ANNEX TO THE ANNUAL REPORT 2022:

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	3547	1849	191,8%	Specific objective 1.1 is well on its way to being achieved. According to programme-level targets, there was an achievement of 743,6% of this objective by end of 2022.
Number of improved or new innovation support measures launched for businesses	174	184	94,6%	Specific objective 1.2 is well on its way to being achieved. According to programme-level targets, there was an achievement of 870,0% of this objective by end of 2022.
Number of improved or new innovation support measures launched for public service delivery	178	109	163,3%	Specific objective 1.3 is well on its way to being achieved. According to programme-level targets, there was an achievement of 890,0% of this objective by end of 2022.
Number of green products, services and processes piloted and/or adopted by the project	628	497	126,4%	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 1231,4% of this objective by end of 2022.
Number of new and/or improved climate change adaptation methods demonstrated	121	90	134,4%	Specific objective 3.1 is well on its way to being achieved. According to programme-level targets, there was an achievement of 484,0% of this objective by end of 2022.
Number of sites managed using new solutions supporting long-term sustainability	229	201	113,9%	Specific objective 3.2 is well on its way to being achieved. According to programme-level targets, there was an achievement of 545,2% of this objective by end of 2022.
Number of new and/or improved green transport solutions adopted	269	201	133,8%	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 538,0% of this objective by end of 2022.
Number of enterprises participating in cross-border, transnational or interregional research projects	8 551	5321	160,7%	Compulsory output indicator

Number of research institutions participating in cross-border, transnational or interregional research projects	1 763	885	199,2%	Compulsory output indicator
Number of organizations/ enterprises adopting new solutions by project end	6 241	6 664	93,9%	Compulsory output indicator
Number of organizations/ enterprises informed about new solutions by project end	1 264 861	211.540	597,9%	Compulsory output indicator

In terms of approved full applications, all four thematic priorities saw an overachievement of the 2022 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 2022.

* 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 2022
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
		Increase in average turnover for SMEs participating in an RCA	5%	37,01%
		Political and Consumer commitment to new products of food related SMEs	€ 2.750.000	€ 2,035,910
1	SHINE	Spin-offs from healthcare organisations	3 Spin-offs from healthcare organisations using the transnational SHINE approach based on shared value creation	11
		Strengthen regional innovation capacity	3 implementations of the jointly development integrated Business model for complex partnerships in the healthcare economy	13
		Transnational networking in healthcare innovation	SME transnational trade contacts embedded in a strategic network platform	0
1	Lean Landing for Micro SME's	Increased turnover and/or export and/or employment	20%	10%

		Created long-term viable knowledge network	1 Soft landing network consisting of 6 NSR member countries	1
		Delivered concrete marketable new products, services or processes	160 partnerships that result in concrete new products, services or processes	157
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
		Improve the effectiveness of delivery of (healthcare) services by enhanced cooperation between formal and informal networks	10% increase in user experience and satisfaction	24%
		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%
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	36
		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%
		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%
2	Northern Connections	Enterprises in partner regions collaborating with innovation partners outside their own country	10% increase from the start of the project	18%
		Enterprises moving at least one step up on the technology readiness level	50% increase from start of the project	88% increase

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	105
		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	0%
		Mainstreaming CORA approach and developing a transnational rural community around digital inclusion	200 CORA rural community members (online community platform around rural digital inclusion)	365
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	10
		Test and evaluation of I4.0 tools and methods, which will help SMEs to implement new business models, techniques or competences	80 SMEs	139
		Upgrading workforce competencies	50%	0
3	Inno-Quarter	Rate of specified business model learnings	70%	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	10
		Transregional Blue Growth innovation projects	2 projects	8
3	SCORE	Reduction in service provision costs using data-driven and open source solutions	10%	21%

		Improvement in service provision of authorities in the sectors of sustainability, environment and urbanism from data-driven and open source solutions	20%	53%
		Reduction in solution development time	30%	79%
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	42
		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	€312.429
		Increased investment in sustainability	€2 million	€803.227
		Long-term engagement and collaboration of SMEs in local and transnational networks	1200 partners	129
5	RIGHT	Increased innovation capacity	75% of participating SMEs	100
		New and Improved Collaborations That Enhance Innovation Ecosystems	90 % Share of interviewed managers/ policymakers evaluating project activities	100
		Enhanced regional innovation support capacity	75 % Share of interviewed intermediaries/ policymakers evaluating project activities	78
7	BLING	Bling will significantly improve the body of knowledge about how to develop and deploy blockchain-enabled services in local/regional government	103 government organisations	347
		Deliver a more cost effective government by reducing the cost of developing and accelerating the deployment of blockchain-enabled services	20% increase in cost effectiveness (of services changed)	0
7	FBD	Increased SME Innovation	180 SMEs	39

		Increased SME Productivity	180 SMEs	39
		Increased SME Growth	180 SMEs	35
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	51%
		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	23%
11	EXSKALLERATE	Increased average turnover of manufacturing and construction SMEs in the North Sea Region through the application of industrial exoskeletons	10%	3,21%
		Musculoskeletal disorders (MSDs) in manufacturing and construction SMEs reduced by exoskeleton use	75%	64%
		Increase SME exoskeleton adoption rate	25%	64%
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%	2
		Number of involved citizens in (neighbourhood) interventions feeling less lonely/isolated	300 people	35

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 2022, 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. This Company Director added further integration of the green hydrogen sector as set out in the approved extension. 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 keys 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 2022, the CORA project focused on its "Smart Rural Journey" (extension) which aims to enhance the basic knowledge of the municipalities and local authorities and improve their practical knowledge for initiating, developing, and implementing digital and smart projects. The maturity check model has been developed and tested within the consortium and 42 regions/municipalities have completed it. In addition, 6 transnational workshops have been organised, covering the following topics: 1. Integrated strategy, KPIs and funding; 2.Smart devices and IoT; 3. Digital skills for employees; 4. Stakeholder and citizen participation; 5. Digitalisation of businesses and 6. Cyber security.

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.

