and separate between scientific knowledge, values, beliefs, and ideologies			**X**	x	x	x

Table 2: Assignments, associated learning outcomes (see Table 1 for details; the number marked with bold is the main learning outcome for a given assignment), and the maximum points for each assignment.

ASSIGNMENT DESCRIPTION	SPECIFICATIONS	LEARNING OUTCOME(S)	POINTS
1. Identify SDG14 trade-offs and conflicts (group discussion, individual essay)	Individual essay discussing the trade-offs and conflicts of SDG14 with the other SDGs (500-1000 words).	4, 7	12
2. Agreements, conventions, reports, research (group presentation)	Each group chooses one of the SDG14 targets and tracks it back in time and prepares a 10-minute presentation to be presented in class.	2, 1, 3, 5, 9	12
3. Describe an NGO and its use of science (group discussions & presentation)	Each group chooses an NGO relevant for SDG14, and studies & discusses its use of science (web pages, publications, campaigns), and presents their findings to the class in 10-minute presentation.	10, 5, 6, 8, 9	12
4. Analyse stakeholders (group discussions, individual essay)	Write a 500-1000 word individual essay describing the stakeholders and their motives in the film 'Cod Is Dead'.	6, 4, 9, 10	12
5. Recreate a current debate (group debate)*	Preparation and participation in Oxford-type debate.	8, 3, 10	
6a. Final poster (group work)	Each group makes a poster on a theme relevant for SDG14. The team members will evaluate their own and each other's contribution towards the teamwork.	1, 4, 5, 6, 7, 8, 10	14
6b. Final paper (group work)	Each group makes a 3-page paper on a theme relevant for SDG14 (to support the poster). The team members will evaluate their own and each other's contribution towards the teamwork.	1, 4, 5, 6, 7, 8, 10	14
P1. Peer-review of your fellow's assignment on SDG14 trade-offs and conflicts	Write a peer review of your fellow student's analysis directly on the word document. Use comments and track changes (ca 300-500 words in total).	9	3
P2. Peer-review of your fellow's assignment on stakeholders	Write a peer review of your fellow student's analysis of stakeholders directly on the word document. Use comments and track changes (ca 300-500 words in total).	9	3
a. Network map of SDG interactions (group discussion, individual map)	Make a network map of the interactions (positive and negative) of all the 17 SDGs.	4	2
b. Participate in SDG Bergen Conference & reflect upon your experience (individual reflection)	Write a 300-word reflection of the activity you participated on.		2
c. Reflective short essay on changes in perception during the course (group discussion, individual essay)	First discussions in mixed groups on your perceptions on sustainability, SDG14, and your perceptions might have changed during this course. 300-500 words to be done "in class".	All	2

* In 2020 the assignment 5 was changed to an 'op-ed' article on an agreed theme due to the COVID-19 pandemic moving the teaching online.

Evaluation of team members' effort

Several of the assignments (2, 3, 5, and 6) in this course are done as teamwork in groups. The students are members of the same team throughout the semester, and these are set up to be as interdisciplinary as possible. All team members evaluate their own and their team members' efforts towards the group work, independently and anonymous to the other group members, and these evaluations influence the point sum each student receives for a given group assignment. The purpose of this effort evaluation is to hinder "free-riding" in the group assignments (e.g., Khuzwayo 2018). In case of large discrepancies in the perception of effort, the teacher discusses with the team members individually to clarify. The evaluations are usually surprisingly uniform, and the students within the group tend to agree on who did more work, or if the effort was equal. The goal is that the effort would be equally distributed among the team members, but occasionally some teams make it into a competition of who has the highest effort, which is not helpful as the scope of each assignment is limited. We have therefore paid special attention to teaching the students also how to work in groups and have found the resources available at University of British Columbia helpful[12].

Student feedback and the course development based on it

Student feedback is an essential part of course development process, particularly when including relevant questions. It is therefore great that out of the number of students who finished the course, 18 out of 18 students in 2019 and 30 out of 38 students in 2020 also filled the online feedback survey. The student feedback for the course has been, in general, positive: 85% and 93% of the students in 2019 and 2020, respectively, have been "in general happy with the course" (Figure 1). One concrete example of how student feedback has been useful for the course is the development of rubrics for the assignments. In 2019, just under a half of the students felt that the expectations for the assignments were clear, and over one third of the students felt they were not clear (Figure 2). In 2020, rubrics were developed for each assignment and, probably largely due to this, 97% of the students felt that the expectations were clear (Figure 2).

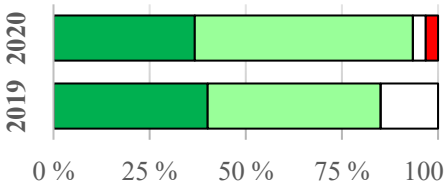

Figure 1: Statement: "I am in general happy with the course".

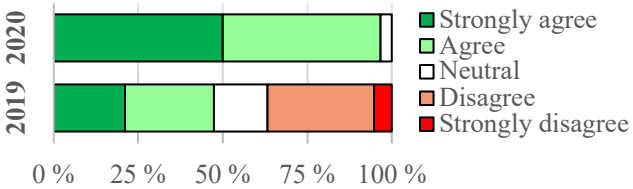

Figure 2: Statement: "Clear expectations were presented for the assignments".

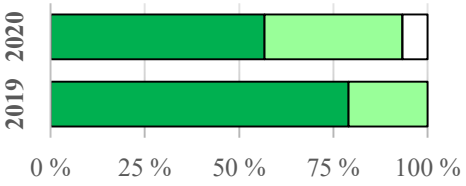

Figure 3: Statement: "The course developed my skills within critical thinking".

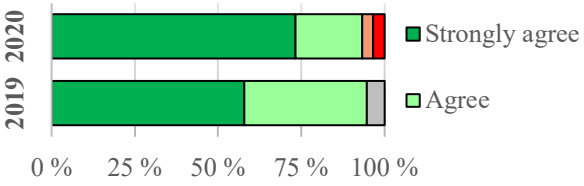

Figure 4: Statement: "The course developed my skills within cooperation".

12 https://learningcommons.ubc.ca/student-toolkits/working-in-groups/group-process/

The skills that most of the students feel were developed during the course are critical thinking (Figure 3), cooperation (Figure 4), and writing. In 2019, 95% of the students and in 2020, 90% of the students agreed that the course developed their skills in writing (figure not shown). The students also give free text feedback, and here are some selected examples highlighting what the students considered good with the course:

> *"Critical thinking was a big part of the course. This is something I haven't worked with that much throughout my years at college and therefore found it interesting to challenge myself"* – Anonymous student review.
>
> *"The working in groups was very interesting as well since we come from different fields of study and understand a bit better how it is at a UN table" – Anonymous student review.*
>
> *"I really enjoyed this course, and it makes me grow in ways beyond the subject itself by all the different tasks and assignments we have"* – Anonymous student review.
>
> *"Learning methods, all engaging and really encourage critical thinking and great discussions in class"* – Anonymous student review.
>
> *"The thorough feedback is a very positive thing, that one learns a lot from"* – Anonymous student review.
>
> *"Understanding the divergences the UN members meet and the science-public-opinion relation was very enlightening as well"* – Anonymous student review.

Conclusions

The SDG 214 course has turned out to be a course that interests a wide range of students. The students also experience improvement in the skills crucial for sustainable development, such as critical thinking and cooperation. The student feedback has been very helpful in developing this relatively new course. These positive experiences from the University of Bergen should encourage others to also set up courses centring around this, and other sustainable development goals.

The next challenge for this course is that we are currently limited by the capacity in our active learning rooms and the teaching staff - there are about twice as many students that want to take this course than there is capacity for, and we are therefore forced to start developing ways to upscale the active learning elements to a larger class size. For example, providing individual feedback as formative assessment is time-consuming, and we might need to consider new ways for providing feedback, by relying more on peer-feedback.

Ackowledgements

I thank all the guest teachers for their invaluable input to the course, Christian Jørgensen and Inger E. Måren for many discussions on developing and improving SDG 214, and all the students for inspiration and letting me learn with them.

Related material

In 2019 three short videos interviewing the students and teacher where made, available here: https://www.uib.no/en/sdgbergen/127497/connecting-student-active-learning-un-system.

The student posters and short papers from the course are openly available here: https://clichex.w.uib.no/category/sdg214/ .

References

Bevan, Samantha J., Chan Cecilia W. L., & Tanner Julia A. 2014. "Diverse Assessment and Active Student Engagement Sustain Deep Learning: A Comparative Study of Outcomes in Two Parallel Introductory Biochemistry Courses". *Biochemistry and Molecular Biology Education* 42(6): 474-479. DOI 10.1002/bmb.20824

Biggs, John. 1996. "Enhancing teaching through constructive alignment". *Higher Education* 32(3): 347-364. Netherlands: Kluwer Academic Publishers.

Boud, David, Cohen Ruth & Sampson Jane. 1999. "Peer learning and assessment". *Assessment & Evaluation in Higher Education* 24(4): 413–426.

Boulton-Lewis, Gillian M. 1995. The SOLO taxonomy as a Means of Shaping and Assessing Learning in Higher Education. *Higher Education Research and Development* 14(2): 143-154.

Bransford, John D., Brown, Ann L. & Cocking, Rodney R. 2000. *How people learn*. Washington, DC: National Academy Press. ISBN 0-309-07036-8.

Byrne, Jack. 2000. "From Policy to Practice: Creating Education for a Sustainable Future". In *Education for a Sustainable Future: A Paradigm of Hope for the 21st Century,* edited by Wheeler, Keith A. & Bijur Anne Perraca, 35-72. New York: Kluwer/Plenum.

Chickering, Arthur W. & Gamson, Zelda F. 1987. "Seven principles for good practice in undergraduate education". *American Association for Higher Education*: 3-7.

Cotton, Debby, & Winter Jennie. 2010. "It's not just bits of paper and light bulbs: A review of sustainability pedagogies and their potential for use in higher education". In *Sustainability education: Perspectives and practice across higher education*, 54-69. ISBN 9781849776516.

Freeman, Scott, Eddy Sarah L., McDonough Miles, Smith Michelle K., Okoroafor Nnadozie, Jordt Hannah, & Wenderoth Mary Pat. 2014. "Active learning increases student performance in science, engineering, and mathematics". *PNAS*, 111(23): 8410-8415.

Johnson, David W., Johnson Roger T. & Smith Karl A. 1998. "Cooperative Learning Returns To College What Evidence Is There That It Works?". *Change: The Magazine of Higher Learning* 30(4): 26-35.

Kearney, Sean. 2013. "Improving engagement: the use of 'Authentic self-and peer-assessment for learning' to enhance the student learning experience". *Assessment & Evaluation in Higher Education*, 38(7): 875-891.

Khuzwayo, Mamsi Ethel. 2018. "Assessment of group work in initial teacher education and training". *South African Journal of Education* 38(2): 1-11.

Nicol, David J. & Macfarlane-Dick Debra. 2006. "Formative assessment and self-regulated learning: a model and seven principles of good feedback practice". *Studies in Higher Education* 31(2): 199-218.

Prince, Michael. 2004. "Does Active Learning Work? A Review of the Research". *Journal of Engineering Education* 93(3): 223-231.

Rittel, Horst W.J. & Webber Melvin M., 1973. "Dilemmas in a general theory of planning". *Policy Sciences* 4: 155–169. Amsterdam: Elsevier Scientific Publishing Company.

Sadler, D. Royce. 1989. "Formative assessment and the design of instructional systems". *Instructional Science* 18: 119–144. Dordrecht: Kluwer Academic Publishers.

SDSN. "Accelerating Education for the SDGs in Universities: A guide for universities, colleges, and tertiary and higher education institutions". New York: Sustainable Development Solutions Network (SDSN), September 2020.

Shute, Valerie J., 2008. "Focus on Formative Feedback". *Review of Educational Research* 78(1): 153-189. DOI: 10.3102/0034654307313795.

Taras, Maddalena. 2005. "Assessment – Summative And Formative – Some Theoretical Reflections". *British Journal of Educational Studies* 53(4): 466-478.

Tilbury, Daniella. 2011. *Education for sustainable development: An expert review of processes and learning*. Paris: UNESCO.

UNESCO. "Education for Sustainable Development Goals: Learning Objectives". Paris: UNESCO, 2017. ISBN 978-92-3-100209-0.

UNESCO. "Issues and Trends in Education for Sustainable Development". Edited by Leicht A., Heiss, J. & Byun, W. J. Paris: UNESCO, 2018. ISBN 978-92-3-100244-1.

Wiek, Arnim, Withycombe Lauren & Redman Charles L., 2011. "Key competencies in sustainability: A reference framework for academic program development". *Sustainability Science* 6: 203–218. DOI 10.1007/s11625-011-0132-6.

SUPPORTING SUSTAINABLE DEVELOPMENT GOAL 14 "LIFE BELOW WATER" THROUGH UNDERSTANDING SURFING COMMUNITIES WITH A SOCIAL-ECOLOGICAL SYSTEMS LENS: HOW DO OCEAN USERS FIT INTO SDG 14 AND THE OCEAN DECADE?

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Abstract

As nearly half the human population now live by the coast (Halpern et al. 2015), development has imposed great pressure on marine ecosystems and coastal environments (Selkoe et al. 2015). To understand better the Human-Ocean System; its processes and problems and work towards the United Nations (UN) Sustainable Development Goal 14: Conserving and sustainably using the ocean (SDG 14); research suggests insight into groups with different "perspectives, interactions, interrelationships and dependencies" (Brennan et al. 2019). Surfers are a key group in this regard. Their social and cultural world is intimately connected to the ocean (Lazarow and Olive 2017) and their relationship is regarded as complex and highly subjective (Scarfe et al. 2003; Ford and Brown 2006, 11; Borne 2018, 7). Surfers meet where waves break and this "surf space", is where the environmental and social interactions exist in surfing (Preston-Whyte 2002; Scarfe et al. 2009; Lazarow et al. 2009). As surfers move up the ranks from beginner to advanced, what tends to change is the surfing habitats they frequent (Hutt et al. 2001) and the skills they develop; including coastal navigation and water safety (Booth 2004, 106). Being aware and knowledgeable of the ocean system is integral to surviving and progressing as a surfer (Weirsma 2014), but more crucially, being aware and knowledgeable of the ocean system lays the foundation for marine citizenship and potential citizen science participation. This article offers the argument that using blue spaces for mental, emotional, and physical benefits not only benefits ocean communities, but also SDG 14 (Life Below Water). It recommends the social-ecological systems framework as a highly useful tool for better understanding surfer and wider coastal communities. This, in theory, could help support and develop citizen science programmes; a methodology being called upon to help increase data collection for the Decade of Ocean Science and SDG 14 targets.

Introduction

On 1 January 2021, the United Nations Decade of Ocean Science dawned and with it "a new narrative", heralding opportunities to reframe the mindset of how humanity views the ocean (Lubchenco and Gaines 2019). The ocean is and has been under threat from human activity since the industrialisation of the seas began approximately 500 years ago (Smith 2000). The use (and exploitation) of coastal habitats has increased dramatically, as too has human population is these areas: with 41% of the world settling permanently in and amongst the dynamic intersection between land and sea (Martinez et al. 2007). Whilst nearly half of human society now living by the coast, it is important to recognise the complexities and discrepancies between the global South, where humans have been drawn to coastal regions for more access to blue economy resources, rather than the recreation and therapeutic reasons associated with high income coastal residents (Ched et al. 2020; Grellier et al. 2017).

