ANNEX TO THE ANNUAL REPORT 2021:

2. OVERVIEW OF THE IMPLEMENTATION OF THE COOPERATION PROGRAMME

Key information on the implementation of the operational programme for the year concerned, including on financial instruments, with relation to the financial and indicator data.

Indicator	Achieved	Target	Percentage achieved	Analysis
Number of enterprises cooperating with new / improved knowledge partnerships	2531	1849	136,9%	Specific objective 1.1 is well on its way to being achieved. According to programme-level targets, there was an achievement of 530% of this objective by end of 2021.
Number of improved or new innovation support measures launched for businesses	145	189	76,7%	Specific objective 1.2 is well on its way to being achieved. According to programme-level targets, there was an achievement of 725% of this objective by end of 2021.
Number of improved or new innovation support measures launched for public service delivery	144	109	132,1%	Specific objective 1.3 is well on its way to being achieved. According to programme-level targets, there was an achievement of 720% of this objective by end of 2021.
Number of green products, services and processes piloted and/or adopted by the project	433	163	265,6%	The output indicator for specific objectives 2.1 and 2.2 is well on its way to being achieved. According to programme-level targets, there was an achievement of 849% of this objective by end of 2021.
Number of new and/or improved climate change adaptation methods demonstrated	103	90	114,4%	Specific objective 3.1 is well on its way to being achieved. According to programme-level targets, there was an achievement of 412% of this objective by end of 2021.
Number of sites managed using new solutions supporting long-term sustainability	183	201	91,0%	Specific objective 3.2 is well on its way to being achieved. According to programme-level targets, there was an achievement of 435% of this objective by end of 2021.
Number of new and/or improved green transport solutions adopted	216	181	119,3%	The output indicator for specific objectives 4.1 and 4.2 is well on its way to being achieved. According to programme-level targets, there was an achievement of 432% of this objective by end of 2021.
Number of enterprises participating in cross-border, transnational or interregional research projects	6613	5396	122,6%	Compulsory output indicator

Number of research institutions participating in cross-border, transnational or interregional research projects	1498	891	168,1,5%	Compulsory output indicator
Number of organizations/ enterprises adopting new solutions by project end	4882	6709	72,8%	Compulsory output indicator
Number of organizations/ enterprises informed about new solutions by project end	836.200	211.240	395,9%	Compulsory output indicator

In terms of approved full applications, all four thematic priorities saw an overachievement of the 2021 milestones.

There is one output indicator for each specific objective, and these are automatically selected for the projects. In addition, all projects must provide information on the compulsory indicators as most of this data is aggregated by the European Commission to measure progress throughout the European Union. Projects report on all five indicators – even if the target is zero. Thus, each of the programme's nine specific objectives contains output indicators that capture the extent to which the pooled resources of the transnational partnership have resulted in improvements to existing practices in participating organisations/regions. These outputs serve as a proof of concept, which validates the project's approach and justifies the duplication of the approach by other organisations.

As the projects progress, the secretariat has processed an increasing number of reports. Achievement of output indicator targets can be seen above.

This table also includes an analysis of achievement against programme-level targets. From these numbers, it is already quite clear that all output targets had been overachieved by the end of 2021.

* This is the only way to make an explanation to the reference 3.3. Table 3: An explanation for the indicator types I and O. I = Information. O = Output. These tables are pre-formatted by the SFC. Hence, no possibility to provide an explanation in the current set-up.

3. IMPLEMENTATION OF THE PRIORITY AXES

3.1. Overview of implementation

1. Thinking Growth: Supporting growth in North Sea Region economies

(This is a continuation of the text provided in the SFC under this heading):

Result targets and achievements:

Call #	Project name	Result description	Quantified target	Achievement through 2021
1	CC	New transnational SME collaborations pursuing novel creative digital opportunities/solutions	30 collaborations	0
		SMEs providing new or more efficient creative digital services or engaging with new markets for these to support sustainability of business and turnover.	50 projects	50
1	REFRAME	New and/or better equipped food related SMEs	€ 2.750.000	553 (final results)
		Increase in average turnover for SMEs participating in an RCA	5%	37,01% (final results)
		Political and Consumer commitment to new products of food related SMEs	€ 2.750.000	€ 2,035,910 (final results)
1	SHINE	Spin-offs from healthcare organisations	3 Spin-offs from healthcare organisations using the transnational SHINE approach based on shared value creation	11 (final results)
		Strengthen regional innovation capacity	3 implementations of the jointly development integrated Business model for complex partnerships in the healthcare economy	13 (final results)
		Transnational networking in healthcare innovation	SME transnational trade contacts embedded in a strategic network platform	0 (final results)

1	Lean Landing for Micro SME's	Increased turnover and/or export and/or employment	20%	10% (final results)
		Created long-term viable knowledge network	1 Soft landing network consisting of 6 NSR member countries	1 (final result)
		Delivered concrete marketable new products, services or processes	160 partnerships that result in concrete new products, services or processes	157 (final result)
2	In For Care	Increase economic growth by enhancing regional innovation demand	€0.5 million growth in turnover of SMEs supported by project	€0,56 million (final result)
		Improve the effectiveness of delivery of (healthcare) services by enhanced cooperation between formal and informal networks	10% increase in user experience and satisfaction	24% (final result)
		Improve service delivery through increased efficiency of networks between formal and informal service delivery	3% reduction of costs of operating budget per year	7.7% (final result)
2	Inn2POWER	Number of participants successfully completing the MBA module (being organized using the methodology developed in the project) within the project lifetime.	100% of participants successful * 70 participants have successfully completed MBA modules in total.	100%
		Number of SMEs that enter new transnational markets (this means delivering services or goods in a country where the SME was not active before)	50 SMEs	33
		Number of long-term (=LT) transnational SME collaborations. The LT intention involves minimum 5 years.	15 Long-term transnational innovative SME collaborations.	19
2	Like!	Deliver the next generation of smart services (with the use of data, digitization, co-design) to support increased customer value across the NSR	10% increased customer satisfaction of end users per new, redesigned, or digitized service within the Like! project	21% (final result)
		Deliver more cost-efficient services (for those services where process-changes occur within the Like! Project)	5% reduction in costs of those services which have been redesigned	39% (final result)
2	Northern Connections	Enterprises in partner regions collaborating with innovation partners outside their own country	10% increase from the start of the project	18% (final result)

		Enterprises moving at least one step up on the technology readiness level	50% increase from start of the project	88% increase (final result)
3	CORA	Enhanced level of local authorities' awareness around new telecommunication technologies and effective solutions for creating advanced digital environment in rural areas	50 local authorities being informed and trained	63
		Improved level of digital inclusion and public digital skills (local communities and enterprises) in rural areas	25% increase in share of citizens and enterprises using digital technologies and services in selected pilots	42 %
		Mainstreaming CORA approach and developing a transnational rural community around digital inclusion	200 CORA rural community members (online community platform around rural digital inclusion)	313
3	GrowIn4.0	Collection of new and improved methods and tools, ready for publication to business support organisations and other relevant target groups.	3 tool collections	0
		Test and evaluation of I4.0 tools and methods, which will help SMEs to implement new business models, techniques or competences	80 SMEs	118
		Upgrading workforce competencies	N/A	0
3	Inno-Quarter	More cost-effective start-up programmes	25% reduction of average costs per start-up programme	0
		Increased regional market uptake of innovations	Market uptake of 30 products, services that have been realised via the integral public service of the Inno-Quarter approach	0
3	PERISCOPE	New emerging Blue Growth markets	€50 million p.a. estimated market value potential	150000
		New transnational SME collaborations pursuing novel Blue Growth market opportunities	10 collaborations	0
		Transregional Blue Growth innovation projects	2 projects	0

3	SCORE	Reduction in service provision costs using data-driven and open source solutions	10%	0%
		Improvement in service provision of authorities in the sectors of sustainability, environment and urbanism from data-driven and open source solutions	20%	0%
		Reduction in solution development time	30%	0%
5	CUPIDO	Stronger cross-sector knowledge based cooperation	8 long lasting partnerships, embodied in culture centres of excellences	18
		Increased culture business capacity	40 SMEs established	37
		Increased regional attractiveness	8 (qualitative perception indicator)	8
5	PROWAD LINK	Increased income from nature visitors / sustainable offers with focus on off-season periods.	€5 million	€79.450
		Increased investment in sustainability	€2 million	€694.009
		Long-term engagement and collaboration of SMEs in local and transnational networks	1200 partners	88
5	RIGHT	Increased innovation capacity	75% of participating SMEs	0
		New and Improved Collaborations That Enhance Innovation Ecosystems	90 % Share of interviewed managers/ policymakers evaluating project activities	0
		Enhanced regional innovation support capacity	75 % Share of interviewed intermediaries/ policymakers evaluating project activities	0
7	BLING	Bling will significantly improve the body of knowledge about how to develop and deploy blockchain-enabled services in local/regional government	30 government organisations	17
		Deliver a more cost effective government by reducing the cost of developing and accelerating the	20% increase in cost effectiveness (of services changed)	0

		deployment of blockchain-enabled services		
7	FBD	Increased SME Innovation	120 SMEs	0
		Increased SME Productivity	120 SMEs	0
		Increased SME Growth	120 SMEs	0
9	COM³	Increased share of new companies being established	10%	0%
		Increased share of new companies and growth of existing businesses	10%	0%
		Increased share of rural enterprises using digital-tech locally and transnationally	10%	0%
9	NorthTick	Optimise diagnostic strategies for Borrelia infections resulting in cost efficiency	10% improvement in health economic evaluation	0%
		Reduce the number of patients with long-term complaints associated with TBDs	20% decrease in the number of patients with long-term complaints associated with tick-borne diseases	34%
		Increase the vaccination coverage in relevant areas against tick-borne encephalitis	10% increase in number of vaccines doses sold in relevant geographic areas	0%
11	EXSKALLERATE	Increased average turnover of manufacturing and construction SMEs in the North Sea Region through the application of industrial exoskeletons	10%	0
		Musculoskeletal disorders (MSDs) in manufacturing and construction SMEs reduced by exoskeleton use	75%	0
		Increase SME exoskeleton adoption rate	25%	0
11	I2I	Improved efficiency of delivery of public social services in order to improve social inclusion and counteract loneliness in NSR communities/neighbourhoods	10%	0
		Improved innovation capacity of the public sector to generate innovation demand and innovative solutions to combat social exclusion	10%	0

The following provides an overview of the projects, their stages of implementation and expected results:

Create Converge: 9 beneficiaries from 5 NSR countries (UK, DE, NL, SE, DK) are focusing on getting the visualization and gaming technology sector to work together with a wide range of other sectors from architecture to science to deliver converging creative technologies (CCTs). The project targets all kinds of creative technologies like animation, screen, visual effects, virtual reality, augmented reality and games, and users beyond entertainment like fashion, energy, architecture, healthcare, and screen tourism. In this way, the project aims to ensure that technology is no longer seen as a niche activity, or a sort of science fiction process, but an integral part of 'business as usual', driving improvements in productivity, design, and delivery.

The project was finalized in 2021. Even though most of the deliverables and output indicators were achieved and overachieved, COVID and Brexit affected the delivery of one of the results envisaged.

Google Earth was one of the inspirations for the project. For them convergence was about bringing art and computer coding together to virtually see and experience the world. The projects key message is to use creative, digital and tech to show tell and sell applications like service delivery, training, and marketing (and entertainment). In this project, 9 partners in 5 countries have worked together and engaged with more than 70,000 people so they Connect, Collaborate, Learn and Reach Out.

By the end of the project, 2 books were published in collaboration with industry; one on fashion and digital and the other entitled "Storytelling beyond the Screen". So far, the project has hosted more than 100 industry events and exchanges and participated in more than 60 industry events. In addition, the project has established a transnational lab with more than 100 companies engaged. A total of 17,000 companies have been mapped, and the project has created a network platform as part of their new website. Lastly, ten demonstrators of VR/AR (covering sectors like space research, fashion, architecture, and healthcare) are running and 50 SMEs have been helped with adopting new approaches in their work.

REFRAME: 15 beneficiaries (public and private) from five NSR countries (NL, BE, DE, DK, SE) were engaged in establishing a Regional Food Frame (RFF) as an effective set of measures to scale up and accommodate urban food demands and regional supplies. The project stimulates large scale urban consumers (public & corporate) to utilize regional sourcing, to cooperate with regional suppliers and thus foster a regional innovative food frame. Reframe helps food related SMEs to find and develop smart specialization options, and to fulfill a role in a regional supply proposition.

On March 25th, 2021, the REFRAME final conference took place online. Throughout the project, more than 75 good practices from the project partners were collected in the REFRAME Online Resource Center for others to learn from on how to implement short food supply chains in their own regions. Innovation support measures have been developed and tested and regional cooperation has been strengthened. Some of the project highlights include 553 SMEs involved in the project increased their sales by 37% on average, consumers and policymakers committed to more than €2 million on new local food products during the project and 445 organizations adopted REFRAME solutions at project end.

SHINE: 8 beneficiaries from 3 NSR countries (BE, UK, NL) worked together to find a solution within the healthcare economy to cope with the changing demography. Faced with an increasingly aging population, it is a challenge to keep tomorrow's care affordable, accessible, and high-quality, tailored to the end user. The general objective of the SHINE project was to develop sustainable integrated business models for the healthcare economy to increase the innovation capacity in this sector. The projects starting point were regional smart specialization strategies since this help to avoid duplication of effort and resource to solve universal challenges. These integrated business models were built on public/private cross-sector partnerships and economic valorization based on transnational exchange of best practices.

The project successfully closed on 31 January 2020. To help new partnerships, the project developed an e-tool guiding organisations to set up integrated business models with shared value. The tool takes users through the process step by step, from defining shared value to scaling up the business. SHINE consulted the tool in 89 countries in Europe and beyond. Over 5,000 people from 136 countries have so far explored the system. Until now, 36 new partnerships have adopted the SHINE approach. These include 11 in West Flanders, 9 in South Holland, and 16 in Scotland. From these, 11 joint ventures have matured into spin-offs aiming to bring the developed solutions to the market. Backed by the experience of the dynamic partnership and the positive feedback from companies and healthcare organizations, it was the project's ambition to further embed the new methodology for setting up integrated business models with shared added value in the healthcare economy.

Lean Landings: 16 beneficiaries (SMEs, incubators, business development and knowledge organizations) from six NSR countries (DK, SE, NO, DE, UK, NL) worked on developing and implementing a soft-landing network and concept between incubators, accelerators, and partners in the North Sea Region to support the internationalisation efforts of micro-SMEs and start-ups. The project was completed in June 2019 and was the first VB NSRP project to close. Overall, Lean Landing succeeded in achieving its objectives. By focusing on co-creation and relationship building, the project built a strong network with a sound physical and digital infrastructure. At project end, 276 SMEs had participated in the project, with 169 SMEs having been abroad and having been presented with new business opportunities in new markets with profit enhancing partners, potential customers, or business partners. Out of these, 157 SMEs delivered concrete marketable new products, services, or processes.

In For Care: 16 beneficiaries (public and private) from 6 NSR countries (NL, NO, SE, BE, DK, UK) addressed the rising costs and need for health and elderly care in the North Sea Region by focusing on informal and voluntary care. The partnership used a quadruple helix model and co-creation sessions to improve the cooperation between informal and formal care, develop smart technological solutions to help voluntary and informal caregivers, and to foster informal care networks cooperation. The project closed in December 2019.

The project successfully produced a wealth of insights and solutions for sustainable informal care in the North Sea Region. By the end of the project lifetime, the project had delivered a 24 % improvement of the effectiveness of delivery of (healthcare) services (measured as increase in user experience and satisfaction), reduced the costs of service delivery by 7.7 % and increased SME turnover in the health care sector by 560.00 Euro by involving them in the development and delivery of innovate solutions. The project's activities resulted in mind-set changes among SMEs, carers and the political level regarding the importance and potential of informal care and the project managed to have the issue of informal care and voluntary

assistance incorporated into several policy documents, thus contributing to policy changes on the local level. Several of the partners in In For Care continue to work together in the Interreg North Sea Region project Isolation2Inclusion (I2I).