GrowIn 4.0 project closed at the end of April 2022. By its end the project developed and/or tested 22 tools aiming at supporting SMEs in their transition towards Industry 4.0. These tools were altogether tested in 139 companies. Not all tools were considered appropriate and finally 10 tools were selected which could be screened by companies to arrive to specific package of tools for their use. Within the final months of project implementation, the attitude of companies towards Industry 4.0 was screened. The final months were busy with partner engagement in national networks and international conferences to raise the visibility of the project and promote its results. Partners worked also with knowledge institutions outside of the partnership who provided expert opinion with the tools developed.

INNO-QUARTER: 12 beneficiaries from five NSR countries (NL, SE, DE, DK, BE) are involved in the project. Inno-Quarter (IQ) provides a new way to short track innovation processes and improve the cost-effectiveness of startup support mechanisms and redirect funds towards sustainable commercialisation of more innovations. 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 2022, the partners continued with the organisation of Inno-Quarters, both online and offline at festivals. The project published several concluding studies and reports and held their final conference in October 2022. It closed in December 2022 and is currently preparing its final report.

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. The project closed its activities in 2022. The project has successfully led to the formation of 10 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.

SCORE: 13 beneficiaries from all 7 NSR countries (BE, DK, DK, NL, SE, UK, and NO) were involved in the project. SCORE aimed 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.

On June 8th, 2022, the final conference of the SCORE project took place in Amsterdam (hybrid event). Throughout the project, 22 open-source solutions replicable to other cities in the North Sea Region have been developed, solving urban challenges in the field of mobility, air quality and flood risk. Two guides were also developed to help cities participating in the NSR programme and 10 principles were defined for developing solutions. Overall, the project reduced the cost-of-service provision by 21% using data-driven and open-source solutions; improved authorities' (in the sectors of sustainability, environment, and urbanism) service provision by 53% using data-driven and open-source solutions; and reduced solution development time by 79%.

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.

In August 2022 CUPIDO ended. Over its lifetime, the project has, through the partners' activities, such as using new digital techniques and skills, films and virtual reality, inspired growth and development of new businesses opportunities and new jobs within the cultural sectors in the regions. More notably, studies developed by the project ("Power of the Culture – the DNA of a region" and "Regional Inspirational Packages") led to insights that inspired partners and stakeholders concerning new business ideas and formats. They also laid the round for the establishment of nine Centres of Excellence which are seen as display windows of what has been done in the pilots. The Centres of Excellence are based on local expertise and are focusing on e.g., cultural products, digitalisation, VR, music, shellfish, tourism, and modern storytelling. Within the Centres partners cooperate with businesses, cultural actors, and local and regional authorities. To show the power of culture more than a hundred innovation support measures, including different testbeds, workshops, events, and documents, have been carried out. Partners have learned from each other on how to find ways to lift culture and make inhabitants, companies, and decision-makers to see the potential in cultural heritage and cultural activities.

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 is 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.

The project came to an end in December 2022. Over its lifetime, PROWAD LINK developed and tested innovative tools and strategies for SMEs in the North Sea Region to improve access to

brands provided by natural heritage sites with economic value; enhance SME sustainability in the North Sea Region and develop innovative marketable offers and products in a co-creation process. Network creation is a fundamental pillar of PROWAD LINK; that is why significant part of the work was dedicated to enhancement and extension of partnership programmes in the participating regions. Furthermore, the transnational Wadden Sea World Heritage Partnership Hub, a "network of networks" connects local and national partner programmes, networks, and other initiatives in supporting knowledge exchange transnationally. Other examples of achievements include many tools and products that were developed to enhance "sustainable entrepreneurship", the online branding toolbox that which functions as a user guide on how SME can connect with Wadden Sea World Heritage, the "North Sea Sustainable Innovation Challenge 2022" that pushes the development of sustainable entrepreneurship and the new "Tourism Radar" which provides local and regional communities with an innovative way to self-determine their acceptable limits of tourism. In total, over 800 organisations engaged in activities or adopted new solutions initiated by the project.

RIGHT: 14 beneficiaries (public and private) from all seven 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 this 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. The project closed in May 2022. In the last months of the project lifetime, the partners organized the final project event in Brussels, with participation of the European Commission and other key actors working with skills. They finalized two additional pilots and published final studies and reports, such as an evaluation of project learnings and an analysis of new and emerging business models. The 16 pilots culminated in the delivery of a set of recommendations which were presented during the final conference. Overall, RIGHT achieved all targets set.

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.

In 2022, the BLING partnership worked on the implementation of pilots and use-cases with some great achievements and exciting developments. For example, Emmen successfully launched an energy wallet which is the biggest blockchain project in the Netherlands. By this service, an uptake of 16% registered for citizens with relation to energy vouchers offered by the city of Emmen was increased to 100% thanks to the new technology provided. This has attracted interest from around the globe. As a follow-up, partners are looking into the development and roll-out of a Food Wallet. The project has held other mature demonstrations like the Attendancy App demonstrated at the Annual North Sea Conference or the

demonstration of Blockchain Readiness Assessment Tool. The project continues strong collaboration with the H2020 TOKEN project.

FBD: 12 partners from five NSR countries (BE, DE, NL, SE, UK) are working to help 300 SMEs in the North Sea Region to grow, increase productivity and innovate better by helping them to use data to drive up performance. 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 that 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.

In 2022, project partners continued with project implementation. Focus was on the "operation", "results" and "dissemination" stages of the project, following its linear approach. By mid-2022, the project had engaged with more than 1000 SMEs, 220 had started their self-evaluation (which is the first step in the 5-step FBD process for SME digitalization), 144 SMEs had started their own digitalization project (step 3), and 42 SMEs had completed their projects and achieved results. The project delivered several studies, guiding documents, developed new tools, and worked on its communication activities. The active dissemination phase began in July 2022. The project closed early January 2023 and is currently drawing up its final report.

COM³: 19 partners from all seven 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.

In 2022, the development of 15 online training modules moved forward with 3 new training solutions. In addition, 3 pilots have been achieved: Digital tools and services for local businesses to provide better visitors' experience (Torsby, Sweden), Creating a hub for local businesses (Vinje, Norway) and Utilization of digital tools in traditional sectors based on circular economy principles (Vejle, Denmark). Finally, the ruraldigital.eu platform has been further developed and enriched with training modules, pilot experiences, and news with the goal to share relevant knowledge and support many municipalities and other organisations within the North Sea Region and beyond.

