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STRATEGIC ENVIRONMENTAL ASSESSMENT OF THE NORTH SEA REGION PROGRAMME

2014-2020

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Non-Technical Summary

The North Sea Region Programme 2014-2020 aims to facilitate the regions around the North Sea to join forces and work together on developing and testing more efficient and effective solutions to the main economic, environmental and transport challenges facing the region. The eligible regions include the whole of Norway and Denmark, eastern parts of the United Kingdom, three provinces of the Flemish Region of Belgium, the north-western regions of Germany, northern and western parts of the Netherlands, and the south-western area of Sweden.

The INTERREG IV North Sea Region Programme, which concluded in 2013, emphasises sustainable development in the general objective of the programme and in two specific objectives. With regard to implementation, activities relating to the sustainable management of the environment have fallen into three main areas: cooperation on sea-related issues, exploring new ways to collaborate on integrated coastal zone management and marine strategies at a North Sea level; addressing water issues such as droughts and salt water intrusion into groundwater, adapting to rising sea level and flooding, and modelling and prediction tools at different scales; and low-carbon energy production and distribution around the North Sea. In terms of improving accessibility, transport projects have integrated energy issues, encompassing new approaches for more environmentally-friendly ships and shipping and enabling airports to address environmental challenges. Sustainable and competitive communities have been promoted through focusing on issues faced by the urban fringe and rural areas, with initiatives to improve services and environmental quality and increase energy efficiency. Overall, projects have supported technological change, derived compatibility between economic growth and environmental improvements, and increased the number of new environmental business opportunities.

The new North Sea Region Programme 2014-2020 has four thematic Priorities: Thinking Growth: supporting growth in North Sea Region economies; Eco-innovation: stimulating the green economy; Sustainable North Sea Region: protecting against climate change and preserving the environment; and Promoting Green Transport and Mobility. These four Priorities and the associated nine specific objectives should contribute to smart, sustainable and inclusive growth with, for example, actions on climate change adaptation including innovative approaches and taking account of the wider needs of communities**.**

Each country or region within the NSRP area has a distinctive environmental profile that conditions and supports programme development, and relevant environmental themes are highlighted in the baseline data and trends. Insofar as possible, these factors have been reviewed in collaboration with competent authorities in the participating countries, culminating in the identification of four strategic environmental issues, as follows.

Biodiversity and Ecosystems continue to be under stress in a number of countries within the programme area. The factors behind these impacts include land-use pressures, exploitation of natural resources and the landscape, pollution of air, water and land, and the effects of climate change. Agriculture is also a key source of diffuse pollutants, potentially impacting on the quality of rivers, coastal and transitional waters. Investment in more systems innovation and the development of more environmentally friendly resources and methods, such as organic pesticides, has been highlighted as

useful for longer-term consideration. Action under this theme should be designed to reverse the decline in degraded ecosystem services such as water quantity and quality, soil and air quality, and halt the loss of biodiversity, delivering greater resource efficiency. Potential activities identified under this theme include developing climate-neutral business parks/urban projects, assessing pollution and environmental risks on the living resources and biodiversity of the North Sea ecosystem, and an ecosystem services approach through which sustainable development is measured throughout the ecosystem and not just by the advancement of technologies at certain points.

With regard to Energy and Resource Efficiency, there is an evident need for increased renewable energy generation, effective promotion of energy efficiency, and changes in travel choices. Whereas the share of energy generated from renewable sources (biomass, wind, sun and water) is increasing, the speed of development in the Netherlands, for example, is insufficient to meet the EU target, and emissions from the oil and gas industry in Norway are expected to remain at the current level up to 2020. A long-term vision for a low-carbon energy system should take into account the strategies of neighbouring countries and build on the four elements of energy savings, wind at sea, carbon capture and storage (CCS) and innovative biomass technologies. Potential activities identified under this theme include developing low-carbon business parks, building up learning factories for resource efficiency in each country in the North Sea Region that could act as competence centres for energy and resource efficiency, and exchanging best practice and supporting uptake between different regions of initiatives related for example to smart cities with low-carbon transport, urban design/land use, and energy efficiency.

Climate Change is associated with a range of potential impacts in the programme area. These factors include an increase in frequency and severity of flooding, sea-level rise, landslides and avalanche, as well as reinforcement of the negative consequences of other pressures resulting in the destruction of habitat, the spreading of alien species, pollution and overuse of natural resources. More frequent and intense precipitation is also expected to cause problems for agriculture and may cause erosion; and sea acidification is also likely to accelerate. Potential activities under this theme include promoting and sharing case studies where businesses have taken advantage of the opportunities of climate change, enhancing climate-modelling capacity with an emphasis on investment in regional initiatives, and creating synergies, for instance by taking measures to adapt to climate change by developing 'building-with-nature' technologies that also promote biodiversity.

Marine Pressures within the programme area include source and diffuse pollution (particularly coastal and transitional waters), marine litter and invasive species, and aspects of climate change. Eutrophication occurs through discharges of nutrients, for example from fish farming, but also through runoff from agricultural areas and inputs from industry and municipal wastewater treatment. The input of nutrients to coastal waters is expected to rise with climate change, which will entail higher erosion rates and more leaching of nutrients from soil, particularly with higher precipitation, especially in winter. Marine areas are under growing pressure from human activities such as aquaculture, extensive fishing and oil and gas production. Potential activities under this theme include utilising integrated coastal zone management (ICZM) to cope with demands on the coastal area made by different economic sectors and the environment, developing a toolkit/procedure/manual on how to improve the efficiency of ICZM in the North Sea region, accompanied by associated demonstration projects illustrating how waste for one is a resource for another, and developing protection systems to handle the increasing pressure on ecosystems and water resources.

In the Strategic Environmental Assessment, the programme's Strategy, Vision and Priorities are considered for their conformity with the Europe 2020 Strategy and the EU Seventh Environmental Action Programme. This analysis demonstrates a clear compatibility between the EU policies and the NSRP programming document. Thereafter, each of the Objectives is assessed for potential impacts on the strategic environmental issues.

With regard to significant positive environmental effects, the potential environmental benefits could be long-term and cumulative in nature, for example as projects designed to support a green economy realise opportunities for investment and employment-creation in areas such as renewable energy and energy efficiency, reducing carbon emissions by furthering the transformation in the energy system away from fossil fuels. Furthermore, the adoption and mainstreaming of a holistic environmental management approach, which ensures that environmental impacts do not exceed sustainable limits for any aspect of the North Sea Region's ecosystem, would allow a natural balance to be maintained in the long term. Other potentially significant impacts could emerge from reorienting businesses towards a more sustainable direction and practices, opening up new growth opportunities, and involving a greater focus on using locally available resources; whereas improving modal choice in transport also has scope for significant positive impact, supporting the transition of the NSR transport system to much less environmentally damaging practices. Other positive effects may emerge from tackling climate change, as the programme supports the development or improvement of methods for adapting to potential and anticipated impacts, and there is potential for long-term positive impact if new niche sectors are created or identified, in which environmental techniques, technologies and other products are promoted and marketed to generate sustainable new activity.

Significant negative environmental effects would relate to unanticipated impacts, indirect effects or where projects are mismanaged or environmental conditions not fully observed. Risks to human health are anticipated as minimal, particularly since the partner countries have robust systems of environmental control and planning, and the transboundary nature of cooperation is likely to produce a better understanding and exchange of experience with regard to environmental control. However, achieving higher energy efficiency could involve negative environmental impacts, depending upon the type of energy generated; and there is also a risk of failing to meet sustainability principles, for example if resources are drawn from other areas and building materials are not based on natural products from the programme area. Other disadvantageous outcomes might relate to supporting familiar regional environmental strengths rather than creating a new development path that generates innovative environmental solutions, and incidences of projects aiming for minimum environmental compliance rather than pursuing environmental excellence.