INN2POWER: 13 beneficiaries from 5 NSR countries (BE, NL, DE, UK, DK) have worked together to create incentives for SME's operating within offshore wind market opportunities. In 2021, the project continued developing the successful Company Director, an online address book containing over 2,300 registered offshore wind companies, making it easier to find domestic and foreign partners. In addition, a Network Brokerage Tool has also been implemented – allowing cluster managers to optimise their "match-making" service provision to businesses within offshore wind sector. In 2021, the project was granted an extension where a special focus will be on further integration between test facilities and local harbours by mapping of combined infra-structural and service-based resources. Finally, the transnational offshore wind energy MBA which comprises 9 modules and a thesis, has had 70 graduates.

Like!: 10 beneficiaries from 5 NSR countries (NL, DE, BE, UK, DK) collaborated to develop a Local Digital Innovation Culture across the NSR, giving authorities & practitioners new skills and knowledge to deliver innovative services, to develop new ways to engage with communities, and to build more inclusive services. The Like! project addressed the themes local government are coping with to improve customer service delivery.

The project closed on 1 March 2020. Services which were restructured by the project have reached more than 250,000 users to date. New and improved skills have been used by both local and transnational innovation teams to deliver more than 50 innovative Smart Services in the NSR. These have helped governments move from delivering generic services to delivering truly local services that meet real community needs. These new services have now been used more than 750,000 times by citizens, organisations, and SMEs across the North Sea Region.

Over the last 3,5 years the Like! project has significantly enhanced the capacity of the public sector in the North Sea Region to facilitate and deliver innovation, resulting in the development of a wide range of services for improved public service across significant numbers of citizens and service users, organisations, and regions. Like! has delivered results at scale and shown significant engagement and impact across partners and regions.

Northern Connections: 21 partners (clusters, cities, regions, and knowledge institutions) from all seven NSR countries (NL, DE, BE, UK, DK, SE, NO) have been working together to create innovation connections between their enterprises and clusters in the energy sector, to involve more enterprises in transnational innovation cooperation and to support SME internationalization. One of the key means to achieving this has been the project's Living Labs where SMEs from across (and beyond) the North Sea region were able to pitch solutions to "challenge owners" - typically public sector organisations or larger companies.

In 2020, the project continued with the implementation of project activities. The project held several living lab events, organized a third iteration of the cluster training seminar, and organized its final conference. The project was able to deal with the consequences of the COVID-19 pandemic in a constructive manner, for example by moving several events to an online setting. The project also continued to work towards ensuring the transferability and durability of the project's results beyond the timeline and outside of the partnership of Northern Connections by evaluating, drawing lessons learned and preparing them in reports,

which in 2020 accompanied the project's on-the-ground implementation. The project was completed in December 2020. It is currently preparing its final report.

CORA: 18 beneficiaries from all seven NSR countries (NL, DE, BE, UK, DK, SE, NO) are targeting the rural digital divide in the NSR, focusing on digital infrastructure, services, and skills, aiming to enhance the adoption of internet, digital technologies and e-services in rural areas and create an environment stimulating digital innovation. To create an advanced digital environment in the North Sea Region, the CORA project works on enabling local authorities to identify their common challenges and empowers them to exchange experiences and test innovative solutions and tools.

In 2021, the project partners have made significant progress testing digital skills, services, and infrastructure solutions in the pilot regions. For instance; the Smart fibre hubs pilot in South West Flanders opened a digital business hub K-orner installed a network of tram sensors and launched a mobile mapping tool, Amt Hüttener Berge (Germany) built data terminals in public areas, the pilot called "SAINT" (Strategies on e-Tourism) aiming to develop new tourism-oriented digital services in Denmark was finalised, in Sweden and Norway, the pilot "BROADEN – Broadband across border" provided high speed Internet access on both sides of the border, in Vejle (Denmark) the pilot "Digital Learning for All (DILA)" was implemented. In addition to the pilots' implementation, the project training platform offers a comprehensive set of guiding measures to rural and local authorities to become ready for their digital transformation journey.

Growin 4.0: 15 beneficiaries from 5 NSR countries (DK, DE, BE, UK, NL) focus on common challenges faced by manufacturing SMEs throughout the NSR. If the manufacturing industry in the NSR is to remain competitive, it needs to capture the potential for productivity and growth that Industry 4.0 has to offer. There is a profound need for an experience based and smart gathering of efficient methods, tools, and knowledge to guide SMEs in their transformation towards Industry 4.0. GrowIn 4.0 aims to build strong competences and tools in the participating regions for the benefit of manufacturing SMEs. The overall objective is to raise the level of innovation and to create more growth within manufacturing SMEs who are heading for Industry 4.0.

In 2021, a lot of effort was put into prolonging the project to place special focus on anchoring of the results and making the tools developed more accessible for the target groups. Another aspect of the work was understanding the reasons for SMEs to not moving to Industry 4.0 – the main challenges and barriers they face.

Project partners have also placed special importance to dissemination activities. Once such opportunity was the Tech Talk in Horsens, Denmark. At that meeting, the GrowIn project manager presented the project and its results and extended an open invitation to the present SMEs to get involved with the GrowIn project.

The partners prepared and delivered the final project conference during which the results of the project were presented, an expert keynote speaker debated how SMEs can work with Industry 4.0 and an SME presented his experience from taking part in the project.

INNO-QUARTER: Inno-Quarter (IQ) facilitates entrepreneurs with an integral public service (innovation quarter) organised at existing events. The aim of innovation quarters is to reduce the costs of conventional start-up programmes, by reducing the time needed to validate a product/service with 2 years. There are 12 beneficiaries from five NSR countries (NL, SE, DE,

DK, BE) involved in presenting innovations at festivals. The project uses European festivals as living labs where innovators within the North Sea Region can work on their product or service and go from idea to market launch very fast.

In 2021, the festival season was still hampered by the COVID-19 pandemic. Most festivals were cancelled, which became increasingly problematic for the project. The project had to prepare the Inno-Quarters for the festivals without a guarantee of whether the festival could take place. Therefore, preparatory costs were made without contributing to project outputs and results. To mitigate this problematic situation, the project asked for additional budget at the Monitoring Committee which was granted in November 2021. The project did manage to test online, for instance, with the OEROL festival. This resulted in a great collaboration and a lot of new information about how to test with start-ups during a pandemic. Inno-Quarter was working on the business model "Viable Growth Model" together with VIA University College and a publication was presented for a model for working with business development in a sustainable framework. Finally, a course on the Inno-Quarter methodology for the Business Academy at Aarhus has been prepared.

PERISCOPE: 13 beneficiaries from 6 countries (DK, DE, NL, SE, UK, and NO) are involved in creating a permanent innovation ecosystem to foster transnational partnerships for sustainable business development in emerging blue markets. In 2021, 9 Market Opportunity Reports were provided to SMEs, knowledge institutions and other players in the innovation chain for further development and uptake of actions and business development. Examples include reports on; aerial drones, drones on ships, microgrids at large ports and offshore energy hubs and offshore logistics hubs.

The project has successfully led to the formation of 8 new partnerships, involving 46 organisations from around the North Sea region. These partnerships are pursuing opportunities such as small-scale hydrogen production, floating battery storage and maritime aerial autonomous inspection system for offshore renewable energy assets. The project will close its activities in 2022.

SCORE: 13 beneficiaries from all 7 NSR countries (BE, DK, DK, NL, SE, UK, and NO) are involved in the project. SCORE aims to improve the delivery of public services, tackling everything from parking and sustainable mobility to water and waste management, by using innovative software solutions based on open data that are open sourced and replicable for other cities. To create these solutions, SCORE has engaged a community of cities, developers, open data experts, and specialists in the domains of water, mobility, and environment. Together they work in an open, agile, and transnational way, where they put end-users, city operators and citizens at the heart of development.

In 2021, the SCORE partners gathered for a third partner meeting focusing on project results, business case pitches, peer review methods, replication, and solution development. Regarding activities for demonstration in living lab, a replication workshop about "Mobility dashboard" was developed by Bergen and took place in March 2021. In April 2021, during another workshop on replication using living lab methods, 3 SCORE solutions were used as examples to test the living lab methods (" QR code toolkit"," Signalen" and" Crowd flow dashboard"). Sustain and long-term scale up activities were also pursued (e.g., linking the SCORE project with the Open and Agile Smart CITY (OASC) network by organising a technical workshop;

drafting of a checklist template of the different topics that should be discussed for each solution to ensure their legacy beyond the project end).

CUPIDO: 16 partners from 7 NSR countries (BE, DE, DK, NL, SE, UK, and NO) are working to develop new business opportunities in the cultural and cultural heritage sector around the North Sea, to reinforce the economic position, competitiveness, and social cohesion of local rural communities in areas with a declining population. The project is mainly about commercialisation of the cultural sector that contributes towards creating vibrant, sustainable rural communities.

The partners have continued to develop and implement innovative ideas for digital heritage products and services based on the principles of CUPIDO that support social and economic growth in rural areas in 2021. Partners have been working with new technologies and have created products and services through filming, video mapping, live streaming, VR, gaming, art, and dance. Cultural heritage has been made more visible through modern technologies and contemporary art.

CUPIDO has, through different activities and events, helped companies and cultural actors to market their local cultural offering to new audiences. These events have also supported knowledge exchange opportunities about the CUPIDO project.

All partners have also been working to stimulate local and regional authorities to include culture as an economic driver in its policy making. The partners want to show decision makers that culture plays an important role for the development of the regions, that it can stimulate to new business opportunities. This can happen through the Centres of Excellence established through the project which are a meeting place for businesses, cultural actors as well as local and regional authorities. More results will be available in 2022.

PROWAD LINK: 14 beneficiaries from 5 NSR countries (DE, DK, NL, UK, and NO) aim to support sustainable economic growth in the North Sea Region (NSR) by engaging SMEs in nature conservation, unlocking the potential of nature heritage brands as a driver for jobs and sustainable regional development. The project will develop and test innovative tools and strategies for SMEs in the NSR to improve access to brands provided by natural heritage sites with economic value; enhance SME sustainability in the NSR and develop innovative marketable offers and products in a co-creation process with knowledge partners. The project will be carried out and implemented in selected pilot areas (Wadden Sea World Heritage Site, Wash & North Norfolk Coast European Marine Site) to ensure transferability of all outputs and results to designated natural areas and World Heritage properties on a national, European, and potentially global scale.

Due to the pandemic, the project looked for new formats and means to engage with stakeholders and reported that in some cases this new reality led to engaging with a wider range of target groups due to the fact that no travel was needed. As the project developed their Brand Activation toolbox, bilateral talks and trainings during this period focused on key stakeholders in the role of brand multipliers in the project regions, encouraging them to use the toolbox in their work. Local SMEs were also engaged to implement brand campaigns and apply the concept for destination development.

Furthermore, the development of a Wadden Sea World Heritage Partnership Hub continued and successfully engaged stakeholders in further initiatives. For example, a partnership project of green NGOs to develop and share knowledge on environmentally friendly shipping

and port operations. ATrilateral Dark Sky initiative was also developed with astronomers, universities, national park authorities and other stakeholders to discuss light pollution policies and to support SMEs and local communities in reducing light pollution.

RIGHT: The RIGHT approach is to connect smart specialisation strategies (SSS) in the North Sea Region (NSR) to human capital and skills in the blue and green energy sector. 14 beneficiaries (public and private) from all seven NSP countries (NL, DE, BE, UK, DK, SE, NO) are working on strengthening the competitiveness and innovation support capacity of the regional economy, with a focus on in the blue growth and energy sector. In these sectors, subject to many disruptive innovations, the current level of education and competencies will not be able to meet the demands in the future. The project is working on bridging the skills gap by developing, adapting, and testing dynamic educational programmes to prepare a strong workforce with the necessary skills to support future growth and eventually to unlock NSR innovation capacity.

Early in 2021, a major change was approved for an adjustment of the project result indicators and the project start working now in this direction. In the first half of 2021, the project could not organise physical meetings, however, pilots ran as planned in 2021. The project requested a 6 months COVID-19 extension, which was approved in June 2021. This provided partners with the opportunity to complete, evaluate and report on the pilots. At the end of June 2021, 13 out 14 planned pilots were running, however 5 pilots had to be put on hold due to COVID-19 restrictions. The number of targeted pilots will be exceeded and is now expected to 16.

BLING: 14 beneficiaries from 6 NSR countries (BE, DE, NL, DK, SE, and UK) target the use of blockchain technology for public service delivery. Blockchain-enabled systems will allow governments to deliver a range of new solutions and service designs that have the potential to redefine the relationship between governments, citizens, and SMEs in terms of transparency, trust, and data-sharing. The project builds upon the substantial investments by the EU, national governments, corporations, SMEs, and wider networks to provide one of the first dedicated platforms to bring these tools and approaches into local and regional services.

BLING provides a unique combination of public authorities, knowledge institutions and SMEs who will work to develop and deploy blockchain-enabled public services focusing on Identity, Direct Democracy, and Customer Services. Several pilots will be tested to demonstrate the viability of the blockchain technology for government services and other public service delivery. The project results will improve capacity-building in this cutting-edge technology applied to the public sector and help reduce the costs of public service delivery.

In 2021, the BLING partnership was extended to include a new partner. The extension of the project included the clustering of transnational activities into 6 themes: Community Support, Capacity Development, Energy, Transport, Developing the Blockchain Readiness Assessment Tool (BRAT), and Knowledge Transfer. The work in various pilots is also reaching a level of maturity and showing results. For example, in Roeselare, Healthy on the Blockchain pilot has been implemented and will be evaluated at the end of 2021. Oldenburg worked on the development of Health App which is to be used by the city of Oldenburg and Emmen has worked on a E-knip application, a digital wallet for the inhabitants of Emmen which is linked to sustainability data they provide.

FBD: 12 partners from five NSR countries (BE, DE, NL, SE, UK) are working to help 360 SMEs in the North Sea Region to grow, increase productivity and innovate better by helping them to use data to drive up performance. In 2021, the project was granted an extension with

increasing the number of SME's including additional dissemination activities. The targeted SMEs are placed at the end of the value chain, typically located in hinterlands of larger innovation hubs. While critical to regional economies, their capacity for success is limited by insufficient access to and ability to analyses data - about finance, legal changes, and markets.

The project is doing this by designing and creating new 'Horizon Scanning Knowledge Transfer' (HSKT) hubs which will provide data-analytic tools and data-harvesting capacities to support SMEs in the health technology, light engineering, and agri-technology sectors, and by evaluating and disseminating the experiences from HSKT and data analytics tools. More results will be available in 2022.

COM³: 19 partners from all seven NSR countries (BE, DK, DE, NL, SE, UK, and NO) come together to address the lack of digitization of business in rural areas in the NSR. The project aims to empower local and regional public authorities in their role as innovation facilitators and enablers. Public authorities can subsequently facilitate the improvement of tech-readiness of rural businesses and exploit local potential for rural innovation and smarter growth. The project aims to develop an innovation framework for SMEs that is established and run by local and regional authorities as facilitators. It will develop the COM³ model for enhancing the tech-adoption of rural businesses, provide guiding measures and training solutions. The project was approved in July 2019.

In 2021, progress has been made in each of the pilot regions: many enterprises and organisations have been involved in workshops focussing on SEO, making use of data, but also in interviews and training sessions. In addition, all the pilot leads were interviewed to understand how the pilots are progressing and identify case studies and opportunities for knowledge exchange. In terms of training and coaching, the first training modules in COM³ have been created around cyber security and additional priority topics have been identified. A survey on the NSR rural business digitalization landscape has been carried out by the partner University of Groningen. With regards to COM³ NSR-rural business platform and mainstreaming, a first mock-up of the platform has been developed by atene KOM and key functionalities have been identified.

NorthTick: 11 beneficiaries from all seven NSR countries (BE, DK, DE, NL, SE, UK, and NO) are involved in combatting tick-borne diseases. In 2021, the project was granted an extension. The additional activities are related to modelling I. ricinus ticks in relation to pathoghenesis (disease causing) of tick-borne micro-organisms; genome relatated to Borrelia miyamotoi: lyme neuroborrelios. The additional research and studies will contribute to the growing tick-transmitted bacterial species that are arising and causing severe infection within human bodies. More results will be available in 2022.