NorthTick: 11 beneficiaries from all seven countries (BE, DK, DE, NL, SE, UK, and NO) are involved in combatting tick-borne diseases. In 2022, many research activities are on-going: It is understood that in Germany, Norway and Sweden, tick-borne encephalitis (TBE) is mandatorily notifiable, while in Belgium, Denmark, and the Netherlands it is not. This was enlightening in relation to the European Commission's list of diseases under epidemiological surveillance. Another interesting finding was that all seven countries around the North Sea include tests for Borrelia miyamotoi. It is also helpful that all seven countries around the North Sea agree on supportive care for TBE and recommend TBE vaccination for people living or spending time outdoor in endemic areas. Finally, it is also understood that the adherence to

national guidelines for antibiotic use and administration is being investigated. This is important to optimize the use and to reduce the antibiotic burden in the North Sea Region.

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 project tackles these issues by focusing on accelerating the adoption of exoskeletons into construction and industrial manufacturing SMEs which could alleviate 10-40% of muscle peak loads for passive, and up to 80% for active exoskeletons. In 2022, testing of exoskeletons continued with SMEs which have confirmed significant health improvement observations. As part of the testing, project partners have also been analysing and recommending design improvements to accelerate the delivery of 2nd Generation Exoskeletons. Now 8 design updates have been shared with manufacturers. The EXSK Community Platform has attracted 121 members who are involved in testing the "Exoskeleton Potential Assessment Tool". In addition, the partnership continues work with national certification bodies towards the creation of a future new standard at European scale.

I2I: 12 beneficiaries from all seven countries (NL, DE, BE, UK, DK, SE, NO) are working together to enhance innovation in social service delivery to improve social inclusion and counteract loneliness in NSR communities and neighbourhoods. These challenges have a negative impact on social cohesion and high hidden socioeconomic cost, but public authorities in the region are not yet adequately able to deal with them. To mitigate this, 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. Focus is thereby on cost-effective preventive care, in addition to care and cure. In 2022, the partners continued with organizing co-creation sessions, designing interventions, and testing them, with the involvement of the quadruple helix. The project also worked on increasing the innovation capacity of the public-sector in-service delivery. Another highlight 2022 was the mid-term conference, next to other dissemination activities.

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 2022
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	66%
		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	38%
1	SCALE-UP	Number of green products, services and processes piloted and/or adopted by the project		42
		Reduced costs for matchmaking ('Meet-the-Buyer') events for NSR cleantech clusters	Reduction of 25% in costs for the MtB events	40%
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	5 days – reduction in production time (average)	4
		Energy saving with respect to heating and supplemental light	15% reduction in kWh and gas (m3)	5
		Energy efficiency increase	10% of first data of energy efficiency per produced unit	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	7764

			period - * this is under revision	
		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.	55%
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	8944
		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)	10

5	DeComTools	Carbon reduction in offshore decommissioning operations	25% 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
		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	48.181
		Reducing NSR environment footprint	Kton CO2	12
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.	3
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	0,45%

			which the household has invested and 100%	
		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%	10%
		Reduced CO2 emissions in the North Sea Region	102.000 Tonnes of reduced CO2 emissions	98004 tonnes of CO2 emissions
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 Wind Propulsion Technology (WPT)	Measuring starts with WPT in operation. WASP performance indicators will be used. Measuring methods will be aligned with EU	557

			Emission Control Area policies and the Energy Efficiency Design index.	
		CO2 reduction realized during the project period with WPT in operation	Measuring starts with WPT in operation. WASP performance indicators will be used. Measuring methods will be aligned with EU Emission Control Area policies and the Energy Efficiency Design index	1757
		KWH generated with WPT's in WASP during the project with WPT in operation	Measuring starts with WPT in operation. WASP performance indicators will be used. Measuring methods will be aligned with EU Emission Control Area policies and the Energy Efficiency Design index	2754000
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 %	34%
		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	16.79
		120 million-euro investment in the reduction of CO2 emission of homes in the North Sea Region	100 000 000	149
		22.000 homes with substantially reduced CO2 emission	22,000 homes	10.327

Dual Ports 16 beneficiaries from six NSR countries (BE, DE, NL, DK, SE, UK) are working together to decarbonize regional entrepreneurial ports across the NSR. The project closed its activities in 2022. The project has successfully developed ports across the North Sea into more sustainable and greener by reducing costs and carbon footprint. The project has managed to show that the selected pilots / initiatives successfully reduced their operating costs by 66 % and their total carbon emission by 38 %. The aim of the project was to lower costs by 20% and collectively to reduce carbon emissions by 12%. In this connection it is positive to see that some of the introduced technologies will continue to be utilized after the project's end having

demonstrated their cost and carbon reduction benefits, especially in the fields of LED, heat and surface, charging poles and floating solar panels.

SCALE-UP (Supporting Clean-tech innovators in Accessing Large Enterprises through Unlocking Procurement) helps clean-tech SMEs bring 42 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 – BE, SE, DE, NL, DK, 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. 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.

COBEN: 11 beneficiaries from all 7 countries (DE, NL, SE, DK, NO, BE and UK) explored 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 aimed 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.

Over the 6 years of implementation, COBEN has been the meeting point for many different types of civic energy initiatives: from energy renovation and shared e-mobility initiatives in Ringkøbing-Skjern (DK), the development of district heating networks in Osnabrück (DE), new spatial plans in the Province of East Flanders (BE), the support of cooperative solar fields and the creation of pioneering social tendering processes in Emmen (NL), to fossil-free farming innovation in Viken (NO). As a final product, COBEN has put all its knowledge and gained experience into the development of an applicable support tool, the "Civic Energy Informer", which will ensure that COBEN's results are accessible to future adopters. As key highlights, 44 NSR communities achieved reduction of CO2 emissions due to adoption of COBEN climate-energy models and 10% (20 regions) of the NSR area adopted one of the COBEN Business models.

