Work Package T3: Pathways to sustainable development

Deliverable T3.1.1: Project report

REPORT ON CAPACITY BUILDING

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SUSTAINABLE RESILIENT COASTS

Project Partners

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Executive summary

This report provides a grass-roots approach to capacity building in coastal communities. Coasts of Northern Periphery and Arctic Territory are at the front-line of sustainability challenges for various reasons. Climate change calls for competence and capability from the people living and working in the coastal areas.

The report presents six case studies to highlight the diversity of issues that are relevant to coastal communities today. Through these case studies, collaboration and mechanisms for sustainability transitions are introduced. The keywords could be summarized as cooperation, participation, and shared understanding. In the following chapters, the interactive work is reported. First, a closer look at the capacity building is taken (Chapter 1). Chapter 2 concentrates on enhancing particular sustainable development goals. Most case studies are at demo sites of the Sustainable Resilient Coasts project. Chapter 3 conclusions and recommendations are made on how to enhance capacity building and resilience at the local level in coastal communities.

Acknowledgements

This report would have not been written without the valuable contribution of the project partners of the Sustainable Resilient Coasts project. Thanks to all for your contribution. Special thanks to Jessica Giannoumis and Samuel Hayes (University of College Cork) for their input and Nikki Maguire (Causeway Coast & Glens Heritage Trust) for giving us the initial idea of how to introduce various capacity building cases to a wider audience.

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1 Introduction

International Panel for Climate Change (IPCC) and its Working Group II released its Sixth Assessment Report on the 28th of February 2022 (IPCC, 2022a). The report focuses on the impacts of climate change, but also on the vulnerabilities of the natural world and human societies to adapt to climate change. The report is written to us all, but specifically, it addresses policymakers worldwide and calls for international cooperation and effectiveness. Urgent action is stressed. IPCC indicates the future becoming the time of *climate-resilient development* and cooperation (Figure 1) (IPCC, 2022b).

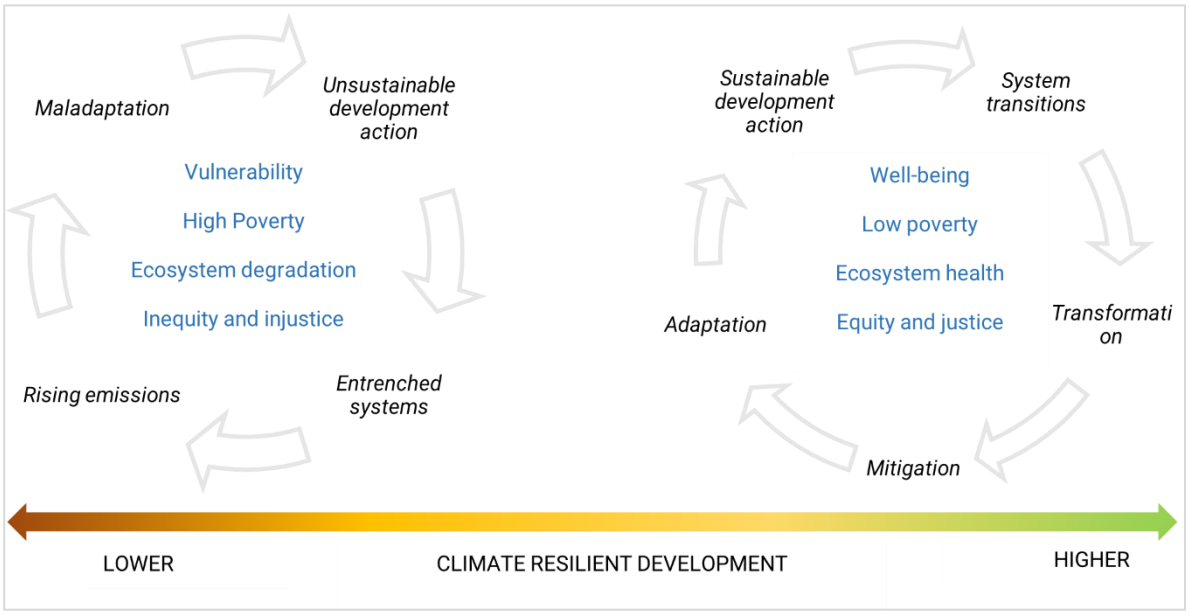

FIGURE 1. CLIMATE RESILIENT DEVELOPMENT (APPLIED FROM *IPCC 2022b*).

Agenda 2030 programme is a well-known global approach to climate change and sustainable development taken by the United Nations (United Nations, 2022). It is an ambitious action plan including 17 specific sustainable development goals (SDG) and nearly 170 associated targets. The Agenda 2030 emphasizes the contribution of all. A sustainable world is acknowledged as a challenge for development and as a world with enormous possibilities and potential.