To mitigate negative impacts, the programme must convey a clear message that positive environmental impact is a key element of the programme's strategy, and that competitiveness should be based on high environmental standards and environmental management techniques. Innovation should be understood to include environmental excellence as a means of fulfilling the vision that the NSR programme is pursuing. Natural resources must be exploited in a sustainable manner, avoiding risks of further pollution, with greater awareness of sustainability thresholds and the capacity of various environments to accommodate greater loads to avoid threatening natural resources and habitats or polluting air, water or land. During implementation, appropriate monitoring and feedback

will be required regarding the impacts of completed initiatives.

Monitoring indicators are required to determine environmental effectiveness. In practice, these indicators should not only encapsulate effectiveness in addressing the strategic environmental issues but should also contribute to measuring the effectiveness of the NSR Programme overall. A range of potential indicators is provided, with suggestions for the division between Priorities and Objectives.

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1. INTRODUCTION

1.1 Objective of the Report

The objective of this Strategic Environmental Assessment (SEA) is to compile a report that improves the environmental dimension of the INTERREG North Sea Region Programme for the 2014-2020 period.

In the context of programme preparation, SEA represents a tool for greening plans and programmes and for improving their overall logic, consistency and effectiveness. The purpose of the SEA is to secure positive environmental impact through constructive participation in the programming process.

The findings of the SEA are not binding on an authority, but they allow scope to create targeted environmental impact. This means going beyond conventional environmental protection to secure environmental gain, defined as the attainment of environmental benefit as a direct or indirect result of economic development activity. In such a scenario, positive environmental impact is envisaged as a result of environmental integration, with development programmes enhancing the environment through innovative measures.

This report has been prepared in accordance with Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment, which describes its objective as:

> '*to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans with a view to promoting sustainable development'* (Article 1).

Article 2 of the Directive defines relevant plans and programmes as including those co-financed by the European Community, and which are likely to have significant environmental effects. Article 3 specifies that an environmental assessment should be carried out for plans and programmes related to activities in agriculture, forestry, fisheries, energy, industry, waste management, water management, telecommunications, tourism, town and country planning or land use, and which set the framework for the development consent of projects listed in Annexes I and II to Directive 85/337/EEC (environmental impact assessment), or which, in the view of the likely effect on sites, have been determined to require an assessment pursuant to Article 6 or 7 of Directive 92/43/EEC (habitats). Projects are defined as construction works or other installations and schemes, and other interventions in natural surroundings and landscape, including those involving the extraction of mineral resources.[1] Criteria for such projects emanating from the programme and steering development consents could comprise limits on the type of activity which is permitted, or conditions to be met by an applicant if permission is granted, or the preservation of certain characteristics of the area concerned.

As the North Sea Region Programme 2014-2020 encompasses and addresses a number of these activities, and has the potential to deliver or support projects that could produce significant (positive and negative) environmental effects, it fulfils the Directive's screening criteria for being subject to strategic environmental assessment.

[1] Article 1(2) of the EIA Directive.

The main steps of the SEA process comprise preparation of an environmental report, consultations with environmental authorities and the public, incorporation of the results of the consultations into decision-making, provision of information on the decision, and suggesting indicators for monitoring the effects of the programme during its implementation. The environmental report identifies likely significant effects of the programme on the environment, taking into account the programme's objectives and the consideration of alternatives, the contents and level of detail of the programme, the stage in the decision-making process, and the extent to which certain matters are more appropriately discussed at different levels in order to avoid duplication.

The SEA Directive states that the environmental authorities must be consulted with regard to the scope and level of detail of the information to be included in the environmental report, contributing to the definition of the content of the report and the fields to be covered. For the North Sea Region Programme, these consultations took place as part of the compilation of the country-specific environmental baseline and trend information from which Strategic Environmental Issues were subsequently identified. These issues were then utilised within the structure of the Strategic Environmental Assessment of the NSR programme.

1.2 Key Facts

Information on the North Sea Region Programme for 2014-2020 is presented in Table 1. These key facts identify the programme boundaries, explain the programme rationale, and specify a contact point where further information can be obtained. The programme's extensive territorial coverage is illustrated in Figure 1.

Table 1: North Sea Region Programme Key Facts

Managing Authority:	Danish Enterprise and Construction Authority, Vejlsøvej 29, DK-8600, Silkeborg
Programme Title:	North Sea Region Programme 2014-2020, European Territorial Cooperation INTERREG V
Programme Rationale	The North Sea Region Programme 2014-2020 will allow the regions around the North Sea to join forces and work together on developing and testing more efficient and effective solutions to the main economic, environmental and transport challenges facing the region. The NSRP 2014-2020 is a programme for experimentation and innovation with a view to changing the NSR through the power of good examples. By evaluating impact through the extent to which non-partner organisations take up new methods, the NSRP aims to define a transnational agenda for future-proofing the programme area against the most important challenges awaiting the North Sea Region.
Programme Duration:	The programme will run for seven years from 2014 until 2020.
Programme Area:	The eligible regions include the whole of Norway and Denmark, eastern parts of the United Kingdom, three provinces of the Flemish Region of Belgium, the north-western regions of Germany, northern and western parts of the Netherlands, and the south-western area of Sweden.
Contact Point:	The North Sea Region Programme Secretariat Jernbanegade 22, DK-8800 Viborg, DENMARK Tel.: +45 7841 1770 | Fax: +45 8660 1680 Website: www.northsearegion.eu

Figure 1: Map of Programme Area

1.3 Programme Context

To set the Strategic Environmental Assessment of the NSRP 2014-2020 in context, it is important to consider the scale, scope and position of the programme, as well as the role of EU territorial cooperation more generally.

Territorial cooperation has been implemented through the long-standing INTERREG initiative, funded through the European Regional Development Fund. Introduced in 1990, INTERREG has evolved over five funding periods, and territorial cooperation is now one of the three EU Structural Funds objectives. Under the current arrangements, territorial cooperation is subdivided into cross-border (Strand A), transnational (Strand B) and interregional (Strand C) cooperation. The transnational cooperation programmes, of which the NSRP 2014-2020 is one, cover larger areas of cooperation

and focus on encouraging regions from different countries 'to work together and learn from each other through joint programmes, projects and networks'.[2]

The incorporation of territorial cohesion as a third dimension of regional policy has focused increased attention on the potential role of programmes, such as the NSRP, to deliver more tangible results. Already, in terms of the qualitative impacts of territorial cooperation, the added value of European territorial cooperation is difficult to dispute:

- cooperation programmes can address areas of significant political and symbolic added value;
- cooperation enables specific territorial problems to be tackled that could not have been addressed through other support programmes;
- opportunities are provided for learning and the exchange of experience;
- different types of organisation which do not regularly work together can be brought together; and
- activities can result in a significant increase in the number, intensity and dynamics of cross-border contacts at national, regional and local levels.[3]

However, the comparatively limited budget allocated to cooperation programmes restricts their scope to produce large-scale tangible impacts. Additionally, the character of INTERREG B (such as the NSR programme), focusing on larger geographic areas and often involving networking activities, limits their 'concrete' impact even further.

These broad considerations can all be applied to the 2014-2020 NSRP. However, it is also worth noting the particular scale, position and scope of the programme. The scale of the programme area and population, in contrast to the comparatively modest resources available, means that the NSRP cannot expect to deliver major change on key economic, environmental and social concerns at the programme level. Additionally, the NSRP has to operate within a congested policy environment. The programme has to consider its place/position in this context and where it can best add value. In doing so, it has had to take into account:

- where the role of the NSRP may be limited, as other policies and programmes may be better adapted to addressing selected development concerns; and
- the scope for synergies with other policies and programmes on specific issues.

The programme's focus is also restricted by European Union Cohesion policy regulations and domestic policy priorities. According to the draft regulation, transnational cooperation programmes are expected to be selective in their focus and be results-oriented. From a prescribed list of 11 thematic objectives set out in the Common Strategic Framework, the NSRP had to choose a limited number of themes, and within the selected themes the programme was then required to select a number of investment priorities and develop its own specific objectives. Actions were also expected to be in line with areas of activity highlighted as relevant for transnational cooperation programmes.[4] In addition, the programme had to develop in line with domestic policies and agendas for territorial cooperation.