SmartGreen: 12 beneficiaries from six countries (DE, BL, NL, NO, DK, UK) are working together to reduce the 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 2022, the project's focus on vertical farming continued, with partners being in good contact with growers and other relevant stakeholders. Other work includes trials on light, multilayer farming, and LED experiments. Work on the IT/data aspects of the project also advanced, e.g., through further enhancing the Graphical Unser Interface, which is related to the previously produced ontology, the development of a cloud-based environment for yield prediction and

an algorithm for balancing crop yield and energy costs. Moreover, the partners continued their dissemination activities.

BIOCAS The main aim of BIOCAS is to realize concrete Biomass Cascading Alliances (BCAs) for a more sustainable conversion of biomass - thereby generating 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 pilots 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 valorizing biomass and working in bio cascading 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 (e.g., 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 successful on-line conferences: (1) Bioeconomy in practice - Biogas becoming sustainable with new perspectives and (2) the Dansk Bioøkonomi Konference. 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. Circular, cascade business cases were very often immature, vulnerable, and risky. Hence, more time is needed for the green transition mindset to settle in society in general, as the new sustainable value chains rely on either public financing or consumers ready to help the new products become economically sustainable. Partners are more than willing to continue and expand the journey they started in BIOCAS after the project has been finalized.

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. Initial plans have been established for the completion of the "2IMPREZS Energy Challenges Digital Blueprint" and the digital 2IMPREZS Energy Challenges programme, which shall serve to support schools well beyond the 2IMPREZS project (and after the project end) in rolling out the digital 2IMPREZS Energy Challenges programme. Work is also progressing with the 4 schools which have been selected to become (nearly) zero carbon buildings. The selected schools are in the Netherlands, Denmark, the UK, and Germany. Highlights so far is that there is a transnational baseline available based of their carbon emission of the building from historic energy consumptions. Future interventions are based on to identify viable advanced low carbon/renewable energy measures that can be implemented in the schools - these include but not limited to: Solar panels; energy efficiency e.g., LED lights, insulation etc.; heat pumps; full electrification and green gas/hydrogen.

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.

It can be concluded that SalFar was a successful project putting saline farming on the North Sea region map. A great number of mainly food products were created during the project. In the end there were 26 test fields realized where there were only 10 planned. The mid-term conference resulted in a book entitled “The Future of Sustainable Agriculture in Saline Environments” which includes 33 articles on saline farming. The final conference took place in April 2022 and was visited by people coming from both inside and outside the North Sea Region. The project delivered another book etitled “Inspiration Guide on Saline Farming” aimed at farmers and entrepreneurs.

Carbon Farming Seven beneficiaries from four NSR countries (BE, DE, NL, NO) were developing new and innovative farming methods to reduce the carbon footprint of agriculture in the North Sea region. More specifically, the project was 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 conducted a feasibility study on the economic viability of carbon sequestration methods for farmers in the NSR and tested and validated economically viable business cases for CS in the whole agri-food chain. In 2022, the project partners worked on finalizing the project's activities. They realized two new business cases in Belgium and organized several meetings in the field for landowners. Another highlight in 2022 the publication of a final report drawing the main conclusions from the show cases as well as other relevant studies and articles, such as a Green Paper explaining what Carbon Farming is and its relationship with organic farming. Next to this, the partners continued their far-reaching communication activities such as a radio broadcast, podcasts, videos, lectures, presentations, and articles. The project closed in August 2022. The final report is currently being processed. The project achieved its objectives and targets.

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. Decom tools 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. In 2022, the project partners continued to work towards the project's objectives and to finalize planned activities. Several important reports and studies were published, such as a report on the "End-of-Life phase and three circularity concepts for wind turbine blades”, a gap analysis of relevant rules and regulations, and a "Cost and Emission Analysis of Decommissioning of Offshore Wind

Farms Using Reverse Installation Method". In September, the project organized a conference on Wind Recycling Concepts. The project closed in January 2023.

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 closed its activities in 2022. The project has successfully developed a Blueprint for an innovative factory that will be able to produce 15,000 renovation packages per year for half of the current price. With the adopted Blueprint, it is now possible for a terraced house being renovated with an 'INDU-ZERO approach' to cost no more than €50.000. It is also very promising to read about the proposal to renovate 50.000 houses in the Netherlands within 3 years for €65.000 which will take place beyond the lifetime of the project.

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.

In 2022, data from the ACCESS cities has been collected and analyzed to develop 1) case studies to inform future policy development 2) a replication assessment of the pilots 3) the pilots monitoring framework. New tools are being developed (e.g., VITO pathway generator) and the AU energy presumption survey has been added to the toolkit. The first ACCESS pilot went live in West Suffolk: The Grid Duck energy monitoring equipment is now operational in 4 businesses on Mildenhall Industrial Estate. Finally, preparation and implementation of 3 other pilots continued (e.g., the building of the parking garage continued and the use cases to be tested were defined with the grid owner in Malmö, the building of the parking lot progressed as well as the preparation of innovative energy system in Mechelen and the procurements of the batteries for the 2 pilots was completed and the equipment ordered for Amersfoort).

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 2022, new tools and guidance materials were developed, such as a Procurement transformation workshop methodology and a Circular procurement transformation Guidebook. In addition, most pilots (out of a total of 32) have now been completed, therefore the tendering processes are finished, and contracts have been awarded (e.g., the virtual tour 'Kijkbox circulair bouwen' for the Potterij pilot has been launched, showcasing the 19 suppliers

of circular construction materials that are part of the pilot). Finally, 2 pilot projects have won procurement awards in 2022: Circular signs in Malmö and Procurement of Workplace ICT Hardware in The Netherlands.

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. The project closed its activities in 2022. The project has successfully developed the Empower 2.0 toolbox which offers citizens, authorities, and energy communities a guided experience so they can find the most pertinent tools to assist them on their journeys to produce their own green energy. In addition, the pilots - despite the difficulty of bringing citizens together in times of the covid-19 pandemic - managed to engage more than 6,000 households. Finally, the White Book, one of the project results, takes a universal mapping model for roadmaps, with real life examples, to enhance empowerment of citizens in a clean energy transition.