EXSKALLERATE: 13 beneficiaries from 6 countries (NL, DE, BE, UK, DK, SE) focus on manufacturing and construction workers that undertake physically strenuous activities which increase the risk of health problems, disability, and sick leave, leading to lower job attractiveness and job candidate scarcity. The unfilled job openings slow growth and competitiveness especially as SMEs in the North Sea region are mostly unaware of available solutions via exoskeleton adoption. The project tackles these issues by focusing on accelerating the adoption of exoskeletons into construction and industrial manufacturing SMEs. Exoskeleton use could alleviate 10-40% of muscle peak loads for passive, and up to 80%

for active exoskeletons. In this way the project contributes to SME competitiveness & occupational health by making NSR a leading exoskeleton ecosystem.

At this stage of the project, 9 field labs for exoskeleton testing and design improvement are up and running. While most of these field labs are still in early stage of testing, one of them has shared the first results, showing a 45-60% muscle activity reduction for certain manufacturing tasks associated with drilling. This data will be further tested at the pilot sites (i.e., at SMEs) where injury prevention/reduction will be tested by the further use of exoskeletons.

The project is also active in developing a new knowledge partnership around exoskeletons for industry. This is done by launching EXSK Community platform, performing workshops and engaging SMEs in testing the "Exoskeleton Potential tool" (ExoPA) which determines if an exoskeleton is the right solution for the needs of an organisation.

I2I: The overall objective in I2I is to enhance innovation in social service delivery to improve social inclusion and counteract loneliness in NSR communities and neighbourhoods. In I2I 12 beneficiaries from all seven NSR countries (NL, DE, BE, UK, DK, SE, NO) are working together to achieve this goal in the NSR area. To mitigate the social service delivery, the project will increase the capacity of public authorities to develop innovative services and provide them with new tools and solutions. It aims to do this by improving cross-sector collaboration using a quadruple helix user-centred approach working with service-/co-design methods. It will develop and test new services and technologies and make existing public services more integrated in a quadruple helix approach and co-creation sessions. These solutions will eventually be brought together in integrated methodologies.

COVID-19 impacted the project in 2021. The pandemic underlined the need to improve social inclusion and to fight loneliness. Target groups in 2021 were not only specifically elderly people, but also 18-30 years old (Aarhus) and 45-55 years old (Assen). However, elderly people remained as an obvious target group, for instance at Arendal and Bremen. Other target groups reached out to be the carers (Dundee), stakeholders (Canal & River Trust, Turnhout) and voluntary organisations (Värmland). In 2021 virtual on-line tools became of increasing importance, such as the online platform GENLYD at Aarhus and the Home game applied by Abertay University. In Bremen first experiments were done with the tool the Virtual Excursions Club. Fortunately, in 2021 it was possible to also have physical interventions like in Arendal, the planned 'Welcome at the table'. Moreover, co-creation initiatives have been proven to be an important part of the project and took place in Canal & River Trust, Region Värmland, the city of Aalst organised workshops and Turnhout held digital co-creation sessions with professional stakeholders. The UK partner Campaign to End Loneliness made a valuable, transnational contribution through sharing their policies and effective interventions.

2. Eco-innovation: Stimulating the green economy

(This is a continuation of the text provided in the SFC under this heading):

Result targets and achievements:

Call #	Project name	Result description	Quantified target	Achievement through 2021
1	Dual Ports	COST REDUCTION by concretely implementing tangible low carbon solutions in DUAL Ports Regional Entrepreneurial Ports	20% DUAL Ports DECARBONISATION PROGRAMME COST REDUCTION	23%
		CARBON REDUCTION by concretely piloting and/or adopting tangible low carbon products and green technologies that improve utilities in DUAL Ports Regional Entrepreneurial Ports	12% DUAL Ports DECARBONISATION PROGRAMME CARBON REDUCTION	89%
1	SCALE-UP	Number of green products, services and processes piloted and/or adopted by the project	Reduction of 30% in carbon emissions	39%
		Reduced costs for matchmaking ('Meet-the-Buyer') events for NSR cleantech clusters	Reduction of 25% in costs for the MtB events	38%
2	COBEN	Climate improvement	44 (Community CO2 reductions)	65
		Civic energy uptake	10% (Percentage of the North Sea Region area)	12%
3	Smart-Green	Productivity and quality	Reduction in time (average)	4
		Energy saving with respect to heating and supplemental light	% of current energy use	6
		Energy efficiency increase	%	4
3	BIOCAS	CO2 reduction	608 CO2 reduction realized by processing biomass streams by the developed BCA's, new techniques, and products during the project period - * this is under revision	7764

		Biomass transformed	26 000 Tonnes waste, biomass transformed to resources or used for new applications till project end.	10429
3	2IMPRESZ	Increased awareness in schools on energy choices, energy usage and energy saving potentials	% Increase of pupils, teachers/school staff and partners that are aware of the concepts of energy choices, energy usage and energy saving potentials	0%
		Increased level of energy saving in existing school buildings through the improved 2IMPREZS 4.0 energy saving programme	% (net) of fossil derived energy saved (against established 2IMPREZS baseline value)	27%
		Decreased environmental footprint of existing school buildings and pupils by CO2-reduction through digital 2IMPREZS 4.0 Energy Challenges concept	Tonnes of CO2 related to energy consumption for heating and electricity, (food) consumption and mobility	769 tonnes
3	SalFAR	Energy per year needed for pumping out saltwater back into the sea to keep the farmland saltwater free.	Reduction of energy consumption by 20% by allowing more seawater in for saline farming methods.	0
		Reduction of freshwater consumption in order to improve resource efficiency	Reduction of fresh water use by 10 % by end of the project.	45%
5	Carbon Farming	Enhanced uptake of carbon farming in the agri-food chain to reduce carbon emissions above ground	10,000 Tons of CO2 (equivalent) sequestered in farming ground	0
		Optimise the application of carbon sequestration techniques to increase the effects and impact.	20 % improved soil quality in structure, water holding, biology	0
		Increased awareness of carbon sequestration as a technique to reduce carbon emission in the food supply chain and as a –regional- option to compensate for carbon emissions.	10 economic actors in the food supply chain (farmers, producers/processors, retailers, consumers) and third parties (i.e. outside the food supply chain)	0
5	DeComTools	Carbon reduction in offshore decommissioning operations	25% By piloting innovative processes and services that improve logistical and technological concepts for	0

			offshore dismantling and recycling operations BASELINE: see C.2.1 Project overall objective	
		Cost reduction in offshore decommissioning operations	20% By piloting innovative processes and services that improve logistical and technological concepts for offshore dismantling and recycling operations BASELINE: see C.2.1 Project overall objective	0
		Raise know-how/expertise capacity in offshore decommissioning operations	1250 Raise know-how/expertise capacity in offshore decommissioning operations	0
5	INDU-ZERO	Cost reduction	Production cost in percentage of current prices	0%
		Reducing NSR environment footprint	Kton CO2	0
7	ACCESS	Reduction of smart energy grid project costs	20% Lower costs for smart grid development using upscaling methodology.	0
		Reduction of CO2 emissions	25% Average CO2 emissions reduction per city related to the pilots. General baseline: European average carbon intensity electricity*electricity consumption.	0
		Reduction of smart energy grid project development time	30% Reduced time for the set-up and implementation of smart grid demonstrator projects.	0
7	ProCirc	CO2 % saved per pilot	20%	0
		% Virgin materials avoided per pilot	20%	0
		% of waste prevented per pilot	25%	0
7	EMPOWER2.0	Increased uptake of renewable energy by households	1% 14000 households. 50% of their electricity consumption generated either by generation on their own building or on a site into which the household has invested and 100%	0,45%

		Reduction of carbon dioxide emissions in North Sea region as result of transition to renewable energy	14.700 tonnes – Average CO2 reduction per household is 2.1 tonnes with transition to 100% renewable energy. 2.1 tonnes times 0.5 times 14000 households make 14700 tonnes total at the end of the project.	12.625
7	OESA	Increased ocean energy capacity deployed within the North Sea Region	30%	0%
		Reduced CO2 emissions in the North Sea Region	102.000 Tonnes of reduced CO2 emissions	0
7	SoilCOM	Utilized amount of water, pesticides and inorganic fertilizers	-5% L/ha per farm or enterprise (water, pesticides); Kg/ha per farm or enterprise (fertilizers)	0
		Crop productivity	10% Kg/ha or pieces/ha	0
		Utilized amount of quality compost	20% Kg/ha at farm or enterprise	0
9	NON STOP	CO2 reduction	2% reduction in port CO2 reduction by smart digitalized management systems	0
		Energy reduction	8% reduction in port energy consumption and pollution by smart digitalized management systems	0
		Time reduction	10% reduction of the time spent for a pre-set defined port maintenance / operation by introducing smart management platforms	0
9	WASP	HFO Heavy Fuel Oil / Marine Diesel Oil saved with WPT in operation on 1 ferry and 4 freight ships during the project period	Tonnes	421
		CO2 reduction realized during the project period with WPT in operation, on 1 ferry and 4 cargo ships in operation during the project period	Tonnes	1328

		KWH generated with WPT's in WASP during the project with WPT in operation, on 1 ferry and 4 cargo ships in operation during the project period	KwH	2081,000
11	CIRC-NSR	Increased share of relevant stakeholders in the piloting partner regions committed to implementing Circular Economy processes due to the improved and disseminated pilots results and governance set-ups/strategies	Increase of %	0
		Saved annual CO2 emissions in companies and stakeholder organisations in the piloting partner regions through improved Circular Economy processes via the actual pilots, capacity building and indirect effects of the governance impact.	Tons of CO2 annually saved	0
11	STRONGHOUSE	36 Kiloton CO2 emission reduction	Kiloton CO2	7,56
		120 million-euro investment in the reduction of CO2 emission of homes in the North Sea Region	100 000 000	60,30
		22.000 homes with substantially reduced CO2 emission	22,000 homes	4.872

Dual Ports 16 beneficiaries from six NSR countries (BE, DE, NL, DK, SE, UK) are working together to decarbonise regional entrepreneurial ports across the NSR. Together they are exploring how to enhance ports' energy efficiency and performance, facilitating low carbonisation at reduced cost, with added value in terms of knowledge and investment. In 2021, the project has started to successfully complete two of its fifteen pilots: The surface pilot in Skagen was completed. The objective was to test new technologies to reduce and absorb green house gases through asphalt and pavement in port development. The total CO2 emissions reduction was calculated to be 25%, that is 8,524 kg / CO2. The pilot on smart LED lightning in ports (Niedersachsen and Emden) were also successfully finalized. More results will be available in 2022.

SCALE-UP (Supporting Clean-tech innovators in Accessing Large Enterprises through Unlocking Procurement) helps clean-tech SMEs bring 40 green services and products onto the market. It is a project whose partnership consists of 8 public authorities and companies from six North Sea Region countries – Belgium, Sweden, Germany, the Netherlands, Denmark, and the UK. Through targeted 'Meet the Buyer' events, SMEs can pitch their innovative concepts to procurement officers of large buyers. The project has contributed to moving towards decarbonization by accelerating the uptake of new technology and green businesses aimed at reducing CO2 levels.

Since the project started it engaged with 71 unique buyers and 921 SMEs. Until the end of 2020 the project reported 32 implemented success cases leading to an average of more than 40% CO2 reduction. The project ended as per 31 December 2021, however the results

achieved in 2021 are not known yet. To support SMEs in matchmaking, SCALE-UP organized business, and skills development trainings. The trainings provided SMEs tools for approaching large companies and investors. While most of the companies did not facilitate the amount of private investment raised through SCALE-UP, at least 12.600.000€ destined to sustainable SME solutions, with the potential to be up-scaled to over €50M in the next 5 years. Beyond matchmaking, 490 cleantech SMEs have participated in business / skills development training since project start which is providing them with the right tools to approach big corporates and investors in the future. Partners now will try to maintain their collaboration and some of the key activities, such as the Meet-the-Buyer methodology, beyond project end.

COBEN: 11 beneficiaries from all 7 countries (DE, NL, SE, DK, NO, BE and UK) are exploring how to improve climate and civic energy uptake focus on civic society as the key driver of the transition to renewables-based energy. The project aims to support a shift of energy value chains from centralized utilities to community-owned renewable energy enterprises that provide tangible economic, environmental, and social benefits to enrolled citizens. Such benefits include profit sharing, rebates, investment in social services, community infrastructure and climate protection.

In 2021, focus was on COBEN's concept of a digital tool, called dashboard. The dashboard will follow and give information and useful material through the phases of the civic energy cycle. The "real life" project meeting in Eeklo and Knokke-Heist in September was a key event: the COBEN team celebrated together with the Flemish Minister of Energy, Zuhal Demir (N-VA), the official inauguration of the first heat cluster in Eeklo. Other key highlights included: Research conducted on the "active customer" which was introduced in the EU Directive 2019/944 for the internal electricity market. Emmen prepared 3 new pilots (contracted the development space needed, restructured the business models and worked on community involvement. Two neighboring farmers in Rakkestad built on-farm bio-methane plants (Viken). These plants will be essential for the future learning of on-farm biogas production in the region.

SmartGreen: 12 beneficiaries from six NSR countries (DE, BL, NL, NO, DK, UK) are working together to reduce energy use, increase the energy efficiency and optimize the productivity of the North Sea greenhouse industry. The partners are using Big Data analysis of climate and production data to pinpoint unnecessary energy use and to improve the climate control and combine it with research and practical demonstrations in commercial greenhouses.

In 2021, the continuation and start of new experiments and joint trials of light on plant performance, smart LED-lightning strategies and methods for energy savings has continued. The project has also continued focus on multi-layer farming, where different trials have taken place. Important progress is the completion of an experimental stand with which height data of plant stands could be obtained not only at one position but also over the entire area. Preparations were made to transfer these initial results to larger greenhouses. More results will be available in 2022.

BIOCAS The main aim of BIOCAS is to realize concrete Biomass Cascading Alliances (BCAs) for a more sustainable conversion of biomass. This should generate economic, societal, and ecological benefits and prosperity. In the project 18 beneficiaries (including co-beneficiaries) from 4 countries (NL, FL, D and DK) collaborate. The project will pilot 13 commercial running Bio-Cascade-Alliances (BCA's). The pilots will be evaluated and actively shared in the involved

regions. These proven concepts will accelerate adoption of high to low value bio-cascading technologies and businesses in rural regions.

By valorising biomass and working in biocascading chains to reach this, the project tested and piloted various ways of promoting resource efficiency. By focusing on products and processes to substitute less ecofriendly products and processes (eg. bioplastics instead of 'normal' plastic, biogas to make electricity instead of natural gas or coals), partners contribute to the protection of the environment.

The project was seriously affected by COVID-19 especially by the closing of many of the laboratories. In 2021, however, the Bio-Cascade-Alliances (BCAs) kept on collaboratively working on their experiments, technologies, and results. Hanzehogeschool was able to finish their lab scale processes on onion, cherry, lupin, and dyers broom. BCA2 continued with the biorefined grass pulp for dairy cattle. Outside activities, such as the field trails at Willsted and Leeuwarden, could proceed under COVID-19 restrictions. Moreover, the project organized two on-line conferences: Bio-economy in practice - Biogas becoming sustainable with new perspectives and the Danish Bio-economy Conference.

In November 2021 the final project meeting took place at Drachten and Groningen in the Netherlands. BIOCAS showed how BCAs have been the 'basecamp' for different types of organizations to develop their products or processes. Partners are keen to continue working together after project closure and expand the journey they started in BIOCAS.

2IMPRESZ: 12 beneficiaries from five countries (NL, FL, DE, DK, UK, and SE) work together to empower school children at 201 schools in the North Sea Region to take a leading role in reaching 35% energy savings and reducing emissions by 11,008 tons of CO2. In 2021, the project was granted an extension. Two additional partners came on-board, including a new country (Sweden). The key focus will be introducing and strengthening the ‘energy challenges’ programme which consider digitalisation in general and more importantly addressing the necessary gaps and rollouts to make it more proper and suitable for the future hybrid school environment. This is in essence the added value of the extension. Focus is on the on-going energy transition and on the digital technology that students; teachers and partners will further endorse and take-up (such as models of technology enhanced learning (TEL, augmented Reality / Virtual Reality (AR/VR). More results will be available in 2022.