[2] http://ec.europa.eu/regional_policy/cooperate/cooperation/index_en.cfm

[3] M Ferry and F Gross, *The Future of Territorial Cooperation in an Enlarged EU*, Paper prepared for 2nd International Conference, Benchmarking Regional Policy in Europe, Riga, 24-26 April 2005.

[4] CEC, (2012) Commission Staff Working Document, Elements for a Common Strategic Framework 2014 to 2020, 14 March 2012

Taken together, these frameworks and regulations mean that the programme is, to an extent, limited in terms of the issues with which it can directly engage.

1.4 Structure of the Report

Section 2 reviews the environmental context of the North Sea Region Programme. This includes consideration of the environmental performance of the INTERREG IVB NSRP 2007-2013, an overview of the priorities of the draft programme for 2014-2020, and a review of relevant environmental strategies, programmes and policies.

Section 3 examines the environmental baseline and trends within the countries participating in the NSRP area.

Section 4 identifies strategic environmental issues, comprising the four themes of biodiversity/ecosystems, energy and resource efficiency, climate change and marine pressures.

Section 5 presents an environmental assessment of the new programme. Following a description of the evolution of the programme's environmental focus, the programme Vision & Strategy, Priorities and Objectives are subjected to an environmental appraisal. Thereafter, the report discusses likely significant effects on the environment, measures envisaged in preventing adverse effects, and potential indicators for monitoring environmental effectiveness.

2. THE NORTH SEA REGION PROGRAMME IN CONTEXT

2.1 Introduction

In a review of the environmental context of the programme, this section considers the environmental performance of the INTERREG IVB North Sea Region Programme 2007-2013, the content of the INTERREG V North Sea Region Programme, and the significance of existing environmental strategies, programmes and policies as guiding instruments.

2.2 INTERREG IV North Sea Region Programme 2007-2013

The INTERREG IV North Sea Region Programme for 2007-13 has four Priorities:

- Priority 1, *Building on our Capacity for Innovation,* which has the objectives of encouraging the introduction and development of new and improved products and processes within the region's businesses and services, stimulating innovation within identified clusters and research and innovation networks, creating the right conditions for an innovation-oriented environment, and encouraging the adoption and use of ICT applications across the North Sea Region.

- Priority 2, *Promoting the Sustainable Management of our Environment*, which has the objectives of sustainable development of the coastal land and sea areas through integrated coastal zone management, developing preventative and response measures to address marine acute and chronic pollution, adapting to and reducing risks posed to society and nature by a changed climate, and promoting environmentally-responsible energy production practices.

- Priority 3, *Improving the Accessibility of Places in the North Sea Region*, with the objectives of promoting regional accessibility strategies, promoting the development of multi-modal and transnational transport corridors, and promoting the development of efficient and effective logistics solutions.

- Priority 4, *Promoting Sustainable and Competitive Communities: Creating Attractive Places in Which to Live and Work*, with the specific objectives of securing solutions to the needs of areas in decline to ensure that they contribute to the economic and social wealth of the North Sea Region, promoting and managing sustainable growth in expanding areas in order that they achieve their full economic and social potential, and implementing energy-efficient solutions for settlements.

With regard to the environmental performance of the NSRP 2007-2013, an appraisal can be drawn from the associated Strategic Environmental Assessment (2007) and the recent Strategic Orientation Report (2013).[5]

The Strategic Environmental Assessment (SEA) of the NSRP 2007-13 concluded that sustainable development was emphasised in the general objective of the programme, as well as in two specific

[5] ECORYS/COWI (2007) Ex ante Evaluation and SEA of INTERREG IVB North Sea Region Programme 2007-2013; INTERREG IVB North Sea Region Secretariat (2013) Strategic Orientation Report - Working paper for the next programme period, ISSN 1904-4704.

objectives. Priority 2 was assessed as supporting SD through its explicit focus on environmental management, and Priority 4 inherently addressed sustainability. With regard to the environmental impact of projects, the SEA observed that the ex-ante stage made project-specific impacts difficult to predict. Nevertheless, a limited number of interventions related to process change were addressed in terms of relevant environment issues and criteria, with the conclusion that there was clear potential for process change through effective environmental integration, ultimately modifying the extent and direction of environmental impact. The SEA also described the project design phase as one where positive environmental inputs could reduce the impacts of existing activities and practices across the North Sea Region. Overall, however, detailed assessment of environmental impact would only be possible at a later stage subsequent to the programming process, and accordingly a downstream environmental screening mechanism was recommended by the evaluation team for use in the programme implementation phase. The SEA also proposed environmental indicators for monitoring the environmental performance of projects, based on the information presented in the initial applications.

With regard to the implementation phase, the Strategic Orientation Report summaries key activities within the projects under different themes. In terms of promoting the sustainable management of the environment (Priority 2), the activities fall into three main areas:

- First, in improving the transnational level of cooperation on sea-related issues, partnerships looked into new ways to collaborate on integrated coastal zone management and marine strategies at a North Sea level. The relevance of marine spatial planning for the region as an upcoming main European policy issue has also been addressed. Another main driver for transnational cooperation on sea issues has been technical feasibility testing to keep sea water clean by running joint pilots in the North Sea Region on ballast water.

- The second main area of activities concerned water issues including major challenges such as droughts and salt water intrusion into groundwater. Concepts for adapting to a rising sea level and flooding were also key focus elements for activities on transnational level. Partnerships developed risk management and adaptation plans and new collaboration and exchange systems and piloted and demonstrated new solutions by bringing in experiences from the different member countries with a potential for these solutions to be taken up around the North Sea. In relation to the Water Framework and Groundwater Directives, aspects of modelling and prediction tools were developed at different scales together with and for the regions around the North Sea. The partnership activities raised significant awareness about the transnational level of implementing the EU Flood Directive.

- The third main area of activities focused on low-carbon energy production and distribution around the North Sea. These activities were inspired by political debates about limited resources and the need for alternatives to fossil fuels. They have implications on a European as well as North Sea level, as the region is a key producer of energy, exploitation and production technologies and an important exporter of gas and oil.

In terms of improving the accessibility of places in the North Sea Region (Priority 3), most of the transport projects have expressed interest in linkages with energy issues, which has led to piloting and demonstrating new approaches for more environmentally-friendly ships and shipping by taking

ferry connections and port operations into account. Enabling airports to address some of their main environmental challenges was another effort in this direction.

Lastly, with regard to promoting sustainable and competitive communities (Priority 4), attention has been given to the challenges faced by the urban fringe and rural areas, and initiatives to improve services and environmental quality have included pilot actions considering how best to regenerate and redevelop derelict inner city land through planning and design. The potential for promoting energy efficiency has also been explored. Transnational activities have included the improvement of energy standards for building and construction activities and have allowed for expertise to be shared to determine, evaluate and implement solutions and responses for the North Sea Region.

These examples illustrate how projects have supported technological change, derived compatibility between economic growth and environmental improvements, and increased the number of new environmental business opportunities. In addition, most environmental projects have had close connections with on-going research projects within the 6th and 7th Framework Programmes as well as on-going national R&D/RTD projects. The innovative work being carried out is expected to have a substantial impact on regional, national and European policy as well as offering considerable potential for the implementation of green industry.

It is also worth noting that both the SURF and TIDE INTERREG IVB projects are highlighted in the Europeans Commission's study on Cohesion Policy and sustainable development in the context of an ecosystem and ecosystem services approach.[6] Specifically, recognition was given to the SURF project's work, which focuses on improving the environment along the River Don. The partner aims to investigate opportunities for green tourism and to improve access for the local people by empowering local communities. The study highlighted the relevant environmental and economic benefits that could be attained as well as the value of developing tools that assist with the economic quantification of ecosystem services. Similarly, the inclusion of the work of the TIDE project illustrated the integration of an ecosystems services approach to planning in estuaries, which allows for the continued development of ports whilst preserving natural assets. It was noted that the TIDE approach will link ecosystem services to economic values by aiming to achieve a win-win situation.