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. The project closed its activities in 2022. The project technology developers have received a total of 37 accelerating services to bring their pilots into the water and an additional 25 companies have received services as early adopters of the service offer. A total of 1.2 MW of tidal energy has been launched through the project. The developers have developed a combined pipeline of 23 MW of deployments which will lead to a CO2 emission reduction of 152.920 t. The indicative carbon reduction was calculated using European Commission CO2 figures from the region where the pilots are principally located (i.e. Denmark & Sweden) resulting in global CO2 saving potential of 152.920 /Tonnes of reduced CO2 emissions, of which 98.000 tonnes in the North Sea Region.

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.

In 2022, several scientific papers based on SoilCom trials are in data analysis and writing phase. New field and pot trials based on the SoilCom+ extension on compost extract and teas are being conducted. In addition, mapping and modelling tools of waste streams were developed and disseminated. Many events were organised/initiatives carried out to increase awareness of growers and stakeholders, such as: an online starters course for professional growers of ornamentals and tree nurseries was organised, individual advices were given to growers to help them modify their work practices and use custom compost (e.g., evaluating plant root growth in environments with different levels of compost), demonstrating new practices in the nurseries.

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 onshore power supply in Korsoer is now almost complete. The similar shore power connection will also be finalized in Meppel and Zwolle, where the integrated digitalized management system will also be finalized. Another important implementation on its way is the camera-based system for real-time data streaming in the Port of Oostende - which is equipped with LED for dark vision and hard disk for data storage.

WASP 15 partners from all 7 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. WPTs are becoming increasingly economically viable, are future proof and offer great potential for fuel and emission reduction. However, at present, WPT operational expertise is weak and fragmented among different players in the NSR. To mitigate this, the project will deliver third party validation of capital and operational performance to encourage market uptake, set up and connect WPT sea trials and improve WPT concepts. With this, the project will enable WPT market penetration and contribute to greener NSR sea transport. The expected results will be considerable CO2, SOx, NOx emissions reduction as well as a reduction of heavy fuel oil/marine diesel oil consumption. The project was approved in June 2019.

In 2022, the project partners had all five planned wind propulsion technologies up and running. Sea-trials started, and the data from these trials was used for developing business cases, the sea trial methodology and the digital twin tool. The project made a digital self-assessment tool available to interested businesses. Interactions with decision makers to support policy changes and meetings for the validation of the design evaluation took also place. This was supported by the partners' communication and dissemination activities.

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. All pilots are on-going and are expected to be finalized as planned. The only outstanding activity that remains is the implementation of the online CE toolbox. It is expected that this will be completed with the final progress report.

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.

In 2022, the development of digital instruments continued (e.g., blockchain based, prototype of an online retrofit calculator, new concepts for developing a digital One-Stop-Shop concept, digital experience for the homeowner). Access to green finance was also supported by the Stronghouse Green Finance Tool and live course for banks, real estate agents and notaries on the EPC (this is to also enable employees to give advice to homeowners). In addition, an inspection protocol for existing homes that may switch to hydrogen has been developed, a

new campaign supporting homeowners with an income up to 130% of the social minimum has been initiated and an energy poverty strategy and heat transition map have been created.

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 2022
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	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. €	At least 60 Mio. €
		Cost savings by exchange of data	300.000 €	720.000 €

1	TOPSOIL	Water quality. Improvement of quality by 20%.	25%	34%
		Water quantity. Improvement of buffer capacity by 20%.	25%	27%
		Water quantity or quality (extension pilots)	10%	14.1%
1	WaterCoGovernance	Long term cross sector commitment (sustainability) to co-governance in pilot areas	3 years	3 years
		Increased return on public investment by adopting participatory/ co-governance approaches to management of NSR ecosystems	20 % increase	20 % increase
		Improvements to the environmental status of pilot areas	15 % increase	15 % increase
2	BEGIN	Reduced probability of floods from extreme rainfall	30 %	68.85 %
		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. €	473,87 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
		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

			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
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 %	0%
		P removal at demonstration sites	80 %	68 %
2	PARTRIDGE	Increased capacity to improve farmland ecosystems across NSR	100 %	80 %
		Farmland ecosystems improved	30 %	0 %
2	Sullied Sediments	Reduced economic cost of disposal of dredged material	10 %	1 %
		Reduced level of selected watch list chemicals in outflow from waste-water sites piloting spore technology	25 %	10 %
		Reduced level of selected watch list chemicals in inflow to waste-water sites in catchments piloting behaviour change activity	20 %	1 %
3	CANAPE	Carbon captured	1640 tons of CO2-eq/year	501 tons of CO2-eq/year

		Profit per Hectare	2089 €	-
		Reduction in flood risk	228600 cubic meters of water per year	192950 cubic meters of water per year
		Conservation Saving Achieved per hectare	500 €/ha	340 €/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	30577 people
3	JOMOPANS	Promoting ecosystems services: Proportion of the North Sea for which underwater noise can be managed	90 %	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 %	10%
		Cost reduction	50 %	33%
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	6

		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)	2
		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)	71
7	C5A	Increased number of multi-benefits (functions / services / outcomes) delivered	3 No. of additional functions of the targeted infrastructure / system	3,29
		Improving long-term risk reduction for less whole life investment	5 Benefit-Cost Ratio (BCR) of the investment in flood protection, in	4,58

			percentages of increase	
		Increased adaptability of flood management approaches	3 No. of additional adaptation pathways available to the decision maker to choose from	5,57
7	GEANS	Improved transnational environmental health assessment	8 competent authorities	7
		Increased time-efficiency	60 %	75 %
		Cost reduction	40 %	42%
9	BEESPOKE	Increase in crop yield or quality on the demonstration sites	10%	10%
		Increase in pollinator diversity compared to the baseline on each demonstration site	10%	0%
		Pollinator conservation and crop pollination actions adopted by responsible agencies across the NSR member states	7 number of NSR member states	0

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 (NL, NO, DE, SE, BE, DK, and 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, the project wanted 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 and achieved its objective. 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. 2021 was the final year of the project and its final report has been submitted and approved.