SalFar aims to promote resource efficiency by (re)using degraded farmland and reducing freshwater consumption. The partnership consists of 15 beneficiaries from all countries around the North Sea Region (NL, DE, BE, DK, SE, UK, NO). As all coastal zones must cope with sea level rise, the shared challenge is to create awareness for salinization and offer new methods of farming across the NSR. This way of thinking green means a real change of perspective in farming and food producing, a change of behavior of the consumers of food, and, for authorities, re-thinking water management and changing policies on environment and agriculture in coastal areas. Ten open field labs will be set up in each participating region to demonstrate innovative methods of farming on saline soil with natural adaptation processes in plants and crops.

In 2021 SalFar partners ILVO and VLM contributed to a pocketbook on climate change for both politicians and public on the Flemish coast in which salinization. Furthermore, there was an unforeseen professional book publication because of the mid-term conference in 2019 entitled 'Future of Sustainable Agriculture in Saline Environments'. The project also boosted the SalFar network by becoming part of the Food and Agriculture Organization of the United Nations (FAO). In 2021 the label and Brand Book were launched and became available for use by saline farmers. Field trials could be continued despite COVID-19 restrictions and the first results will be presented in October 2021. Two new partners from Denmark came on board being SAGRO I/S and Aarhus Universitet the activities of WP5 were boosted together with the partner Food & Bio Cluster (FBCD).

Carbon Farming Seven beneficiaries from four NSR countries (BE, DE, NL, NO) are developing new and innovative farming methods to reduce the carbon footprint of agriculture in the North Sea region. Adopting carbon sequestration (CS) techniques in land management can help to reverse biodiversity losses and play a crucial role in food security and climate change mitigation. Greening the food supply chain through carbon farming (CF) will restore the organic component of the soil; actively remove atmospheric CO2, increasing soil biodiversity, and providing better nutrient and water holding capacity for crops. The project is using carbon sequestration methods, which previously have been scientifically validated, but for which the potential for up-scaling and demonstration in practical farming has not yet really been exploited. To mitigate this, the project conducts a feasibility study on the economic viability of carbon sequestration methods for farmers in the NSR and tests and validates economically viable business cases for CS in the whole agri-food chain.

COVID-19 had an impact on the implementation of Carbon Farming; however, the project could find ways to work around. For instance, two new business cases were realized, and farmers were met in smaller groups than planned. Moreover, the project noticed that the topic of carbon faming received increasing attention in the media. Two major milestones should be mentioned here. The first one being the launch of the Carbon Farming movie during a digital watch party. The second one being the publication of the White Paper titled ‘Incentivizing Carbon Farming; policy recommendations from the Carbon Farming project’. The White Paper was handed over to Euro Commissioner Frans Timmermans in person. Frans Timmerman also attended the on-line end conference that took place in December.

DeComTools: 13 beneficiaries (private and public) from six countries (BE, DE, DK, NL, NO and UK) are involved in the project. The partnership aims to develop a sustainable approach to the offshore wind farms' end of lifecycle. DecomTools is doing this by devising and developing eco-innovative processes of decommissioning and repowering offshore wind parks, and by combining innovative and already existing technologies in the areas of logistics, safety, ship design and up-/re-cycling. These are validated by demonstration pilots.
Focus during 2021 has been on the overall delivery of several reports and studies such as “Pre-Decommissioning Marine Operations of Offshore Wind Parks”, the completion of the Market and Stakeholder Analysis, a status Overview Report and the report “A market survey of ROVs and decommissioning tools for the removal of monopole foundations in the offshore wind industry”. In addition, the partnership has also conducted 4 technical (online) workshops in the different work packages to help collect key data and know-how. Especially useful were those held to better define the Live Product Model and the Decision Support System for

Decommissioning as the version has now been upgraded to DDSS-v2). More results will be available in 2022.

INDU-ZERO: 14 beneficiaries from six countries (BE, DE, NO, NL, SE, UK) are working together to design a blueprint for a factory that can produce these renovation packages at an industrial scale. The project is preparing a blueprint for smart factories delivering net zero energy renovation packages at industrial scale and at half the cost. The standardized INDU-ZERO approach can be applied to terraced houses and apartments built between 1950 and 1985.

In 2021, the project was mentioned in a letter from the Dutch commissioner of the king in Overijssel to Frans Timmermans of the European Commission. In the letter, the commissioner stated that INDU-ZERO was one of two projects within the province of Overijssel which offered solutions within the built environment as stated in the Green Deal. A smart Renovation Factory will be able to mass produce standard renovation packages at an industrial scale (at least 15,000 per year). The renovation packages towards energy neutrality are to be the solution for quick and inexpensive sustainability improvements of existing homes in the North Sea Region. The Blueprint includes a business case that demonstrates the market potential. Governments, housing corporations, industry and potential investors who want to play a role in building the first Smart Renovation Factory can use the Blueprint as a staring point. So far 14 parties have already signed a letter of intent to become part of this solution.

ACCESS: 10 beneficiaries (public and private) from five NSR countries (NL, SE, FL, UK, and DK) are working together to advance the coordination of future low-carbon energy grids development in cities. The focus is to increase the capacity of governments to scale up and plan future investments in low-carbon smart grids. A transnational and transferrable Upscaling Framework will be developed for supporting cities in systematically upscaling their smart grid projects with reduced costs and time. The project aims to reduce CO2 emissions in smart-grid pilots by at least 25% through the uptake of resource-efficient, sustainable technologies and processes enabling increased renewable energy generation, reduced consumption, and optimized management.

In 2021, ACCESS partners have closely worked on the development of Future Energy Scenarios as well as in the further advancement of the upscaling toolkit with the integration of a local energy system governance analysis and a replication guide. Energy transition pathways were jointly developed with municipalities (quantification and visualization of local challenges related to energy transition and development of potential routes to enable the achievement of sustainability targets). In addition, local authorities have worked to finalise the preparation of their smart grid pilots for testing innovative energy models, smart services, and advanced low-carbon technologies. Overall, work on pilot preparation and/or implementation progressed very well.

ProCirc: 11 beneficiaries from 6 countries (NL, FL, SE, UK, DK, and NO) experiment to learn how circular economy and procurement can benefit the region. To fully benefit from circular opportunities and to contribute to the international development of circular economy, ProCirc will conduct 30 pilots to demonstrate procurement opportunities. Each pilot aims to reduce 20–25% raw materials, waste and CO2 emissions. Insights and tools regarding specific sectors

like construction, furniture and ICT will be disseminated in the North Sea region by creating an active transnational network on the topic.

In 2021, the project actively engaged with procurement organisations through the 30 active pilots that were reached in the period and with many supply chain stakeholders through the 18 Communities of Practice (CoP) and the sector specific exchange at transnational CoP meetings (focus on Circular ICT). Highlights from 2021also include thorough progress towards key project outputs, including updates of the ProCirc toolbox with new tools and functionality and accompanied by publicly available pitches about tools, organisation of multiple internal workshops to align and prepare for the Minimum Circular Requirements based on a "procurement journey" and several structured interviews with pilots to capture knowledge for an opportunity mapping around circular procurement.

EMPOWER2.0: 15 beneficiaries from four NSR countries (BE, DK, NL, and UK) are addressing entry barriers to citizen-led energy transition in the NSR. Citizens encounter significant challenges (governance, technical, legal, financial) in playing an active role in the energy market. Empower2.0 will create a framework to remove these barriers through empowerment of "prosumers" (citizens or social structures that produce as well as consume energy) and local energy communities.

In 2021, saw the completion of the White Book which investigates and maps what drives or hinders the transition towards a renewable energy system with citizens and local civil society as active prosumers. Suffering from the pandemic in particular, the project has finally gained momentum in implementing activities, deliverables (especially the pilots), outputs and results. More results will be available in 2022.

OESA brings together 13 beneficiaries from 6 NSR countries (DE, NL, UK, SE, NO, DK) to create an accelerator programme for SMEs in the marine energy sector. OESA partners work together to develop new services to support accelerated deployment of ocean energy parks in NSR. This is the first project building an alliance between the Nordics and North-West Europe. The partnership will realise the deployment of 5 pilots during the project that will increase the installed ocean energy capacity with 30% and reduce 100.000 tonnes CO2 emission. In addition, OESA engages policy makers, offshore companies, and investors to realise even more deployments.

The focus of the OESA project for the first half of 2021 has been on stakeholders. The aim was to showcase the potential for collaboration between with other renewable sources. Further all partners have continued their acceleration work on the 4 pilot technologies through hydrodynamic testing as well as modelling work. The Scale-up Service Offer, which is the one of main project objectives, was further developed and applied to the 4 pilots. The Lead Beneficiary DMEC organized an interesting meeting at the Dutch Parliament giving Members of Parliament the opportunity to have a virtual experience the offshore renewable energy sources.

SoilCOM: brings together 12 beneficiaries from 5 NSR countries (DE, DK, NL, BE and UK) to develop and implement new quality compost products for specific uses, as economically and environmentally effective soil improvers. The project aims to increase the demand for compost and enhance the recycling of biological waste suitable for composts as part of the

growing circular economy. The project also involves a governance element and wants to provide NSR authorities involved in biological waste, compost, and water management with tools to regulate and administer the sector.

The project submits only 1 report per year. Therefore, there is currently no written update of what has been achieved in 2021. Nevertheless, the project has been extended, so the new end date for the project is June 2023. At the end of 2020 there were joint efforts on compost sampling and analysis (physical, biological, chemical, pollutant properties) at selected compost producers and plans have been made for testing of the effect of these composts on plant growth in pot trials (one conducted successfully at AU and two more coming up in 2021).

Trans-regional collaboration took place with a variety of public and private stakeholders on compost quality assessments, waste and compost inventories, and exchange of knowledge and compost samples.

Information on compost production, quality and use was disseminated to many farmers and producers through SoilCom newsletters, advice, website, YouTube films and demos from SoilCom activities across the regions.

NON STOP: 8 beneficiaries from four NSR countries (DE, NL, BE and DK) are working together to implement a green smart digital transition in the management of North Sea Region ports. This will be achieved by introducing, testing, and monitoring intelligent technologies and processes in the storage, deployment, sharing and transmission of data related to marine conditions, sea/landside operations and energy production / consumption / distribution in ports. The goal is to reduce by 10% the time of pre-defined logistical / maintenance port operations and lower by 10% the port energy and pollution by building on collaborative expertise and joint practice.

One of the highlights in 2021 was the installment of a smart shore power plant in the Port of Korsør. The shore power plant makes it possible to supply electricity to 80% of the ships that are entering the quay. It is not possible with full coverage for the simple reason that some ships are too old to receive the shore power. The onshore power plan has capacity for two ships and two electric cranes. Therefore, in the long term, the plan is to replace the port's two diesel-powered cranes with a crane that runs on electricity. The potential for green shore power is enormous.

WASP 15 partners from all seven NSR countries (NL, DE, BE, UK, DK, SE, NO) are working together to accelerate the uptake of hybrid wind assisted ship propulsion (WPT) on sea in the North Sea Region. In 2021, the pilots gained momentum. 4 out of 5 pilots are now in place – the pilots have focused on the following technologies: Ventifoils or 'suction wings'; wings sails (rigid) and flettner rotors. The latest example was Rörd Braren who became the fourth partner to install their chosen wind-assist system on board their MS Annika Braren, a newly built 86-meterlong. 5,035 dwt multi-purpose freighter, part of the Rörd Braren fleet.

Circ-NSR 9 beneficiaries from 6 NSR countries (DE, BE, NL, NO, DK and SE) aim to bring the North Sea Region on a path to a stronger Circular Economy by supporting better Circular Economy governance structures. It has managed to attract some public interest as the Head of the Swedish Representation of the EU Commission Christian Danielsson visited the project at RecoLab in Helsingborg in December 2021. He took an interest in the unique recycling sewage system in the Ocean harbour. The project was also towards the end of 2021 finalising

a major change request where the lead beneficiary was changing from Denmark to Belgium. This major change will be approved in 2022 which means that more results also will be available in 2022.

Stronghouse: 14 beneficiaries and 5 sub-partners from 6 countries (DE, BE, NL, UK, DK, and SE) are working together to change the attitude and behaviour of individual homeowners and neighbourhoods. The aim is to adjust and redesign these measures based on a better understanding of the drivers that motivate homeowners – individually and on a neighbourhood level - to invest and reduce the environmental footprint of their homes. Together these redesigned measures support homeowners in their journey from initial interest, to planning, financing and contracting energy renovation. Therefore, the partnership has been set up to address and develop support measures that lead to lower costs and thus make energy renovation more affordable.

In 2021, Stronghouse continued its work on Persona's and insights in the experience of target groups. Especially relevant here are the insights in energy poverty and the user experience of digital tools. Results from analysing existing practices and their impact were being made available through the Stronghouse e-learnings. User-stories based on the homeowner perspective have helped Stronghouse partners to identify room for improvement of current support measures and to start the targeted development of missing support measures. Additionally, the partners designed instruments, neighbourhood approach, market access and adoption strategies (e.g., green finance tool, e-learning modules, EPC strategy, heat transition maps and a strategy to reach out to vulnerable homeowners). Finally, pilots' preparation was initiated, including preparations to involve target groups (e.g., presentation of *Stronghouse Best practice Sonderborg* at a national CONCITO workshop).

3. Sustainable North Sea Region: Protecting against climate change and preserving the environment

(This is a continuation of the text provided in the SFC under this heading):

Result targets and achievements:

Call #	Project name	Result description	Quantified target	Achievement through 2021
1	BwN	Climate change resilience increase at target sites.	10 %	229 %
		New catchment areas managed using shared BwN techniques as a result of the effectiveness of project demonstrations, based on Building with Nature principles.	550 km^2	10938 km^2
		New coastline plans using shared insights, designs and demonstrations of the effectiveness of the methods of Sand Nourishments, based on Building with Nature principles.	700 km	7800 km
1	FAIR	Increase in the number of functions of the targeted infrastructure in comparison to current mono functions	2 # of functions	2 # of functions
		Reduction of life cycle costs of flood protection infrastructure	5 % decrease	5 % decrease
		Increase in the lifespan of targeted infrastructure	5 % decrease	5 % decrease
1	NorthSee	Reductions of time spent on application procedures for interconnectors and transboundary EIA procedures	36 Months	-
		Avoidance of stranded investments for application of wind farms in designated shipping routes, and of sunk costs for development of unsuitable environmental areas	60 Mio. €	-
		Cost savings by exchange of data	300.000 €	-

1	TOPSOIL	Water quality. Improvement of quality by 20%.	25%	27%
		Water quantity. Improvement of buffer capacity by 20%.	25%	33%
		Water quantity or quality (extension pilots)	10%	-
1	WaterCoGovernance	Long term cross sector commitment (sustainability) to co-governance in pilot areas	3 years	3 years (final result)
		Increased return on public investment by adopting participatory/ co-governance approaches to management of NSR ecosystems	20 % increase	20 % increase (final result)
		Improvements to the environmental status of pilot areas	15 % increase	15 % increase (final result)
2	BEGIN	Reduced probability of floods from extreme rainfall	30 %	55,91 %
		Reduced expected impact from flood events in NSR by 2020	9 Mio. €	45,1 Mio. €
		Increased long-term financial performance of investments, including social, environmental and financial benefits	430 Mio. €	366,96 Mio. €
2	FRAMES	Resilient authorities: Increase the awareness, capacity and policy drivers for public authorities and practitioners to taking action to reduce the impact of flooding	2 scale increase from baseline; aggregated improved resilience level for 13 flood prone areas measured by increase of average capacity on a scale from 1 to 10	0,5 (final result)
		Resilient areas: Achieve an improved level of resilience against the impact of flooding in areas	2 scale increase from baseline; aggregated improved resilience level for 13 flood prone areas	0,7 (final result)

			measured by increase on 1 to 10 scale	
		Resilient communities: Achieve an improved level of resilience against the impact of flooding in at-risk communities	432 stakeholders and 2800 inhabitants have an increased level of self-efficacy and resilience in case of flooding through empowerment of inhabitants and sustainable coalitions	432 (final result)
2	NuReDrain	Direct reuse of P-containing filter material as fertilizer	20 %	30 %
		N removal in demonstration sites	80 %	80 %
		Regeneration of P saturated filter material	75 %	
		P removal at demonstration sites	80 %	68 %
2	PARTRIDGE	Increased capacity to improve farmland ecosystems across NSR	100 %	60 %
		Farmland ecosystems improved	30 %	10 %
2	Sullied Sediments	Reduced economic cost of disposal of dredged material	10 %	1 % (final result)
		Reduced level of selected watch list chemicals in outflow from waste-water sites piloting spore technology	25 %	10 % (final result)
		Reduced level of selected watch list chemicals in inflow to waste-water sites in catchments piloting behaviour change activity	20 %	1 % (final result)
3	CANAPE	Carbon captured	1640 tons of CO2-eq/year	79 tons of CO2-eq/year