2.3 North Sea Region Programme 2014-2020

For 2014-2020, the North Sea Region Programme has four thematic Priorities, which follow from and contribute to the programme strategy:

- Thinking Growth: Supporting growth in North Sea Region economies
- Eco-Innovation: Stimulating the green economy
- Sustainable North Sea Region: Protecting against climate change and preserving the environment
- Promoting Green Transport and Mobility.

[6] http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/sustainable_development/sd_final_report.pdf

Nine specific Objectives are associated with these four Priorities, as outlined in Tables 2 to 5.

Table 2: NSRP Priority 1: Thinking Growth: Supporting growth in North Sea Region economies

Objective 1.1 **Develop new or improved knowledge partnerships between businesses, knowledge institutions, public administrations and end-users with a view to long-term cooperation (post project) on developing specific products and services**
Rationale: This objective targets the improved integration of research, innovation and education through establishing new networks and clusters for project and service development. Its aim is to establish a regular exchange of information leading to concrete joint development projects that ultimately lead to new or improved products and services for participating companies.
Objective 1.2 **Enhance regional innovation support capacity so that it will allow regions to effectively increase innovation levels after the end of the funding period and particularly in line with smart specialisation strategies**
Rationale: This objective seeks to ensure that all regions – regardless of location and capacity – are well-placed to develop their role in the knowledge economy and thereby deliver growth and jobs to the population. Rather than encouraging adoption of generic development models, its aim is to facilitate solutions that clearly differentiate each region and build development pathways based on existing assets.
Objective 1.3 **Stimulate the public sector in generating innovation demand and innovative solutions for improving public service delivery**
Rationale: Public sector actors can create demand for new and/or improved products and services and thereby 'pull' innovation, rather than relying on research to 'push' it with new inventions. This would encourage the development of more efficient and effective solutions for major challenges facing important areas of public service delivery such as public administration, healthcare, energy and the environment.

Table 3: NSRP Priority 2: Eco-Innovation: Stimulating the green economy

Objective 2.1 **Promote the development and adoption of products, services and processes to accelerate greening of the North Sea Region economy**
Rationale: Within the ecosystem approach, economic activities must move away from practices that will ultimately destroy the environments in which they operate. The programme aims to act as a catalyst for an industrial transition, supporting experimentation and transformative actions that will pilot a major shift in current patterns of production, consumption, working and living, redirecting activities in a more sustainable direction.
Objective 2.2 **Stimulate the adoption of new products, services and processes that reduce the environmental footprint of regions around the North Sea**
Rationale: Focusing on energy use and generation, new initiatives will help to reduce the regional environmental footprint. Local and regional-level action can contribute to energy savings and carbon emissions reductions, including greater use of renewables. Technological development, wider take-up of proven technologies, changes to working practices and/or behavioural changes will all be utilised to develop new solutions.

Table 4: NSRP Priority 3: Sustainable North Sea Region: Protecting against climate change and preserving the environment

Objective 3.1 **Demonstrate new and/or improved methods for improving the climate resilience of target sites**
Rationale: Climate change is a major threat that could impact on all aspects of affected ecosystems. Actions will be designed to address the negative impacts that have already occurred and prepare the North Sea Region for projected changes based on a further temperature rise of at least 1.5^{o}C. Climate change adaptation actions will include – but extend far beyond – cooperation on flood defence.
Objective 3.2 **Develop and/or implement new methods for the long-term sustainable management of North Sea ecosystems**
Rationale: Sustainable management aims to ensure that human impacts do not exceed the sustainable limits of the North Sea Region's ecosystems, so that a natural balance can be maintained. This will include ways of reducing nitrogen and phosphorus overloads, pollution and biodiversity loss, as well as ensuring sustainable limits for resource extraction, freshwater use and land use.

Table 5: NSRP Priority 4: Promoting Green Transport and Mobility

Objective 4.1 **Develop demonstrations of innovative and/or improved transport and logistics solutions with potential to move large volumes of freight away from long-distance road transportation**
Rationale: Effective transport of goods is a condition for growth in all parts of the North Sea Region. A major step in reducing emissions would be to extensively expand multimodal services and limit the use of trucks to the first and last kilometres of any journey. Better integration of services is needed so that goods can move easily from door-to-door at a level of speed, cost and reliability that is competitive with road transport.
Objective 4.2 **Stimulate the take-up and application of green transport solutions for goods and personal transport**
Rationale: Local and regional freight transportation is dominated by trucks, and new solutions need to be found that can offer comparable levels of convenience at a much lower environmental cost. Similarly, passengers should continue to move from private cars to other means of transport, and this should be achieved through the integration of services and sustainable urban transport planning.

2.4 Relevant Environmental Strategies, Programmes and Policies

This section identifies key environmental initiatives that characterise and determine the operational context for the North Sea Region Programme. This contextual awareness also highlights significant aspects of these various strategies, programmes or policies with regard to the scope for environmental impact afforded to the NSRP.

Global initiatives

At global level, the major relevant initiatives are the United Nations Conference on Sustainable Development (Rio+20), which took place in Brazil in 2012, and the updated Kyoto Protocol.

Rio+20 marked the 20th anniversary of the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro and the 10th anniversary of the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg. Its objectives included securing renewed political commitment for sustainable development, and it resulted in a focused 'political outcome document' that contains practical measures for implementation. It also reaffirmed the need to achieve sustainable development by promoting sustained, inclusive and equitable economic growth, creating greater opportunities for all, reducing inequalities, raising basic standards of living, fostering equitable social development and inclusion, and promoting integrated and sustainable management of natural resources and ecosystems. The Conference also adopted guidelines on green economy policies, and launched a process to develop a set of Sustainable Development Goals (SDGs) that build upon the Millennium Development Goals and converge with the post-2015 development agenda.

The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) is an international treaty that sets binding obligations on industrialised countries to reduce emissions of greenhouse gases. The UNFCCC is an environmental treaty with the goal of preventing degenerative anthropogenic impacts on the climate system. As part of the Kyoto Protocol, which entered into force in 2005, many developed countries have agreed to legally binding limitations/reductions in their emissions of greenhouse gases over two commitments periods. The first commitment period applied to emissions between 2008 and 2012, and the second commitment period applies to emissions between 2013 and 2020. In December 2012, an agreement was reached to extend the Protocol to 2020 and to set a date of 2015 for the development of a successor document to be implemented from 2020. In addition, the new concept of 'loss and damage' was introduced, an agreement in principle that richer nations could be financially responsible to other nations for their failure to reduce carbon emissions.

EU perspectives

Within the European Union, the documents with the greatest relevance are the Europe 2020 Strategy and the Seventh Environmental Action Programme. Sustainable development became a fundamental objective of the EU in 1997, when it was included in the Treaty of Amsterdam as an overarching objective. Subsequently, at the Gothenburg Summit in 2001, the first EU Sustainable Development Strategy (SDS) was launched. Whereas the Lisbon Strategy focused on employment, economic reform and social cohesion, the SDS added an environmental dimension and established a new approach to policy-making. In June 2006, the European Council adopted a renewed SDS.

Europe 2020

In 2010, a strategy for sustainable growth was launched – Europe 2020: A Strategy for smart, sustainable and inclusive growth[7] – which sets out a vision of Europe's social market economy for the 21st century. All future INTERREG programmes are expected to be in line with Europe 2020. Its priority of sustainable growth means promoting a more resource-efficient, greener and more competitive economy. Such an approach is anticipated to help the EU to prosper in a low-carbon, resource-constrained world, while preventing environmental degradation, biodiversity loss and unsustainable use of resources. It will also underpin economic, social and territorial cohesion.

Amongst its five objectives, which relate to employment, education, research and innovation, social inclusion and poverty reduction, and climate change/energy, the factors of greatest environmental relevance include limiting greenhouse gas emissions by 20 percent or even 30 percent compared to 1990 levels, creating 20 percent of energy needs from renewable sources, and increasing energy efficiency by 20 percent (the "20/20/20" climate/energy targets). Each EU Member State has adopted its own targets in these areas.

In addition, specific areas of action have been addressed through seven flagship initiatives, three of which are especially environmentally relevant, as illustrated in Table 6.