In the Sustainable Resilient Coasts project (COAST) the need for a joint effort to combat climate change is recognized. COAST takes the consideration of action to the grass-root level. Sensitive coastal areas of the European Northern Periphery and Arctic Territory are the prime focus. These coasts are at the front-line of sustainability challenges, where low population density, low accessibility, low economic diversity, management of abundant natural resources and high impact of climate change often occurs. A lot of competence (skills and knowledge) and capacity (capability) are expected of the communities representing these districts, whether referring to local public authorities or, for instance, a specific non-governmental organization having a strong role in enhancing sustainability issues in the region.

The main interest of COAST is to study the means and possibilities of the northern coastal areas to work for a better future. A change, a shift or a transition is also important for coastal communities addressing issues like biodiversity, natural resources, sustainable land use and well-being. Adaption, mitigation, and resilience (stamina) are called for. Cooperation and effectiveness are particularly addressed:

How to collaborate and, at the same time, have far-reaching impacts on the community and region? Typically, cooperation at the grass-root level brings together local public authorities, decision-makers, residents, various stakeholders, and other interest parties. Such encounters highlight diversity in thinking, preferences and value judgement. Various alternative pathways to e.g., sustainable development appear and are brought forward. It is important to understand and reflect on the variety of ideas brought forward. An acceptance and agreement on the chosen path (or a decision) must be achieved. A shared commitment to the chosen route is essential.

According to Green (Green, 2010), the greatest asset for community development is the people. The first step in any community development project is to admit the knowledge, skills and experience that already exists. Mapping these resources leads to choosing appropriate methods and approaches for further engagement, co-development, and capacity building. Such an example is given from the Finnish agricultural sector, where farmers, advisor organizations and scientists work towards more sustainable agriculture. The know-how and experience of the farmers are appreciated and taken into account to facilitate more effective climate solutions from the academic sector. Intensive cooperation with the farmers takes place throughout the development project. (Natural Resources Institute Finland, 2022)

Capacity building is a widely used term and has various definitions (see e.g., Sobeck & Agius, 2007). In this report, capacity building is defined as "*the sum of efforts needed to nurture, enhance, and utilize the skills and capabilities of people and institutions at all levels (…). It does not seek to resolve specific problems but rather seeks to develop the capacity within the communities*." (Berkes, 2002) The definition is shared with the National Research Council of the US (National Research Council, 2008a), which claims that developing capacities for people living and working in coastal areas is the key to overcoming various challenges faced in the areas due to climate change.

The report introduces several approaches and solutions to showcase the potential that local communities possess for sharing capacity building and action, and re-building new capacity collectively. Each case can be tailored to another region facing similar challenges. It is acknowledged that the definition is small-scale. The cases address the "think globally, act locally" principle (National Research Council, 2008b) and as to locations, the majority represent the demonstration sites of the COAST project.

Rathlin Island is the only inhabited offshore island in Northern Ireland with approximately 160 residents. The island is described as rugged terrain, towering sea cliffs, iconic lighthouses, and diverse wildlife. There are many important natural, historic, archaeological, and built heritage sites on the Island, to which climate change poses a risk due to erosion. *Hailuoto* is an island and a municipality in Bothnian Bay, Finland with some 1000 inhabitants. The natural and cultural environment of the island is unique and attracts a lot of tourists annually. Sustainable tourism and land use are common concerns on the island. Also, proposals to build a causeway and two bridges from the mainland to the Hailuoto island stirs talk. *Westfjords* in the northeast of Iceland have barren, otherworldly scenery, and rugged beauty, dominated by deeply indented fjords and coastal mountains. It is an important location for the tourism industry. The landscape of the Westfjords is subject to several forms of environmental degradation. Last but by no means least the *village of Tuktoyaktuk*, Canada is included in this paper. Here experts and authorities worked together with locals to tackle the challenges of erosion on the permafrost coasts and so it is a suitable addition to the COAST case study areas.

Each case is an example of an effort to respond to climate change locally. Working towards sustainable resilient coasts is a complex and demanding task. There are a number of variables to be taken into account when deciding on the next steps, a pathway or a plan. Decisions concerning the future based on limited information in an uncertain world must be made. Collaborative planning is required in order to reach common ground and shared understanding. The cases described in the report do not introduce decision-support tools per se, but they show successful ways to facilitate such collaboration. Through various efforts, it is ensured

that the communities have the tools, knowledge, and skills to be able to act and react instead of “in-act”. With growing competence and capability also adaptability and resilience of the communities also evolve. (IPCC 2022c, p. 6; National Research Council 2008c)

2 Approaches to capacity building in coastal areas

In this chapter, various approaches to capacity building are introduced. The chosen examples have been applied in the demonstration sites of the COAST project i.e., in County Mayo Coast in Ireland, Municipality of Hailuoto in Finland, Rathlin Island in Northern Ireland and Westfjords in Iceland. Also, a closer look at Western Canadian Arctic, village of Tuktoyaktuk is taken due to its contribution to the topic.

2.1 Collective coastal heritage monitoring on Rathlin island, Northern Ireland

Jamie Laverty and Nikki Maguire, Causeway Coast and Glens Heritage Trust

Rathlin Island is Northern Ireland's only inhabited island. It is 4 miles east to west and 2.5 miles north to south. The geology makes the island visually striking as a white limestone sits below contrasting, dark basalt layers (Figure 2). Rathlin Island is home to some 160 permanent residents, across 70 households and is thought to have been inhabited for over 1,500 years.