Scientists across the United Kingdom and Europe have begun to study how exactly the oceans provide vitality for these more affluent communities, examining the benefits the ocean has on human health and the solutions it could bring to address "poverty, hunger, economic development, inequity, peace, security, coastal resilience, and climate mitigation and adaptation" (Lubchenco and Gaines 2019). Experts at the European Centre for Environment and Human Health created the Blue Gym Initiative in the United Kingdom in 2009 to explore whether blue space environments might be positively related to human health and well-being. An early finding pointed towards individuals living near the coast as being generally healthier and happier than those living inland (White et al. 2016). Depledge and Bird (2009) discuss how regular contact with coastal areas reduce health inequalities by providing major benefits such as: increasing people's level of physical activity; improving mental health and wellbeing; promoting understanding of the richness of the coastline and fostering participation in conservation work (Depledge and Bird 2009). A recent study in Norway showed activities by or on the sea are the second most common form of recreation, with experiencing nature generally rated as the second-most important physical activity motive (Calogiuri and Elliot 2017). However, more knowledge of how human and ocean systems interact has been called for, not only by the European Centre for Environment and Human Health (Fleming et al. 2015) but by the Decade of Ocean Science (Ryabinin et al. 2019); in order support and promote positive Ocean and Human Health linkages whilst mitigating and minimising potential risks between humanity and the ocean.

Surfing Connects People with the "Blue Gym"

Surfing is an example of a "blue gym" activity undergoing exponential growth, currently with 35 million global participants (Britton 2017). Surfing's debut in the 2021 Olympics, will signal emergence into the mainstream sporting arena and could offer potential and promise for more environmentally sustainable practices. Yet scholars insist that attitudes and behaviour towards environmental issues within the surf industry are contentious, complex, and paradoxical (Hill and Abott 2009; Wheaton 2020). Despite "the soul of surfing" intertwined with "being one with nature" (Anderson 2013); surfers are still consumers of toxic materials (plastic surfboards and neoprene wetsuits) and emitters of carbon dioxide (traveling to surf destinations); often with little regard for the consequences (Bourne 2018, 120-121; Laviolette 2019). Whilst the origins of surfing are known to reside in a sustainable (us-

ing natural, local materials), spiritual and social practice performed by indigenous people of Hawaii, Polynesian Islands, and mainland Peru (Doering 2018), it now equates to a global industry worth "between $70 and $130 billion dollars" a year (O'Brien and Eddie 2013, in O'Brien and Ponting 2018). This is a huge economic shift, powered by the invention and availability of more durable surfboards and thick rubber wetsuits (1950s and onwards) which enabled surfers to enter less temperate waters and more diversely shaped waves. Essential cold-water suits opened the gateway to surf spots in the Jæren region and Lofoten Islands of Norway during the mid 1990s (Langseth 2011), placing Norway on the cold-water surf destination map and birthing the Norwegian surf industry.

With surfers receiving physical (Armanito et al. 2015), mental (Caddick et al. 2015), emotional (Hignett et al. 2018) and inter-personal (Clapham et al. 2014) benefits from surfing ocean waves, qualitative data gives more insight into the experience of recreational surfers who reveal: "It's about being in the sea, harnessing the power of nature to catch waves" (Anderson 2013). Insight from surf therapy participants in the United Kingdom shows "When I Go There, I Feel Like I Can Be Myself" (Marshall et al. 2019), and Booth (2013) labels surfing as an "affective experience" - a deeply personal meeting point between surfer, board, wave, and ocean that is a mechanism for many, diverse interactions and outcomes.

Surfing in a world of human pressures

The Anthropocene has led to overfishing, sea level rise, and habitat destruction (He and Silliman 2019), all processes that undermine the health of our oceans and the resilience of the communities that depend on them (Finkbeiner et al. 2017, 148). Surfing is not exempt from systems archetypes such as "Limits to Growth" (Meadows 1972, 27), and "tragedy of the commons" (Hardin 1969). In fact, Nazer (2004) addresses this in the paper "Tragicomedy of the surfer commons" and questions how much human use can waves and surf ecosystems sustain.

There is emerging evidence of human-induced pressures affecting surfing ecosystems. Grassroots organisations such as Surf Rider Foundation and Surfers Against Sewage have evolved to tackle issues such as marine plastics, water quality and coastal development (Camins et al. 2020; Buckeley 2002). Yet, with no universal governing structure for surf breaks, surfers have so far managed their own 'commons' through cultural norms and rules. To what extent can surfers be relied upon to continue this management of surf breaks, as the unique coastal- and marine-based spaces that surfers visit need protection measures, if they are to carry the weight of frequent and increased use, as well as actions to mitigate and manage increasing anthropogenic impacts?

From the standpoint of Ocean Science, "knowledge about marine socioecological systems will be crucial if we want to maintain a safe operating space for human activities" (Ghilardi-Lopes et al. 2019). As leading Ocean and Human Health expert Lora Fleming points out, the ability to engage with the fragmented and diverse global ocean community "will determine the future health of both humans and the oceans" (Fleming et al. 2014).

Knowledge exchange between science, policy, and surfer communities, leading to actionable change, could herald a new frontier, with sustainability frameworks providing a roadmap of how to reach such new territory. Implementing citizen science programmes, to understand and assess

how the dynamic variables of the ocean interact with equally dynamic and varying ocean users, is required. Incorporating a social-ecological systems framework to overview this process "can serve as a diagnostic tool" in synthesising these varying components (Arroyo et al. 2019).

Surfer Interactions in a social-ecological system

The key ingredients for a surfing interaction are a surfer and their craft (Actors) and a wave (Resource Unit; RU) - which can happen within three distinct coastal habitats - reef, point, or beach breaks (all various Resource Systems; RS). In the social-ecological systems (SES) framework (Ostrom 2009), Governance Systems (GS) are also taken into consideration. In this case, the social hierarchy, rules or ruling of the surf break, which can be political or cultural. In surfing this is known as "localism", where "skilled and/or local surfers prevail over non-local and/or less skilled surfers" (Olive 2015). This system serves as an organising principle at best, and at worst, can lead to disrespect, hostility, and violence within surf spaces. In Figure 1, we see how the social components of the surfers and the hierarchy within the local area interacts with the ecological components to produce unique outcomes.

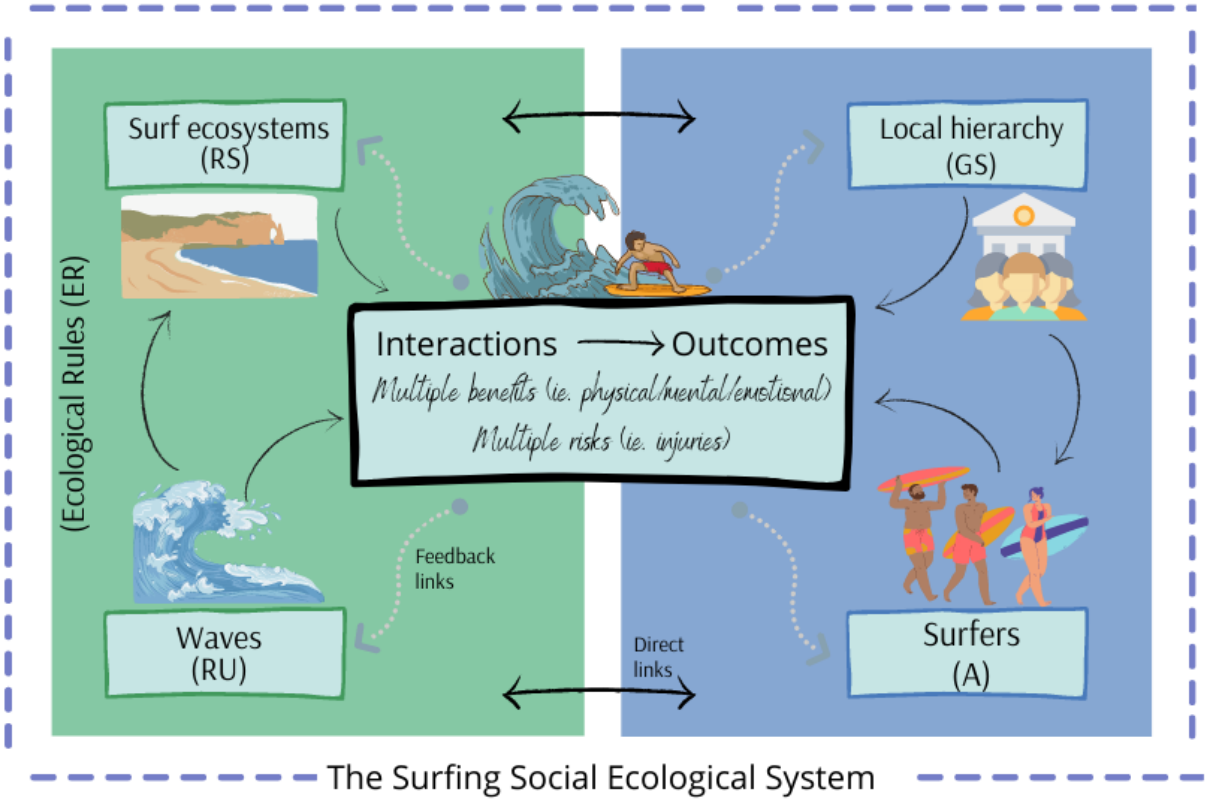

Figure 1: Mapping a surfing community on a social-ecological systems framework. Surfers (Actors, A) have direct links to the waves (Resource Unit, RU) and the surf ecosystems (Resource System, RS). The surfers' skills produce Outcomes which feedback to the Local Hierarchy (Governance System, GS). Adapted from (McGinnis and Ostrom 2014).

Scientific research on these interactions and outcomes has highlighted benefits, risks and, of course, ongoing feedback when surfers are immersed in these dynamic conditions. For instance, a study of surfers in Norway found that 25% of respondents reported a total of 511 acute injuries (Ulkestad

and Drogset 2016). Along with trauma from contact with the surfboard as the most reported injury, the research found surfing in cold, Arctic waters leads to different injuries compared with surfing in warmer water due to more wetsuit coverage.

Lifelong learning as an outcome in the surfing social-ecological system

In terms of education, we can use the surfing SES to explore further how surfing works to increase ocean knowledge, as an example of lifelong learning or informal science, which takes place in leisure or recreational settings (Falk and Storksdieck 2010). Using the SES model, we can observe how surfing may also instigate marine stewardship, where stewardship is defined as residing at the intersection between care, knowledge, and agency (Enqvist et al. 2018). One study draws on the example of group of Irish surfers taking a political stance against the potential loss of their local surf spot due to a golf hotel construction, and coins the term Saltwater citizenship (Whyte 2019).

As surfing takes place across the world, there are multiple variables due to the diverse environmental factors involving how and when waves break, the season, the bathymetry of break, the tide, the swell, and the wind. Not to mention different water temperatures, pollution, and wildlife, which feed back into different social and cultural background of the user experience. Ocean knowledge or awareness has been equated to ocean literacy, as it means to understand "our influence on the ocean and the ocean's influence on us" (Ashley et al. 2019). One recent study has taken both the SES framework and the ocean literacy framework to evaluate ocean literacy principles that are embedded in the surfing social-ecological system (Fox et al. 2021). However, analysing surfing and ocean literacy scenarios is not explicit to the SES framework, and comparing other social-ecological analysis tools such as the ecosystem services cascade framework, which links ecological processes with elements of human well-being (La Notte et al. 2017), could provide further opportunities to understand human and ocean system interactions. Arroyo et al. (2019) goes a step further, to explore the case study of Bahía de Todos Santos World Surfing Reserve by combining the SES framework with the Driving Forces-Pressure-State-Impact-Response and Adaptive Co-management frameworks, finding that integrating scientific and place-based knowledge improves surf break management.

Connecting Surfing and Citizen Science for SDG 14

Regardless of the framework, the activity of surfing provides an opportunity to read, understand and interpret information conveyed by the ocean, to harness the ability to surf waves. The frequent and unique interactions that surfers encounter within surf breaks, is partnered with local knowledge about changeable conditions and leads to an understanding of the oceans influence on human wellbeing. This connection, awareness and knowledge may also include information on environmental indicators or changes that have taken place over time and could indeed be vital data for marine scientists.

Citizen science has been highlighted to build a more robust picture of our coasts by involving the public as volunteer scientists (Hyder et al. 2015). For participants, citizen science "actively involves citizens in a scientific endeavour that generates new knowledge or understanding" (Carcia-Soto and van der Meeren 2017). With the climate crisis changing global weather systems, shifting currents, and already altering surfing habitats (Roös and Jones 2013), citizen science offers opportunities for

surfers to become involved in data sampling and collection. Additionally, citizen science can also benefit by shifting research from the "scientific Ivory tower" (Volten et al. 2018) to a more community-based approach with social and self-efficacy benefits (Johnson et al. 2014). One tool making its way onto the market to enable surfers to monitor environment indicators of climate change is the *Smartfin*. Embedded with a GPS motion and temperature sensor, this specifically designed surfboard fin automatically updates information to the *Smartfin* database after the surfer has been in the water, adding to a global dataset monitoring sea surface temperature in surfing zones (Brewin et al. 2020). Innovation ventures like *Smartfin* technology are a way to join the dots between ocean ecosystem users, data scientists and marine conservation policy, serving to invest in reliable, credible, and under-utilised marine citizen science strategies (Cigliano et al. 2015).

Whilst there is much more research needed in this novel, inter-disciplinary field, using the surfing SES framework primarily to investigate variations within surfing, citizen science ventures and learning outcomes on a small, or even on a global scale, will help visualise how ocean and human interactions can produce ocean education and pro-marine environment behaviour outcomes. Sharing the findings with the public sector could inspire recreational ocean users to utilise their ocean knowledge and agency and engage more in citizen science projects. By investigating surfing communities, this process is likely to provide more evidence on how recreational ocean users like surfers, might evolve into active, engaged and ocean literate marine stewards - a key challenge of the Ocean Decade and SDG 14 (Garcia and Cater 2020).

References

Anderson, Jon. 2013. "Cathedrals of the surf zone: Regulating access to a space of spirituality". *Social & Cultural Geography* 14(8): 954-972.

Arroyo, Mara, Levine, Arielle, & Espejel, Ileana. 2019. "A transdisciplinary framework proposal for surf break conservation and management: Bahía de Todos Santos World Surfing Reserve". *Ocean & Coastal Management* 168: 197-211.

Ashley, Matthew, Pahl, Sabine, Glegg, Gillian and Fletcher, Stephen, 2019. "A Change of Mind: Applying Social and Behavioral Research Methods to the Assessment of the Effectiveness of Ocean Literacy Initiatives. *Frontiers in Marine Science* 6: 288.

Booth, Douglas. 2004. "Surfing: From one (cultural) extreme to another". In *Understanding Lifestyle Sports: Consumption, Identity and Difference*, edited by Wheaton, Belinda. London: Routledge, 94-110.

Booth, Douglas. 2013. "History, Culture, Surfing: Exploring Historiographical Relationships". *Journal of Sport History* 40(1): 3-20.

Borne, Gregory. 2018. *Surfing and sustainability*. London: Routledge. ISBN: 9781315719276.

Brennan, Caroline, Ashley, Matthew, & Molloy, Owen. 2019. "A system dynamics approach to increasing ocean literacy". *Frontiers in Marine Science* 6: 360.

Brewin, Robert J., Cyronak, Tyler, Bresnahan, Philip J., Andersson, Andreas J., Richard, Jon, Hammond, Katherine, Billson, Oliver et al. 2020. "Comparison of two methods for measuring sea surface temperature when surfing". *Oceans* 1(1): 6-26.