		Profit per Hectare	2089 €	-
		Reduction in flood risk	228600 cubic meters of water per year	3000 cubic meters of water per year
		Conservation Saving Achieved per hectare	500 €/ha	-
3	CATCH	Reduced costs from flood events due to extreme rainfall	30 %	10 %
		Reduced probability of floods due to extreme rainfall	30 %	15 %
		Increased awareness of the need to accelerate the formulation and execution of water sensitive climate adaptation strategies in midsize cities	2000 people	14600 people
3	JOMOPANS	Promoting ecosystems services: Proportion of the North Sea for which underwater noise can be managed	90 %	-
		Promoting ecosystems services: Potential for management to reduce the area adversely affected by underwater noise. The capacity to identify and validate measures to reduce the area adversely affected by ambient noise will be built	10 %	-
		Cost reduction	50 %	-
5	IMMERSE	Increased potential delivery of measure benefits, resulting from advances in measure development during the project	25 %	30%
		Increased stakeholder acceptance of measure designs and subsequent implementation	25 %	-
5	North Sea Wrecks	Increased capacity of key stakeholders for sustainable & efficient management of the North Sea, reducing the risks	14 uptake of management measures by key stakeholders as	-

		associated to wrecks, munitions, related pollution and hazardous substances for human-being, life species and blue growth options	a part of a holistic assessment of mitigation options for shipwrecks and dumped munitions during user testing (2-4 scenarios x 3 locations)	
		Improved coordination between the relevant NSR actors and stakeholders, especially for cross-border and transnational agreements, such as OSPAR or providing relevant portals (EMODnet) with decision-relevant data	5 number of national policies (regulations, initiatives, strategies) influenced by the project thanks to the input provided (1 by participant country (NO,DK, DE, NL, BE))	-
		New knowledge used by stakeholder organisations about risks of hazardous substances – better access to knowledge & information: 1. improved access to existing data, 2. providing missing eco-toxicological data 3. applying data for decision support	25 number of square miles with sensitivity indicators, where the inventory and comparable data about risks of hazardous substances in selected/ representative North Sea sub-regions are used (4 pilot studies x 5 square miles = 20)	-
7	C5A	Increased number of multi-benefits (functions / services / outcomes) delivered	3 No. of additional functions of the targeted infrastructure / system	-
		Improving long-term risk reduction for less whole life investment	5 Benefit-Cost Ratio (BCR) of the investment in flood protection, in	-

			percentages of increase	
		Increased adaptability of flood management approaches	3 No. of additional adaptation pathways available to the decision maker to choose from	-
7	GEANS	Improved transnational environmental health assessment	8 competent authorities	-
		Increased time-efficiency	60 %	45 %
		Cost reduction	40 %	27 %
9	BEESPOKE	Increase in crop yield or quality on the demonstration sites	10%	-
		Increase in pollinator diversity compared to the baseline on each demonstration site	10%	-
		Pollinator conservation and crop pollination actions adopted by responsible agencies across the NSR member states	7 number of NSR member states	-

The following provides an overview of the projects, their stages of implementation and expected results:

BwN - Building with Nature has 13 beneficiaries and two co-beneficiaries from seven countries (The Netherlands, Norway, Germany, Sweden, Flanders, Denmark, and the UK). The overall objective of the project is to make coasts, river estuaries and catchments of the region more adaptable and resilient to the effects of climate change. To achieve this, aim the project wants to demonstrate "Building with Nature" solutions that utilize natural processes to deliver flood risk and coastal erosion management whilst enhancing ecosystem related services.

Using 18 living laboratory-pilots on the technical aspects (geomorphology, biology etc.) followed by endeavoring socio-economic and governance aspects, BwN led to a great number of products, e.g. the first transnational co-analysis and source pathway receptor approach of the eastern North Sea Coast was produced, the potential of BWN has ended in a partnership between the Danish Ministry of Environment and the Coastal Authority and a dedicated fund of 8M Euro to show how coastal towns in Denmark can use BwN to adapt to climate change, or a framework for the appraisal of nature based solutions projects, just to mention the main ones.

The overachievement of the planned results is self-explanatory and indicating that the project contributed to a more climate-resilient North Sea region in general. In 2020 a Policy Brief on

nature-based solutions was produced in favor of making the NSR more climate resilient. This Policy Brief was picked up by several high-level institutions and it has been disseminated through EU DG Regio to other DGs (DG Environment, DG Climate, DG Mare) as well as the CPMR (Conference of Peripheral Maritime Regions). This year there was also an opportunity to present the findings to the DG Environment Working Group Floods.

For the CPMR North Sea Commission Energy and Climate Change group the project produced the "Climate change adaptation and the North Sea Commission" paper in cooperation with the Interreg North Sea Region projects Topsoil, Frames, Fair, Catch, Begin, Canape and C5a.

2021 was the final year of the project and its final report has been submitted and approved. Building with Nature is a project the North Sea programme is proud of, delivering much more results than planned at the project start, triggering many valuable take-ups by relevant organisations (as highlighted above). The project was also a success from financial management point of view, using more than 98% of the available funds.

FAIR - Flood defense infrastructure Asset management & Investment in Renovation, adaptation, optimisation and maintenance has 12 beneficiaries and one co-beneficiary from seven countries (The Netherlands, Norway, Germany, Sweden, Flanders, Denmark, and the UK). The overall objective of the project is to reduce flood risk across the North Sea region by demonstrating climate change adaptation solutions to improve the performance of flood protection infrastructure. 2020 was the closing year for the projects and therefore a very intense period for all partners. Project partners met several times to coordinate project activities and to elaborate on the main outputs of the project. The project's final report was submitted at the end of the year and processed and approved in early 2021. All the planned result targets were achieved. By its closure the project gave a state-of-the-art approach of risk-based asset management of flood defense in relation to the future challenges like climate change, end of lifetime of vital assets and limited resources to adapt these assets.

The main outcomes and benefits from FAIR included; a review of existing asset management practices and asset management processes for flood protection and flood risk management; formulation of a framework around which asset management can best be planned and delivered (the FAIR Framework) and recommendations for policies that can help to deliver this in a Policy Brief

Reviewing the application of the framework in FAIR pilot projects, it has been proven that the use of the framework can help to ensure that flood protection assets are designed and used to be as multifunctional as possible, that there can readily be reduced life cycle costs of at least 5%, and a typical prolongation of the lifespan of targeted infrastructure by at least 5%. There are many challenges for asset managers, including how best to deal with single assets in the context of a network of defense. The FAIR project outcomes demonstrate that a risk based quantified approach needs to be used for adaptive asset management.

In 2021, some of the project partners were organizers - together with other EU co-funded project partners – of follow-up meetings, also reflecting on the relevant parts of the year's climate summit in Glasgow. The focus of this follow-up meeting was to identify the further tasks and directions in the subject of asset management, creating even more resilience in the region. The programme representatives are invited and attending those meetings, also looking at future opportunities in transnational cooperation.

NorthSEE - A North Sea Perspective on Shipping, Energy and Environmental Aspects in Maritime Spatial Planning, with 12 beneficiaries from 7 countries *(*Germany, the Netherlands, Norway, Sweden, Belgium, Denmark, and the UK), the project is the frontrunner in achieving greater coherence in Maritime Spatial Planning (MSP) and in Maritime Spatial Plans across the North Sea region (NSR). NorthSEE focuses on the fields of shipping, energy, and environmental protection. The project is promoting sustainable development for the marine space, while also balancing environmental, economic, and social objectives.

The project published the official "NorthSEE Interim Findings" brochure in 2020 and continues to support important transnational initiatives on MSP, such as the Meeting of Representatives of the North Sea Maritime Spatial Planning Authorities, as well as a few individual sector activities. The "NorthSEE Interim Findings" report provides an overview of the main interim project results with more details to be found in the referenced main reports. It is designed for planners, sector and regional stakeholders and experts. Findings will hopefully inform the discussion on how to continue transnational cooperation in the future.

The project was able to continue to support important transnational initiatives for shipping, as well as overarching MSP planning, by bringing together relevant experts from across the NSR to translate NorthSEE project results into planning practice for shipping andto strongly support the newly set-up Meeting of Representatives of North Sea Maritime Spatial Planning Authorities. The latter is an informal cooperation of national planning authorities within the NSR which has been started in 2019 and lead to the additional meetings in 2020. Both initiatives are strongly supported by NorthSEE and its project partners. Most recently, the project enabled a few high-level transnational initiatives on MSP and related sectorial activities, such as the North Sea MSP Collaboration Group.

NorthSEE is going to continue to work on transnational cooperation in MSP until March 2022 to continue the facilitation of greater coherence in MSP and to support the implementation of the MSP Directive (2014/89/EU) for a strong and healthy North Sea. In 2020 a new lead partner, University of Oldenburg, took over the tasks of the lead beneficiary and proved to be an engaged and competent to move forward and facilitate project activities.

TOPSOIL - Top soil and water - The climate challenge in the near subsurface, implemented by the partnership of 20 beneficiaries and 4 co-beneficiaries from 5 countries (Denmark, Germany, the Netherlands, the UK, and Flanders), aims at the joint development of methods to describe and manage the uppermost 30 meters of the subsurface, in order to improve the climate resilience and protect the environment of the North Sea Region.

In 2020 many pilot activities were successfully finalized and several of the project objectives were formally achieved. The original project ended in April 2020 and a preliminary Final Report has been published on the webpage. Given the need for more work on climate change adaptation in groundwater management, the project applied for and was granted an extension until December 2021. As continuation, numerous local, regional, and national meetings and events have been organised in all regions aimed at ensuring the right stakeholders are involved in the development of the pilot aims and activities. Even though the efforts in many pilots have been concentrated on analysing and summing up results of TOPSOIL, investigation methods and models have been further tested and developed in few pilots.

Partners started new activities in 2020, addressing the two objectives of the extension. The new focus is on balancing between seasonal extremes and its impact on groundwater issues

which are expected to increase due to climate change. Further, the partnership is also putting extra efforts into capitalisation of the project results. A major success in terms of innovation and capitalization is the tTEM system, developed in TOPSOIL by Aarhus University. In 2020, the tTEM system was redesigned into a smaller and more mobile system, able to acquire data in more difficult terrains. There is now a high demand for tTEM surveys all over the world.

New farmers were involved to improve soil management and groundwater protection. Activities combined demonstrations on appropriate land management with governance issues. The project also continued to establish and strengthen connections to other projects and transnational stakeholders.

The project finished its implementation on 31 December 2021 and now preparing its final report. In the final report it is expected to receive exciting results from the newest tTEM data collections on one hand and to read the actual take-up of the project results, together with the outcomes of the planned policy week.

WaterCoGovernance – Water Co-Governance for sustainable ecosystems is comprised nine partners from five different North Sea Region countries (UK, DK, SE, DE and NL). The project closed end of 2021. Beneficiaries were working together to develop new solutions and technologies for delivering sustainable ecosystem management of the North Sea Region. The project has demonstrated through the adoption of new participatory, ecosystem service-based approaches that implementation and integration of different water management frameworks can be achieved at the same time as providing additional social, economic, and environmental benefits.

The last year of implementation was characterized by focusing on the last delivery of project activities. The results achieved by the project can be summarized across five themes. Firstly, co-governance structures in water management are needed to achieve strong multi-sector and wider civil society support which is essential for sustainable management of ecosystems. Secondly, securing and sustaining appropriate co-governance structures can generate a significant return on public investment. Thirdly, co-governance project activities have led to an improved the environment and its ecosystems. On top of that a greater ownership for protecting and enhancing the natural environment on a more sustainable long-term basis has been achieved. Fourthly, strong transnational cooperation during the project has enables greater change and project impact. Lastly, through project implementation a lasting impact has been achieved. WaterCoG has resulted in several spin-off projects in the UK, Denmark, and Sweden explicitly. The project managed to reach all output and result indicators as outlined at the start of the project.

BEGIN – Blue Green Infrastructure through Social Innovation includes 16 cities and research institutions from six countries in the programme area (BE, NL, NO, SE, DE, and UK). They use pilots to demonstrate how cities can improve climate resilience with Blue Green Infrastructure (BGI), involving stakeholders in a value-based decision-making process. The BEGIN project helps cities to overcome implementation barriers for BGI´s through Social Innovation (SI) that empowers multiple stakeholders to contribute to the design, construction, and maintenance of BGIs.

In 2021 the BEGIN project continued to implement project activities according to work plan. 16 BEGIN pilot sites already provided data to measure the impact of these pilots. Therefore,

impressive progress was made on the delivery of the result indicators. While pilots were measured, work on the pilots continued. During 2021 the work of 10 pilots was concluded and work on the remaining 28 pilots continues according to plan.

Despite the effects of COVID-19, stakeholder engagement via Social Innovation (SI) continued to be a core of the implementation in this project – with citizens, NGO´s, students, companies, and policymakers being involved in the design phases. The successful Social Innovation and dissemination is the consequence of good communication and engagement. Social media tools, public publications, websites, leaflets, and posters were used frequently. A public report has been published with the title "Delivering Blue Green Infrastructure through Social Innovation – Evidence from the pilots in the 10 BEGIN cities".

The City2City Learning and Action Programme was continued but in an online format. Several exchanges took place between BEGIN beneficiary cities and external organisations (including ICLEI). More than 7000 stakeholders were engaged since the beginning of the project.

Since the project will be ending in January 2022, one of the activities during 2021 was also the organization of the final conference that took place in a hybrid format in Dordrecht in October 2021.

FRAMES – Flood Resilient Areas by Multi-layEred Safety is comprised of 16 partners from five countries in the programme area (NL, BE, DE, DK, and UK). More frequent and severe flooding due to climate change is one of the most significant risks for the North Sea region. The project closed in 2020 as one of the priority 3 projects. FRAMES aimed to reduce the effects and impacts of flooding and reduce recovery time through enhanced resilience of flood prone areas and communities in several selected target sites.

The project succeeded in reducing the impacts of floods and increased response capacity in all 15 pilots. The FRAMES partners combined their knowledge and experience to test, demonstrate and validate the MLS concept by developing helpful tools and creating a large involvement of stakeholders. It was proven that an integrated approach (affecting all four layers of MLS) is sustainable and effective on the short and long term. Based on input of the pilots the knowledge institutes produced a series of academic articles, creating impact on a scientific level as well.

The results of the project led to invitations for presentations on a European level, a presentation at the Floods Directive Working Group (DG Environment) in October 2019 and a workshop during the joint event of the Interreg NSR projects Fair, Building with Nature and C5a in May 2020. The results of the FRAMES project have already been incorporated in other EU projects. Finally, partners will continue disseminating FRAMES results, even after project closure.

NuReDrain – Nutrients Removal and Recovery from Drainage Water consists of eleven partners from three different North Sea Region countries (BE, DE, DK. The North Sea region is recognized as an intensive farming area and nutrient inputs from land have resulted in eutrophication in rivers, lakes, estuaries, and coastal zones. The NuReDrain project aims at developing a technology for trapping phosphorus and nitrogen in agricultural waste streams such as drainage discharges and greenhouse effluents. The project wants to stimulate joint development of cost-effective filter technologies, targeting nutrients removal for different situations and regions, reuse the recovered phosphorus for agricultural purposes and eventually offer guidance to policy makers about implementation strategies.

During 2021 the removal of N was further investigated by applying three different kinds of filter. greenhouse effluent was treated with a DIY MBBR (= do-it-yourself moving bed bio reactor) filter. An average removal efficiency of 75% was achieved. Also, drainage water was treated with an MBBR. Average removal efficiency varied between 60-95%. The ZVI filter also resulted in a successful N removal being on average 94%. A mobile constructed wetland was installed along a ditch. N-removal is very low due to poor microbial community development.