FIGURE 2 WHITE AND BLACK LAYERS (No copyright needed)

People working and living on the island have shaped it, evidenced by buildings, land workings and signs of industry along the coastline and inland. The ties to the sea are clear, with three lighthouses on the Island; East Lighthouse (Figure 3), West Light house and Rue Lighthouse.

FIGURE 3 EAST LIGHTHOUSE (©Sam Hayes)

This case study contributes towards SDG 11 Sustainable Cities and Communities, 13 Climate Action and 15 Life on Land.

Stakeholder Engagement

The Causeway Coast and Glens Heritage Trust (CCGHT), COAST partners in Northern Ireland and established heritage organisation in the area, connected with the local community via Rathlin Island Development Community Association (RDCA) to explore the prescient issues facing this coastal community. RDCA represents this island community and supported community engagement by including CCGHT articles in community newsletters, asking residents for input on the COAST project and helped coordinate online and in person meetings.

As a result of CCGHTs various engagement activities, it became clear within the community that records of the coastlines natural and built heritage were needed, upon which the layers of cultural history could be documented. Naturally some residents became more interested and involved, however opportunities were offered to all residents to ensure transparency.

Action and Technology

To enable the community to document their island and heritage assets three residents were trained and certified by CAA as drone pilots (Figure 4)., therefore able to filmed and capture data. Furthermore, through research, community consultation and landowners discussions two locations were identified to start the digital record collection; Doon Point (a spectacular basalt headland (Figure 5) and East Lighthouse (a striking lighthouse with a compound).

FIGURE 4. DRONE TRAINING FOR RESIDENTS (No copyright needed)

FIGURE 5 DOON POINT (©Sam Hayes)

COAST partners with expertise in drone filming, University College Cork, carried out drone data collection at the two locations in Summer 2021. The data was then processed to create high quality images and 3D models of both sites (Figure 6). This work acts as a guide for the community and others on how to collect quality digital data

to inform present and future coastal development decisions. The outputs were shared with the community and trainees.

Lessons Learned

Through this case study, specifically facilitated community conversations, it is clear that those living and working on Rathlin Island truly knew, valued and understood the changes happening along the coast and wanted to safeguard the heritage for future generations. This is probably true across coastal communities in the NPA area.

Some challenges were experienced during this process, namely some resistance to drones near residential houses and where the data/footage would be used. People were keen it because a useful, accessible resource that trainees could add to. And so CCGHT worked to develop a Rathlin Island digital map, displaying heritage sites and island information.