Table 6: Europe 2020 Flagships

Resource-efficient Europe aims to decouple economic growth from the use of resources. It supports the shift towards a low-carbon economy, increased use of renewable energy resources, the development of green technologies and a modernised transport sector, and the promotion of energy efficiency. This flagship stresses the need for an urgent and significant transition towards using natural resources efficiently. This applies to producers and consumers in relevant areas such as energy, transport, climate, environment, agriculture, fisheries and regional policy.
An Industrial Policy for the Globalisation Era aims to improve the business environment, notably for SMEs, and it supports the development of a strong and sustainable industrial base able to innovate and compete globally. Its focus includes adjusting production processes and products to a low-carbon economy, realising opportunities within the green economy, supporting the transition to greater energy and resource efficiency, promoting technologies and production methods that reduce natural resource use, and increase investment in the EU's existing natural assets.
The *Innovation Union* flagship is also relevant, along with its associated financial instrument, Horizon 2020, turning innovative ideas into products and services that create growth and jobs. Its aim is to re-focus R&D and innovation policy on the challenges facing society, such as climate change, energy and resource efficiency, health and demographic change. A strategic research agenda will focus on challenges such as energy security, transport, climate change and resource efficiency, health and ageing, environmentally-friendly production methods and land management. It seeks to facilitate the key enabling technologies to shape Europe's industrial future.

The targets within Europe 2020 are interrelated: increased resource efficiency will improve competitiveness and foster job creation; and investing in cleaner, low-carbon technologies will help the environment, contribute to fighting climate change and create new business and employment opportunities.

[7] European Commission (2010) – Europe 2020: A Strategy for smart, sustainable and inclusive growth. COM(2010) 2020 final.

EU Seventh Environmental Action Programme

The 7th Environmental Action Programme[8] sets out priority objectives to be attained (art. 192.3) in environmental policy in the context of the Europe 2020 Strategy. As part of the follow-up to the 2012 United Nations Conference on Sustainable Development described above, the new environmental action programme supports international and regional processes aiming to transform the global economy into an inclusive green economy in the context of sustainable development and poverty reduction.

Whereas many environmental challenges are global and can only be fully addressed through a comprehensive global approach, other environmental challenges have a strong regional dimension, which requires cooperation with neighbouring countries. The programme foresees significant scope for reducing greenhouse gas emissions and enhancing resource efficiency in the Union. This will ease pressures on the environment and bring increased competitiveness and new sources of growth and jobs through cost savings from improved efficiency, commercialisation of innovations and better management of resources over their whole life cycle.

While progress has been made in the EU to decouple growth from GHG emissions, resource use and environmental impacts, resource use is still largely unsustainable and inefficient, and waste is not yet properly managed. As a result, EU businesses are foregoing the significant opportunities that resource efficiency offers in terms of competitiveness, cost reductions, improved productivity and security of supply. Water quality and air pollution levels are still problematic in many parts of Europe, and EU citizens continue to be exposed to hazardous substances, potentially compromising their health and wellbeing. Unsustainable land use is consuming fertile soils, with impacts on food security and the achievement of biodiversity targets. Soil degradation continues largely unchecked. Addressing some of these complex issues requires tapping into the full potential of existing environmental technology and ensuring the continuous development and uptake by industry of the best available techniques and emerging innovations. Rapid advances in promising fields of science and technology are also needed.

Reflecting recent policy developments, the 7th programme is more strategic in nature than the 6th programme, re-clustering the previous four areas for action into three core thematic objectives:

(i) to protect, conserve and enhance the EU's natural capital;

(ii) to turn the EU into a resource-efficient and more competitive low-carbon economy; and

(iii) to safeguard EU citizens from environment-related pressure and risks to health and wellbeing.

In providing an overarching framework for environmental policy to 2020, the new programme should build on the EU Biodiversity Strategy to 2020, the EU climate and energy package, the Roadmap for moving to a low-carbon economy in 2050, the Roadmap to a resource-efficient Europe, and the Innovation Union Flagship Initiative.

[8] European Commission (2012) Proposal for a DECISION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on a General Union Environment Action Programme to 2020 "Living well, within the limits of our planet" COM(2012) 710 final.

The programme has nine Priority Objectives, as outlined in Table 7.

Table 7: 7th Environmental Action Programme Priority Objectives

Examples of relevant features	
1: To protect, conserve and enhance the EU's natural capital	Halt the loss of biodiversity and ecosystem degradation, reduce impacts on fresh and coastal waters, reduce pressures on marine waters, protect soil and remediate contaminated sites, and improve the resilience of forests to climate change and fires.
2: To turn the EU into a resource-efficient, green and competitive low carbon economy	Meet 2020 climate and energy targets, reduce the environmental impact of industry, increase resource efficiency, reduce waste generation, limit energy recovery to non-recyclable materials, eradicate landfilling of recyclable and compostable materials, and reduce or prevent water stress.
3: To safeguard EU citizens from environment-related pressures and risks to health and wellbeing	Improve air quality, decrease noise pollution, assess and minimise environmental risks, make progress in adapting to climate change impacts, and integrate climate change adaptation and disaster risk management into policy initiatives and sectors.
4: To maximise the benefits of EU environment legislation	Ensure that EU citizens have access to clear information showing how EU environmental law is being implemented, reinforce respect for EU environmental law at all administrative levels, and enhance trust and confidence in environmental law.
5: To improve the evidence base for environment policy	Improve the basis for developing and implementing environment and climate polices, including measuring costs and benefits, improve the ability to evaluate and manage emerging environmental and climate risks, and strengthen the environment policy-science interface.
6: To secure investment for environment and climate policy and get the prices right	Achieve environment and climate change policy objectives in a cost-effective way, supported by adequate finance, and increase private sector funding for environment and climate-related expenditure.
7: To improve environmental integration and policy coherence	Integrate environmental and climate-related conditionalities and incentives in policy initiatives, and carry out systematic ex-ante assessments of environmental, social and economic impacts to ensure their coherence and effectiveness.
8: To enhance the sustainability of EU cities	Implement policies for sustainable urban planning and design, define criteria to assess the environmental performance of cities, and ensure that cities have access to financing for measures to improve urban sustainability.
9: To increase the EU's effectiveness in addressing regional and global environmental and climate challenges	Engage in relevant international, regional and bilateral processes in a strong, focused, united and coherent manner, and address challenges related to water, oceans, sustainable land and ecosystems, resource efficiency (particularly waste), sustainable energy and climate change.

The Impact Assessment accompanying the programme acknowledges that greener, more efficient technologies, improved productivity and new employment opportunities will support growth and jobs; and a coherent and more integrated policy framework in support of resource efficiency and greener products will help also SMEs striving to become more resource-efficient by reducing their production costs and facilitating their access to new markets. Meanwhile, ensuring the resilience of our

ecosystems that support growth and protecting the health of citizens is essential to ensure the sustainability of economic advancement.[9]

In a consultation, businesses stressed the need for innovation and resource efficiency while taking into account competitiveness concerns.

North Sea Region 2020

In 2011, the North Sea Commission published a North Sea Commission Strategy (NSR 2020) envisaged as a contribution to the Europe 2020 Strategy, which would more efficiently address common transnational challenges and exploit perceived opportunities. Priority areas in the NSC strategy, which are largely seen as interconnected, include managing maritime space, increasing accessibility and clean transport, tackling climate change, and maintaining attractive and sustainable communities, as well as a horizontal principle of promoting innovation, excellence and sustainability.

The NSR 2020 contributes especially to the Europe 2020 Flagship for a Resource-Efficient Europe. Specifically, in supporting sustainable growth, the NSR 2020 aims to reduce energy consumption, increase the use of renewable energies, modernise the transport sector by making it more environmentally friendly and more efficient, and promote green tourism.

Furthermore, it identifies energy and environmental challenges and risks, as well as opportunities in terms of transport, energy resources, environmental assets and innovation.