FAIR - Flood defense infrastructure Asset management & Investment in Renovation, adaptation, optimisation and maintenance has 12 beneficiaries and one co-beneficiary from all 7 countries (NL, NO, DE, SE, BE, DK, and 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. The main outcomes of 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. The FAIR project outcomes demonstrate that a risk based quantified approach needs to be used for adaptive asset management.

2020 was the closing year for the project, however, 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.

NorthSEE - A North Sea Perspective on Shipping, Energy and Environmental Aspects in Maritime Spatial Planning, with 12 beneficiaries from 7 countries (DE, NL, NO, SE, BE, DK and UK), the project was the frontrunner in achieving greater coherence in Maritime Spatial Planning (MSP) and in Maritime Spatial Plans across the North Sea region (NSR). NorthSEE focused 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.

NorthSEE project results 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. The project enabled several high-level transnational initiatives on MSP and related sectorial activities, such as the North Sea MSP Collaboration Group. NorthSEE closed its project activities in March 2022 and was successful in achieving greater coherence in MSP and supporting the implementation of the MSP Directive (2014/89/EU) for a strong and healthy North Sea.

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 (DK, DE, NL, UK, and BE), aimed at the joint development of methods to describe and manage the uppermost 30 meters of the subsurface, to improve the climate resilience and protect the environment of the North Sea Region. The project resulted in significant improvement of water quality/quantity at the pilot areas and developed practical tools (e.g., tTem) for quick and precise measurement and management of subsurface waters. Besides the project managed to engage and involve stakeholders in the development of groundwater management solutions. TOPSOIL has closed its project activities at the end of 2021 and submitted its final report has been accepted in early 2022.

WaterCo-Governance – Water Co-Governance for sustainable ecosystems brought together nine partners from five different North Sea countries (UK, DK, SE, DE, and NL) 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 project closed in 2021.

BEGIN – Blue Green Infrastructure through Social Innovation 16 cities and research institutions from six North Sea countries (BE, NL, NO, SE, DE, and UK) demonstrated how cities can improve climate resilience with Blue Green Infrastructure (BGI), involving stakeholders in a value-based decision-making process. Beginning of 2022 the project closed after a very fruitful and impactful implementation of the project. One of the main highlights was that BEGIN was gifted with the great recognition of the REGIO STARS awards. The project received the public choice award for the Green Europe Category and for the General category.

FRAMES – Flood Resilient Areas by Multi-layEred Safety was comprised of 16 partners from five North Sea countries (NL, BE, DE, DK, and UK). 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 researched how Multi-Layer Safety (MLS) can improve the overall flood resilience of areas, communities, and authorities by working with the different layer prevention, mitigation via spatial planning and emergency response. The project closed in 2020.

NuReDrain – Nutrients Removal and Recovery from Drainage Water consists of eleven partners from three different North Sea countries (BE, DE, DK). 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. In 2022 a sound financial model was explored to realize the implementation of nutrient removal technologies. Dialogues with regional and national authorities, farmer' organizations, auctions and processing industry are ongoing to discuss long lasting impact.

PARTRIDGE - (Protecting the Areas Resources through Researched Innovative Demonstration of Good Examples) brings together eleven partners from four North Sea countries (UK, NL, BE, DE). the partner. The overall objective is to demonstrate how to improve biodiversity and ecosystem services by up to 30%. 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. In 2022 the project published and promoted four national and one international in-depth stakeholder interview reports. An online farmer/hunter survey was held. The data is almost analyzed fully and details how national Agri-environment Schemes (AES) can be improved for farmers. The key findings will be published in a nicely designed final report in 2023.

Sullied Sediments - Sediment Assessment and Clean Up Pilots in Inland Waterways in the North Sea Region consisted of 13 partners from U.K, DE, BE, and NL. 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 behaviour.

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 analyzed, 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 (UK, DE, NL, BE, and DK), 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.

2022 marked the final phase of the project. Despite some hiccups caused by the pandemic restrictions, or permission procedure debates, all work at the pilot's sites managed to be finalized. The projects made honest re-calculations of the actual CO2 reductions and

contribution to flood risk reduction, which still underline the importance of working with peatland-restoration to create more climate change resilience. The final report will be submitted in early 2023 and the results will be confirmed for 2022, once the report has been processed and approved.

CATCH – water sensitive Cities: The Answer to Challenges of extreme weather events 12 beneficiaries from six North Sea countries (NL, DE, SE, BE, DK, and UK) were focusing on the redesign of urban water management of midsize cities to become climate resilient cities. CATCH developed the Adapt My City tool, a digital application to support midsize cities in designing long term climate adaptation strategies. In 2022 work on the different pilots on water sensitive communities as well as ecosystem services have been finalized. The final conference took place in November in Zwolle, the Netherlands.

JOMOPANS - Joint Monitoring Programme for Ambient Noise North Sea, with 11 beneficiaries from 7 countries (NL, UK, DE, BE, NO, SE and DK), was recognized as a leading project on underwater noise monitoring in the North Sea.

The results of Jomopans were discussed and taken up in the OSPAR committees EIHA and ICG Noise and in the EU Technical Group on Noise. The project worked 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 were 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. The results help implement noise monitoring in the North Sea, but they will also help to define monitoring in other sea regions. 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 formed the basis for the OSPAR Quality Status Report and the EU MSFD reporting. The project closed in 2022.

IMMERSE - Implementing Measures for Sustainable Estuaries 11 beneficiaries from 6 countries (BE, NL, UK, DE, SE, and DK) collaborate on sharing knowledge and experiences on stakeholder engagement and estuary governance. In March 2022 the project organized its Final Conference in-person in Antwerp. The objective was to tell the IMMERSE story of the development process of solutions and put the 15 solutions being developed as part of the project in the picture. The event was a perfect networking moment for those involved in estuary management in the North Sea Region. Another project achievement in 2022 was the publication of our interactive communication tool. It allows visitors of the website to interactively discover the solutions developed with a lot of visual elements. The StoryMaps collection is a legacy product of the project and will remain online until 2026.