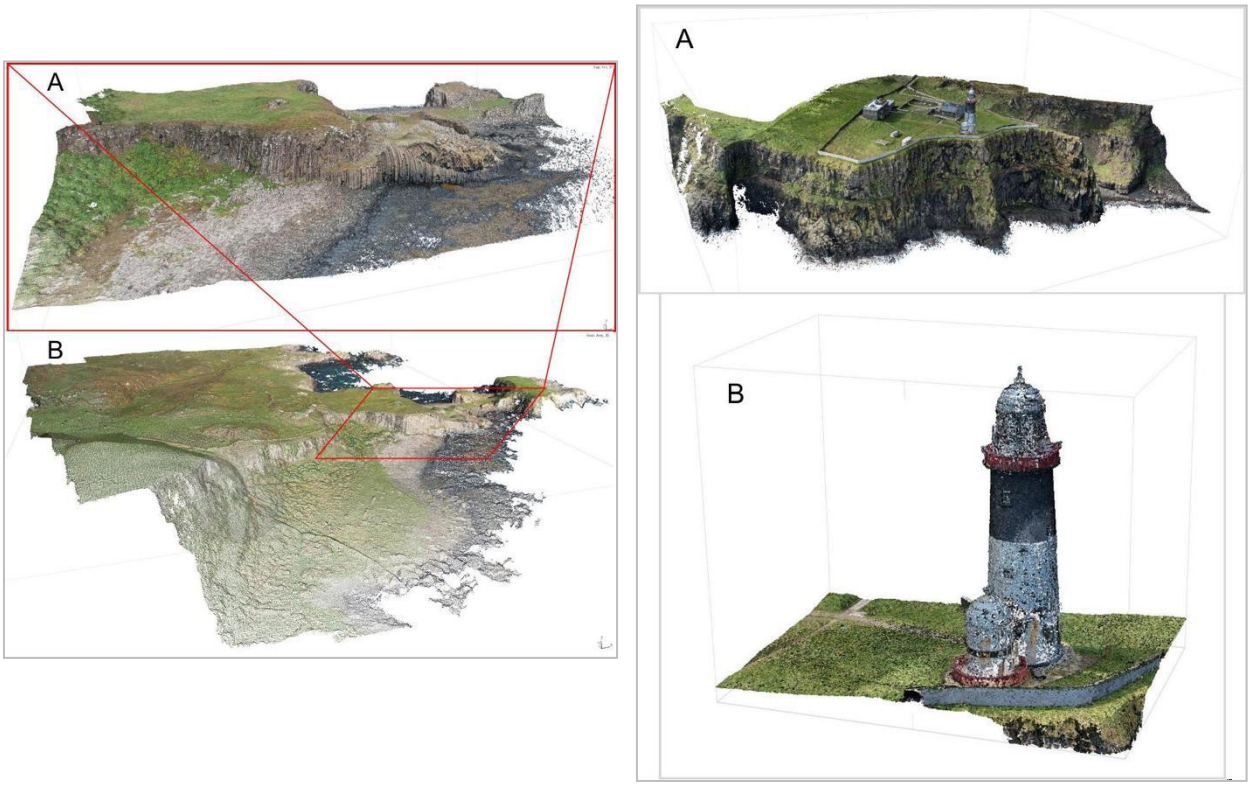

FIGURE 6 DIGITAL MODELS (©Sam Hayes)

2.2 Climate Coffee Break – Youth solving the climate crisis in Oulu region, Finland

Kati Tervo, Oulu University of Applied Scienced

Climate Coffee Break is a concept that has been developed during the pandemic 2020-2021. It is a one-hour online-based coffee break hosted by different organizations on a monthly basis. In each session, various keynote speakers give short presentations on a specific theme concerning climate change, followed by facilitated discussion.

The main target group in the Climate Coffee Breaks has been local authorities and municipal workers in the Oulu region. This diverse region covers a large area of northern Finland coming from the shores of Bothnian Bay to the Eastern border of Finland and the European Union. With busy cities like Oulu and slow-paced countryside municipalities like Hailuoto the population density varies. The population of the region is rather young. It is one of the youngest in Europe, the average age is 44 years old. . There are around 22 000 higher education students living in the region.

In this casestudy , the main target group were youth. The main SDGs to tackle were SDG5 – Gender Equality, SDG10 – Reduced Inequalities, SDG11 – Sustainable Cities & Communities, and SDG13 – Climate Action.

Stakeholder identification

The Climate Coffee Break for the youth was organized by two EU projects. The preliminary stakeholder listing came from one of the project leaders, which was cautiously evaluated, and some additions were made. Since the theme of this event was Youth Solving the Climate Crisis different youth organizations e.g., the Student Union of Oulu University of Applied Sciences and the Union of Upper Secondary School Students in Finland and their members were added to the stakeholder listing.

Engagement

Four youths and one rural municipality manager were invited to share their expertise in climate actions as keynote speakers. The event was advertised e.g., in social media (Figure 7). This online event gathered 33 participants, mostly municipal employees, local authorities, and a few youths from the area. Participants were able to comment and ask questions during the session.

FIGURE 7 SOCIAL MEDIA ADVERTISEMENT OF THE EVENT

Action

All Climate Coffee events have an identical structure. In Youth Saving Climate Crisis themed event keynote presentations were heard from Kalle Pyky, Head of the Board Youth Agenda 2030, Anni Katajikko, Head of the Board of Youth Council of Municipality of Vaala, Miira Raiskila, Municipal Manager of Municipality of Vaala and Lumi Ripatti's essay read by Annukka Loukola from Municipality of Hailuoto. All presentations given considered youths and their ways of tackling climate issues.

Technology

Just like most of the events during the COVID-19 pandemic Climate Coffee event was held online. The platform that was used was Microsoft Teams. Three of the speakers had their presentation live and one of them had recorded her presentation earlier with a mobile phone. The recording was played on the host's shared screen. Those participating were able to take part by the chat feature of Microsoft Teams.

The event was recorded and edited afterwards. The recording was subtitled, both in Finnish and English. Also, shorter videos were made, so that one presentation made one video. The whole recording and the cut-out versions will be published on COAST's YouTube and be attached to this document.

Lessons learned

This case succeeded in enhancing knowledge and appreciation of different norms and values as well as outlining the opportunities and constraints that underpin societal, institutional, and individual change. All together three youths were telling their story and the way they see the climate actions and how adaptation to it, should be handled. The main message of this event was, as Miira Raiskila clarified it, "The youth have opinions and knowledge, and they need to be heard".

Link to video introducing Oulu Region - Northern Ostrobothnia: https://youtu.be/66kjJo2v58U

2.3 Participation in coastal and marine planning in the Westfjords, Iceland

Maria Wilke, Agricultural University of Iceland

The Westfjords are a particularly rugged and remote part of Iceland, attached to the mainland only by a thin stretch of mountainous terrain (Figure 8). About 6000 people live in the small communities that are dotted in the sheltered fjords at the flanks of steep cliffs, right by the sea. The region's largest town is Ísafjörður, with roughly 2600 inhabitants. People in the Westfjords have always had to be resilient and innovative to survive the harsh climate and the challenges that floods, avalanches, winter storms and the rugged terrain continue to bring to this day. The towns in the Westfjords have been established as fishing and whaling stations and have long since been dependent on the resources of the sea.