Arctic Strategy

Aware of the need for international cooperation on Arctic issues, the European Parliament approved a resolution on Arctic governance in 2008, and the Commission adopted its first communication on the Arctic in the same year, setting out EU interests and proposed actions around three main policy objectives:

- protecting and preserving the Arctic in unison with its population;
- promoting sustainable use of natural resources; and
- contributing to enhanced governance in the Arctic through implementation of relevant agreements, frameworks and arrangements, and their further development.[10]

More recently, in 2012 the Commission and the High Representative of the EU for Foreign Affairs and Security Policy published a joint communication highlighting areas where the EU is making a contribution to the protection and development of the Arctic. Specific environmental aspects include: fighting climate change; research on the Arctic environment that highlights the EU environmental footprint; and investing in sustainable development in the North to develop environmental potential. Proposals for further policy development include supporting research and channelling knowledge to

[9] European Commission (2012) IMPACT ASSESSMENT *Accompanying the document* Proposal for a Decision of the European Parliament and of the Council on a General Union Environment Action Programme to 2020 "Living well, within the limits of our planet" SWD(2012) 397 final.

[10] European Commission (2008) Communication from the Commission to the European Parliament and the Council, The European Union and the Arctic region, COM(2008) 763, 20 November.

address the challenges of environmental and climate changes in the Arctic, and ensuring that economic development in the Arctic is based on the sustainable use of resources and environmental expertise.[11]

The Northern Dimension policy also encompasses Arctic issues and is looking to expand its involvement. Environment-related themes in the Northern Dimension that are complementary to the NSRP include partnerships in environmental protection, energy efficiency and the use of renewable energy.

[11] EC and High Representative of the European Union for Foreign Affairs and Security Policy (2012) Joint Communication to the European Parliament and the Council, Developing a European Union Policy towards the Arctic Region: progress since 2008 and next steps. SWD (2102) 182.

3. ENVIRONMENTAL BASELINE AND TRENDS

3.1 Introduction

The purpose of this section is to provide environmental information that describes the current environmental conditions in the NSRP area, that supports the identification of environmental issues or problems, and that contributes to a baseline against which the programme's environmental effects can be assessed. This comprises both quantitative and qualitative data. It does not present an exhaustive list of every possible environmental parameter, but is selective in choosing topics considered relevant to the scope and potential influence of the programme.

Data and information have been gathered through a combination of desk-based research and direct consultation with a network of environmental contacts in each of the participating countries. The following organisations were involved in this interaction:

- Land-Use Consultants, Scotland;
- Ministry of the Environment, Denmark;
- Enterprise Flanders, Belgium
- Ministry of the Environment, Norway;
- Environmental Protection Agency, Sweden;
- Association for Housing, Urban and Spatial Development, Germany;
- Environment Agency, England;
- Ministry of Infrastructure and the Environment, Netherlands.

3.2 Regional Environmental Characteristics/Baseline Information

SCOTLAND

The programme area in Scotland includes Ramsar sites, Special Areas of Conservation, National Nature Reserves, Sites of Special Scientific Interest, Special Protection Areas and National Scenic Areas. Scotland's rich biodiversity is a major part of the country's identity, and many of its species and habitats are of international and European importance. A range of pressures have the potential to impact on Scotland's wildlife and biodiversity. Key issues include land-use pressures (i.e. loss or damage of natural habitats), nutrient deposition, exploitation of natural resources, pollution of air, water and land, increases in invasive non-native species, and the effects of climate change. Nevertheless, climate change may also favour certain species, potentially creating new opportunities for Scottish fisheries.

Agriculture remains the dominant land use in Scotland, covering 5.6 million hectares, equating to around 75 percent of the land area. However, agriculture is also a key source of diffuse pollutants, potentially impacting on the quality of rivers, lochs, coastal and transitional waters. Scottish soils are generally of good quality, and there is little evidence to suggest that serious soil erosion, compaction

or other problems related to land management are occurring widely. Scotland contains a much higher proportion of organic soils than the rest of the UK.

Over half of Scotland's administrative territory is marine, for which the key pressures include climate change and acidification, source and diffuse pollution (particularly coastal and transitional waters), marine litter and invasive species. Work is currently ongoing to identify new Marine Protected Areas (MPA) in the seas around Scotland, which will protect important marine habitats and wildlife, geology and geomorphology, as well as features of cultural importance.

Trends in emissions in Scotland show that there was an overall decrease (-22.8 percent) in total greenhouse gas emissions from 1990 to 2010, but that between 2009 and 2010 there was an increase of 5.8 percent. The energy sector is one of the largest contributors to greenhouse gas emissions followed by transport, agriculture and related land use, and the domestic sector. With regard to reducing greenhouse gas emissions mitigation is required across a range of sectors and through changes in individual behaviour, including renewable energy generation, energy efficiency and changes in travel choices. The Scottish Government has the target of producing 100 percent of gross electricity and 11 percent of heat demand from renewable energy sources by 2020.

Scotland's water environment is in a good condition overall, but a wide range of problems exist at local levels. In terms of trends, environmental effects from industry are declining, whereas effects from urban development are increasing, in particular placing greater demands on urban drainage systems. Air quality in Scotland has improved considerably over the last few decades, though there are persistent issues with pollution from traffic and congestion in cities. In recent years concentrations of harmful pollutants in the atmosphere have fallen, achieved through tighter controls on pollutant emissions from industry, transport and domestic sources.

Flood risk is presented from numerous sources including pluvial, groundwater, rivers and coastal inundations. Flooding due to loss of floodplains from agriculture is manageable under current and new policies, but an increase in frequency and severity of flooding is likely as a result of climate change. With regard to sea-level rises, the land surface in most of Scotland is rising due to post-glacial rebound, but this is not expected to be sufficiently rapid to negate sea-level rise, which is anticipated for almost the whole coastline, with the lowest levels of change on the Inner Clyde and sea lochs of Argyll, and the highest levels of change on Shetland, Orkney and the Western Isles.

Changes to landscape character in recent years is seen by some stakeholders as an important issue, principally resulting from a concentration of wind farms in certain areas, as well as continuing land abandonment. Changes in land use that can create direct or indirect pressures on biodiversity include energy generation, infrastructure enhancement, land and flood management, agricultural and forestry practices and expansion.

Future development is expected to prioritise sustainable locations for new development, seek to avoid flood risk, promote access to services, and provide good public transport links. Improvements to environmental quality should include providing good quality greenspace, remediation of derelict and vacant land and in relation to air quality avoid increases in or reliance on the private car. Climate change mitigation can also be supported through the development of renewable energy resources, reduced reliance on fossil fuels and wider support for the transition to a low-carbon economy.

SWEDEN

The overall goal of Swedish environmental policy is to provide the next generation with a country in which the major environmental problems have been solved, without increasing environmental and health problems outside Sweden's borders. This goal has been adopted by the country's parliament, along with 16 environmental quality objectives addressing themes such as clean air, a healthy living environment, and opportunities to enjoy nature.

Of the country's total land area of 45 million hectares, forest land is overwhelmingly the most common category, accounting for 53 percent, a share that has not changed significantly since 2000. However, the scope of agriculture has been changing over time, with a gradual reduction in the acreage of arable land, the greatest decline being in Norrland (and in southern Sweden's forested districts). There is also an abundance of lakes and watercourses, with about 96,000 lakes greater than one hectare in size and about 300,000 kilometres of brooks, streams and rivers. Traditionally, the economy has been dependent on natural resources such as forests and ore, which continue to be of major importance. Most people – almost 85 percent of the population - live in towns and cities, which are generally located along the coast.

The major challenges for the environment include limiting climate impacts, dealing with marine eutrophication and stopping the loss of biological diversity. By the 2080s, the mean temperature in Sweden is expected to rise by 3-5º C as a result of climate change. At the same time, precipitation will increase, particularly in winter, and there will be a considerably greater risk of flooding, landslides and avalanches. In terms of its contribution, Sweden's national emissions are low, whether calculated per person or per unit of GDP, compared with most other developed countries. These relatively low emissions are largely due to the use of hydroelectric and nuclear power in electricity production and a significant use of bio-fuels, as well as an active climate and energy policy.