Caddick, Nick, Smith, Brett, & Phoenix, Cassandra. 2015. "The effects of surfing and the natural environment on the well-being of combat veterans". *Qualitative Health Research* 25(1): 76-86.

Calogiuri, Giovanna, & Elliott, Lewis R., 2017. "Why do people exercise in natural environments? norwegian adults' motives for nature-, gym-, and sports-based exercise". *International Journal of Environmental Research and Public Health* 14(4): 377.

Camins, Elsa, de Haan, William. P., Salvo, Vannesa-Sarah, Canals, Miquel, Raffard, Amandine, & Sanchez-Vidal, Anna. 2020. "Paddle surfing for science on microplastic pollution". *Science of the Total Environment* 709: 1-10.

Carcia-Soto, Carlos & van der Meeren, Gro Ingleid. 2017. "Advancing citizen science for coastal and ocean research". In Position Paper 23 of the European Marine Board, edited by French, Veronica, Kellett, Paula, Delany, Jane & McDonough Niall. Ostend: *European Marine Board IVZW,* 112. ISBN: 978-94-92043-30-6

Cigliano, John A., Meyer, Ryan, Ballard, Heidi L., Freitag, Amy, Phillips, Tina B., & Wasser, Ann. 2015. "Making marine and coastal citizen science matter". *Ocean & Coastal Management* 115: 77-87.

Clapham, Emily D., Armitano, Cortney N., Lamont, Linda S., & Audette, J. G. 2014. "The ocean as a unique therapeutic environment: Developing a surfing program". *Journal of Physical Education, Recreation and Dance* 85(4): 8-14.

Depledge, Michael H., & Bird, William J., 2009. "The blue gym: Health and wellbeing from our coasts". *Marine Pollution Bulletin* 58(7): 947-948.

Doering, Adam. 2018. "From he'e nalu to olympic sport: A century of surfing evolution". In *Sport Tourism Development*, edited by Higham J., Hinch, T, 200-203. Bristol: Channel View Publication.

Falk, John H. & Storksdieck, Martin. 2010. "Science learning in a leisure setting". *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching* 47(2): 194-212.

Fox, Natalie, Marshall, Jamie, & Dankel, Dorothy Jane. 2021. "Ocean Literacy and Surfing: Understanding How Interactions in Coastal Ecosystems Inform Blue Space User's Awareness of the Ocean". *International Journal of Environmental Research and Public Health* 18(11): 1-21.

Finkbeiner, Elena M., Oleson, Kirsten L., & Kittinger, John N. 2017. "Social Resilience in the Anthropocene Ocean". In *Conservation for the Anthropocene ocean*, 89-106. Elsevier.

Fleming, L. E., McDonough, N., Austen, M., Mee, L., Moore, M., Hess, P., Depledge, M. P., White, M., Philippart, K., Bradbrook, P. & Smalley, A. 2014. "Oceans and human health: A rising tide of challenges and opportunities for Europe". *Marine Environmental Research* 99: 16-19.

Fleming, L., Depledge, M., McDonough, N., White, M., Pahl, S., Austen, M., Goksoyr, A., Solo-Gabriele, H. & Stegeman, J. 2015. "The oceans and human health". *Oxford Research Encyclopedia of Environmental Science*.

Ford, Nicholas J., & Brown, David. 2006. *Surfing and social theory: Experience, embodiment and narrative of the dream glide*. Abington: Routledge. ISBN: 0415334330

Garcia, Olga, & Cater, Carl. 2020. "Life below water; challenges for tourism partnerships in achieving ocean literacy". *Journal of Sustainable Tourism*, 1-20.

Ghilardi-Lopes, Natalia Pirani, Kremer, Laura Pioli, & Barradas, Juliana Imenis. 2019. "The importance of "Ocean literacy" in the anthropocene and how environmental education can help in its promotion". *Coastal and marine environmental education*, 3-17. Springer.

Halpern, Benjamin S., Frazier, Melanie, Potapenko, John, Casey, Kenneth S., Koenig, Kellee, Longo, Catherine, Stewart Lowndes, Julia, Cotton Rockwood, R., Selig, Elizabeth R., Selkoe, Kimberly A. and Walbridge, Shaun. 2015. "Spatial and temporal changes in cumulative human impacts on the world's ocean". *Nature Communications* 6(1): 1-7.

Hignett, Amanda, White, Matthew P., Pahl, Sabine, Jenkin, Rebecca, & Froy, Mod Le. 2018. "Evaluation of a surfing programme designed to increase personal well-being and connectedness to the natural environment among 'at risk' young people". *Journal of Adventure Education and Outdoor Learning* 18(1): 53-69.

Hill, Lauren L., & Abbott, J. Athony. 2009. "Surfacing tension: Toward a political ecological critique of surfing representations". *Geography Compass* 3(1): 275-296.

Hutt, James A., Black, Kerry P., & Mead, Shaw T. 2001. "Classification of surf breaks in relation to surfing skill". *Journal of Coastal Research*, 66-81.

Johnson, McKenzie F., Hannah, Corrie, Acton, Leslie, Popovici, Ruxandra, Karanth, Krithi K. & Weinthal, Erika, 2014. "Network environmentalism: Citizen scientists as agents for environmental advocacy". *Global Environmental Change* 29: 235-245.

Langseth, Tommy. 2012. "Liquid ice surfers—the construction of surfer identities in Norway". *Journal of Adventure Education and Outdoor Learning* 12(1): 3-23.

La Notte, Allessandra, D'Amato, Dalia, Mäkinen, Hanna, Paracchini, Maria Luisa, Liquete, Camino, Egoh, Benis, Geneletti, Davide et al. 2017. "Ecosystem services classification: A systems ecology perspective of the cascade framework". *Ecological indicators* 74: 392-402.

Laviolette, Patrick. 2019. "The materiality of waves and the liminality of things". *Liminalities: A Journal of Performance Studies* 15(1): 1-21.

Lazarow, Neil. 2009. "Using observed market expenditure to estimate the value of recreational surfing to the Gold Coast, Australia". *Journal of Coastal Research*, 1130-1134.

Lazarow, N., and Olive, R. (2017). "Culture, meaning and sustainability in surfing". In *Sustainable Surfing*, edited by Borne, Gregory & Ponting, Jess, 202-218. London: Routledge.

Lubchenco, Jane, & Gaines, Steven D. 2019. "A New Narrative for the Ocean". *Science* 364 (6444): 911-911.

Marshall, Jamie, Kelly, Paul, & Niven, Ailsa. 2019. " "When I go there, I feel like I can be myself." exploring programme theory within the wave project surf therapy intervention". *International Journal of Environmental Research and Public Health* 16(12): 2159.

McGinnis, Michael D., & Ostrom, Elinor. 2014. "Social-ecological system framework: Initial changes and continuing challenges". *Ecology and Society* 19(2).

Meadows, Donella H., Meadows, D. L., Randers, J., & Behrens III, W. W. 1972. *The limits to growth.* New York: Signet. ISBN-10: 0451066170

Nazer, Daniel. 2004. "The Tragicomedy of the Surfers' Commons". *Deakin Law Review* 9(2): 655-713.

O'Brien, Danny, & Ponting, Jess. 2018. "STOKE certified: Initiating sustainability certification in surf tourism". In *Handbook of sport, sustainability, and the environment,* edited by in McCullough, B., Kellison, T., 301-316. Routledge. ISBN: 9781317214175.

Olive, Rebecca. 2015. "Surfing, localism, place-based pedagogies and ecological sensibilities in Australia". In *Routledge International Handbook of Outdoor Studies*, edited by Humberstone, B., Prince H., Henderson, K. A., 501-510. Abingdon: Routledge. ISBN: 1317666518.

Ostrom, Elinor. 2009. "A general framework for analyzing sustainability of social-ecological systems". *Science* 325(5939): 419-422.

Preston-Whyte, Robert. 2002. "Constructions of surfing space at Durban, South Africa". *Tourism Geographies* 4(3): 307-328.

Roös, Philip, & Jones, David. 2013. "Visions of the surf coast-changing landscapes under future climate effects". *International Urban Planning and Environment Society,* 361-372. Conference: Planning for a new Energy & Climate Future. Sydney, N.S.W.

Ryabinin, Vladimir, Barbière, Julian, Haugan, Peter, Kullenberg, Gunnar, Smith, Neville, McLean, Craig, Troisi, et al. 2019. "The UN decade of ocean science for sustainable development". *Frontiers in Marine Science*, 6: 470.

Scarfe, B. E., Elwany, M. H. S., Mead, S. T., & Black, K. P. 2003. "The Science of Surfing Waves and Surfing Breaks - A Review". UC San Diego: Library – Scripps Digital Collection, 1-12.

Scarfe, Bradley E., Healy, Terry R., Rennie, Hamish G., & Mead, Shaw T. 2009. "Sustainable management of surfing breaks: Case studies and recommendations". *Journal of Coastal Research* 25 (3): 684-703.

Selkoe, Kimberly A., Blenckner, Thorsten, Caldwell, Margaret R., Crowder, Larry B., Erickson, Ashley L., Essington, Timothy E., Estes, James A., et al. 2015. "Principles for managing marine ecosystems prone to tipping points". *Ecosystem Health and Sustainability* 1(5): 1-18.

Smith, Hance D. 2000. "The industrialisation of the world ocean". *Ocean & Coastal Management* 43(1): 11-28.

Ulkestad, Gunn-Elisabeth, & Drogset, Jon Olav. 2016. "Surfing injuries in Norwegian arctic waters". *The Open Sports Sciences Journal* 9(1): 153-161.

Volten, Hester, Devilee, Jeroen, Apituley, Arnoud, Carton, Linda, Grothe, Michel, Keller, Christoph, Kresin, Frank, et al. 2018. "Enhancing national environmental monitoring through local citizen science". In *Citizen Science: Innovation in Open Science, Society and Policy,* edited by Hecker, S., Haklay, M., Browser, A., Makuch, Z., Vogel, J. & Bonn, A. London: UCL Press, 337-352.

Wheaton, Belinda. 2020. "Surfing and Environmental Sustainability". In *Sport and the Environment,* edited by Wilson, B. & Millington, B. *Research in the Sociology of Sport* 13: 157-178. Bingley: Emerald Publishing Limited.

White, M. P., Pahl, S., Wheeler, B. W., Fleming, L. E. F., & Depledge, M. H. 2016. "The 'Blue Gym': What can blue space do for you and what can you do for blue space?" *Journal of the Marine Biological Association of the United Kingdom* 96(1): 5-12.

LOCALIZING THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS FOR NORWAY: MOVING FROM POLICY TO ACTION

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Abstract

Although the United Nations Sustainable Development Goals (SDGs) are global in scope, the successful achievement of its broader aim (to ensure a healthy planet and people) is directly applicable to all scales of governance, including the local scale. Are the SDGs integrated in a fundamental way in local-level society, or are they merely used as a placeholder for potential action for the future? Considering the formulation of the Goals and their hierarchy with Targets and Indicators, the question then is *How can the SDGs be localized* and what is the *ability* of local-level actors to promote and pursue sustainable development? The SDGs can be relatively simply integrated into local-level policies, but the success of this integration depends on whether the fundamental objectives behind the SDGs are manifested in local norms and practices. Local-level integration of the SDGs can only occur when the Goals are seen as relevant and inclusive to local stakeholders, their needs, and aspirations. A key aspect to understanding the local relevance of the SDGs is to first understand different characteristics of the location. How are the social, ecological, economic, political, and other dynamics of that location defined? How are local stakeholders linked in terms of the attitudes and perspectives they share on sustainable development and where are the gaps in consensus? What are the relationships that define human-environment interactions for that location? Mapping these human-nature relationships in the form of a social-ecological system offers insights to areas for targeted management interventions to achieve sustainability, and this, coupled with social science studies on societal perspectives, can offer a comprehensive description of a location and how the SDGs can be integrated for that location in a credible, legitimate, and salient way.

The United Nations Sustainable Development Goals and higher education

Since their adoption in September 2015, efforts to implement the United Nations (UN) sustainable development goals (SDGs) have called for integrated, holistic, and multi-stakeholder approaches (Reynolds et al. 2018) that draw from bodies of research bridging multiple disciplines such as social, political, and ecological sciences. The global notoriety of the SDGs has thrust academic institutions into a whirlpool where traditional disciplinary education is being re-evaluated, which is much needed and long overdue. As we face ecological threats that are growing in complexity, we are quickly approaching a critical point in the Anthropocene where our traditional cultural and political institutions are proving to be poorly equipped to deal with rapid social and ecological change.

The multi-disciplinary SDGs offered an opportunity for academic institutions to study the rapidly changing landscapes and seascapes of our human-nature system. While the relationships within this system are not a novel concept, the unique challenge of the SDGs themselves being somewhat convoluted and conflicting in aims inevitably means that people's values vis-à-vis sustainability must be considered foremost (Mair et al. 2018) if the goals are to be effective or relevant in any practical sense. Higher education can reveal its full potential by providing the intellectual resources to critically study the SDGs and bridge the gap between the global-level SDGs and local realities: how can the SDGs be *localized*.

Viewing the SDGs through a critical and reflective lens to understand how the goals can be localized is the primary objective behind the LoVeSeSDG project, a four-year interdisciplinary and inter-faculty project at the University of Bergen with the aim to review and critically analyse the current state of knowledge in relation to delivering on the SDGs at the local level. This project is an example of how global policy can be critically studied in higher education and demonstrates the need for transdisciplinary research that uses pedagogical approaches to review the fit-for-purpose need of global policy. This article describes the underlying approach of the LoVeSeSDG project and provides the theoretical background to an example of how the project is being implemented, also described in this issue (Blome and Dankel, *this issue*).

The LoVeSeSDG Project at the University of Bergen

Although the UN SDGs are global in scope, their successful achievement will affect all scales of governance, including the local scale. To address this, the LoVeSeSDG project asks: *How can the SDGs be localized* for Norway and what is the *ability* of local-level actors to use the SDGs for sustainable development? The success of SDG integration into local-level policies depends on whether the fundamental objectives behind the SDGs are manifested in local norms and practices. Meaningful local-level integration of the SDGs can only occur when the Goals are seen as *relevant* to local stakeholders. A key aspect to understanding the local relevance of the SDGs is to first understand the context of that location. How are the social, ecological, economic, political, and other dynamics defined? How are local stakeholders linked in terms of the attitudes and perspectives they share on sustainable development and where are the gaps in consensus? How are the human-environment interactions for that location defined? Mapping these human-nature relationships in the form of a social-ecological system offers insights to areas for targeted management interventions to achieve sustainability, and this, coupled with studies revealing societal attitudes and perspectives towards sustainability, can offer a comprehensive description of a location and how the SDGs can be integrated into local-level policies and practices for that location in a credible, legitimate, and salient way.

The question of *how* to localize the SDGs launches the concept of *transformations* and the need to observe the SDGs *in action*. A key realization from the LoVeSeSDG project is how knowledge about transformations can inform efforts towards *intentional* change of social-environmental challenges and the SDGs (Sachs et al. 2019; Scoones et al. 2020). Scoones et al. (2020) identified three types of transformations in this sense: *structural* (fundamental changes in the way production and consumption is governed, organized, and practiced by society); *systemic* (intentional change targeted

at the interdependencies of specific institutions, technologies, and constellations of actors in order to steer complex systems towards normative goals); and *enabling* (fostering the human agency, values and capacities necessary to manage uncertainty, act collectively, and identify and enact pathways to desired futures, i.e., empowering individuals and communities to take action on their own behalf).