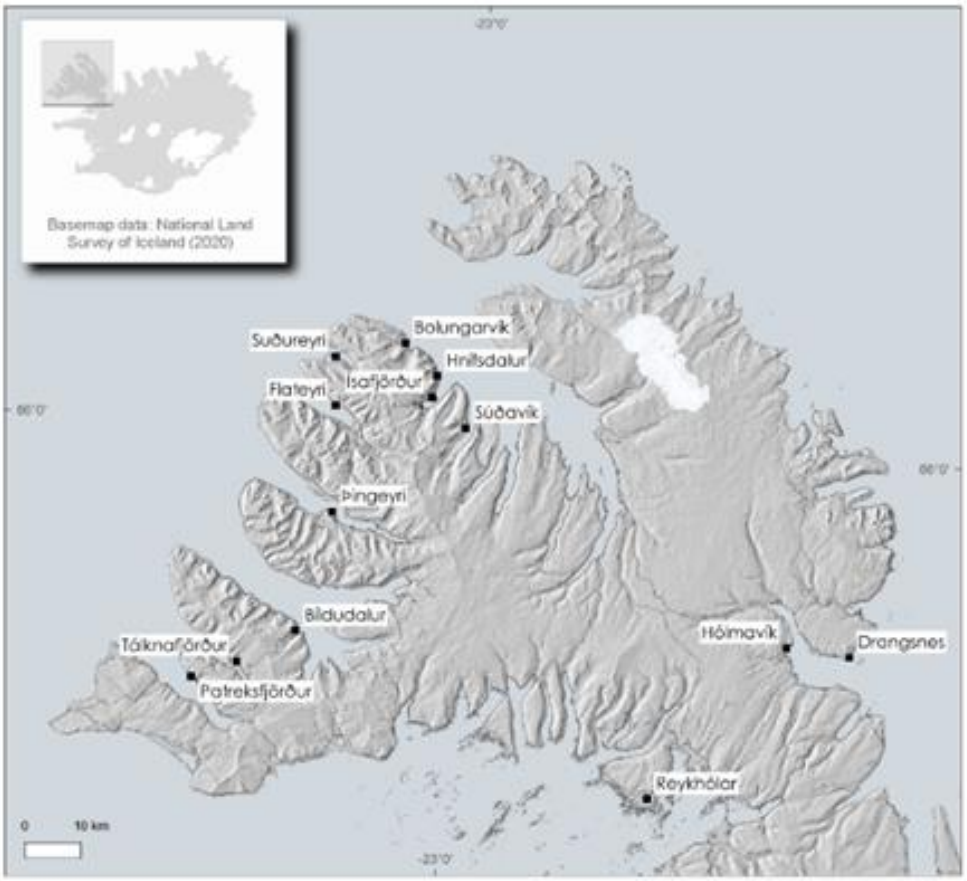

FIGURE 8. GEOGRAPHICAL LOCATION OF THE WESTFJORDS IN ICELAND (© GOOGLE MAPS, 2019).

Today, small scale fisheries, trawlers, angling boats and aquaculture still count among the most important industries. tourism has recently been booming with cruise ship landings increasing every year. The fjords are getting increasingly busy and draw the attention of different industries (Figure 9). This is why Iceland has recently begun to mandate coastal and marine planning with the objective to facilitate sustainable use of the fjords and environmental protection of vulnerable areas.

FIGURE 9. ÍSAFJÖRÐUR AND THE WESTFJORDS (© MARIA WILKE, 2018).

The planning of the coastal and marine areas is currently piloted in the Westfjords and the Eastfjords, where most of the rapidly growing aquaculture has taken hold. Fish farming has become the fasted growing industry and local authorities have lacked comprehensive regional plans for the sea. The pilot planning process was started in 2020. Yet, there has been little public discussion around marine issues.

The COAST case study in the Westfjords is attempting to bring attention to and work on the following SDGs:

- **4 – Quality Education**: Raising the issue that marine environmental education and ocean literacy are lacking in Iceland and need to urgently be addressed, especially in remote coastal communities about to embark on coastal and marine planning.
- **10 – Reduced Inequalities**: Raising the opportunities for members of the community to make their voice heard in matters of marine decision-making.
- **13 – Climate Action**: Emphasising the importance of intact ecosystems and biodiversity as a baseline for decisions on the use of marine space, particularly with view on imminent changes in the climate as well as the region's dependence on marine resources.
- **14 – Life Below Water**: Emphasising the importance of life in the ocean and coastal areas for all species, discussing the role of science in terms of vulnerability of habitats and capacity of human industrial activity in the ocean space.
- **17 – Partnerships for the Goals**: Offering opportunities to discuss issues and explore common ground between interest groups and individuals. Emphasising the need for constructive cooperation in marine decision-making and future planning.

Stakeholder engagement and interviews

In order to facilitate meaningful discussion around the ongoing coastal and marine planning process, key individuals who should be involved in the planning process were contacted. This included local authority representatives, planning experts, official stakeholders of the marine planning process, local citizens with broad

networks in the community, key people in important industries such as tourism, fisheries and aquaculture, as well as in education and research. Additionally, the snowball method was used whereby interviewees were asked to identify other relevant individuals or organisations as potential interviewees. All in all, 53 people were contacted and interviewed, some in casual conversations and others in semi-structured interviews, depending on their role in the planning process and the surrounding discussions. Most people were interviewed in person, only very few interviews were conducted online (due to COVID restrictions).