Between 2011 and 2012, emissions of greenhouse gases in Sweden fell by 5 percent to reach 58.3 million tonnes carbon dioxide equivalents.[12] This is the lowest figure since the base year of 1990. Overall, according to preliminary data, emissions have decreased 20 percent since 1990, which is equal to 14 million tonnes carbon dioxide equivalents. In sectoral terms, emissions from the energy sector (production of electricity and district heating, solid fuels and refineries) decreased by 5 percent between 2011 and 2012, whereas emissions from industry decreased by 8 percent over the same period. The latter decrease is primarily due to reductions in the iron and steel industry, the pulp and paper industry and the chemical industry due to the weak economy and declining export figures. Emissions from road transport decreased by 4 percent between 2011 and 2012 due to the fact that new cars are more fuel-efficient than older ones, as well as a higher proportion of bio-fuels and a reduction of the total amount of traffic on the roads in 2012.

With regard to the marine environment, over 6 percent of the territorial sea off Sweden's coasts and 3.5 percent of the exclusive economic zone are protected, and many marine areas are included in the Natura 2000 network. However, eutrophication, heavy fishing and the emission of pollutants have had a major impact on the seas. A large, efficient fishing fleet is a drain on a finite resource, and illicit cod fishing also takes place, estimated at 10 percent of reported Swedish catches. The vast majority of emissions come from other countries, such as the nitrogen emissions of the international shipping

[12] Press release 4/18/2013.

industry. Swedish emissions of phosphorus and nitrogen primarily come from sewage and industries, and diffuse leakage from arable land. A large proportion of nitrogen also comes from transport, combustion and animal husbandry. Although emissions of the eutrophying substances of nitrogen and phosphorus have declined, there is no noticeable change in the marine environment, and concentrations of persistent organic environmental pollutants in fatty fish are still higher than the threshold for the sale of fish for consumption that the EU has adopted.

Other environmental trends include reductions in the acidification of Swedish lakes, watercourses and forest land, which is a good example of the positive effects of international agreements and purposeful environmental initiatives. Although sulphur and nitrogen fallout has been reduced, acidifying fallout must decline further to reach a level that does not damage land and water.

With regard to biological diversity, Sweden has a long history of nature conservation, including being the first country in Europe to create national parks. Following the requirements of the EU habitat and species directives, Sweden's network of Natura 2000 areas is now almost complete. However, despite significantly increased initiatives, the loss of species, natural habitats and ecosystem services continues to increase. The intensive exploitation of the landscape has led to impacts on crucial environments, and it is difficult to reverse this trend. One example of this is farming land, parts of which are used increasingly intensively, while others become overgrown or are planted with forest. Nevertheless, there are also instances of nature conservation efforts having positive effects on biological diversity in lakes, watercourses and certain wetlands, measured by reductions in emissions of acidifying substances and the establishment of new wetlands.

DENMARK

Renewable energy has been high on the political agenda in Denmark for years, thus resulting in Denmark having a global role, especially concerning know-how regarding wind energy. Since the first oil crisis in 1973, Denmark has reoriented its supply of energy and developed its own production of energy in terms of its oil and natural gas resources in the Danish part of the North Sea and the production and development of renewable energy. Since 1990, total consumption of renewable energy in Denmark has almost quadrupled, with biomass and wind power being the two main contributors to the increase in the production

With regard to maritime strengths, Denmark is one of the world's leading maritime nations and Danish ship-owners and shipping companies are the fourth-largest operators of foreign gross tonnage worldwide. Danish maritime companies account for 24 percent of Denmark's total exports with a total production of more than €39 billion, corresponding to approximately 10 percent of overall production in Denmark.

Generally speaking, the Danish Government is exploiting the lead in eco-innovation through growth plans promoting innovation in energy- and resource-efficiency in areas such as water, bio-economy and environmental solutions, energy and climate, and agriculture and food.

In terms of the repercussions from climate change, Denmark is probably less exposed to impacts in comparison to other countries in Europe. However, in 2010 and 2011 Denmark experienced cloudbursts resulting in flooding of urban areas such as Copenhagen, Århus and several other cities, with damage in Copenhagen in the range of €800 million. Consequently, the Danish Government has

passed a law with a budget of €0.4 billion addressing flooding problems through a programme of investments in sewerage, drainage and reservoirs to collect, contain and drain the vast amounts of water. Climate adaptation has been integrated into the spatial planning and water plans in the municipal water companies. Denmark is also vulnerable with regard to the growing demand for territory and land-use, since territory is a scarce resource, and agriculture, urban areas and infrastructure and other sectors make intensive use of the land, while Denmark is quite a small country.

At the end of 2013, the Danish Government published the Communication on national spatial planning policies. The main theme of the communication is 'Green change – new opportunities for all Denmark'. The Communication covers themes such as: Denmark in a Nordic and European context; green transformation, climate adaptation, resource efficiency and low carbon energy; cities on track towards sustainability; and rural areas in development and landscape and nature-management in the countryside.

Denmark has a strong tradition in sustainable urban planning, design and development. Much of the innovation and technology development addresses the needs of cities and is developed from a bottom-up perspective, e.g. in cooperation with NGOs, grassroots, volunteers and associations. Denmark has potential to improve its competitive edge through exporting innovative services and products that increase the sustainability of cities. In 2014, Copenhagen city will have the EU designation of environmental capital of Europe. Denmark shares the lead position on sustainable urban development with countries, regions and cities in the North Sea Region. Denmark should take advantage of and exploit its lead in eco-innovation and ensure continuity in terms of research and education in the green sector.

Competition is increasing from BRIC countries (Brazil, Russia, India and China), several of which are focusing their innovation projects on renewable energy, bio-economy and sustainable solutions for cities. There is also a strong competition between key maritime nations and regions in order to attract and maintain maritime activities.

As Denmark is relatively densely populated and the countryside is intensively used, the natural resources, ecosystems and water-resources are continuously under stress. The main threats to biodiversity are similar to other Member States within the region, e.g. nutrients deposition, fragmentation of habitats, invasive alien species, disturbance of species and deterioration of habitats from on-going activities. Sharing the same objectives on favourable conservation status and the 2020 biodiversity target, the potential for projects and cooperation between Member States within the region on developing nature conservation is evident, e.g. on methods for nature restoration, management and interpretation, and monitoring and assessment of the effectiveness of measures taken.

The most obvious field for cooperation on biodiversity conservation is the Natura 2000 network. Denmark has designated 262 sites for a wide range of species and habitats, covering in all approximately 200,000 square kilometres, and approximately 85 percent of the surface in marine waters. The designation covers 8.3 percent of the land surface and 17 percent of the Danish marine waters.

The low land coverage of designated sites reflects land-use in Denmark. However, large areas of dune systems along the North Sea coast are unique. The large proportion at the sea reflects the importance of the surrounding marine waters for European biodiversity, e.g. for waterfowl, reefs and harbour porpoise. The Natura 2000 Network includes the entire Wadden Sea, designated by UNESCO as a World Heritage Site. The conservation of marine biodiversity is in general an obvious field for the development of regional solutions.

Natura 2000 sites cover core areas for biodiversity, and additional sites throughout the country contribute substantially to the conservation of biodiversity. Almost all natural habitats (grasslands, bogs, saltmarshes, lakes, streams, heathland), covering approximately 10 percent of the land surface, are generally protected.

Together with forests and small biotopes, these natural habitats have considerable potential - for example through restoration, linking and the creation of ecological stepping stones - for increasing, the ecological robustness and connectivity within and between Natura 2000 sites, which can also support the development of green infrastructure and eco-tourism, enhancing biodiversity and benefiting the quality of life for the region's population and creating self-sustainable management solutions.

GERMANY

The overall goals of the federal sustainability strategy are identified in the 'prospects for Germany' paper in 2002, in which the government presents a widespread strategy for sustainable growth, aiming at intergenerational justice, a high quality of life and social cohesion, as well as fulfilling Germany's international environmental responsibility. The greatest challenges are seen as the inclusion of every citizen and enabling self-reliant actions by every social group in the realisation of their responsibility.