While approaches for implementing the SDGs might utilize one or all such transformational pathways, knowledge of the *space* and *context* in which those transformations are meant to take place is key and will ultimately determine their perceived relevance by stakeholders at the local level. Thus, the LoVeSeSDG project argues that *localizing* the SDGs marries two theoretically different, but conceptually related, research approaches: systems thinking, and an approach to eliciting attitudes and perspectives of local stakeholders towards the social, economic, and ecological components of that system. The former approach offers insights that could inform structural transformations towards sustainability, while the latter provides insights to the local society that would undergo systemic and/or enabling transformations. Thus, the aim of combining these two approaches is to identify the strategic changes required to both the technical mechanisms of the physical environment, and the behavioural aspects of society.

Localizing the SDGs through the LoVeSeSDG Project

In recent decades, *sustainability* and *resilience* have emerged as two key paradigms to understand human-nature relationships (Johnson et al. 2018), conceptually known as social-ecological systems (SESs). SESs are nested, multi-level systems that provide essential services to society such as the supply of food, water, and energy (Binder et al. 2013), the study of which has cumulated into the conceptualization of our world as humans interacting with and relying on nature (Ostrom 2009; Partelow 2015). What the SES framework can also reveal is the distinction between society *in* nature vs. society *as part of* nature. In other words, the SES framework reveals the natural mechanics of the social-ecological system, and knowledge of a person's attitude and perspectives towards that system. Ultimately, this knowledge has implications for the overall sustainability of that system, and this is where the LoVeSeSDG project sees its relevancy: by understanding the human-nature interactions within a SES and revealing the perspectives of people that make up those interactions through quantitative network analysis and qualitative social science methods, the project can test a transdisciplinary approach for localizing the SDGs in a social-ecological case study.

Figure 1 illustrates a preliminary SES conceptualization of the LoVeSeSDG project's local case study in Norway, which elaborates on the original design by Elinor Ostrom (2009). It presents a simplified version of the SES framework, which categorizes a system into *Resource Systems* (e.g., a designated protected area of a coastal habitat); *Governance Systems* (e.g., the specific rules related to the use of the park and who manages it); and the *Resource Units* (e.g., flora and fauna species contained within the park). The *Actors* are the local stakeholders (individuals or institutions) who rely on and utilize the system (e.g., the neighbouring community to the protected area). Finally, the *Influence, Interactions,* and *Outcomes* represent the human-based actions within that system. The *Interactions* describe the types of interactions the Actors have with each other and with the Resource Units and Resource Systems (e.g., harvesting of coastal fisheries or cultures and norms that define that com-

munity). The *Influence,* in this case, is the integration of the SDGs within the system. This may be in the form of adapting governance policy that includes specific SDG indicators, or it may be community-led awareness raising activities. The *Outcome* is what the LoVeSeSDG project is aiming for: the localization of the SDGs for that system.

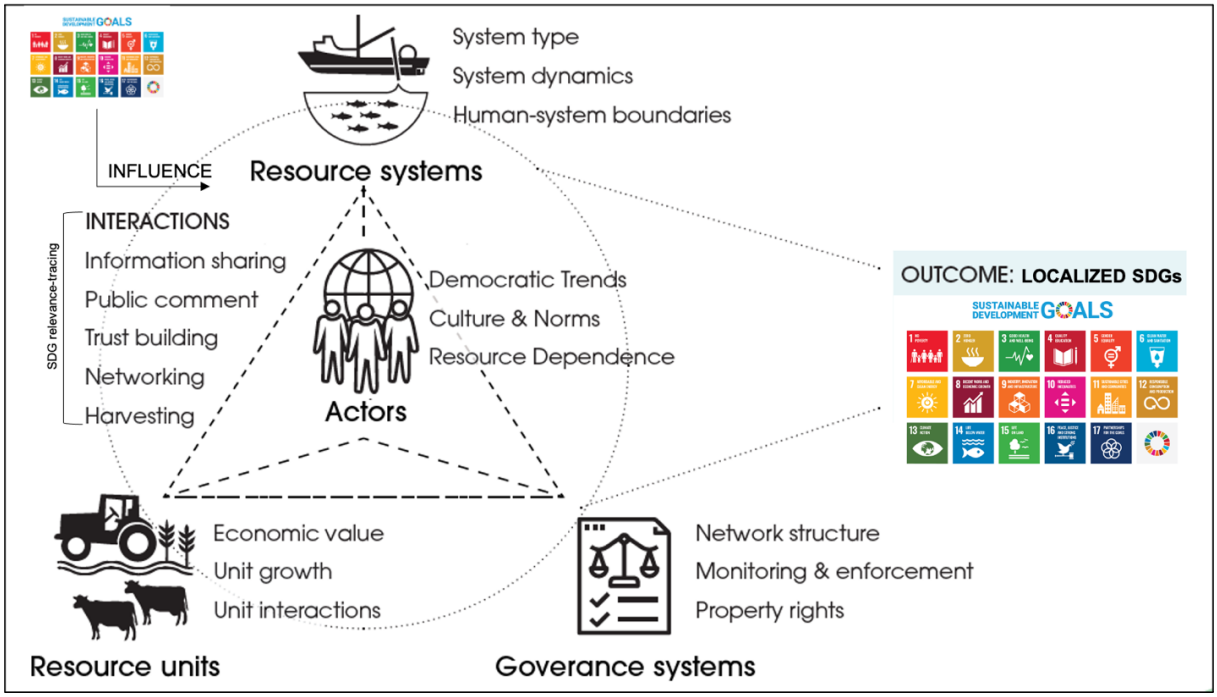

Figure 1: A social-ecological systems (SES) conceptualization of a generic coastal case study area, showing how the SDGs could influence the dynamics of the system to result in localized SDGs. *Graphics by Linley Kristofferson (2020).*

Semi-structured interviews with local stakeholders (i.e., the *Actors*) and published white and grey literature, including local government documents, provided the information to structure the composition of the different SES elements. Once having defined the local SES context, we will then enable local communities to recognize where they fit into this place-based, human-nature system and review their placement with a critical lens: *what does sustainability look like for us?* In other words, we aim to support the community to find answers to: *sustainability of what* and *sustainability for whom?* (Funtowicz and Ravetz 1993; Saltelli et al. 2020). Finally, it is imperative to understand the *need* for this information. If this research is intended to aid practitioners (fishery managers, decision-makers, etc.), then management approaches need to consider a comprehensive, coherent, and holistic perspective towards identifying and understanding human-nature interactions in SESs (Partelow 2015): how will the SDGs be *translated, operationalized,* and *integrated* to that local context?

The LoVeSeSDG project is answering these questions. By working directly with a local municipality in Norway, the project is providing the intellectual resources to facilitate local stakeholders to begin thinking about what sustainability means for them, and how they can use the SDGs. Connecting the social-ecological systems to the SDGs in a localizing process involves a lot of scientist-stakeholder interactions which is never a trivial matter. The guiding framework for the LoVeSeSDG project is that of Responsible Research and Innovation (RRI) in which a key philosophy is that science should work

with and *for* society (von Schomberg 2013). Stilgoe et al. (2013) outline four RRI principles that we apply in our transdisciplinary approach: *anticipation* (the need for localizing the SDGs), *reflexivity* (e.g., awareness of the role of scientific as well as tacit knowledge in localizing), *public engagement* (interactions with the community beyond field work) and *responsiveness* (co-creating solutions for localizing with the community).

Blome and Dankel (*this issue*) elaborate on this engagement process using "SDG Target Relevance-Tracing", which used a conceptual mapping exercise to reveal how local businesses view the relevance of the SDGs to their business practices. These results reveal the struggle of local-level entities to understand the relevance of the global SDGs to their contexts: why should local businesses be concerned about global goals? What kind of influence can they have on these global goals? What this also reveals is that the localization of the SDGs needs to evolve around the idea that they can function as a comprehensive set of guidelines from which local action could be inspired.

The future of our world depends on the action we take now to prevent a destructive legacy. We need to move towards "social-ecological transformations" that integrate interdisciplinary understanding of the relationships between resource use and societal change (Eisenmenger et al. 2020) if we are to get ahead of climate change, for example. Thus, only achieving the SDGs will not be enough to sustainably transform the world, but they emphasize the importance of balancing social, economic, and environmental needs and they can act as a reference point from which further changes should be made. There remain chasms of little or no knowledge on how relevant the SDGs are at the different governance levels of our society. Ultimately, this relevance is what will determine the success of the SDGs.

References

Binder, Claudia R., Hinkel, Jochen, Bots, Pieter W.G., & Pahl-Wostl, Claudia. 2013. "'Comparison of Frameworks for Analyzing Social-ecological Systems'". *Ecology and Society* 18(4): 26.

Blome, A., and Dankel, D.J. (*this issue*).

Eisenmenger, Nina, Pichler, Melanie, Krenmayr, Nora, Noll, Dominik, Plank, Barbara, Schalmann, Ekaterina, Wandl, Marie-Theres, & Gingrich, Simone. 2020. "The Sustainable Development Goals prioritize economic growth over sustainable resource use: a critical reflection on the SDGs from a socio-ecological perspective". *Sustainability Science* 15, 1101–1110.

Funtowicz, Silvio O., & Ravetz, Jerome R. 1993. "Science for the Post-Normal Age". *Futures* 25(7): 739-755.

Johnson, Jennifer L., Zanotti, Laura, Ma, Zhao, Yu, David J., Johnson, David R., Kirkham, Alison, & Carothers, Courtney. 2018. "'Interplays of Sustainability, Resilience, Adaptation and Transformation'". In *Handbook of Sustainability and Social Science Research*, edited by Filho W. Leal. Cham: Springer International Publishing, 3–25.

Mair, Simon, Jones, A., Ward, J., Christie, I., Druckman, A., & Lyon, F. 2018. "'A Critical Review of the Role of Indicators in Implementing the Sustainable Development Goals'". In *Handbook of Sustainability Science and Research*, edited by Filho W. Leal. Cham: Springer International Publishing, 41–56.

Ostrom, Elinor. 2009. "A General Framework for Analyzing Sustainability of Social-Ecological Systems". *Science* 325(5939): 419–422.

Partelow, Stefan. 2015. "Key steps for operationalizing social-ecological system framework research in small-scale fisheries: A heuristic conceptual approach". *Marine Policy* 51: 507–511.

Reynolds, Martin, Blackmore, Christine, Ison, Ray, Shah, Rupesh, & Wedlock, Elaine. 2018. "The Role of Systems Thinking in the Practice of Implementing Sustainable Development Goals". In *Handbook of Sustainability Science and Research*, edited by Filho W. Leal. Cham: Springer International Publishing, 677–698.

Rybråten, Stine, Bjørkan, Maiken, Hovelsrud, Grete K., & Kaltenborn, Bjørn P. 2018. "Sustainable coasts? Perceptions of change and livelihood vulnerability in Nordland, Norway". *The International Journal of Justice and Sustainability* 23(12): 1156–1171. DOI: 10.1080/13549839.2018.1533931.

Sachs, Jeffrey D., Schmidt-Traub, Guido, Mazzucato, Mariana, Messner, Dirk, Nakicenovic, Nebojsa, & Rockström, Johan. 2019. "Six Transformations to achieve the Sustainable Development Goals". *Nature Sustainability* 2: 805-814.

Saltelli, Andrea, Benini, Lorenzo, Funtowicz, Silvio, Giampietro, Mario, Kaiser, Matthias, Reinert, Erik, & van der Sluijs, Jeroen. 2020. "The technique is never neutral. How methodological choices condition the generation of narratives for sustainability". *Environmental Science and Policy* 106: 87–98.

von Schomberg, René. 2013. "A Vision of Responsible Research and Innovation". In *Responsible Innovation: managing the responsible emergence of science and innovation in society,* edited by Owen, R., Heintz, M., and Bessant, J.. London: John Wiley & Sons, 51-74.

Scoones, Ian, Stirling, Andrew, Abrol, Dinesh, Atela, Joanes, Charli-Joseph, Lakshmi, Eakin, Hallie, Ely, Adrian, et al. 2020. "Transformations to sustainability: combining structural, systemic and enabling approaches". *Current Opinion in Environmental Sustainability* 42: 65–75.

Stilgoe, Jack, Owen, Richard, & Macnaghten, Phil. 2013. "Developing a framework for responsible innovation". *Research Policy* 42(9): 1568–1580.

A SYSTEMIC APPROACH FOR SUSTAINABILITY CHALLENGES RELATED TO THE OCEAN

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Abstract

The complex sustainability challenges addressed by the United Nations 2030 Agenda need to be tackled by systematic research approaches. The application of a systemic approach to the Sustainable Development Goals (SDGs) helps to explore the interactions between different dimensions of sustainability and emphasizes the understanding of the systemic whole. An example of a sustainable goal that needs to be pursued through complex systems-thinking is SDG 14 on life below water, which touches upon several other goals set up in the 2030 Agenda, such as achieving zero hunger, ensuring healthy lives, and promoting the wellbeing of humans, animals, and plants; reducing ocean overharvesting and overfishing; tackling climate change; driving economic growth, and promoting innovation. A case study of systems thinking applied to the oceans relevant for research and high education is offered by the research conducted within the SECURE project, at the UiT The Arctic University of Norway, and focusing on the multiple potentialities of low trophic marine species as a constituent of food production, environmental protection, and health.

Introduction

This article suggests a reading key of the 2030 Agenda through the systems-thinking lens, elaborating on how such an approach supports research and higher education institutions in the framing, implementing, and upscaling smart practices relevant to achieve effective sustainability. An example of a systems-thinking approach applied to the Sustainable Development Goals (SDGs) relevant to the ocean, and specifically to SDG 14 on life below water is offered by the research carried out by the team of the project SECURE at UiT The Arctic University of Norway, on Novel Marine Resources for Food Security and Food Safety. Conceptually framing climate-smart practices through systemic approaches helps to provide a coherent explanation of observed realities, enabling assumptions and logical consequences that can lead to accurate predictions and help to overcome complex challenges posed by the growing interactions between socio-political and ecological systems (Battistoni et al. 2019). Conceptualizing climate-smart practices through systems thinking can set the stage for the generalization of empirical phenomena, in turn making it possible to assess the accuracy of predictions – an essential tool in the scientific approach. The majority of the studies on climate-smart agriculture practices focus on soil management practices (Jagustovic et al. 2019) while very little research focuses on the regulatory aspects of climate-smart practices applied to the ocean (Poto 2020). Therefore, this paper addresses a knowledge gap in the need to assist systematic mapping of the 2030 Agenda's goals with a specific focus on climate-smart practices applied to the ocean.