Workshop

In addition to the stakeholder interviews, the planning process was analysed through participant observation in the community to investigate how the process works, who is driving it and how the community engagement is developing. In order to encourage public discussion about the process, an open online event in May 2021 (Figure 10). This event was intended for the Westfjords public to inform local inhabitants about the planning process, discuss issues and raise questions.

FIGURE 10. PUBLIC ONLINE EVENT FLYER

Local inhabitants, scholars, industry representatives and a few regional governance representatives attended the online workshop, all in all about 45 people. After the event, a short feedback survey was circled among the participants.

Lessons Learned

Engaging a wide variety of sparsely spread-out population across six municipalities is not an easy task. However, using the popular social media platform facebook helped to spread the word about the ongoing research project and invite participants to the workshop. In the interviews, selected individuals were able to talk about their engagement in planning freely, as well as discussing concerns and raising questions. The workshop attracted a broad variety of people, mainly from Ísafjörður, but also a few from further afield from other municipalities. In order to establish an effective engagement strategy for future planning endeavours, extra steps need to be taken to involve particularly marginalised communities and members of society who are not heard in the decision-making processes: women, youth, and foreign nationals in particular.

2.4 Online scenario workshops in Hailuoto, Finland

A series of scenario workshops were organised for various target groups representing the municipality of Hailuoto, Finland in spring 2021. Hailuoto is the largest island in Bothnian Bay and has approximately 1000 inhabitants. The distance to the city of Oulu (with approx. 200 000 inhabitants) is about 50 kilometres. The ferry is used for commuting. The natural and cultural environment is unique (Figure 12). Nature is protected through various conservation programmes. The island is well known nationally, and it is a famous tourist destination year-round.

FIGURE 12. THE LIGHTHOUSE IN MARJANIEMI, THE WESTERNMOST POINT IN HAILUOTO (license to use the photo, downloaded from here 10.1.2022)

Due to the COVID-19 pandemic scenario workshops took place online in the spring of 2021. The aims were: (1) To increase and share an understanding about the challenges and possibilities of sustainable development (hence SD) work in the coastal areas. (2) To define common goals for the municipality's SD work, (3) To acknowledge various scenarios for strengthening sustainability, (4) To define measures and assessment tools for the SD work, and (5) To generate open discussion.

Of the seventeen SD Goals in Agenda 2030, 11 Sustainable cities and communities was particularly addressed.

Stakeholder identification

Stakeholder mapping (see COAST toolbox) was made in cooperation with the representative of Hailuoto municipality. Key stakeholders were divided into three equally important groups: (I) Regional authorities, Municipality officers and Decision-makers; (II) Entrepreneurs and NGOs; (III) Inhabitants and Leisure residents. Under these groups, altogether 171 stakeholders were identified. However, the group (III) was not individualized.

Engagement

Hailuoto's strategy is committed to sustainability and supports open dialogue. In the scenario workshops, all target groups were equally valuable. To reach plenty of participants *ads* in the local paper and the municipality's Facebook were published. *Posters* for the noticeboards of the local grocers were fastened. For the group (I) information was disseminated in the meetings and via the municipality's *email contact lists*.

Each workshop had an identical realization.

Action

The scenario workshop has several definitions. Common to them is future orientation, active data collection and comparison of alternatives. Also, broadening thinking is one feature. All of these are closely linked to capacity building.

In the Hailuoto case, each workshop lasted approx. four hours. Since the participation was voluntary, the realization was carefully planned. Special attention was given to the pedagogical orientation and presentation. The feedback and data collected from the previous workshop were considered when planning the next one. An open discussion was emphasized and supported by various individual and group tasks. Several questions were raised during the workshop. They addressed issues on what is known and what seems uncertain. The specific questions were: Why SD work is important for the municipality and islanders? How do you define the islander's resilience? What are the most important SD issues to be tackled in Hailuoto? Who ought to do and what? All answers were collected and saved.

Technology

Due to the online realization, much software was utilized. Google Forms was used for registration, Questback for the pre-assignment and Innoduel for collecting responses during the workshop. The workshops were organised in Zoom which allowed working in small groups i.e., in breakout rooms.

Lessons learned

In general, the scenario workshops achieved all five aims listed earlier. Participants took part in various roles, e.g., as municipal officers and as private individuals. A good atmosphere fostered active participation. Diversity of the values and norms occurred and emphasized the complexity of the SD work from the municipality's point of view. The schedule was tight. Potential scenarios were acknowledged and discussed, but there was very little room to outline any scenario and compare various alternatives. The online realization was not ideal. Exchanging ideas and views, posing questions, and criticizing is easier and come more naturally in in-person encounters. The participation was voluntary. That often means that those already interested in the topic take part. During the workshops, it became obvious that young adults (Figure 13) and children had to be reached otherwise.