IMMERSE has continued its activities as a results of a successful extension application in 2022. 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), brings together nine organisations from five North Sea countries (DE, BE, DK, NL, and NO). The partners develop and implement a common approach for facing economic, environmental and safety challenges caused by existing ship and aircraft wrecks, lost cargo, and munitions in the North Sea. The overall objective is to improve the sustainable management of the North Sea ecosystem. In 2022 NSW has made a lot of progress on several layers with a high media coverage. The project is successful in providing abundant data, information, methods, and tools on the specific North Sea conditions on munitions and wrecks. NSW is hence contributing to increase the capacity for making decisions and for managing the North Sea area by the relevant actors.

C5A – Cluster for Cloud to Coast Climate Change Adaptation brought together ten partners from all seven North Sea countries (NL, DE, BE, UK, DK, SE, NO). The partners have cooperated to respond to the challenge of climate change by applying a whole system approach, called 'Cloud-to-Coast' (C2C). Catchments, coasts, cities, and infrastructure networks were considered when managing flood risk at different pilot sites. In 2022 practical guidelines as well as a policy brief with four priority recommendations to support the uptake and implementation of the Cloud-to-Coast approach in practice was finalized. The project ended in June 2022.

GEANS comprises nine partners from all North Sea countries (NO, SE, DK, DE, NL, BE, UK). The overall objective is to bring promote the shift from morphological species identification to harmonized genetic tools to save time and money. Stakeholder are supposed to take up the new solutions to carry out more reliable ecosystem health assessments of the North Sea Region. In 2022 the focus was on finalizing several pilots to start the drafting of the decision support framework. The decision support framework will guide end-users and stakeholders with a certain management or monitoring question in mind to the appropriate protocols, methods, reference library and other informative outputs.

BEESPOKE (Benefitting Ecosystems through Evaluation of food Supplies for Pollination to Open up Knowledge for End users) brings together 16 partners from six North Sea countries (SE, DK, DE, NL, BE and UK). Partners are cooperating transnationally to increase levels of 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. In 2022 evaluations of previously sown BEESPOKE seed mixes were conducted. A draft report was prepared about the agri-environment measures in each partner country that supports pollinators. SWOT analyses were conducted to identify where improvements could be made in current national Agri-environment Schemes (AES). Results will be available next year.

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 2022
1	SEEV4-City	Increase of real zero emission kilometers in the SEEV4-City Operational Pilots	150 tons CO2 emissions avoided annually	2786
		Increase in energy autonomy in SEEV4-City sites	25%	2%
1	SHARE-North	New or improved shared mobility services	60	106
		Cars removed from public streets through car-sharing	10,000	15450
		Reduction of local and global transport-related emissions	66000 tonnes of CO2 saved during project lifecycle	114839 t of CO2 saved during project lifecycle (
2	HyTrEc2	Reduction in the cost of hydrogen vans, large trucks and other tested vehicles	25%	21%
		Number of organisations and operators investing and integrating hydrogen technology	22	14
		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	103

		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	5.557
		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)	382.106
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	27%
		Increase in the usage of sustainable mobility solutions	20% increase in number of passengers	39%
		Increase social integration through mobility	20% increase of yearly travel in km using sustainable mobility solutions	33%
7	ART-Forum	Removing bottlenecks: Improved efficiency and safety in passenger and freight transport	50%	More than 50%
		Increased capacity of authorities in the NSR to future proof their transport strategies – 100 organisations	100	122
		Revised Transport Strategies	75%	More than 75%
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	134
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	0
		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	25.000
		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)	22

		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) were 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.

One of the legacies of the project is the successful launch of mobility hub concept across the North Sea region. After the success of mobilpunkte in Bremen, it spread widely in the region and lead to mobilpunkte in Bergen and other Norwegian cities, mobihubs in Belgium and the Netherlands and has inspired wide-scale mobility hub policies in the UK as well as the development of follow-up EU-funded projects. As a result of the launch of the mobihub concept in Flanders, the Flemish Ministry of Transport formed a resolution and dedicated more than 100 Mio EUROS toward the planning and implementation of 1000 mobility hubs in Flanders.

Another major success of the project that features many practical examples is the culmination of nearly six years of work: The Planner's Guide to the Shared Mobility Galaxy, a

comprehensive guide to the types and impacts of shared transport modes for planners and decision makers was published in English, German, Dutch (https://share-north.eu/the-guide/)

The project partners all excelled in communication. Communication through studies carried out, presentations at countless international events, creative and fun communication campaigns (e.g., Shared Mobility Rocks) or the shared mobility film, all helped to promote the benefits of shared transport for citizens.

The results of this project have had an important impact on accessibility and quality of life through regained space for people and improved environmental quality. The project has been closed in 2022.

HyTrEc2 (Hydrogen Transport Economy in the North Sea Region 2) brings together eight partners from four North Sea countries (UK, SE, DE, and NL). The partners are exploring how the conditions for hydrogen-fueled transport can be improved across the North Sea Region. In 2022 vehicle trials continued and further progress was made on delivering the final outstanding three vehicles. A map was developed to provide an overview of the supply chain across the North Sea Region. Planning also took place for a training event working in partnership with other initiatives in the same field.

G-PaTRA (Green Passenger Transport in Rural Areas) has 12 beneficiaries and one co-beneficiary from DK, BE, DE, NL, NO and 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.

Documentation of the legal and regulatory frameworks for public transport in partner countries is almost complete and was expected to be circulated for review by the end of 2022.

The Norwegian partners have completed the business case for hydrogen production at Smøla island, which has attracted a lot of attention, with one company making plans for a hydrogen plant. In 2022 the project was reported to politicians and the public in the UK through the mechanism of the Aberdeenshire Council's infrastructure Services Committee in September 2021 and January 2022, and the council continues to promote the project within the CPMR North Sea Commission Transport Group.

SURFLOGH (Smart Urban Freight Logistics Hubs) has six beneficiaries from four North Sea countries (NL, BE, SE, and UK). The partners 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. In 2022 findings from the different pilots have not only led to direct insights that could function as an example for other cities, but also to the creation of a business model canvas. The work on the different pilots is scientifically analyzed and brought together in a position paper that will be published beginning of 2023.