When it comes to P removal, NuReDrain continued to investigate further into 4 different P removal technologies. Drainage water treated with the P filterbox achieved an 80-100% P removal. The associated filter material used is ICS (=iron coated sand). This filter material has also been tested for P removal in greenhouse effluent. ICS showed to be a very good absorbent as 99% P could be removed. A hydro separator and Water Care sediment filter have been trialed for sediment removal in Denmark, but the functioning is not yet optimal.

NuReDrain held workshops during 2021 to communicate to relevant stakeholder and there seems to be more requests from different stakeholder to carry out more tests. Therefore, the project applied for a call 12 extension request that was granted during summer 2021. It includes a longer lifetime and additional activities. The activities of the extension impacted in increased targets for all output indicators, two out of three result indicators. On top of that an additional result indicator was added.

PARTRIDGE (Protecting the Areas Resources through Researched Innovative Demonstration of Good Examples), which has 11 partners in four North Sea Region countries (UK, NL, BE, DE), is demonstrating how new best practice management solutions can improve biodiversity and ecosystem services by up to 30% in four years, and how these can be transferred across all regions of the NSR and the EU. The project measures are tailored to their flagship species, the Grey Partridge, because existing evidence shows that partridge-friendly measures benefit farmland biodiversity in general.

Since the beginning of the project around 70 farmers managed 8% high-quality habitats at all demo sites (PARTRIDGE flower mixes). Other measures include beetle banks, supplementary winter feeding (managed by hunters and volunteers), indirect predation management via habitat blocks. Legal lethal predator management were installed at six sites and electric fences were used to protect nests on two sites. Progress at all sites was monitored by using key indicator species and ecosystem services to prove that the measures work. These were compared with 10 reference sites where the same data was collected but no additional management measures took place. In 2021 a mid-term report about results was published for internal use, highlighting significant increases for some of the indicators already.

To inform key stakeholders (farmers, hunters, advisers, NGO´s, local, regional, national, EU and UK agri-policy makers & influencers), PARTRIDGE held 184 farm walks, informing more than 2700 people directly since project start. To ensure that the measures and approached find their way into policy across NSR, PARTRIDGE lobbied for the including of the measures into future national Agri-environment Schemes (AES). Key events included the national grey partridge symposiums in the Netherlands and in Germany, the EU Green Week, EU parliamentary intergroup meetings and 1:1 policy meeting. To inform the public more widely about the farmland biodiversity crisis and how to address is, the project run an intensive

media campaign, having reached an estimated 8,4 Mio. people so far via the printed press, social media, regional& national TV & Radio and direct engagement.

The consortium published and promoted four national in-depth stakeholder interview reports and held an online farmer/ hunter survey, which achieved 1700 submissions from across the NSR.

Sullied Sediments - Sediment Assessment and Clean Up Pilots in Inland Waterways in the North Sea Region consisted of 13 partners from United Kingdom, Germany, Belgium, and The Netherlands. They developed and tested new tools, procedures, and protocols to better assess, treat and prevent contamination from emerging pollutants in the sediments in our waterways. 2020 was the last full year of implementation and the project closed at the end of 2021.

This project focused on the sediments from inland waterways: their characterization in terms of chemicals present as well as any associated toxicities or wider impacts (including the new chemical watch list); a spore-based technology intervention to attempt to remove selected chemicals at wastewater treatment plants; and a citizen engagement initiative and intervention to prevent further chemicals from entering these waterways by influencing citizen's behavior.

The outputs of the project included an extensive database comprising data on ecotoxicity, chemical contaminants, sediment properties and biological community status that were gathered during 18 sampling surveys in three river catchments over the course of 30 months. The database and information about how to use it can be found here: https://northsearegion.eu/sullied-sediments/sampling-database/.

The project also launched a volunteer sampling programme called RiverDip, including a portable dipstick-sampler that measures phosphate levels in samples and an app that enables volunteers to share their results. The deployment of the RiverDip website greatly enhanced efforts to reach volunteers across the North Sea Region and was complemented by a virtual workshop in Belgium in October to engage with volunteers there who completed over 100 tests in the last 3 months of the project. By the end of the project over 300 measurements had been made, with the majority of new (100+) measurements appearing in the Elbe and Scheldt catchments. These were the result of engagement with waterway users within these regions via VMM (Flemish regulator), through the Flanders Anglers Group, and through engagement with the RiverDip website.

The analytical chemistry methods developed earlier were applied to activities, which includes the "Bioavailability" (of estrogens attached to SpECs) experiments. These results give preliminary indications of the potential of SpECs to 'tie up' estrogenic compounds in wastewater treatment plant effluent and render it less toxic.

In 6 sampling campaigns over the course of the project, 3 watersheds of presumably different chemical pressures were sampled at 3 sites each, within a time window of a few weeks. Sediments were shared among partners. More than 130 chemical substances were analysed, among these 3 watch list chemicals, 10 bioassays performed, and two biotic indices for community diversity derived. All data were compiled in a relational, now published database, which has provided the scientific basis for identifying the pressures on the different sites and for deriving a new biological effect-based assessment scheme that will reduce uncertainties for risk managers.

CANAPE - **Creating A New Approach to Peatland Ecosystems**, with 6 beneficiaries and 7 co-beneficiaries from 5 countries (The UK, Germany, the Netherlands, Flanders, and Denmark), aims at reducing CO2 emissions, increasing flood resilience, developing new wetland products, and restoring unique ecosystems in the North Sea Region, also through several pilots in the region.

2020 saw good progress made on a few project deliverables, and a few notable successes. 4 sites (Store Vildmose, Lille Vildmose, Hickling Broad, Barver Moor) saw construction work, with Barver Moor and Store Vildmose being converted from agricultural fields to pluviculture sites.

Alongside this, despite the disruption of the pandemic, the project reached out to 180 people in person, and put out 9 news stories. The project was recognised with 2 awards, a Green Apple International Environmental Reward, and the photo contest award from the North Sea Region programme. Alongside this, the project has continued to build relations with 3 other peat projects - CARE-PEAT, C-CONNECTS and LIFE Peat Restore. This has included joint workshops across the projects, and the preparation towards a joint conference with C-Connects in October 2021 is in progress.

2020 marked also the mid-point of the project, therefore a Mid-Term review was conducted, including initial carbon calculations for the project. Following the review, the partnership prepared and submitted a project modification, which allows CANAPE to expand its work to additional sites and make up for time lost due to the pandemic.

CATCH – **water sensitive Cities: The Answer to Challenges of extreme weather events** has 12 beneficiaries from six North Sea region countries (NL, DE, SE, BE, DK, and UK) that are focusing on the redesign of urban water management of midsize cities to become climate resilient cities.

During 2021 CATCH managed to finalise the web-based tool and the roadmap. They will support mid-size cities in their challenge to become climate adaptive. Furthermore, final reflections took place on the finalized CATCH pilots, based on the use of the web-based tool. This resulted in a report with recommendations for all pilot partners and a report with recommendations for effective use of the web-based decision support tool to become a water sensitive city.

Three pilot sites finalized their implantation during 2021. Zwolle developed and tested the garden battle as an online serious game, OOWV finalized and inaugurated the traffic control system in Oldenburg and VMM completed the designs for the Kleine Nete valley I Herentals. Vejle already finalized the pilot activities earlier than 2021 but during summer the celebrations of the inauguration of the park took place.

Also, the last strategies were finalized. Arvika finished their local climate adaptation strategy. Zwolle finalized their strategic monitoring action and the translated version of the adaptation strategy of Zwolle. As more regional and national beneficiaries have another role in climate adaptation strategies, the beneficiaries chose different approaches to use the CATCH lesson learned in an optimal way for strategic planning. Värmland used the cases in Arvika and Norfolk to make a storymap as a climate service for other municipalities in Värmland. Overijssel used the CATCH+ spin off project to offer CATCH lessons learned and tools to support other municipalities in the development of their climate change adaptation strategies.

VMM will use the CATCH lessons learned and the water sensitive cities principles in the development of their climate portal that aims to support local authorities in future.

The project applied for a call 12 extension request that was approved during summer 2021. It includes an extended lifetime and additional activities which will support the additional needs of mid-size cities and will contribute to the development of a range of learning networks.

JOMOPANS - Joint Monitoring Programme for Ambient Noise North Sea, with 11 beneficiaries from 7 countries (The Netherlands, the UK, Germany, Belgium, Norway, Sweden, and Denmark), is recognised as a leading project on underwater noise monitoring in the North Sea.

The results of Jomopans are being discussed in the OSPAR committees EIHA and ICG Noise and in the EU Technical Group on Noise. The project works closely together with the JONAS project that focusses on the Atlantic region and with INTAROS on the Arctic seas.

By the end of the project sound scape maps will be presented in a GIS management tool. Marine managers can use this tool to evaluate the ambient noise levels in the North Sea and their spatial distribution. Based on this information measures can be defined to reduce the pollution by underwater noise. In the last year of the project all elements will come together. The results will help implement noise monitoring in the North Sea, but they will also help to define monitoring in other sea regions.

Originally, the project would have been ended in June 2021, but due to a successful extension application the project continues its measures for one more year, until mid-2022. The focus though in 2021 was to finalize the activities of the original project and deliver the remaining outputs and results. All major deliverables were ready by 30 June 2021 and all reports have been published the the Jomopans website.

Jomopans partners have organised a successful final event, which was held on 10 June 2021. It was attended by more than 100 people. The results of the Jomopans project are summarised in an *End Report*, which contains links to all underlying technical reports of the work packages, that are available on the website.

The results of Jomopans were used to draft a first time ever assessment of the environmental status of the North Sea with respect to ambient noise. This assessment will form the basis for the OSPAR Quality Status Report and the EU MSFD reporting.

Together with topics to safeguard the legacy of Jomopans, the project aims in its one-year extension period:

-to evaluate the effects of the pandemic on underwater noise due to a reduced shipping activity

-to extend model and measurement analysis, elaborating on aspects that were out of scope for the original Jomopans, the extraction of statistical parameters from the measurements and the improvement of AIS (Automatic Identification System), one of the major input data sets for the modelling.

- to take care of many valuable results that need to be preserved and to be made available to a large community. The measurement data will be archived and disseminated through a database at the International Council for Exploration of the Seas (ICES). The project has contributed to the design of the database that has been commissioned by HELCOM (regional

sea convention for the Baltic). Also, the management GES Tool that was developed by Jomopans will hold all the soundscape maps made in Jomopans. This tool will be integrated in the OSPAR Data and Information Management System (ODIMS) in close co-operation with the OSPAR Secretariat.

IMMERSE - Implementing Measures for Sustainable Estuaries 11 beneficiaries from 6 countries (Flanders, the Netherlands, the UK, Germany, Sweden, and Denmark) collaborate on sharing knowledge and experiences on stakeholder engagement and estuary governance, which resulted in the publication of the first project outputs in 2020:

- the results of a stakeholder mapping exercise, designed to inform partners about key types of stakeholders to engage
- a report on improving stakeholder integration, based on an analysis of past experiences

Both outputs set the stage for further engagement with estuary stakeholders, which is a key project objective.

Media coverage in this period focused on work done by Chalmers University to develop a new integrated assessment tool for improved management of contaminated sediments. A scientific journal article and subsequent press release was covered by several Swedish media channels.

In 2021 the IMMERSE partnership continued the advancement of measures development and realized several achievements, despite the continuous COVID-19 pandemic. The project has organised the third and the fourth Transnational Estuary Exchange Labs (TEEL) in this year. The main themes of this TEELs were 1) local flood protection strategies, in particular the regional approaches to coordinating the development of local flood protection strategies and technical modelling approaches to develop and test flood protection solutions and 2) ecological restoration and habitat creation with a focus on the Humber and Tees estuaries in the UK and how IMMERSE measures can contribute to habitat creation.

Other notable progress made on the IMMERSE activities during PR5 included the publication of the terms of Reference for the Interactive Communication Tool as well as the kick start of the Stakeholder Survey activity, which will assess stakeholder acceptance of the IMMERSE measures.

IMMERSE is continuing its activities as a results of a successful extension application. The project aims to explore potential solutions for microplastic pollution in estuaries and identify sustainable sediment management strategies to deal with sediment-bound pollutants.

North Sea Wrecks (NSW), consisting of nine partner organisations from five NSR countries (DE, BE, DK, NL, and NO), is developing and implementing a common approach for facing economic, environmental and safety challenges caused by existing ship and aircraft wrecks, lost cargo, and munitions to improve the sustainable management of the North Sea ecosystem. The consortium will generate and share information about the location of the polluting and potentially dangerous items and assess and prioritize their risk. This will strengthen the capacity of key stakeholders as well as promote the North Sea as a safer space for new business opportunities for a better use of natural and maritime resources (as for example blue growth activities).

One objective of the projects is also to define transnational policy recommendations to address hazards. In addition, the project wants to preserve cultural and historic heritage by developing the travelling exhibition "Hazardous Waters". The exhibition is part of a sensibilization campaign to raise awareness and social acceptance for the problems arising from wrecks and dumped munitions.

NSW was granted a call 12 lifetime extension during summer 2021, which included a longer lifetime as well as additional activities. 2021 was again subject to COVID-19 restrictions. The restrictions mostly affected the planned research cruises, especially the German expedition. Expeditions in Denmark, Belgium and around Terschelling could however take place and deliver important results for the risk assessment tool. Sample analysis was also slow but good results were discovered with impacts on the marine food chain.

Initial contacts with the European Food Safety Authority (as planed in the call 12 extension) did not achieve much response. This is a tricky situation because the additional work package that was been granted as part of the call 12 approval focused on the marine food chain model under North Sea conditions. The project will continue to build contacts with the European Food Safety Authority to have an impact. Despite the obstacles, work on the decision support/ risk assessment tool (WRECKNS) continued as planned. So far, the decision support tool is a prototype in a restricted version online but University Chalmers and EGEOS and Periplus are cooperating to develop the tool further.

NSW is successfully communicating about the project achievements. The project received again a high level of media attention. As a result, an expert network was developed over the last years. The cooperation with OSPAR and contacts with the Environmental Impact of Human Activities committee (EIHA) was extended in 2021.

Finally, the Travelling Exhibition was adjusted to COVID-19 circumstances, further developed further, and had its premiere in 2021.

C5A - Cluster for Cloud to Coast Climate Change Adaptation has ten partners from all seven North Sea Region programme countries who are cooperating to respond to the challenge of climate change. C5A will deliver a from 'Cloud-to-Coast' (C2C) approach to the management of flood risk. The whole-of-system approach will integrate four constituent systems (catchment, coasts, cities, infrastructure networks) and enable the development of multifunctional and adaptable solutions that deliver more sustainable, integrated, and multifunctional solutions across the NSR. To do so, the project will build upon the outcomes of seven ongoing Interreg NSR projects to ensure our approach is both evidence-based and practical. The project will organise 7 case studies, 2 sessions with EU DGs and a high-level policy learning group. Project partners will reach out to local, national, transnational, and global networks to raise awareness and acceptance in- and outside the NSR. C5A builds capacity and support for the take-up of Cloud to Coast by relevant authorities and practitioners across the NSR, and beyond.

The project will be ending mid-2022. Therefore, the focus was on the delivery of the outstanding project activities and the achievements of the output as well as result indicators in 2021. Activities have been carried out on different levels. The Cloud-2-Coast approach continued to be developed in response to ongoing feedback from the case studies and the science team. Interaction between the science team and case study leads and wider stakeholders continued to underpin the co-evolution of the framework.

Most of the case studies (five out of seven) were completed their stakeholder workshops and were in the process applying the Cloud-2Coast approach. Stakeholders were encouraged to look beyond the status-quo and develop a whole system understanding of present and future risks and work collaboratively on solutions to adapt to climate change. On top of that, a maturity analysis was applied in the different case studies. The analysis is an instrument used to determine where the case studies are today and what is needed to achieve their climate adaptation goals. As the main delivery during 2021 the internal launch of the Cloud-2-Coast approach website can be highlighted. The Cloud2Coast website will be an interactive site, where the target group can get access to a toolbox and where the approach and the tools linked to it will be presented in an educational way. The website will also function as the platform for the delivery of several of the main deliveries.