FIGURE 13. YOUNG ADULTS IN HAILUOTO SUMMER 2020 (© MARJA HULKKO)

2.5 Policy Roadmap to Create Marine Policies

The Policy Roadmap was informed by the ProtoAtlantic regional ProtoAtlantic Blue Growth Policy Round Tables which were held in the partner regions. The workshops aimed to understand the current state of the available marine resources and infrastructures in each region and to discuss Blue Growth strategies as potential pathways to coastal development. The ProtoAtlantic partner regions include Brest in France, Cork in Ireland, Porto in Portugal, Orkney in Scotland, and the Canaries in Spain.

Stakeholder identification

Five interactive consultative workshops were held in the regions between December 2018 and November 2019. The first consultative workshop was held in December 2018 in Cork, Ireland, subsequent workshops were held in Edinburgh, Scotland in February 2019, in Brest, France in June 2019, in Santa Cruz de Tenerife, Spain in June 2019, and in Porto, Portugal in November 2019. All workshops followed a similar template which was designed and tested at the University College Cork. Altogether, 218 stakeholders participated in the workshops, 36 policymakers, 108 industry representatives, and 74 representatives from academia.

Engagement

The workshops were advertised via online platforms and offline via posters at “hotspots”. The workshops were open to anyone with a stake and interest in regional marine development. The interactive workshops were based on two methods to increase stakeholder engagement: 1. the PESTLE technique which looks at political, economic and business-related, social, technical, legal, and environmental foci. This allowed the stakeholders to discuss the current understanding of regional marine development. And 2. The SWOT technique, whereby the stakeholders first identified potential development strategies and then identified the strengths, weaknesses, opportunities, and threats of the development strategy. Facilitators ensured that the findings of these discussions were captured and encouraged the active participation of all stakeholders.

Action

The Policy Roadmap was informed by the ProtoAtlantic regional ProtoAtlantic Blue Growth Policy Round Tables which were held in the partner regions. The workshops aimed to understand the current state of the available marine resources and infrastructures in each region and to discuss Blue Growth strategies as potential pathways to coastal development. The ProtoAtlantic partner regions include Brest in France, Cork in Ireland, Porto in Portugal, Orkney in Scotland, and the Canaries in Spain.

Lessons learned

To develop marine and coastal areas, five themes were identified across the Atlantic Area:

1. Political will needed to overcome economic barriers
2. Building social capacity to meet market demands
3. Pipeline of opportunities for development and investment
4. Nurturing innovation and entrepreneurship
5. Marine cluster creation to increase competitiveness

2.6 Vulnerable Arctic Coasts: Tuktoyaktuk, West Canada

Under the strains of accelerated polar warming, coastal erosion rates have increased significantly in recent decades across large parts of the Arctic. One of the regions strongly affected is the Western Canadian Arctic. Here, the village of Tuktoyaktuk is under threat and homes and building have already been relocated due to erosion undermining buildings near the shoreline (Figure 14). We aimed into investigate the controls and drivers of erosion in these permafrost coasts and potentially improve the planning and reliance of Arctic villages, addressing UN sustainable development goal 11.

FIGURE 14: FLYING INTO TUKTOYAKTUK (©Samuel Hayes)

Stakeholder identification

We collaborated with Natural Resources Canada, who had several years of experiences in working in the region and identified local community groups and leaders as the main stakeholders.

Engagement

We worked closely with local villagers, in identifying survey locations, hiring them as navigators and boat drivers to access tricky locations and collect instruments. We also consulted the Tuktoyaktuk Hunters and Trappers Committee and Parks Canada in order to secure permissions and permits for surveying on Inuvialuit and government land.

Action

Detailed studies were conducted on numerous coastal sites over several years, including Tuktoyaktuk Island. These examined the current and changing morphology of several sites, each with different soil and topographic properties, producing many unique erosional processes. This was combined with desk-based

analysis of historic satellite and aerial imagery from the 1930s to present day, providing a historical and multi-decadal context to more recent changes.

Technology

Consumer grade drones, the DJI Phantom 3 and 4, were used to create high-resolution digital models of rapidly eroding sites and passive seismic recording devices (Tromino) were used to detect and map layers of ice buried beneath the ground. When exposed, these ice layers tend to produce rapid changes in the landscape, and so detecting them is important for determining areas susceptible to rapid destabilisation. We also used aerial thermal imaging, thermal sensors in the soil and time-lapse cameras (Figure 15).

FIGURE 15: PENINSULA POINT SURVEY SITE, WITH A RESEARCHER AND SOME INSTRUMENTS VISIBLE (©Samuel Hayes)

Lessons learned

Through the studies and new technology used, new insights were gained that can help local communities plan more effectively for future coastal change. Tools were shown to be able to detect subsurface ice layers, a key feature that significantly increases the vulnerable of coastal areas to rapid geomorphic change. The improved understanding of dynamics, drivers and controls of rapidly changing sites has the potential for local Arctic communities, such as Tuktoyaktuk, to create local hazard maps and thus plan the coastal defences and relocation of key infrastructure more with more certainty.