MOVE (Mobility Opportunities Valuable to Everybody) Eleven beneficiaries (including one local partnership) from five North Sea countries (NL, BE, DE, DK, and UK) were developing and disseminating innovative, environmentally sustainable, and economically viable mobility initiatives through multidisciplinary co-creation, bringing together different stakeholder. It was discovered that sustainable mobility is closely linked to social innovation, livability, health sustainability and economic development. A standard co-creation methodology (explore, design, and develop, evaluate) alongside questionnaires was developed to identify residents' needs in rural areas. Over four years, several sustainable mobility concepts were developed and implemented in pilots in the programme area.

ART-Forum (Automated Road Transport Forum for the North Sea Region) has 14 beneficiaries and one co-beneficiary from 6 countries (DE, BE, DK, NL, and UK). The project's aim was 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.

The project has provided a critical-constructive reflection on the potential implications of Autonomous Vehicles on the work towards of a more sustainable future mobility mix. Cities involved in the project were sharing lessons learned on implementing autonomous applications, which boosted their capacities in terms of potential introduction of AVs in public transportation.

During the project the partners had a great transnational exchange and tackled the complex relations of automated mobility. Even if the full adoption of automated technologies is still a long way off and many questions are still unanswered. ART-Forum built capacity and has convinced stakeholders, society, and authorities to take on the topic in the North Sea Region.

The project has closed its implementation at the end of 2022 and submitted its final report.

BITS (Bicycles and ITS), with ten (plus three from 2021) beneficiaries from 5 countries (NL, DE, BE, DK, and 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.

In total the project has now 14 ITS implementations operational, and other pilots were started implementation in 2022. The project was extended with an additional nine months until the end of 2022 in the extension calls of the programme. 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.

The project closed its implementation at the end of 2022 and will submit its final report early 2023.

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 North Sea countries (NO, SE, DK, DE, BE, NL, and UK). The overall objective was to investigate the future role of public transport authorities regarding combined mobility in sparsely populated areas.

Several pilots were carried out in the project which even led to some negotiations with the Flemish government to introduce the mobility solutions developed within the project in the long term. The final conference of the project took place in November 2022.

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, efficient, smart, and ecological transportation networks are needed. Intermodally should enable a concentration of transnational traffic and long-distance flows, and because of their integration, provides for a highly resource efficient infrastructure use.

In 2022, the project worked with implementing pilots in Hamburg, Oostende, Brussels, and Gothenburg. These pilots focus on developing digital twins, testing autonomous loading through a digital simulation environment, reinforcing the links between North Sea ports and their hinterlands, optimizing the supply chain and city distribution, the development of smart and integrated port processes, etc. A business case is under preparation on the "Possibilities for Port of Vordingborg to be integrated into the TEN-T system and in the European Inland Water system providing green development". Other reports on legal frameworks and feasibility studies have also been developed.

PAV (Planning for Autonomous Vehicles), with 12 partners from 7 countries (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. 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 2022 the PAV partners have made impressive strides with promoting AV integration in European cities. For example, in Varberg (SE) research into possible AV applications was done which serves as a good example of how AV can be integrated into spatial planning strategies. Good progress was achieved with the pilot in Inverness campus, in Orkney and Hannover where AV were tested over time (up to several months). In addition, reports on the social acceptance were drafted considering people's experiences, the attitudes, and behaviors towards AV. A methodology for estimating the CO2 impact from AV is also under development. During this period, an important liaison was established with the International Cleantech Network (ICN) which supports visibility and stakeholder engagement with project results.

ZEM Ports NS (Zero Emission Ports North Sea) has 8 partners from 5 countries (DK, NL, 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.

In 2022, the project initiated significant changes in the project content, also leaving three beneficiaries inactive for the rest of the project implementation. The project will launch a second retrofit propulsion vessel as a pilot and use the experiences for drawing a conclusion on fuel-cell vessels and necessary port infrastructure on inland waterways. The remaining beneficiaries have started this work, mainly focusing on equipment purchase, testing and stakeholder workshops. With an additional lifetime extension, the project will be able to finalize its activities and deliver the main outputs.

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 2022, the project continued the realization of several autonomous water transport solutions. These include the testing of the Maverick (1ton autonomous vessel); the AVATAR (25tons highly autonomous vessel which in in the final stages of installing the equipment), testing of small autonomous boats where a cooperative control of multiple vessels was achieved and the development of a remote-control system for operation of vessels. Use cases in Hamburg and Gent were also prepared in support of the economic assessment studies. Another important achievement was the fine-tuning of KPIs and guidelines for testing and real-life operations as well as the finalization of a guidance for successful implementation of (highly) autonomous zero-emission vessels. Further tests with a sensor box and AI technologies on-board of test boats were also performed.

5. Technical Assistance

(This is a continuation of the text provided in the SFC under this heading):
2022 marked the end of the pandemic and to a large extent a return to normal. This meant that many activities which were cancelled due to the covid pandemic could now be delivered. One of these were the North Sea Conference which took place in May in Bruges. The event took place over 3 days with 330 participants and was delivered in cooperation with the Flemish authorities and the North Sea Commission. Focus during the event was both to promote the new VIB programme but equally important to present the results of the VB programme.

The National Contact Points have been operational in a North Sea Context since 2000 and continue to play a very important role as liaison points between the national authorities in the programme i.e., the Member States/Norway/UK and the secretariat. The contact points are operational in all participating countries (except for Denmark) and play a crucial role in terms of assisting project development and troubleshooting when something goes wrong. The Contact Point network will also be operational in the new Interreg VIB North Sea programme and currently the contact points are in a transition phase between the two programmes.

The preparation of the new Interreg VIB programme was completed and submitted to the European Commission in 2022 and subsequently the programme was approved in August 2022. There have been no physical MC meetings in a VB context in 2022 but a few on-line meetings have been held, not least in connection with the phasing process. Brexit was the big issue in 2020 and 2021 but despite all fears and uncertainties during the transition phase, the change from the UK being an EU country to no longer being so has, on project level, been 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. This good cooperation continues and there is significant interest from the UK in having some kind of cooperation with the North Sea programme in the future. If and how this could happen will obviously be subject to a political decision, but the channels of communication remain open.

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 2022. The table contains information on total funding allocated to operations and to technical assistance, and the amount of eligible expenditure these operations have 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.