GEANS comprises nine partner organisations from all North Sea Region member states (NO, SE, DK, DE, NL, BE, UK) that are cooperating in the field of ecosystem health assessment of the North Sea Region and will promote the shift from morphological species identification to harmonized genetic tools. The first step is to develop a reliable DNA sequence reference library, which will be complementary to traditional monitoring and allow continuity over time.

A set of pilot studies will be carried out by the project to implement genetic approaches into existing environmental assessment and management. Finally, the project will develop a decision support framework, which will facilitate the implementation of a transnational uniform DNA-based approach by all competent authorities. A harmonized genetic approach will reduce conflicts and create synergies and improve the environmental health assessment, as demanded by different EU directives. In addition, it is supposed to result in an increased time-efficiency by 60% as well as cost reduction by 40%.

In 2021 around 100 new sequences, belonging to 36 species, were added to the DNA reference library. It contains 57% (595 species) of the target (1035 key North Sea species). This is reflecting a small increase in absolute numbers but a huge increase in quality. Contaminated or incorrect sequences were removed through thorough validation. Also, due to museum collections, GEANS was able to get hold of many extra species (>60) to sequence. By that the number if missing species was decreased to 11%. This leaves 32% still to be sequenced during the next stages. Also, a harmonized laboratory protocol for DNA metabarcoding of soft sediment macrobenthos in the North Sea was released. This was validated by different labs across the North Sea (transnational ring test) and showed to be highly repeatable and very robust as well. Three pilots (hard-bottom, soft-bottom and Non-Indigenous Species (NIS)) to investigate implementation and applicability of bulk DNA metabarcoding for environmental monitoring are operational and run-in close collaboration with national authorities responsible for sustainable North Sea management.

The project was granted a call 12 extension request during summer 2021. GEANS has been granted more time but also additional activities. On top of the original pilots focusing on bulk DNA, eDNA (environmental DNA) pilots were initiated. For these pilots, eDNA from water samples are collected. This has the advantage that only one sample type is needed to cover different animal groups, so this could be an even faster and easier alternative for monitoring.

Finally, the project designed and developed an output website that will make the produced outputs available in an easily accessible way and that will include the decision support framework combining results of the different work packages.

BEESPOKE (Benefitting Ecosystems through Evaluation of food Supplies for Pollination to Open up Knowledge for End users) comprises 16 partners from six North Sea Region member states (SE, DK, DE, NL, BE and UK). Partners are cooperating transnationally to increase levels of pollinators and crop pollination at local and landscape scales by providing land managers and policy makers with the new expertise, tools and financial knowledge to instigate bottom-up change creating more sustainable and resilient North Sea Region ecosystems.

This is to be achieved by enhancing and improving non-crop habitats for pollinators, by creating more resilient ecosystems for pollinators and crops and by demonstration of improved habitats for pollinators and techniques for measuring pollination. In addition, the project will focus on stakeholder engagement, delivery and uptake of outputs and results to bring change in land management and policy.

The BEESPOKE project was granted a call 12 extension request during summer 2021. This includes a lifetime extension as well as additional activities (work on creating new demo sites, tools and knowledge for stakeholders and improving the legacy from the project). 2021 was a very active year. An annual flower mix for leguminous crops was established in Belgium. Four new flower-rich areas were established in fruit farms, two in Denmark and two in the UK.

BEESPOKE conducted the second year of investigations into the success of 27 new seed mixes targeted at supporting the types of pollinators needed by each crop type. The areas started to flower already and offered opportunities to evaluate their attractiveness to pollinators and impact on crop pollination. Investigations were continued in whether existing landscape features, such as hedgerows and other flower-rich areas were influencing numbers of pollinators and pollination in field bean crops in the UK, the Netherlands and Belgium. In addition, the dependency on insect pollination of 7 winter field bean varieties to pollinator visits was investigated in Belgium. University of Ghent completed the computer modelling that predicts and provides maps showing the expected levels of pollination for the whole NSR. A report was produced about the effect of an alternative mowing regime of alfalfa (as a bee-supporting measure on yield. Work also continued a report about agri-environment measures in each partner country that support pollinators. Even though a lot of progress has been made, COVID-19 limited the ability to conduct field-based events with farmers, although three were still held.

With a focus on communication, two new BEESPOKE branded guides were developed. The first one is "A Farmers Pollinator Survey Guide" and the second one has the title "Common bumblebees in the UK". The second guide will also be adapted and translated for the other North Sea Region countries. A draft was produced on "Nature based solutions to Habitat and Crop Management" which provides advice on best management practices for 16 habitats and which types of farm wildlife they support. Seven training videos were also produced.

4. Promoting green transport and mobility

(This is a continuation of the text provided in the SFC under this heading):

Result targets and achievements:

Call #	Project name	Result description	Quantified target	Achievement through 2021
1	SEEV4-City	Increase of real zero emission kilometers in the SEEV4-City Operational Pilots	150 tons CO2 emissions avoided annually	2786 (final result)
		Increase in energy autonomy in SEEV4-City sites	25%	2% (final result)
1	SHARE-North	New or improved shared mobility services	60	20
		Cars removed from public streets through car-sharing	10,000	1515
		Reduction of local and global transport-related emissions	66000 tonnes of CO2 saved during project lifecycle	50611
2	HyTrEc2	Reduction in the cost of hydrogen vans, large trucks and other tested vehicles	25%	10%
		Number of organisations and operators investing and integrating hydrogen technology	22	11
		CO2 reductions from tested vehicles including hydrogen boat and ground unit applications	18 kilograms per vehicle per month	0
3	#IWTS2.0	Number of companies and institutions realizing modal shifts by the end of the project period	4	5
		Long distance modal shifts from road to IWT in tkm until 2021	20,000,000 tkm	48.008.073 tkm
3	G-Patra	Additional passenger transport km using green transport solutions	100,000 passenger kilometers	105,802
		Demonstrate reductions in CO2 emissions from remote, rural and island transport using lighthouse projects and business cases	10%	0
3	SURFLOGH	Increased use of zero emission urban vehicles in last mile distribution	35 zero emission vehicles used in pilots	41

		Reduced conventional freight traffic in last mile by using bundling solutions or zero emissions vehicles	3.000 conventional trips saved by using consolidation options or covering by zero emission vehicles	4.407
		Increased volume handled, carried out and/or distributed by emission reducing logistics solutions	130.000 parcels handled by emission reducing solutions (e.g. consolidation, lockers, hubs) and vehicles (e.g. cargo bike)	233.704
5	MOVE	Reducing the use of private cars in local mobility streams	10% reduction of the number of single local private cars trips of target groups individuals	2%
		Increase in the usage of sustainable mobility solutions	20% increase in number of passengers	1%
		Increase social integration through mobility	20% increase of yearly travel in km using sustainable mobility solutions	1%
7	ART-Forum	Removing bottlenecks: Improved efficiency and safety in passenger and freight transport	50%	2
		Increased capacity of authorities in the NSR to future proof their transport strategies – 100 organisations	100 organisations	102
		Revised Transport Strategies	75%	1%
7	BITS	Reduction of CO2 emission thanks to cycling (instead of using other modes)	9%	0
		Increase in cycling use (kms) of commuters, students, school children and recreational cyclists within the project period	10%	0
		Realisation of a CyclingDataHub as an open platform to share cycling data in the North Sea Region	100 datasets	136
7		Relative increase in number of passengers in rural public	30%	0

	Stronger Combined (SC)	transport (implying increase cost coverage and profitability of public transport services)		
		Relative decrease in CO2 emissions per person-kilometer travelled using combined mobility services	20%	0
9	North Sea CONNECT	Cargo handling with sustainable modes	5% increase in cargo handling / shifting to sustainable modes	0
		Efficiency raises	5% cost reduction in sustainable modes	0
		Increased awareness of smart intermodality and comprehensive network	20 smart intermodality users/stakeholders	0
9	PAV (previously SUV)	Number of citizens in NSR that will benefit from the green transport training of urban developers within PAV	810000	95,070
		Value of public/private investments shaped by materials developed within SUV such as the open innovation community platform and the publications about socio-economic impact.	150 million €	0
		Reduced GHG emissions through the use of autonomous, shared and electric vehicle solution	50%	0
9	ZEM Ports NS	Total reduction in emissions of CO2, NOx, SO2 and particulates	7000 tonnes of annual CO2 reduction	0
		Expected reduction in the cost of port side energy and services during the project period	15% reduction in the costs of energy and port side services during the project	0
		Reduction in the cost of zero emission vessels	15%	0
11	AVATAR	Level of goods transported during the project	30000 kg transported goods	0
		CO2 reduction realized during the project period with zero-emission vessel, assuming one 20T operational vessel in the last year of the project	750 kg (CO2 saved)	0

		Level of automation for vessels smaller than 100 tonnes	2 Increased levels of automation (as defined in CCNR Resolution 2018-II - 16)	0

The following provides an overview of the projects, their stages of implementation and expected results:

SEEV4-City (Smart, clean Energy and Electric Vehicles 4 the City): 11 beneficiaries from 4 countries (BE, NL, NO, UK) demonstrated smart electric mobility solutions, integrated renewable-energy sources, and encourage take-up of both in cities. When SEEV4-City started, Vehicle-to-Grid (V2G) was still a largely theoretical concept and smart charging not yet pervasive. The goals were CO2 emissions mitigation, increasing ultra-low emission kilometers, increasing energy autonomy, avoiding grid investments, and making power grids compatible with an increase in electro-mobility and local renewable energy production. The project closed on 25 October 2020.

The consortium ran seven operational pilots. They tested the possibilities for sustainable urban mobility and energy plans (SUMEP), Electric Vehicle-for-Energy-Services (eV4ES), and business models for home, business, neighborhood, and city-scale solutions. These ranged from a single household, office buildings with multiple electric vehicles, a car parking garage, stationary batteries, and power parking at a football stadium, to large-scale public smart charging solutions. The SEEV4-City project consulted public and private stakeholders to create an extensive support base. The team then used the results of their pilots and research to recommend appropriate policies at local, regional, national, and EU levels. They also highlighted challenges, such as the regulatory and fiscal framework, the need for standardization and communication protocols, subsidy schemes and other incentives, as well as the need for awareness raising and further research. The team ensured knowledge transfer and exchange across stakeholder groups and projects, including educational materials.

SHARE-North (Shared Mobility Solutions for a Livable and Low-Carbon North Sea Region) with 10 beneficiaries from 6 countries (DE, SE, UK, NO, BE, NL) are contributing mobility hubs and discussions on lessons learned from the project partners active in this area have increased the knowledge of all project partners in the project and have led an expansion that goes beyond Bremen, Bergen, Flanders, and the Netherlands.

The Covid-19 pandemic continued to present challenges in 2021 which prevented the planning and attendance of physical communication events within the project but also with external stakeholders and citizens. Particularly the promotion of ridesharing was challenging and often not possible due to restrictions within the region. This period was also challenging for the business case of some shared mobility offers. However, the pandemic also presented opportunities for creative communication events and long-term strategic planning and quick action on other fronts. For example, during this period, the project provided on-demand transport to the vaccination centers for older people, all rides carried out by volunteer drivers. By the beginning of June 2021, the service had already provided 20,000 journeys.

The implementation of mobility hubs and the communication of the concept throughout the North Sea Region has continued to be success with several mobility hubs in the concrete

implementation stage. The communication highlight in 2021 was the Shared Mobility Rocks “Around the Clock” event on March 3-4th, 2021(www.shared-mobility.rocks). To avoid being just another online conference, the organizers decided to make a 24-hour around the globe shared mobility event.

As for specific achievements, the targets of the Carsharing Action Plan for 20,000 carsharing users and 6,000 fewer cars on the streets of Bremen were reached and celebrated in 2021. In Flanders, the Green Deal Shared Mobility was completed and achieved many of its goals. The goal to increase the number of carsharing members to 80,000 was exceeded by early 2021 and the goal to increase the number of bikes sharing members to 400,000 was exceeded with approx. 450,000 users as of June 2021. The results of this had a serious impact on accessibility and quality of life through regained space for people and improved environmental quality.

HyTrEc2 (Hydrogen Transport Economy in the North Sea Region 2) has eight partners from four North Sea countries (UK, SE, DE,and NL) who are exploring together how the conditions for hydrogen-fueled transport can be improved across the North Sea Region.

In 2021 the project continued the implementation of activities. Due to COVID-19, several activities had to either moved online or could not be carried out at all. Especially the communication activities had to be moved online. The project was promoted and has started its own "digital series" of online events in connection with the vehicle trials and the supply chain development and training. HyTrEc2 was also presented as part of the CPMR North Sea Commission activities.

Vehicle trials continued in 2021 but COVID-19 had also an impact on their delivery. Despite that, progress has been made in connection with the hydrogen boat which is part of the call 12 extension request by the project that was approved. Work on low carbon production, storage and distribution proceeded successfully worth mentioning are the activities in Groningen, Drenthe, Tromso and Aberdeen. Regarding the supply chain development and training, the University of Tromso continued to map the supply chain across the North Sea Region. Atene KOM distributed a skills questionnaire with contributions from across Germany, the Netherlands, Norway, and the UK to identify industry issues and where HyTrEc2 can add value.

#IWTS 2.0 (#Inland Waterway Transport Solutions), with 10 beneficiaries from 5 NSR countries (NL, DE, BE, UK, SE), aims at carbon emission reduction by promoting a modal shift from road to water. The project strives to develop solutions for minimum intrusion adaptations of existing, smaller waterways to make them accessible for Classification of European Inland Waterways (CEMT) standard vessels.

2021 marked the end the #IWTS 2.0 project. One of the most notable achievements was the real vessel (GreenWave) built by the project and which is located and functioning in the inner city of Ghent. Even after the project end, tests in Ghent continue.

The partnership explained that a notable outcome of the work carried out is the awareness created for the potential of IWT and for smaller and underused waterways. The demonstrate the feasibility of modal shift, the project attracted and engaged various stakeholders, such as waterway authorities, shipping companies, educational institutions, and freight forwarders. In addition, the project has developed numerous simulations as a testbed for further proofs of concept in terms of logistical concepts (green Wave/test Dairy factory Leeuwarden), as well

as for the test of future and enhanced waterways infrastructure (Waterways in around the Frisian city of Drachten).

The project has also been active in building the capacity for young professionals in the field of Inland Waterway Transport through a center of expertise. A training programme targeting future skippers was also developed targeting skills for navigating and use of smaller barges on waterways. The project has also created strong links to the EDINA (Education in Inland Waterways) network which disseminates the project results.

G-PaTRA (Green Passenger Transport in Rural Areas) has 12 beneficiaries and one co-beneficiary from Denmark, Flanders, Germany, the Netherlands, Norway, and the UK. The project aims to promote green transport and mobility by enhancing the capacity of authorities to reduce CO2 from personal transport in remote, rural and island areas by embedding more zero emission vehicles in rural transport systems and by improving, optimizing, and better integrating available passenger transport resources.

Despite the pandemic situation in 2021, the project continued its activities, highlighted by the following examples: The project's Norwegian partners have finalised the business case for green hydrogen production. Amt fur regionale Landesentwicklung Leine-Weser organized a virtual event attracting 140 participants, at which they presented G-PaTRA in co-operation with project partner Mpact from Belgium. A guide called 'Shared mobility off the beaten track' has been created by Mpact to inspire governments about shared mobility in rural areas.

The Aberdeenshire G-PaTRA pilot service continued but with pre-booked journeys only, under Covid-19 operational measures. The school related journeys were suspended for part of the period (due to the closure of schools in Scotland). The interactive passenger information facility at the main service hub is operational, due to the pandemic it is currently operated as a display only system though. Development of the Business Information tool by the Provinces of Drenthe and Groningen has been completed and a report will be written to document findings, conclusions, and recommendations. The HITRANS electric bus returned to its original route in September 2020 in line with the lifting of some Covid 19 restrictions and has since been running successfully.

The project has been granted with an extension of its lifetime by 18 months and its budget to carry out additional activities such as supply side demonstration that takes account of Institutional and operational inertia as a barrier to transferability and scaling up, demand led passenger transport innovation that reduces CO2 and enhances passenger journey making and learning from COVID and considering how we can reshape low carbon rural transport for the post COVID new normal.