Video from Tuktoyaktuk and nearby sites, with the research described: https://youtu.be/iXkrS1u5fl8

3 Conclusions and recommendations

While finalizing this report, The Working Group III of IPCC released its Sixth Assessment Report. Perspective is global climate change mitigation and progress, and the main message is clear: global total net of GHG emissions have continued to rise. There are numerous options available to reduce net emissions by 2030 e.g., in agriculture, forestry and other land use, in energy, transport, buildings and industry. All of which have relation to sustainable development goals. (IPCC 2022d)

Altogether seven of seventeen SDGs were addressed in the COAST cases described in Chapter 2, the most common being SDG11 Sustainable Cities and Communities (United Nations 2022b). COAST cases varied in scale and context-wise. Still, they show how even a brief event, like Climate Coffee Break, can be effective. When carefully planned, it can touch upon several SDGs and integrate participation into capacity building and empowerment.

Based on the cases, capacity building boils down to cooperation, enhancing engagement and knowledge sharing. Gathering with peers i.e., persons with the same age or the same social position, or the same abilities as other people in a group (Cambridge Dictionary 2022) appears important. There are various ways to achieve all this. To define one's target group(s), is the ultimate starting point. In the COAST cases the voice of the participants was listened to in multiple ways. For instance, by organizing stakeholder interviews (Westfjords), by training local residents (Rathlin Island), and by utilizing appropriate techniques and/or methods like PESTLE and SWOT for gathering information openly and transparently (Policy Roadmap).

If one wishes to strengthen capability in the community that is to "develop the capacity within the communities" three things, somewhat overlapping, matter and ought to be paid attention to:

Invest in people. Tackling coastal climate change involves people living and working in and for the area. Only by cooperation and by aggregating people from e.g., scientific, technological, municipal, and local level, decisions and solutions have more long-term impact. (IPCC 2022e; National Research Council 2008d).

Invest in knowledge creation. The success of any capacity building effort relies on understanding the diverse knowledge base interest parties involved possess (Figure 16). Concerns and perspectives can be manifold. Ziervogel et al. (2021) emphasize that capacity building ought to commence as knowledge creation at the grass-root level. Empowering the community actors leads to more resilient outcomes. National Research Council talks about "the responsible people". Improving their capability is crucial. (National Research Council 2008d).

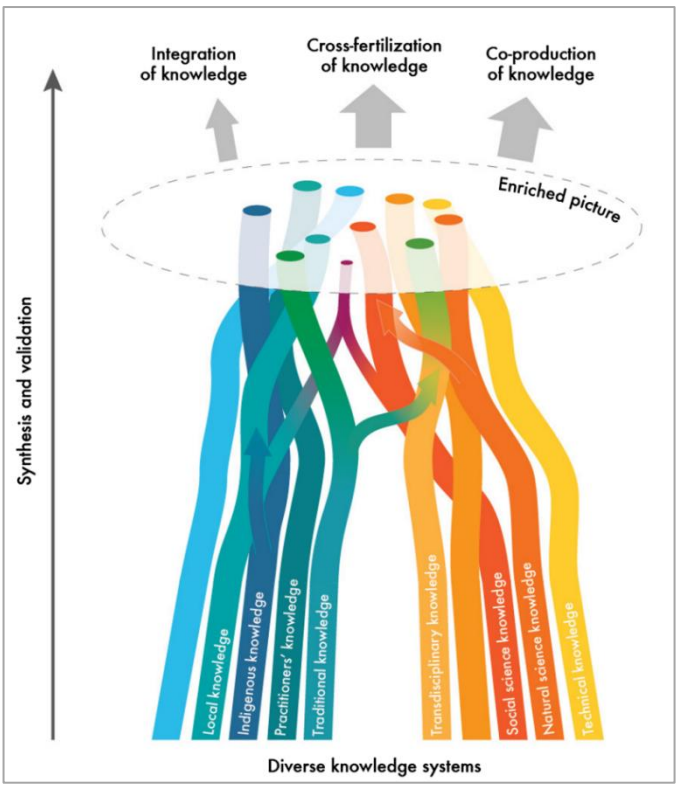

FIGURE 16. AN ILLUSTRATION OF DIVERSE KNOWLEDGE SYSTEMS (TENGÖ ET AL. 2014, p. 582)

Invest in facilitated decision-making. Plans and deeds precede decision-making by those who participate. The more sensitive topic and the greater number of participants, facilitation is needed. For dynamics, it is important to study and pilot various decision-support tools for enhancing collaborative decision-making when

e.g., establishing preferences and evaluating alternatives. Many such tools are available online, like a decision-support catalogue ActionCatalogue - methods (altogether 62 methods).

Invest in innovations. Lastly, it is recommended to consider the concept of innovation when planning capacity building activities. Shortly defined innovation is "something that has impact" (Scott 2012). The impact ought to be measurable and thus to be able to monitor. The impact of a social innovation, a new idea, whether a product, service, or model, meets social needs and creates new relationships and collaborations. It is not only good for the society, but also enhances individuals' capacity to act. (European Commission 2013)

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