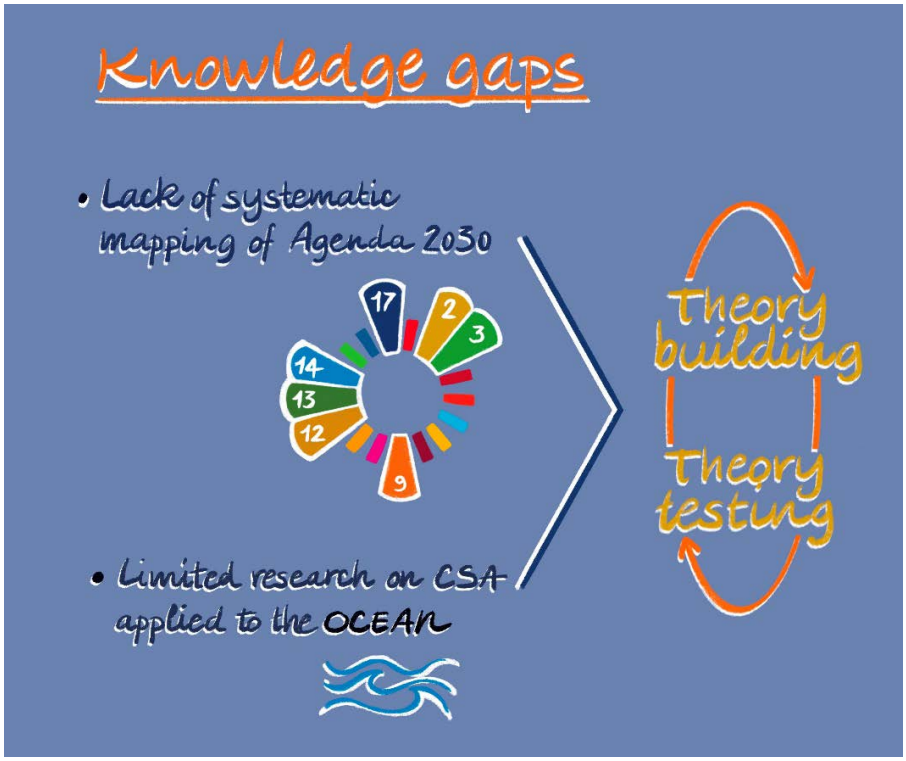

Figure 1: The systems-thinking approach applied to the ocean in the project SECURE at the UiT The Arctic University. *Illustration by Valentina Bongiovanni (2020).*

Research questions and methods

The 2030 Agenda calls for a coherent and systematic implementation of the seventeen SDGs endorsed by the United Nations global community. The goals are interrelated and therefore expected to be achieved in an integrated manner.

Adopting a systemic approach to the achievements of the goals has a twofold purpose: 1) it assists systematic mapping and critical analysis of multiple objectives of Agenda 2030; and 2) it offers an approach for framing, implementing, and upscaling climate-smart practices. The two purposes are in a mutually reinforcing relationship: a framework for the 2030 Agenda encourages the development of smart-solutions practices which, appropriately upscaled, have the merit of offering concrete solutions for achieving the SDGs.

Engaging systematically with the legal dimensions and the implementation of the SDGs, generates four related research questions (RQ), on: (1) the rationale for a systematic approach (why?); (2) the building blocks of a systematic approach and the implications for implementation (what? what actors, processes and outcomes from a legal viewpoint?); (3) the drawbacks to such way of proceeding (the obstacles); and (4) the methodology involved (how to proceed?). The answer to these research questions contributes to a better understanding of how to tackle the complexity of problems posed by sustainability research and consequently to the advancement of sustainability knowledge in higher education.

The systematic approach is grounded on the idea that changes in one part of the one-Earth support system affect changes in the entire system. The application of such an approach has multiple educational, societal, environmental, and even economic advantages (RQ (1)). First, it offers the opportunity for humanity to take charge of and responsibility for the systems by which they live. Second, these changes are evident in the geographical and spatial relationship local-global: changes in one part of the world affect the whole. Third, there is the recognition that a systems approach has benefits also in terms of leveraging synergies and costs.

In response to RQ (2), (on what?) systems thinking applied to sustainability engages at least two levels of analysis. First, it highlights the need to identify the components and boundaries of each legal system involved – the structures, outcomes, and relationships that govern and inform the 'SDGs grid', and presumably (but not limited to) the spheres of human rights law, food law, health law, and environmental law. Second, it inquiries how legal systems, as subsystems of a larger unit, interact with other subsystems (health science, food science, environmental science for example) and contribute to the functionality of the larger system as a whole.

Such a theoretical approach encounters obstacles and produces some unintended consequences (RQ (3)). Achieving a coherent level of decision-making and actions (where actions include research and education, innovation, policy, and management), encounters the obstacle of fragmentation in institutions, governance, and research funders. Moreover, the path of transitioning from mono- to inter-disciplinary (and therefore, systematic or systems-thinking) approaches remains fraught with obstacles and doubts.

As an answer to RQ (4) (how?), previous studies related to the current approach to systems thinking show how systems-thinking can offer a solid conceptual basis for the further assessment of the need to engage integrally with the 2030 Agenda.

Systems-thinking in relation to SDG 14

An example of systems thinking approach applied to sustainability comes from ocean protection-related research, under the umbrella of the SDG 14 on "Life below water". As known, SDG 14 aims to tackle marine pollution, restore and protect marine ecosystems, achieving both economic benefits for all and the protection of sea life. In this sense, SDG 14 can be seen as a 'system in the system' of sustainability in the 2030 Agenda, having multiple connections to issues of poverty, food, economic growth, innovation, production and consumption, and climate (SDGs 1, 2, 8, 11, 12, and 13). Deepening the understanding of these systems, and thereby increasing ocean literacy and research (OLR) in higher education, requires the adoption of systemic approaches also to the marine ecosystems. In this sense, systems thinking has a potentially important role to play in furthering the understanding and management of complex problems posed by the human-ocean relationship.

The research conducted by the group SECURE at the UiT The Arctic University of Norway offers an example of how ocean-related research is developed in a systems-thinking context. By contributing to policy dialogues and taking up complex governance issues related to the interaction between systems (national, regional, international legal systems, as well as health, food, environment and industry innovation systems), the project aims to achieve better socioeconomic and ecological welfare, with an increase in the level of trust in seafood from environmentally conscious consumers.

Under the SECURE project, interdisciplinary research is conducted on the legal framework regarding the harvesting of new species, the composition of nutrients and contaminants in these raw materials, their effects on the oral and gut microbiome, on cardio-metabolic diseases and atherosclerosis and on the link between gut microbiota and atherosclerosis. Research results are expected to enable targeted dietary advice.

The first leg of the project focuses on the need to develop a matrix that conceptually encompasses the objectives of the 2030 Agenda and its 17 SDGs from a regulatory perspective on the one side and allows the upscaling of climate-smart practices applied to the ocean on the other side. The observed lack of a systematic mapping of the SDG's interactions and the void in the study of climate-smart practices applied to the ocean spurred reflections on the need to create a critical conceptual framework as a reading key for the SDG's interactions and for upscaling successful climate-smart practices. The application of the systemic thinking lens within a legal fabric opened the floor to reflections about integrated regulatory approaches applied to the sea (Poto and Morel 2021). Based on this premise, the second step of the legal research at SECURE concluded that the systemic approach overcomes regulatory fragmentation caused by 'glocal' environmental challenges (where the adjective 'glocal' is meant to comprise both worldwide ranging and local issues). From the study conducted by the SECURE team, it emerged how an integral ecology context helps focus on the interconnection of living systems of any kind, be they living organisms, social systems, or ecosystems (Esbjörn-Hargens 2005). Such a perspective intends to guide the legislator towards a regulatory solution that unifies the protection of human rights and nature rights in one integral system. In a third step, the research team has explored some practical applications of systems thinking in the case of plastic pollution. Plastic pollution, with its multiple potential impacts on the marine environment, food security, and food safety, as well as human health, is certainly one example of a complex problem that needs to be tackled through a process-based, multi-tiered and systemic approach. The research team in SECURE suggested adopting a regulatory framework informed by the principles of systemic thinking, that overcomes the uncertainties of science in relation to the risks of plastics for food security, safety, and human health, as well as the fragmentation of the existing legal provisions tackling plastic pollution at sea.

Conclusions

This contribution has addressed the need to tackle sustainability in research and high education through a systemic lens. Suggesting the adoption of a systems-thinking approach as a reading key for the SDGs' interactions with a specific focus on SDG 14 (with the case study offered by the SECURE project) addresses such a need, shedding light on the validity and scope of conceptual frameworks for complex systems.

The application of a conceptual model for organizing the multiple goals of the 2030 Agenda within a systematic research framework offers a context where climate-smart solutions and practices can blossom, multiply, and develop (also in ocean-related research). As such, advancing research and consequently, education towards systematic approaches is likely to require years of in-depth analyses and experimentation – as well as preparations for dealing with the shockwaves of success and failure. In addition, comes the importance of constantly testing and rethinking the approach, responding to the changes and challenges encountered, starting from an evaluative analysis of alternative solutions, and listening sincerely to other voices.

Recasting the foundations of systems thinking towards the centrality of nature is essential in the readjustment process. The natural world does not always behave in ways that we humans can predict. As a living organism, it coevolves and changes at varying scales. Surely, it is time for us to use this opportunity to develop a better understanding of the natural world and its changes by deeply acknowledging, respecting, and attempting to restore the symbiotic relationship that we, as human beings, have with all the non-human others on this planet.

Funding

The legal research is funded by the Faculty of Law, UiT The Arctic University of Tromsø. The funds to cover publication costs are partly covered by the annum provided by the Faculty of Law to the author (proof-editing) and partly covered by UiT Publication Fund, UiT The Arctic University of Norway (publication fee).

Acknowledgments

The author is grateful to Edel O. Elvevoll and the SECURE research group for the comments on the early manuscript; to the anonymous peer reviewers that greatly contributed to the improvement of the piece; to Valentina Bongiovanni for her illustrated interpretation of this article (Figure 1; contact: bongiovanni.valentina@gmail.com).

Conflicts of Interest

The author declares no conflict of interest.

References

Battistoni, Chiara, Giraldo Nohra, Carolina, & Barbero, Silvia. "A systemic design method to approach future complex scenarios and research towards sustainability: A holistic diagnosis tool". *Sustainability* 11(16): 2019, 4458. doi:10.3390/su11164458

Esbjörn-Hargens, Sean. 2005. "Integral ecology: The what, who, and how of environmental phenomena". *World futures* 61(1-2): 5-49.

Jagustovic, Renata, Zougmoré, Robert B., Kessler, Aad, Coen, J., Ritsema, Keesstra, Saskia, & Reynolds, Martin. 2019. "Contribution of systems thinking and complex adaptive system attributes to sustainable food production: Example from a climate-smart village". *Agricultural Systems* 171: 65–75.

Poto, Margherita Paola. "A Conceptual Framework for Complex Systems at the Crossroads of Food, Environment, Health, and Innovation". *Sustainability* 12(22): 1-10. doi:10.3390/su12229692

Poto, Margherita Paola, & Morel, Mathilde. D. 2021. "Suggesting an Extensive Interpretation of the Concept of Novelty That Looks at the Bio-Cultural Dimension of Food". *Sustainability* 13(9): 1-10.

The Arctic University of Norway (UiT). SECURE Novel Marine Resources for Food Security and Food Safety. Accessed June 20, 2021. https://uit.no/research/seafood/project?pid=667623.

HAS THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOAL 14 *'LIFE BELOW WATER'* BEEN IMPLEMENTED IN THE NETHERLANDS? AN ANALYSIS ON THE STATUS OF IMPLEMENTATION OF GOAL 14 IN THE NETHERLANDS

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Abstract

The status of the United Nations sustainable development goal (SDG) 14 *Life Below Water* lags in the Netherlands while target horizons (2020, 2025, and 2030) have either been reached or are fast approaching. In 2016, recommendations have been formulated by the PBL Netherlands Environmental Assessment Agency, calling for adjustments in the Dutch implementation of the environment-related SDG Targets. This article focuses on the extent of implementation of SDG 14 in the Netherlands, and the recommended adjustments on SDG implementation as proposed by the 2016 PBL Netherlands Environmental Assessment Agency. Research for this article was conducted with the aim to provide advice to Dutch policy makers at the Ministry of Agriculture, Nature and Food Quality and other interested stakeholders on areas that need further implementation. This research was conducted through desk research and literature analysis as well as interview analysis with a semi-structured approach. Results showed that the recommendations have, for a large part, not been implemented. Exceptions to this are related to the coordination of policy efforts and active societal participation to implement SDG 14. A limited number of respondents was found that could actively provide information on SDG 14 to the researcher.

Introduction

Governments and their countries are primarily responsible for implementing the United Nations Sustainable Development Goals (SDGs) and are called upon to translate the global goals into long-term visions with clear targets and integrated policy agendas, based on the national context (OECD 2016; Ruijs, Van der Heide, and Van den Berg 2018). Urgency to achieve SDG 14 is evident as Targets are set for 2020 (14.2, 14.4, 14.5, 14.6), 2025 (14.1), and 2030 (14.3, 14.7, 14.A, 14.B, 14.C) (Our World In Data, n.d.). The PBL Netherlands Environmental Assessment Agency (PBL in Dutch: *Planbureau voor de Leefomgeving*) which is the national institute for strategic policy analysis in the fields of the environment, nature and spatial planning, conducted a policy study in 2016 on the *'Sustainable Development Goals in the Netherlands. Building Blocks For Environmental Policy For 2030'*. The study concluded that the implementation could build on already existing goals, policy programs and monitoring reports, but that adjustments were needed to successfully implement the environmental related SDG Targets (41 SDG targets from 13 goals) in the Netherlands, which are formulated in the following recommendations:

1. Firstly, the global SDGs have to be translated into a national ambition level, consisting of a clear, long-term vision supported by new and updated national policy targets for 2030.
2. Secondly, successful SDG implementation requires close coordination of policy efforts and responsibilities between various ministries and provincial and local authorities, thereby ensuring policy coherence.
3. Furthermore, active participation of various groups within society (e.g., citizens, businesses, NGOs) is required in defining and implementing the national vision and policy targets.
4. Finally, a periodic national monitoring report is needed to track progress and – depending on the political ambition – to promote accountability by explaining underlying developments or even to evaluate policy performance.

(Lucas, Ludwig, Kok and Kruitwagen 2016, 8)

The research of this paper aimed to provide advice to Dutch policy makers at the Dutch ministry of Agriculture, Nature and Food Quality and other interested stakeholders concerning areas that need further implementation of SDG 14 in the Netherlands. The status of SDG 14 in the Netherlands is lagging according to both international and national reports. Dashboards developed by the *Bertelsmann Stiftung and the Sustainable Development Solutions Network* (SDSN) show the performance of the Netherlands on SDG 14 as a 'major challenge' and the trend in achieving the Goal as 'moderately increasing'. The 'average performance indicates that SDG 14 is behind most other Goals (Sachs et al. 2020). It was unclear to what extent the recommendations for adjustments, made by the 2016 PBL Netherlands Environmental Assessment Agency concerning the implementation of the environmental related SDG Targets, were implemented in regard to SDG 14. Therefore, the research question of this paper and related analysis is: to what extent has the UN Sustainable Development Goal 14 'Life Below Water' been implemented in the Netherlands, in regard to the recommended adjustments on SDG implementation, proposed by the 2016 PBL Netherlands Environmental Assessment Agency? The following sub-questions were formulated to answer the main research question. The years 2020, 2025, and 2030 were included as it refers to SDG 14 Target horizons:

1. Which SDG 14 Targets have been translated into a national ambition level, consisting of a clear, long-term vision supported by new and updated national policy targets for 2020, 2025, or 2030?
2. What coordination of policy efforts and responsibilities exists between various ministries and provincial and local authorities, ensuring policy coherence in regard to SDG 14?
3. What active participation of various groups within society exists in defining and implementing the national vision and policy targets, in regard to SDG 14?
4. Which periodic national monitoring exists that serves to track progress and - depending on the political ambition - account on the underlying developments or even to evaluate policy performance, in regard to SDG 14?