SURFLOGH (Smart Urban Freight Logistics Hubs) has six beneficiaries from four North Sea region countries (NL, BE, SE and UK) that are focusing on the improvement of the role of logistic hubs in the structure of urban logistics. By investigating, evaluating, and implementing different actions, techniques, organizational forms and logistic tools, the goal is to increase the efficiency of last mile logistics between hubs and to stimulate green transport solutions.

During summer 2021 the SURFLOGH project got granted a call 12 extension request. The project got extended by 18 months and an additional focus was added. To be able to deliver the original project activities plus the additional activities that were granted as part of the extension request, SURFLOGH beneficiaries organized regular project meetings as well as a transnational conference in Mechelen in September. During the conference experiences and

achievements on stakeholder approaches and business models on bicycle logistics were exchanged.

Several project activities have been implemented and beyond the application form several activities have been carried out as spin-off projects. Some examples include: The pilot with the lockers in Mechelen expanded. The ecozone that was launched is in full practice and expanded further. Inspired by the pilot in Mechelen, Drenthe started a pilot project with parcel lockers installed on hubs for public transport. In April, Mechelen held a SURFLOGH zero emission working group. Further steps in the realization of the covenant were taken. The roadmaps and strategy report were finalized in draft and will be presented and shared with readers at the beginning of 2022. Along with Napier, SEStran carried out and completed all stakeholder interviews and produced draft case studies. A tender was published to realise an upscaling in the operation of a city hub and a zero-emission last mile.

On an overall level it must be mentioned that SURFLOGH has made impressive progress on the delivery of their output indicators as well as result indicators during 2021.

MOVE (Mobility Opportunities Valuable to Everybody) Eleven beneficiaries (including one local partnership) from five North Sea Region countries (NL, BE, DE, DK, and the UK) are developing and disseminating innovative, environmentally sustainable, and economically viable mobility initiatives through multidisciplinary co-creation, bringing together different stakeholder. The project will use local specificities to create practical solutions in four pilots based on unlikely combinations. MOVE supports the greening of the transport sector by offering solutions aiming at a reduction in the use of individual vehicles and by using alternative greener options. The overall objective is to enhance accessibility of small and middle-sized cities/ towns and their surroundings within the North Sea region.

2021 was the last year of project implementation because the project will close beginning of 2022. The year was again affected by the COVID-19 pandemic. Some beneficiaries and hence activities were more affected by others. For the beneficiary NHS several MOVE activities had to be put on hold for a while. In other cases, pilots had to be adapted, communication in general and meetings had to be moved online. However, several pilots made progress and others were finalized. As in the previous years, knowledge institutes provided additional support to the pilot partners to achieve the goals. The focus was much on usability and scalability; hence these aspects were considered when developing the blueprints and when working on the business models. Also progress on the whitepaper was made.

A project lifetime extension has been discussed with the secretariat. The official ending date will be end of August 2022 but in order not to lose momentum, MOVE would like to finalize project activities (including the delivery of the final conference) beginning of 2022. Especially during the last month of project implementation to focus on communication and capitalization efforts.

ART-Forum (Automated Road Transport Forum for the North Sea Region) has 14 beneficiaries and one co-beneficiary from 6 countries (Germany, Flanders, Denmark, the Netherlands, and the UK). The project's aim is to create a debating ground for local/regional authorities, address risks and opportunities and help guide policy development about the impact that automated transport could have on the road transport system and life in cities and regions of the North Sea Region.

After 1,5 year of the pandemic the situation has opened a little more in 2021, so the first hybrid and physical events of the project took place. Furthermore, the partners were trying to adapt their activities to the circumstances.

The autonomous public bus pilot in Aalborg is still changing the image of the district Aalborg-East. From April 2021 until mid-august 2021 the busses could carry 5 passengers, but in mid-august all restrictions were lifted both regarding number of passengers and facemasks. Due to all obstacles, this shuttle project is showing, that mobilizing is more than running a technology testing pilot and has wider, (positive) social effects as well.

Project partners were working on analysis and writing studies based on the data gained from pilot activities, relevant scientific literature, and different surveys. Another important activity of the project, development of simulation-optimization tool for modelling and simulation of different scenarios have continued this year.

The project partners have presented their activities and results at major international online conferences, e.g., Autonomy Digital 2.0, Urbanism Next Europe, but also at important national events, e.g. Trafikdage (Denmark) and Energy Forum (The Netherlands), Scenario Workshops (Belgium). This led to a discussion paper ('A.R.T. you ready: Towards a society in which autonomous vehicles are deployed sustainably') with 12 policy recommendations. The project has still a great awareness and capacity-building of interested students within the format of the Lost Lectures and a starting Hackathon (Mpact).

BITS (Bicycles and ITS), with ten (plus three from 2021) beneficiaries from 5 countries (The Netherlands, Germany, Belgium, Denmark, and the UK), aims at implementing ITS solutions that directly increase the take-up of cycling and reduce CO2 emission, while collecting and processing reliable and useful cycling data for policy making.

Especially at the beginning of the year, the COVID-19 crisis has still influenced the project activities, and the overall cycling patterns in NSR countries, moreover, bicycle and chip deliveries were delayed and some implementations requiring face to face instructions were not possible. However, some of the project partners finally have been able to present project achievements in live conferences, among others the Velo-City conference, the ITS World Congress, the POLIS conference, and the Cycling Research Board Annual Meeting.

In total the project has now 14 ITS implementations operational, and another 10 pilots are close to start implementation. To mention a few of the implementations that started this year: The bicycle parking information system in Bruges (BE), the bicycle challenge app for companies in Oldenburg (DE), safety by radar in Aarhus (DK), smart cameras for incident detection in Zwolle (NL), bike sharing by Deelfiets Nederland in Kampen, Ommen and Dalfsen (NL) and the Bicycle Library in Withernsea (UK). Also, the BITS CycleDataHub, the web portal for bicycle data collection launched by the project, is now operational and all bicycle data owners are welcome to contribute to it on www.cycledatahub.eu.

The project was extended with an additional nine months until the end of 2022 in the extension calls of the programme. With the extension the project will be able to do additional seven new ITS implementations, by involving three new partners: Deelfiets Nederland, City of Oldenburg and Cycledata.

Cycling, as a sustainable and active travel mode, is being recognized more and more as a solution for sustainability related challenges and the pandemic even speeded up the demand

for good cycling conditions. The transnational sharing of knowledge and experience on this are central to BITS.

Stronger Combined (SC, Combined Mobility in the rural public transport system to build sustainable rural public services in symbiosis with private mobility providers and citizens) comprises 15 beneficiaries (including two local partnerships) from all seven member states in the North Sea region (NO, SE, DK, DE, BE, NL, and UK) that are investigating the future role of public transport authorities regarding combined mobility in sparsely populated areas. By presenting open data infrastructure, validated service models and public-private mobility cooperation, the project wants to stimulate the take-up and application of green transport solutions for personal transport. As a result of a shift from single-person private car trips to multiple-person shared vehicle trips, CO2 emissions are expected to be decreased.

2021 was a year that was still impacted by COVID-19 restrictions and hence impacts on the delivery of several project activities, as for example some of the pilots of the STRONGER COMBINED project. The open school traffic pilot as well as the bike sharing scheme had to be postponed. In the second example the availability of bikes to procure was low due to the pandemic. This will have an impact also on the delivery of the last evaluation work package, but the project is hoping for lifted restrictions. In this case they will still be deliver according to plan.

Several other pilots could however be launched during 2021. GEN launched their cycling library for adults, DIE launched their bicycle sharing system next to the village point of Kortemark. DIE has also managed to install their new bicycle racks at the village point in Alveringem. HIT`s GIHI app, a MaaS app, also launched during summer 2021. GOHI offers an integrated, account-based service linking together multiple sustainable transport modes allowing users to plan, book and pay for their entire journey. HIT also launched their eBike Dock System in Inverness. OPP has continued to run their pilot for a second season during the summer period. Still, was heavily limited to national users as the Norwegian borders were still closed due to the pandemic.

On top of the delivery of the pilots the innovation processes in Germany and Denmark were implemented. In Rinteln the cooperation with the Leibniz University of Hanover through student projects and interviews with the residents and potential users in and around Kollegienplatz gave good insights to how Kollegienplatz can become a more central traffic and mobility center. Residents and potential users were invited to future workshops to strengthen the communication and link to the user needs. In Denmark an analysis of the mobility potential was completed with citizen involvement in Lihme. Citizen involvement was carried out by organizing online meetings and a questionnaire with local citizens, mobility walks, focus groups and workshops. Five potential mobility solutions have been suggested and some of them may turn into pilots in the STRONGER COMBINED context.

North Sea CONNECT (CONNECTing North Sea Region's TEN-T nodes - Support intermodally growth in the North Sea Region through smart efficiency enhancements) is comprised of 9 partners from 5 countries (DE, BE, DK, UK, and SE) that focus on intermodal nodes in the North Sea region. To increase attractiveness of a location along with its market potential, i.e., the achievable market, efficient, smart, and ecological transportation networks are needed. Intramodality should enable a concentration of transnational traffic and long-distance flows, and because of their integration, provide for a highly resource efficient infrastructure use. The

overall project objective is to support smart intermodally growth in the NSR through efficiency enhancements.

To test the new transport concepts envisaged by the project, groundwork on the pilots planned was initiated by bringing together the relevant stakeholders and the partnership started the situational analysis concerning bottlenecks in the relevant countries. Mapping of experience with digitalization processes in ports was initiated in 2021. The partnership is looking into access management to establish seamless information exchange between actors (terminal, road, and rail operators) in seaport terminals.

PAV (Planning for Autonomous Vehicles) (previously SUV), with 12 partners from 7 countries (the UK, SE, BE, NO, DK, NL, and DE), will promote Autonomous Vehicles (AV), or self-driving vehicles, to become widely available, low-cost, clean, door-to-door transport for people and goods. Widespread use on Europe's roads is anticipated by the 2030s and is expected to have numerous societal implications for equity, health, economy, and governance resulting in potential impacts on city development and design (from street to district- and regional development). Many cities (plan to) start experimenting with AV in Europe. However, integration of AV in spatial planning has yet to start. This is urgent as cities plan district (re)developments, transport infrastructure and related investments decades ahead. PAV aims to stimulate the uptake of electric, shared AV by developing green transport and spatial planning strategies that incorporate AV.

In 2021 the PAV partnership launched their first demonstration pilot with Autonomous vehicle in Varberg, Sweden. The pilot ran for two weeks in June where an AV-bus covered 720m stretch of road and transported 800 passengers during the test. The stretch used was in full operation during the pilot meaning that it was piloted in real-life conditions which included interactions with pedestrians, cyclists, cars, caravans, motorhomes, trucks, tractors, etc. In the reporting period, procurement and tendering procedures were set for the rest of the pilots and implementation work is expected at the start of 2022

In this period, the partnership worked as well on developing a case study which is used to identify innovative solutions for the implementation of AV, and which are used while preparing the tests and demonstrations. In the longer-run, they are to be used by urban planners as well.

ZEM Ports NS (Zero Emission Ports North Sea) has 8 partners from 5 countries (DK, NL, the UK, SE, and BE) and will facilitate the use of zero emission fuels (electric and hydrogen) in the NSR ports and maritime sector. The project looks at the role of ports in the interface between zero emission vessels and port infrastructure. It especially addresses the integration of zero emission fuels into the port refueling infrastructure and local energy systems as well as port and on-ship energy storage. It will develop refueling infrastructure for vessels and training for the crews of zero emission vessels and staff using associated infrastructure. The design of a mobile filling station that will be used for training has been carried out and training course outline has also developed.

The main progress until now has been the data collection and subsequent analysis conducted on the Danish Island of Ærø in 2020 and 2021. The electricity consumption demands of the E-Ferry in Soeby has been assessed, modelled, and analysed in terms of flexibility provider for Ærø. In the UK the project is preparing for the construction of the mobile charging unit. In the Netherlands the project has finalized the HAZID certificate for the pilot vessel. The design of

the mobile filling station that will be used for the training and has proceeded to assemble the station. They have also developed the training course outline.

Most activities have been affected by the COVID-19 outbreak, but some more than others. In Strömstad the project planned to facilitate a charging facility for the new Color Line ferry. However, the work in Strömstad has been delayed due to financing issues directly resulting from COVID-19 implications as the ferry stopped operating in March 2020. Unfortunately, this situation remained in 2021. However, at the end of the last year, the project announced significant problems in the implementation and initiated discussions with the secretariat, how to address the challenges the partnership faces, in the worst-case scenario to close the project. The Lead Beneficiary is working in close cooperation with the secretariat on possible scenarios at the beginning of 2022.

AVATAR (Sustainable urban freight transport with autonomous zero-emission vessels > modal shift from road to water) comprises 10 partners from 4 countries (BE, DE, NL, and SE) that aim to develop, test, and assess adequate technologies and business models for urban autonomous zero-emission inland waterway transport solutions. Through this, the project unlocks the economic potential of urban vessels and corresponding waterways, increases available solutions for full-cycle automation and sets up a sustainable supply chain model for urban goods distribution and waste return.

In 2021, the focus of the work was on converting a 1-ton research vessel into an automated vessel that will be also suited for remote control. The idea is that the technology used for this vessel is later scaled up and used for the development of a big 25-ton vessel that will be used on rivers and canals. The work carried out engaged partners in design, building and developing the sensor system for the vessel. Tests were also carried out for a direct connection between the ship and the remote-control center. The importance of this work is that it will showcase how ship can be steered remotely from another location.

To lay the ground for further work, operational scenarios for fleet of autonomous vessels were created. In addition, safety, control strategies, hardware and software standardization procedures were at the heart of the testing and operation. Project partners are investigating use cases for Ghent and Hamburg; it is anticipated that the use case in Hamburg will be launched at the start of 2022. The economic viability of these vessels is also studied as well as the necessary conditions for long-term uptake of the developed concepts.

5. Technical Assistance

(This is a continuation of the text provided in the SFC under this heading):

The National Contact Points have been operational in a North Sea Context since 2000 and have always played a very important role as national representatives of the programme in the member states/Norway. The contact points are operational in all participating countries (with the exception of Denmark) and play a crucial role in terms of assisting project development and troubleshooting when something goes wrong. It is anticipated that the Contact Point network will be operational in the new Interreg VIB North Sea programme as well.

The preparation of the new Interreg VIB programme has been a major task in 2021 and the draft Interreg Programme was submitted to the European Commission in early 2022. By the end of 2021 a total of 12 meetings had been held by the Programme Preparation Group, which oversees the programme preparation. It has been a very intense experience but also a good

option for transferring the lessons learned in the Interreg VB programme to the new Interreg VIB programme.

Brexit represented another big issue in 2020 and 2021 was the first year after the UK formally left the EU and the North Sea Region Programme. Despite all fears and significant uncertainty, which characterised the transition phase, the change from the UK being an EU country to no longer being so has, on project level, been relatively pain free and no significant difficulties are expected in the winding up phase. The main reason for this is that there has been a very close and positive cooperation between the secretariat and the UK national authorities in this process with the key aim of making the transition as painless for the projects involved as possible.

Table 4: Financial information at priority axis and programme level

Present information on reported information submitted to the Commission via the SFC system by the end of 2021. The table contains information on total funding allocated to operations and to technical assistance, how many operations they programme by the end of 2021 is supporting and the amount of eligible expenditure these operations has reported to the programme and entered the accounts of the Certifying Authority.

Table 5: Breakdown of the cumulative financial data by category of intervention

Represent a detailed breakdown on the eligible expenditure reported to the programme. The detailed perspectives include a breakdown in the format of the template provided in the SFC system, including breakdown on the dimensions of territory, delivery, thematic objectives, economical and location. The interventions are detailed and outlined in the cooperation programme; however, the location dimension is not outlined in the cooperation programme as this information has been requested in the SFC template after the delivery of the programme has been initiated. The location dimension is a bit unclear and challenging for a transnational programme to report on, due to the transnational nature of the operations and not located in individual territories. The point of departure of the programme when reporting on this dimension is to demonstrate in which country the lead beneficiary of the largest economic activity of an operation is located at the time of reporting.