Research methodology

This research was divided in two stages, applying first a desk and literature analysis (part A), followed by an interview analysis (part B). This order of analysis was carried out to follow up concerning missing data or to clarify data as well as to understand situations in daily practice from desk and literature analysis. The scope of this research was limited to the national situation, with a focus on targets 14.1 to 14.6 in accordance with the PBL policy study.

Desk and Literature Analysis

The latest, most recent governmental/policy documents were retrieved, which concerned documents in the 2016-2021 policy cycle. Documents were retrieved in English where possible, using Google Search. The documents were selected as it concerns the latest policy cycle. The national reports/documents on the SDGs as well as the National Water Plan and the Policy Document on the North Sea 2016-2021 served to collect additional governmental/policy documents. Data collection was finalized when new documents/information was not found on the concerned matter in a timespan of four weeks. The Dutch inventory on the implementation of the SDGs from 2016, listing policy for each SDG Target was used in data collection and became the scope for the analysis of Dutch policy targets (Government of the Netherlands, 2016). Figure 1 shows a sample of matrixes designed for analysis, representing units derived from the sub-questions (B, Figure 1).

Sub-question concerned		Goal/Target	14.1	14.2	14.3	14.4	14.5	14.6	SDG14
Translation of the SDG14 ambition level		Label							
1a	Unit	Present/ Lacking	Lacking						N/A
1b	Unit	Completely/ Limited/ Lacking		Completely				Completely	
1c	Unit	Yes/ Not linked			Not linked		Not linked		
1d	Unit	Present/ Lacking				Lacking			

A

B

C

Figure 1. Sample, matrixes used in analysis of part A.

So called 'units' in the figure, concern specific parts of a sub-question. The labels 'present/ lacking', refers to whether units were found described ('present'). The labels 'completely/limited/lacking', refers to the extent the national targets cover the problem/theme of the SDG 14 Target (completely/ lacking), considering the possibility of a partly covered problem/theme (limited). The labels 'yes/ not linked' refers to whether Target horizons correspond (yes) or whether horizons do not correspond and therefore do not link (not linked). In case data were not found ('lacking') or found 'not linked' or 'limited' concerning a certain SDG 14 target, the colour red was applied (A) and therefore selected for follow-up in interview analysis. Labels (C) have been developed to present results in an overview during the analysis (present/completely/limited/lacking/not linked).

Interview Analysis

Findings labelled as 'lacking', 'not linked' or 'limited' in desk and literature analysis were addressed in follow-up interviews with experts, selected from the Ministries of Agriculture, Nature and Food Quality; Infrastructure and Water Management; Foreign Affairs; SDG *Nederland* (NGO) and its affiliated SDG 14 alliance coordinator, as well as from Statistics Netherlands.

The semi-structured approach was selected as the preferred method of data collection for interviews. Considerations in the selection of type of respondents concerned the different backgrounds and positions connected with SDG 14. In interviews with ministerial officials, the preferred method concerned a group session, however, due to COVID-19, the researcher was restricted to one-on-one interviews. Five interviews were conducted through online video-calling, planned for one hour, with five minutes of introduction, ten minutes for additional questions that could arise during the interview, with five minutes to end the interview. In addition, a sixth respondent replied to interview questions in writing instead of video-calling. The respondent's reply was still taken into consideration due to the value of her responses for the research even though no video interview was possible. Interviews were recorded, using a phone, and were transcribed into Word formats. Figure 2 was designed for analysis, using a colour scheme to represent answers provided, further explained in Figure 2. In the case that a respondent indicated that a certain "unit" was not (completely) adjusted/implemented or not existing, the concerned "unit" was considered not implemented (colour red), as desk and literature results indicated that this "unit" was "lacking" or "not linked".

Respondents		Respondent	Respondent	Respondent	Respondent	Respondent	Respondent
Concerned sub-question							
1a	Unit						
1b	Unit						
1c	Unit						
1d	Unit						

Legend	
	Answer provided confirmed unit does not exist or not (completely) adjusted
	Answer provided, indicated uncertainty
	Not answered or answer to question relating to a different unit
	Unit not addressed in interview
	Answer provided without indication it being 'unknown' or not implemented/adjusted

Figure 2. Sample, matrixes used in analysis of part B.

Results

In the desk and literature analysis, no translated ambition level into Dutch policy targets, consisting of a clear national long-term vision was found (Figure 3 and Figure 4). However, the problem/theme of targets 14.1, 14.2 and 14.4, was found covered in national policy targets. Either policy targets did not correspond with SDG 14 target horizons or were not clearly defined.

Respondents		Foreign Affairs	I&WM	AN&FQ	SDG Nederland	SDG14-alliance coordinator	Statistics Netherlands
Translation of the SDG14 ambition level							
1a	Clear long-term vision						
1b	Ambition level of problem/ theme covered in national policy targets						
1c	Corresponding target horizon with policy targets						

Figure 3. Results, sub-question 1, part A.

Sub-question concerned		Goal/Target	14.1	14.2	14.3	14.4	14.5	14.6	SDG14
Translation of the SDG14 ambition level		**Label**							
1a	Described clear long-term vision	Present/ Lacking	**Lacking**	**Lacking**	**Lacking**	**Lacking**	N/A	**Lacking**	**Lacking**
1b	Ambition level of problem/ theme covered in national policy targets	Completely/ Limited/ Lacking	**Completely**	**Completely**	**Lacking**	**Completely**	N/A	**Lacking**	N/A
1c	Corresponding target horizon with policy targets	Yes/ Not linked	**Not linked**	**Not linked**	N/A	**Not linked**	N/A	N/A	N/A

Figure 4. Results, sub-question 1, part B.

No responsible authorities on SDG 14 and its Targets were found determined (Figure 5 and Figure 6). Instead, its responsibilities are assumed where policy areas of ministries link with SDG targets. Coordinated governmental efforts were found specifically contributing to SDG 14.

Sub-question concerned		Goal/Target	14.1	14.2	14.3	14.4	14.5	14.6	SDG14
Coordination of policy efforts and responsibilities		**Label**							
2a	Described (coordination of) responsibilities between authorities (ministries, provincial, local)	Present/ Lacking	**Lacking**	**Lacking**	**Lacking**	**Lacking**	**Lacking**	**Lacking**	**Lacking**
2b	Described (coordination of) policy efforts between authorities (ministries, provincial, local)	Present/ Lacking	**Present**	**Present**	**Present**	**Present**	**Present**	**Present**	**Present**
2c	Described responsibility of policy coherence	Present/ Lacking	N/A	N/A	N/A	N/A	N/A	N/A	**Present**

Figure 5. Results, sub-question 2, part A.

Respondents		Foreign Affairs	I&WM	AN&FQ	SDG Nederland	SDG14-alliance coordinator	Statistics Netherlands
Coordination of policy efforts and							
2a	(Coordination of) responsibilities between authorities (ministries, provincial, local)						
2b	(Coordination of) policy efforts between authorities (ministries, provincial, local)						
2c	Responsibility of policy coherence						

Figure 6. Results, sub-question 2, part B.

Due to a lacking national long-term vision, societal active participation in defining and implementing the national vision could not be analyzed (Figure 7). However, its implementation was considered 'present' as societal participation in implementing this SDG was found (point 3c, Figure 7). Active participation in defining policy targets was found in certain cases. No clear results could be presented on concerning participation in implementation of policy targets.

Sub-question concerned		Goal/Target	14.1	14.2	14.3	14.4	14.5	14.6	SDG14
Participation of societal groups		Label							
3a	Described active participation in defining national vision	Present/ Lacking	Lacking (see 1a)	Lacking (see 1a)	Lacking (see 1a)	Lacking (see 1a)	Lacking (see 1a)	Lacking (see 1a)	Lacking (see 1a)
3b	Described active participation in defining policy targets	Present/ Lacking	Present	Present	N/A	Present	N/A	N/A	N/A
3c	Described active participation in implementing the national vision	Present/ Lacking	Present	Present	Present	Present	N/A	N/A	N/A
3d	Described active participation in implementing policy targets	Present/ Lacking	?	?	N/A	?	?	N/A	N/A

Figure 7. Results, sub-question 3, part A. Respondents were either unknown about parts of sub-question 3 or where not able to inform on the subject.

A periodic national monitoring was found reporting on the status and trends of four indicators (Figure 8), which is brief, compared to reporting on other SDGs in the Monitor of Well-Being and SDGs (2019 and 2020) by Statistics Netherlands. Also, indicators concerning the Wadden Sea were lacking. In the Netherlands, this monitoring report is published along with a national appreciation on the status of the SDGs in the Netherlands, however, no reporting on accountability on underlying developments and policy performance evaluation was found (Figure 8 and Figure 9).

Sub-question concerned		Goal/Target	14.1	14.2	14.3	14.4	14.5	14.6	SDG14
National monitoring and accountability		Label							
4a	Periodic national monitoring	Global indicator/ Alternative indicator/ Not reported	Alternative indicator (Montor of Well-Being & SDGs)	Not reported	Not reported	Global indicator (Montor of Well-Being & SDGs)	Not reported	Not reported	Status: Major challenges remain, Trend: Moderately increasing
4b	Most recent reporting year	Year	2019	N/A	N/A	2018	N/A	N/A	2020
4c	Reported accountability on underlying developments	Present/ lacking	Lacking	Lacking	Lacking	Lacking	Lacking	Lacking	Lacking
4d	Reported policy performance evaluation	Present/ lacking	Lacking	Lacking	Lacking	Lacking	Lacking	Lacking	Lacking

Figure 8. Results, sub-question 4, part A.

Respondents		Foreign Affairs	I&WM	AN&FQ	SDG Nederland	SDG14-alliance coordinator	Statistics Netherlands
National monitoring and accountabi							
4a	Periodic national monitoring						
4b	Most recent reporting year						
4c	Reported accountability on underlying developments						
4d	Reported policy performance evaluation						

Figure 9. Results, sub-question 4, part B.

Discussion

The two-part research design applied in this research, proved well-fit in preventing uncertainties found from data on paper and to follow-up on expected knowledge gaps in desk and literature analysis to understand implementation. Important findings of this research include the missing clear and recognizable national long-term vision on SDG 14 to serve as a form of direction whereby societal organizations could tailor efforts and investment decisions, as national implementation requires broad participation (Lucas et al. 2016). Societal active participation in implementing SDG 14 is found but often the precise contribution to SDG 14 remained unclear. Another finding concerned the lack of an assigned ministry to direct the implementation, monitoring reportage as well as to account on underlying developments or even to evaluate policy performance on this SDG, of which the importance was addressed by the PBL Netherlands Environmental Assessment Agency. Not much is known concerning the status of this SDG as the status of four indicators are reported in the Monitor of Well-Being and SDG.

The statement made by the Dutch prime Minister Mark Rutte, who affirmed the intention of the Netherlands to make the SDGs its leading policy framework for the next 15 years, during the UN Sustainable Development Summit in September 2015, was not recognized based on findings of the research of this paper (United Nations 2017). Important limitations concerned the limited population of respondents as well as the limited extent to which respondents were able to provide information. A limited number of persons were found to have knowledge on SDG 14 in order to participate, or competent to confirm, debunk, or elaborate on findings from desk and literature in case of interview participation. One ministerial official, coordinating the efforts on the SDGs within its department, was able to elaborate concerning the national level to a limited extent. Two experts participating in SDG 14 related activities and a working group focused on SDG 14, were unable to participate, missing potential rich data. As societal active participation in the implementation policy targets was not analyzed to the desired extent within the time-budget, the third sub-question was considered as the least satisfied in both desk and literature analysis and interview analysis due to lack of clear links from desk and literature analysis and knowledge concerning this topic by respondents.

Conclusion

The adjustments recommended by the PBL policy study on SDG implementation concerning SDG 14 has, for a large part, not been found implemented. The SDG14 targets have not been translated into a national ambition level. A (clear) long-term vision was lacking and therefore a clear direction is missing on implementation for societal active participation. Coordinated policy efforts by authorities on different levels contributing to SDG 14 are conducted. However, no responsible authority has been found on this SDG. The limited reporting by the Monitor of Well-Being and SDGs causes uncertainty on the status of SDG 14 in the Netherlands.

References

Government of the Netherlands. "Duurzame Ontwikkelingsdoelen Inventarisatie Nederlandse Implementatie Per 31-12-2016". The Hague: Government of the Netherlands, 2016. Accessed July 03, 2020.

International Institute for Sustainable Development (IISD). "Sustainable Development". IISD, (n.d.). Accessed July 03, 2020. https://www.iisd.org/topic/sustainable-development,

Lucas, Paul, Ludwig, Kathrin, Kok, Marcel, & Kruitwagen, Sonja. "Sustainable Development Goals in the Netherlands. Building Blocks for Environmental Policy for 2030". The Hague: PBL Netherlands Environmental Assessment Agency, 2016. Accessed Jly 03, 2020.

OECD. "Better Policies for 2030. An OECD Action Plan on the Sustainable Development Goals". Paris: OECD, 2016. Accesed December 14, 2020.

Our World in Data. *SDG Tracker: Sustainable Development Goal 14*. Our World in Data, 2018. Accessed July 03, 2020. https://sdg-tracker.org/oceans

Ruijs, Arjan, van der Heide, Martijn, & van den Berg, Jolanda. "Natural Capital Accounting for the Sustainable Development Goals. Current and potential uses and steps forward". The Hague: PBL Netherlands Environmental Assesssment Agency, 2018. Accessed December 15, 2020.

Sachs, Jeffrey, Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G., & Woelm, F. 2020. *Sustainable Development Report 2020: The Sustainable Development Goals and COVID-19*. Cambridge: Cambridge University Press.

United Nations (UN). *Netherlands*. United Nations, 2017. Accessed November 09, 2020.

ADVANCING MARINE EDUCATION TO PREPARE FUTURE OCEAN LEADERS

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Abstract

As human populations grow, oceans and marine resources are under increasing pressure from multiple activities. Sustainable Development Goal (SDG) 14 is focused on safeguarding life below water and sets important targets and indicators, but no blueprint for how these are to be achieved. Future ocean leaders must have wide ranging knowledge and expertise if ocean challenges are to be resolved, yet higher education curricula tend to focus on discrete fields – such as marine science, ocean engineering and law of the sea. Clearly, multi-disciplinary courses are required that equip graduates to successfully address these challenges. The University of Western Australia introduced the innovative *Master of Ocean Leadership* as one such multi-disciplinary program. This paper examines the curriculum and analyses the ways in which it advances marine education.

Introduction

The world's oceans and marine resources are under pressure from multiple human activities, including sectors such as shipping, mining, fishing, coastal and offshore development, waste disposal and even tourism (Halpern et al. 2008). As human populations continue to grow, ocean degradation is increasing, creating complex challenges to be addressed (Halpern et al. 2019). Myriad laws, policies, interventions, and initiatives have been developed over several decades to sustainably manage, conserve, and restore our oceans (Zacharias and Ardron 2019). Yet ocean indicators have not improved, and in 2015 the Sustainable Development Goals (SDGs) were adopted to set tangible targets and measurable indicators to stimulate further action (United Nations 2015). Relevantly, one set of goals focuses on 'Life Below Water' (https://www.un.org/sustainabledevelopment/oceans/).

SDG 14 covers wide-ranging issues such as marine pollution, ocean acidification, unsustainable fishing and fisheries subsidies, conservation and management, economics, transfer of marine technologies, and the implementation of international law (Techera 2019). These are all areas where attention is squarely focused on marine concerns. Nevertheless, oceans are implicated in other SDGs, including SDG 7 relating to increasing the share of renewable energy in the global energy mix, and SDG 13 centring on combating climate change. Such ambitious goals require responses that are multi-faceted, and which necessarily involve different disciplines including physical, natural, and social sciences. Indeed, reference is made in various SDGs to science, technology, law, trade, economics, politics, education, and engineering. Yet the SDGs provide no blueprint for how these goals are to be achieved, nor how education could equip future leaders to contribute to meeting the targets. Multi-stakeholder partnerships are highlighted as critical to mobilizing and sharing 'knowledge, expertise, technology, and financial resources' (SDG 17.16), but such collaborations will only be effective if members have the skills and expertise to work across disciplines.

The SDGs have drawn support from governments, non-governmental organisations (NGOs), private industry, academic institutions, the scientific community, and civil society demonstrated, for example, by the range of voluntary commitments to SDG 14 (https://oceanconference.un.org/commitments). This highlights the need to equip the people within these organisations with the necessary multi-disciplinary knowledge and expertise. Clearly, the higher education sector has a role to play in this regard, by providing formal education programs that cross multiple fields. Yet historically degree programs have focused on single disciplines, and universities have frequently created barriers to cross-disciplinary education. In an effort to break down these siloes, and to equip future ocean leaders with much needed educational opportunities, The University of Western Australia developed an innovative multi-disciplinary program – the *Master of Ocean Leadership* (https://www.uwa.edu.au/study/courses/master-of-ocean-leadership). This paper explores the role of multi-disciplinary education in achieving the SDGs, examines the *Master of Ocean Leadership* curriculum in detail, and analyses the ways in which it advances marine education to prepare ocean leaders of the future.

The role of multi-disciplinary education in achieving the SDGs

Education is highlighted throughout the SDGs and is the focus of SDG 4, where emphasis is placed on universal access (https://www.un.org/sustainabledevelopment/education/). Although multi-disciplinary education is not explicitly mentioned, SDG 4.7 seeks to 'ensure that all learners acquire the knowledge and skills needed to promote sustainable development'. Furthermore, it is recognised that this must necessarily involve 'adopting an interdisciplinary approach to education for sustainable development' (Annan-Diab and Molinari 2017).

'Inter-disciplinary' and 'multi-disciplinary', to which may be added other terms such as 'cross-disciplinary', 'trans-disciplinary' and 'bridging disciplines', are not interchangeable terms (Alvargonzález 2011; Youngblood 2007). But for the purposes of this paper, these differences are set aside, and both are used to refer to the tools and knowledge of multiple disciplines combined to address multifaceted problems. The benefits of multi-disciplinary education are three-fold. First, critical discipline-specific knowledge and skills can be built across several relevant fields. Secondly, multi-disciplinarity builds collaborations across disciplines, faculties, and universities (Aris et al. 2017). Thirdly, multi-disciplinary approaches can contribute to building sustainability competencies in participants (Teresa Fuertes-Camacho et al. 2019). Indeed, this has been recognised by the SDG Academy, which is the flagship education platform for the SDGs and a global initiative for the United Nations (https://sdgacademy.org/about-us/). The annual *International Conference on Sustainable Development* focused specifically on the theme 'Interdisciplinary Approaches to Educate for Sustainable Development' which sought to 'present and discuss innovative ways of delivering education and engagement that enables and empowers students and future decision-makers to analyse and confront the interrelated challenges of the SDGs (Storey 2020).

Multi-disciplinarity is not a new concept and has been embraced in university research contexts for several decades. Yet few formal educational programs incorporate more than a handful of related fields, frequently limited to a selection of sciences (http://handbook.curtin.edu.au/courses/32/320711.html), or social sciences (UTEP Connect 2017; https://www.grantham.edu/online-degrees/multidisciplinary-studies-bachelors/). One of the only examples of a tailored mul-

ti-disciplinary program is the Master of Philosophy in Conservation Leadership at the University of Cambridge, but it does not focus on oceans (https://www.cl.geog.cam.ac.uk/study). It was in this context that The University of Western Australia commenced development of a multi-disciplinary degree program in 2017, focused on oceans-related studies. The explicit purpose of the course is to develop 'future leaders to address global oceans challenges.

Master of Ocean Leadership

The *Master of Ocean Leadership* is a two-year program open to students from any discipline. The program combines compulsory and optional coursework units, with research and experiential-learning opportunities. The foundation of the course is eight compulsory units, which cover key natural science, social science, and engineering fields. The core units are all free of pre-requisites and overall, the program is open to students from all fields of study, which promotes the multi-disciplinary nature of the graduate outcomes that can be achieved. These features of the program ensure that the cohort within each of the core units is incredibly diverse, and the resulting peer learning supports the achievement of program-level outcomes.

The compulsory subjects include *The Indian Ocean Environment, Oceans Governance, Marine Conservation and Fisheries Management, Ocean Hazards, Strategic Leadership for the Blue Economy, Ocean Data Analysis, Ocean Engineering and Technology*, and *Working with Multiple Disciplines*. *The Indian Ocean Environment* provides an overview of the dynamic processes governing the structure and function of marine ecosystems, with a particular focus on the Indian Ocean. *Oceans Governance* explores marine law and policy including law of the sea, fisheries regulation, shipping and marine pollution, marine-based tourism, and conservation frameworks. In *Marine Conservation and Fisheries Management* students learn about goals of fisheries management and marine conservation, and about the outcomes and effectiveness of global and local management strategies. *Ocean Hazards* covers the risks and threats themselves, as well as the processes that lead to them, their prediction, and different mitigation and planning options. *Strategic Leadership for the Blue Economy* introduces the fundamentals of leading people and organisations as well as innovation in the context of the oceans, exploring the concepts of leadership, strategy, and entrepreneurship. *Ocean Data Analysis* equips students to apply different analytical methods to physical and biogeochemical data sets. *Ocean Engineering and Technology* provides students with fundamental knowledge of the technology and engineering challenges associated with coastal, offshore and seabed infrastructures and the interface with economics, regulation, and biological sciences. The final core unit explores *Working with Multiple Disciplines* examines the concepts of multi-, inter-, cross- and trans-disciplinarity and how they can be applied to address the many challenges facing the oceans. Students learn to work in teams drawn from different fields, to apply various disciplinary approaches and ways of thinking to current issues of local and global importance.

The students then select optional units. They can tailor their program to align with their chosen field, by concentrating on areas such as the sciences or governance. Alternatively, they can specialise in concepts, rather than along disciplinary lines, exploring 'risk', for example, from economic, legal, ecological, and technological perspectives. Relevantly, students can also tailor their program to focus on one of the ten targets of SDG 14. This approach prepares them to address ocean challenges associated with, for example, ameliorating marine pollution, restoring ecosystems, or man-

aging resources. Furthermore, students have the option of undertaking research projects across multi-disciplinary fields, working with leading academics and other research students. The different educational backgrounds of student are provided for, with a range of electives available to all students, from any field, as well as other optional subjects that build on undergraduate and professional experiences.

The *Master of Ocean Leadership* program allows students to apply disciplinary, as well as multi-disciplinary, knowledge to real world problems. Building problem-solving skills is equally as important as the foundational knowledge needed to address ocean challenges. A particular feature of the program is the emphasis on cross-cutting issues, including those at the intersection of conservation and utilisation of the ocean environment and resources, and the critical analysis of ocean issues from industry, non-governmental and governmental perspectives. In this way, the program is contributing significantly to multi-disciplinary marine education that will ultimately allow graduates to work in a variety of sectors and to contribute to solving the challenges at the heart of SDG 14.

The program has only been made possible because of the wealth of academic expertise at The University of Western Australia. The program is administered by the University's *Oceans Graduate School* (https://www.uwa.edu.au/ems/schools/oceans-graduate-school) and is taught by staff from that School and the *Oceans Institute* (https://www.oceans.uwa.edu.au/). The *Oceans Institute* includes over 100 of the world's most recognised ocean engineers, marine scientists, oceanographers, maritime archaeologists, and oceans governance researchers, who work collaboratively and effectively to deliver this unique coursework program.

Conclusion

Education, and appropriate educational programs, are critical to building the human capital necessary to achieve the SDGs. This is as true for 'Life Below Water' as for other SDGs. Although multi-disciplinary education is not a new concept, relatively few higher education programs truly cover the range of disciplines necessary to equip graduates with the skills and knowledge to address ocean challenges. The University of Western Australia's *Master of Ocean Leadership* course is a unique and innovative program. Whilst in its early years, the program has already attracted considerable interest with the first cohort of future ocean leaders to graduate shortly.

References

Alvargonzález, David. 2011. "Multidisciplinarity, Interdisciplinarity, Transdisciplinarity, and the Sciences". *International Studies in the Philosophy of Science* 25(4): 387-403:

Annan-Diab, Fatima, & Molinari, Carolina. 2017. "Interdisciplinarity: Practical approach to advancing education for sustainability and for the Sustainable Development Goals". *The International Journal of Management Education* 15(2B): 73-83.

Aris, S.R.S., Isa, W.A.R.W.M., Yahaya W.A.W. & Mohamad, S.N.A. 2017. "Multidisciplinary curriculum design approaches towards balanced and holistic graduates". *IEEE 9th International Conference on Engineering Education* (ICEED), Kanazawa, 2017, 17-22. doi: 10.1109/ICEED.2017.8251157.

Fuertes-Camacho, M. Teresa, Graell-Martin, Mariona, Fuentes-Loss Mariana & Balaguer-Fàbregas M. Carmen. 2019. "Integrating Sustainability into Higher Education Curricula through the Project Method, a Global Learning Strategy". *Sustainability* 11, 767: 1-25. doi:10.3390/su11030767.

Halpern, Benjamin S., Walbridge, Shaun, Selkoe, Kimberly A., Kappel, Carrie V., Micheli, Florenza, D'Agrosa, Caterina, Bruno, John F. et al. 2008. "A Global Map of Human Impact on Marine Ecosystems". *Science* 319(5865): 948-952. DOI: 10.1126/science.1149345.

Halpern, Benjamin S. Frazier, Melanie, Afflerbach, Jamie, Lowndes, Julia S., Micheli, Fiorenza, O'Hara, Casey, Scarborough, Courtney & Selkoe, Kimberly A. 2019. "Recent pace of change in human impact on the world's ocean". *Scientific Reports* 9:11609.

Storey, M. 2020. "Sustainable development in(between) the disciplines: Reflections from ICSD 2020". *SDG academy*. October 08, 2020.

Techera, Erika. 2019. "Sustainable Development Goals Online – Core Essay: Life Below Water". UK: Sustainable Development Goals Online (SDGS), March 20, 2019.

United Nations General Assembly. "Transforming our world: the 2030 Agenda for Sustainable Development". UN Doc A/RES/70/1. General: United Nations, 2015.

UTEP Connect. 2017. "What is the multidisciplinary studies program?". UTEP, January, 2017.

Youngblood, Dawn. 2007. "Multidisciplinarity, interdisciplinarity, and bridging disciplines: A matter of process". *Journal of Research Practice* 3(2): 1-8.

Zacharias, Mark & Ardron, Jeff. 2019. *Marine Policy: An Introduction to Governance and International Law of the Oceans*. Abingdon: Routledge, 2nd Ed. ISBN 9780815379270.

OCEAN GRADUATE TRAINING AS A CRITICAL AREA OF FOCUS FOR THE UNITED NATIONS DECADE OF OCEAN SCIENCE AND SUSTAINABLE DEVELOPMENT GOAL 14: THE OGEN EXAMPLE

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Abstract

Only a small portion of graduate students can expect to secure academic positions upon graduation, and with a growing number of students seeking graduate degrees, it is critical to make them aware of the explosion of employment opportunities outside of academia. With these opportunities come new requirements for expertise in communication, outreach, and other "soft" skills not traditionally part of academic graduate training. A new model of graduate training is needed to support students in developing a broader range of skills, and direct engagement with other academic-flavoured career paths. The Ocean Frontier Institute (OFI) is a transnational hub for marine research, exploring the ecosystems of the North Atlantic and Canadian Arctic Gateway to discover innovative solutions that strengthen the economy and protect the environment. OFI is now aiming to build further connectivity around the UN Decade of Ocean Science for Sustainable Development, particularly around Sustainable Development Goal 14 (Life Below Water). Specifically, OFI will progress SDG 14 through contributions to Indigenous Engagement, data flows and management, ocean literacy and ocean graduate training. This paper specifically focuses on OFI's advancement of ocean graduate training. OFI's new Ocean Graduate Excellence Network (OGEN), launched in 2021, represents a novel mechanism to link academic institutions with government and industry collaborators whose interests align with SDG 14.

Background

According to a Conference Board of Canada news post (2015) only 18.6% of graduate students can expect to land a full-time academic position. This is even though academia depends enormously on graduate student work for its research outputs (Lauten 2018), and more than half of graduate students initially aim for an academic position (Woolston 2019). Given the increase in the number of PhD degrees being awarded, in Canada and globally, we expect the likelihood of a career purely in academia to continue to decrease, especially considering the cost-effectiveness for academic institutions in Canada to employ temporary lecturers, as opposed to full-time professors (Walters, Zarifa and Etmanski 2020). It is therefore critical that academic institutions offer broader and deeper training for graduates to open their career opportunities beyond academia.

Building on this, students, and employers, have new requirements for skills/expertise in communication, outreach, resilience, adaptability, and other "soft" skills not traditionally part of academ-

ic graduate training. Many Canadian academic institutions are developing skills and competency frameworks to design, develop and support students in gaining these desirable "soft" skills (Gyarmati, Lane and Murray 2020).

We urgently need a new model of graduate training that supports students in developing a broader range of skills and an awareness of other academic-flavoured career paths. The creation and support of a network of ocean graduate students and a collaborative approach to graduate training will greatly enhance the future community of Canadian ocean leaders. Creating opportunities for ocean graduate students to experience a government, industry, or NGO work environment, prior to degree completion, will broaden their perspectives, as well as their employability.

Ocean Frontier Institute

The Ocean Frontier Institute (OFI) is a transnational hub for marine research, exploring the ecosystems of the North Atlantic and Canadian Arctic Gateway to discover innovative solutions that strengthen the economy and protect the environment. As an institution, OFI works transnationally to build collaboration with its member universities (Dalhousie University, Memorial University of Newfoundland, University of Prince Edward Island) and formal partners (Alfred Wegener Institute, Christian-Albrechts-Universitat zu Kiel, GEOMAR Helmholtz Centre for Ocean Research, Institute of Marine Research, ISBlue, Lamont-Doherty Earth Observatory, Marine Institute – Galway, and Woods Hole Oceanographic Institution). OFI is now aiming to build further connectivity around the UN Decade of Ocean Science for Sustainable Development, particularly around Sustainable Development Goal 14 (Life Under Water). Specifically, OFI will progress SDG 14 through contributions to Indigenous engagement, data flows and management, ocean literacy and ocean graduate training. This paper specifically focuses on OFI's advancement of ocean graduate training.

Enter the Ocean Graduate Excellence Network

OFI's **Ocean Graduate Excellence Network (OGEN)** represents a novel mechanism to link academic institutions with government and industry collaborators whose interests align with SDG 14. By leveraging donor and government/industry partner funding, academic supervisors and government/industry partners forge new connections, while also attracting top-tier students; additionally, OGEN students have access to highly competitive stipends, while gaining valuable practical skills through collaborations with government/industry partners.

The OGEN mechanism operates as follows: overall, partners fund half of the cost of the positions, supervisors/universities fund a quarter, and a quarter is contributed through OGEN donor funding to catalyse the agreement. This provides significant leverage for all partners and researchers involved, such that even where the salaries are pitched at the high end of what is common, the funding model is still seen as advantageous.

Once a government or industry partnership is identified, OGEN hosts a joint workshop for member university researchers and government/industry researchers from the partner organization to come together. These joint workshops introduce OGEN, and the partner's research themes and goals. Attendees are often broken into smaller groups to brainstorm potential collaborations around the

specific research themes. For example, the very first joint OGEN workshop was held virtually in January 2021 and involved a partnership with the National Research Council Canada (NRC). The workshop had over 120 researchers, from OFI member universities and NRC laboratories, in attendance, who brainstormed in five breakout groups aligned with the NRC's five strategic goals.

A formal call for expressions of interest (EOIs) directly follows the joint research workshop. Academic researchers from OGEN's partner universities are invited to join forces with the partner's researchers in developing individual project proposals. In the case of the NRC partnership, twenty proposals were received. Project EOIs are concurrently reviewed and ranked by OFI scientific community members and the partner organization. The OFI scientific directorate comes together with the lead from the partner organization to discuss all proposals and select successful projects. In the NRC example, ten NRC-OGEN projects were awarded, with topics ranging from 'assessing the role of nature-based infrastructure in mitigating coastal erosion' to 'deep learning models and best practices for measuring the effects of seismic oil and gas exploration on commercial fish'.

Once projects are selected, the successful co-supervisors (academic and partner) begin student recruitment through their usual means, with enhanced support from OGEN. OGEN studentships are advertised internationally as a cohort across prominent job boards, including ***Nature*** and ***Science***, as well as through topic-specific posting locations. Interested students meet with the co-supervisors, who are jointly involved in the entire student recruitment process. The successful student must be mutually agreed upon by both the academic and partner supervisor.

Upon selection and admission to their home institution, OGEN students have access to a network of multi-disciplinary ocean researchers, as well as diverse co-curricular activities. OGEN compiles and offers beneficial co-curricular opportunities, which are not traditionally offered through academic programs.

While a couple of OGEN students have already begun their studies, the inaugural OGEN cohort will officially commence in September 2021.

Opportunities for targeted talent development

In the broader ocean industry sector, unlike in academe, there are increasing shortages in trained ocean professionals who possess not only the desired knowledge, but also the needed skills to take up a range of new job opportunities. A Marine People Partnership report (2015) on the challenges, needs and opportunities for the marine workforce found that marine industry partners indicated recent graduates/new employees were lacking skills such as oral communication, project management, entrepreneurism, working with others and thinking and reasoning skills.

It's been said for years that a PhD is the new MBA. According to Sobara (2017), one of the main drivers for companies to seek new employees with PhD degrees, instead of MBAs, is innovation. Not only are PhD graduates knowledgeable in their field, but they also contribute to and are advancing that field. Combining a PhD degree with government or industry experience produces desirable employees.

Thus, deficiencies in real world experience and competencies can be addressed, at least partly, through training models such as OGEN. By working closely with government and industry partners from the very early days in the joint development of a project, through student recruitment and training, both OGEN students and government/industry organizations benefit from the collaboration: the students gain practical, relevant exposure to government/industry and government/industry partners can train potential future employees and benefit from innovative thinking.

Co-curricular activities

Graduate students begin their OGEN experience by completing an individual learning plan, outlining key skills they wish to develop and identifying opportunities to participate in activities that will aid skill development. Based on the learning plan and conversations with the students, OGEN will identify, share, and potentially build unique development opportunities for graduate students pursing studies, and careers, in ocean sectors, allowing OGEN students to build their CVs beyond their thesis. Examples of co-curricular activities include:

Internships and other partner (i.e., potential employer) experiences

Given the collaborative partnership nature of OGEN, students are organically exposed to government or industry workflows and tendencies. In addition to the natural exposure through co-supervisors, OGEN students may also gain experience from hands-on lab visits to government/industry facilities or internship terms with the partner organization.

Indigenous cultural awareness training

OFI is working with NVision Insight Group to offer *The Path: Your Journey Through Indigenous Canada*, an Indigenous cultural awareness learning opportunity available to OGEN students. This program consists of five modules covering topics such as residential schools, disease epidemics, legal issues regarding the *Indian Act*, historical and modern treaties, Aboriginal law, the importance of cultural traditions and values of First Nations, Inuit and Métis and ways to strengthen relationships with Indigenous peoples.

Professional "soft" skills training

OGEN students will seek out professional "soft" skills development opportunities through their academic institutions; in addition, OGEN compiles these opportunities into a central database, easily accessible to students.

Professional "soft" skills that may be targeted for development include, but are not limited to communication, self-awareness, leadership, problem solving, making decisions, health and wellness and project management, to name a few.

Interdisciplinary exposure and networking

Participation in diverse activities exposes OGEN students to researchers across varying disciplines, allowing them to develop an appreciation of the necessity, and benefits, of an interdisciplinary approach to ocean research.

Workshops, seminars, conferences, and summer schools

OGEN works with academic, industry and private organizations currently offering workshops, seminars, conferences, and short summer schools related to the ocean and professional development, to compile existing opportunities. Participation in these activities exposes OGEN students to development opportunities such as collaborating across disciplines and with diverse participants towards a common goal and formulating and sharing opinions and personal research through effective communication. OGEN plans to identify gaps in this type of activity and design workshops, seminars, and summer schools for ocean graduate students. Work is underway to host a data visualization/ocean communication summer school.

Seafaring opportunities

Access to research cruises is often limited in Canada, and internationally. OGEN seeks to increase awareness of the need for research cruise experience for graduate students and connect OGEN students to existing seafaring programs, while striving to create new collaborations allowing for increased cruise opportunities.

Entrepreneurial training

Despite having excellent innovative ideas, graduate students are often unaware of the existing avenues that can bring their innovation ideas to market, or the level of intellectual satisfaction that can be gained from such an option. OGEN students have the opportunity to explore entrepreneurship through the Lab to Market (L2M) program and can test-run building their research ideas into an entrepreneurial concept.

The future of ocean graduate training

OGEN students will graduate well-rounded, multi- and trans-disciplinary, connected and prepared to shape the future of the ocean. They will graduate with knowledge and experience beyond academia. As ocean and educational leaders, we need to work together, to collaborate, not duplicate, our offerings and resources. The Ocean Frontier Institute, through OGEN, will create an international network of ocean graduate students, building connectivity between, strong ocean universities across the world.

References

Conference Board of Canada. 2015. "Where are Canada's PhDs employed?". Conference Board of Canada report, November 24, 2015.

Gyarmati, David, Lane, Janet, & Murray, Scott. 2020. "Competency Frameworks and Canada's . Essential Skills". Public Policy Forum, 2020.

Institute for Ocean Research Enterprise. "Marine People Partnership: the challenges, needs and opportunities for strategic workforce development in the greater marine industry". Canada: Institute for Ocean Research Enterprise (IORE), 2015.

Lautens, Mark. "Graduate students are the lifeblood of research. They need more support". The Globe and Mail. December 17, 2018. Graduate students are the lifeblood of research. They need ...www.theglobeandmail.com › opinion › article-graduate...

Sorbara, Catherine (@CatherineSorbara, PhD). 2017. "Why the PhD is the new MBA". LinkedIn, November 02, 2017. https://www.linkedin.com/pulse/why-phd-new-mba-catherine-sorbara-phd/

Walters, David, Zarifa, David, & Etmanski, Brittany. 2020. "Employment in Academia: To What Extent Are Recent Doctoral Graduate of Various Field of Study Obtaining Permanent Versus Temporary Academic Jobs in Canada?". *High Education Policy*, 2020.

Woolston, Chris. 2019. "PhDs: The tortuous truth". *Nature 575(7782): 403-406.*

THE INTERNATIONAL ASSOCIATION OF UNIVERSITIES: THE GLOBAL VOICE OF HIGHER EDUCATION

About

Founded in 1950, under the auspices of UNESCO, the International Association of Universities (IAU) is the leading global association of higher education institutions and organisations from around the world. IAU brings together its Members from more than 120 countries for reflection and action on common priorities. IAU is an independent, non-governmental organisation and an official partner of UNESCO (associate status).

It acts as the voice of higher education to UNESCO and other international organisations, and provides a global forum for leaders of institutions and associations. Its services are available on the priority basis to Members but also to organisations, institutions and authorities concerned with higher education, as well as to individual policy and decision-makers, specialists, administrators, teachers, researchers and students.

Vision

To contribute to peace and human development by promoting and enhancing the power of higher education to transform lives, build capacity, connect diverse peoples, generate and disseminate new knowledge, create insights and find sustainable solutions to local and global challenges.

Mission

As the global voice of higher education, IAU will be the most influential and representative global association of diverse higher education institutions and their organizations, advocating and advancing a dynamic leadership role for higher education in society. Articulating the fundamental values and principles that underpin education and the pursuit, dissemination and application of knowledge, the Association will lead and advocate the development of higher education policies and practices that respect diverse perspectives promote social responsibility and contribute to the development of a sustainable future. IAU will be a think tank and forum for the development of new approaches, the sharing of best practice and the undertaking of joint action, encouraging and facilitating innovation, mutual learning and cooperation among higher education institutions around the world.

This publication forms part of IAU's work on the Thematic Priority:
Higher Education and Research for Sustainable Development (HESD)

IAU's engagement with Sustainability and Agenda 2030

Sustainable development has been part of the strategic commitment of the International Association of Universities (IAU), the global university network, to improve higher education for over 25 years. In 1993, the Association adopted the **IAU Kyoto Declaration** on Sustainable Development (IAU, 1993), reaffirming its commitment to sustainable development in 2014 with the **IAU Iquitos Statement on Higher Education for Sustainable Development** (IAU, 2014). IAU is one of the strongest advocates promoting the role of higher education in sustainable development globally; it speaks out at many UN organisations including UNESCO and the UN in New York.

Integrating sustainable development fully into higher education strategies is since 2016 one of IAU's 4 strategic priorities. The IAU HESD work (Higher Education and Research for Sustainable Development) is diverse and dynamic. In addition to the specialized IAU HESD portal, IAU conducts surveys on HESD, monitors developments and engages in sustainability projects with and for Members and partners.

The Association has been supporting **United Nations programmes for sustainable development** since its founding in 1950. For example, IAU was one of the Key Partners in UNESCO's Global Action Programme on Education for Sustainable Development (GAP ESD, 2014 – 2019). IAU continues to be part of the follow up programme, ESD for 2030, which combines Education for Sustainable Development (ESD) principles with the United Nations' 2030 Agenda (UNESCO, 2019). In 2019, IAU started to take an active part in the High-Level Political Forum on Sustainable Development (HLPF), taking place at the United Nations Headquarters every year in July (virtually in 2020 and 2021). The UN-HLPF is one of the key mechanisms monitoring the implementation of the 2030 Agenda for Sustainable Development.

IAU conducted a first *Global Survey on Higher Education and Research for Sustainable Development* (HESD) in 2016, with the aim to map what higher education institutions (HEIs) are doing in support of education for sustainable development and the Whole Institution Approach for Sustainable Development. A subsequent survey in 2019 focused more specifically on Agenda 2030 and the SDGs. It is available online here. The 3rd IAU HESD survey will be launched in early 2022.

The IAU Global HESD Cluster is the flagship project in IAU's HESD work, an innovative network connecting higher education and the SDGs.

The Cluster brings together **16 lead universities, one bringing in expertise for each SDG; IAU leads the work on SDG 17 on global partnerships**. The lead institutions, based in all world regions, are working with 2 to 8 'satellite' institutions to advance a particular SDG and initiate concrete projects, while ensuring synergies among all goals. Furthermore, the Cluster promotes the role and potential that HEIs globally have in order to achieve the SDGs and Agenda 2030. Institutions of higher education have already started to address the SDGs in multiple ways, thus having an impact on teaching, research, leadership, and campus operations. The Cluster encourages collaboration and a holistic method to work with the SDGs, focusing specifically on the whole institution approach, which means including sustainable development in all dimensions of an institution: education and teaching, research, community engagement, and campus initiatives.

Within the overarching goal of "Accelerating the implementation of the 2030 Agenda for Sustainable Development" (UN SDG Summit 2019), the Cluster has two concrete objectives: Firstly, to **serve as a resource and networking hub for HEIs around the world** for institutions already engaged in SDGs locally and seeking partnerships, and **those starting to incorporate the SDGs at their institutions to turn to the Cluster for collaboration and guidance** on best practices to translate and advance SDGs in local, national and international contexts. Secondly, the IAU Global Cluster aims to serve as a global voice for higher education in sustainable development, and the IAU has advocated for this for instance at the UN High Level Political Forum in three consecutive years, and IAU International Conferences, as well as Cluster Members using their outreach at the local/regional level.

Further links:

- IAU work on HESD overview: https://iau-aiu.net/HESD
- IAU HESD Portal (specialized portal to collect our Member universities' and partners' actions, news and events on sustainable development): https://www.iau-hesd.net
- The IAU Global HESD Cluster: 70+ universities connected in subclusters for the SDG https://www.iau-hesd.net/contenu/4648-iau-global-cluster-hesd.html
- IAU HESD Survey Report (Published in January 2020, analyzing the results of the IAU second global survey conducted in 2019 to investigate how the SDGs are integrated at different levels at universities.
- IAU events at the UN High Level Political Forum (HLPF): https://iau-aiu.net/HESD?onglet=3
- Virtual events from 2020 and 2021 and resources are available for replay.
- Information Hub on Higher Education at COP26 and activities on climate action: https://www.iau-aiu.net/HESD?onglet=5
- Publication on University Actions for SDG 13: Climate Action (2019), Publication on SDG 5: Gender Equality (2020).

OTHER INFORMATION

International Association of Universities (IAU)

International Association of Universities www.iau-aiu.net

IAU HESD Portal with university actions: www.iau-hesd.net

Higher Education and Research for Sustainable Development (HESD)

IAU work, Cluster and projects on Higher Education and Research for Sustainable Development (HESD): www.iau-aiu.net/HESD

IAU webinar series on the Future of Higher Education (with past recordings): https://iau-aiu.net/IAU-Webinar-Series-on-the-Future-of-Higher-Education-929

SDG 14 Cluster

University of Bergen

Bergen Summer Research School at the University of Bergen www.uib.no/en/rs/bsrs

SDG 214 course at the University of Bergen www.uib.no/en/course/SDG214

Ocean Sustainability Bergen

Ocean Sustainability Bergen https://www.uib.no/en/ocean#

Further reading

South Africa's SEAmester programme https://seamester.co.za

University of Cape Town postgraduate studies in Oceanography at the Faculty of Science http://www.science.uct.ac.za/sci/departments/study-oceanography

International Maritime Organization www.imo.org/en

IMO Maritime Safety www.imo.org/en/OurWork/Safety/Pages/default.aspx

United Nations Sustainable Development Goals https://sdgs.un.org

LoVeSeSDG project: localizing the SDGs for Norway https://sdg.w.uib.no

Intergovernmental Oceanographic Commission https://ioc.unesco.org/node/2

IOC and higher education http://ioc.global

The University of Western Australia Master of Ocean Leadership www.uwa.edu.au/study/courses/master-of-ocean-leadership

Ocean Frontier Institute https://oceanfrontierinstitute.com

Ocean Graduate Excellence Network https://oceangraduate.com/about

IAU publications, including on SDG 13: Climate Action and SDG 5: Gender Equality: https://www.iau-aiu.net/Publications

Content: University of Bergen and the International Association of Universities **Design:** Communication Division, UiB

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