The German part of the North Sea Region is embodied by the federal city states of Hamburg and Bremen and the area states of Lower Saxony and Schleswig Holstein. The two city states form important maritime transport hubs, but they are also distinctive in terms of their variety and abundance of species and natural areas of maritime and terrestrial regions (within which agriculture and agricultural animal farming form a major share of state economies).

The programme area in Germany includes marshland along the coast, heath, geest landscape, rivers and meadows, downs and lowlands. These features shape the natural and cultivated landscape that characterise the northern part of Germany, sometimes also referred to as the North German flatland. Hardly any other area in Germany has such diverse and largely intact nature. The North Sea is one of the richest and most biologically productive maritime areas in the world. Its richness in fish has been the basis of life and the coastal economy for hundreds of years. The sea-related economy, including tourism, and the maritime culture have become part of the history and heritage of the German North Sea coast region and are still cherished today. In addition, the terrestrial and the maritime region nowadays have a great variety of conservation areas that aim to preserve natural biodiversity, including bird sanctuaries, numerous biotopes, water protection areas as well as the Lower-Saxony, Schleswig-Holstein and Hamburg Wadden Sea, and the National Park reaching from the Netherlands

to lower Denmark and forming the largest continuous tidal flats in the world. It is one of the last areas in Europe where nature can still develop to a great extent with little human influence. Together with the areas in the Netherlands, the German tidal flat was placed on the UNESCO World Heritage List in 2009.

The Natura 2000 network includes broad areas of land as well as the tidal flat all along the German coast (only excluding the river outfalls that are important as canals) covering 16 percent (862,000 hectares) of Lower Saxony, 10 percent (156,000 hectares) of Schleswig Holstein, 24 percent (20,000 hectares) of the state of Hamburg and 20 percent (8,500 hectares) of the state of Bremen (in each case including the maritime area within the 12-mile zone). In total, about 9.7 percent of the terrestrial area in Germany is protected by Natura 2000.

Nevertheless, a number of developments challenge the protection goals. Development pressure focusing on the growth of sustainable energy plants often causes direct competition in land and sea areas between protective and growth-oriented aims. In the maritime regions, this leads to a loss of protected areas of land and sea (bird and fish sanctuaries) and an increase in pollution. Another example is Germany's biotopes: according to a federal government report in 2006, 24 percent of biotope types are endangered, 35 percent have been classified as severely endangered, and 14 percent are at risk of complete destruction. The main conflicts derive from intensive agricultural use, particularly in areas with intensive emission of nutrients, and impacts on natural areas.

Another sustainability goal that the government set out in 2002 comprises 'prospects for Germany'. Referring to the high degree of new land consumption (77 hectares per day in 2010), the consumption-reduction goal was set at 30 hectares per day in 2020 and at zero percent in 2050. This is to be achieved through conversion of already occupied land or post-concentration of urban areas. Nevertheless, due to the high cost of conversion, the goal appears to have no prospect of success.

Many watercourses and water meadows have undergone changes as a result of impacts from shipping, technical flood protection, hydropower and agriculture. For example, 80 percent of all watercourses have been intensively transformed, 83 percent of all biotope types in rivers and meadows are endangered, and only around 15-20 percent of natural water meadows have been preserved. Accordingly, the government aims to protect watercourses and their water meadows in their role as habitats, and the diversity of natural area in Germany is to be secured by 2020. Flooding has increased in recent decades, a factor that results also from an unnatural straightening of watercourses. By returning stream beds to their original shape and establishing new flooding areas, future floods, including those resulting from climate change, will be prevented.

Conflicts have occurred and will most likely increase in the German part of the North Sea Region with the construction and extension of industrial as well as cruise-ship ports, alongside the on-going need to deepen the river Elbe. Emissions, particularly from cruise vessels, have become a major problem in the port of Hamburg and impact on the inhabitants of the city.

Another means of reducing the impact of climate change is to significantly reduce CO_2 emissions. Goals were set in the Kyoto protocol, in accordance with which Germany had to reduce its emissions by 21 percent in 2008-12 on the basis of emissions in 1990. Trends show that there was a

greenhouse gas emission decrease of almost 25 percent from 1990 to 2010, although an increase has been observed since then, the greatest being about 1.6 percent from 2011 to 2012. This resulted from the economic recovery and the very recent atomic turnaround in combination with low coal prices that currently favours the production of conventional, environmentally unfriendly energy. The energy sector is the largest producer of greenhouse gas emissions, which explains its substantial impact on total emissions. It is followed by transport, industry and private households.

By 2020, Germany aims to reduce the total emission of greenhouse gas by 40 percent compared to 1990. This will be achieved through massive support for renewable energy, which already has a share of 22 percent of total energy production and therefore fulfils the EU target of 14 percent by 2020. This mainly results from the German Renewable Act 2000, which is expected to be modified in future to cap the heavily increasing funds for renewable energy, particularly solar power. On the other hand, wind energy is now favoured instead of solar power, and therefore substantial investments will be necessary in future to provide the country with infrastructure, as the main part of wind energy will be obtained from offshore wind-parks. Establishing this energy infrastructure already challenges politics today and will be a major task in the future. Consequently, in addition to the new energy plants, the high-voltage wirings from the sea and across the southern shores have already become an area of conflict.

NORWAY

Whereas income from the Norwegian oil and gas industry has resulted in a considerable increase in living standards in the last 20 to 30 years, and it is the main reason for Norway's favourable economic position, oil and gas production has been the main cause of increased carbon dioxide emissions in Norway since 1990. Total greenhouse gas emissions increased by nearly 6 percent from 1990 to 2011, with emissions from the oil and gas industry increasing by 73 percent and emissions from road traffic increasing by nearly 30 percent. Emissions from manufacturing industries fell by almost 38 percent, and emissions from agriculture and landfills also decreased. Up to 2020, emissions from the oil and gas industry are expected to remain at about the current level, and then to decline towards 2030. However, emissions from the transport sector from manufacturing industries are expected to continue to grow.

Many changes caused by climate change have already been observed in the Norwegian natural environment, and major changes are expected to occur in future. Traditional recreational opportunities, such as skiing, may disappear in some areas. In some instances, climate change can reinforce the negative consequences of other pressures resulting in the destruction of habitat, the spreading of alien species, pollution and overuse of natural resources. As the climate warms up, indigenous species and ecosystems may be negatively affected, especially those that are already vulnerable and threatened. Large parts of the mountains will develop forest cover in the long run, and the growing season will be considerably longer. More frequent and intense precipitation can cause problems for agriculture and may cause erosion. In general, floods are expected to increase in extent, but with great local variations. Sea acidification is also likely to accelerate.

With regard to waste volumes generated by economic growth, in recent years more waste has been recovered and emissions from the waste sector have been reduced. Twenty years ago, it was common to landfill most of the waste in Norway. Since then, the proportion of the waste that is landfilled has decreased, while the proportion that is recovered has increased correspondingly. In 2011, approximately 87 percent of all waste was recovered. Material recovery and biological treatment account for 39 percent of the waste recovered, and about 30 percent is incinerated with energy recovery.

The Norwegian coastline, including the fjords and islands, is more than 57,000 kilometres long. About 80 percent of the population live in the coastal areas. The coastal zone and the coastal resources have played, and still play, a major role for settlement, employment and the national and regional economy. Significant activities in the coastal zone include fisheries, aquaculture, sea transport, tourism and recreation, and this spatial concentration creates a range of environmental pressures. In response, Norwegian land-use planning has developed Integrated Coastal Zone Management (ICZM), which promotes a holistic, collaborative and bottom-up approach involving all relevant stakeholders. The main objective is to ensure sustainable development of the coastal resources, both for the benefit of the coastal communities and for the nation as a whole.

Eutrophication in coastal waters and fjords in Norway is caused by discharges of nutrients particularly from fish farming, but also through runoff from agricultural areas and inputs from industry and municipal wastewater treatment. In addition, there is long-range transport of nutrients with ocean currents from more southerly parts of Europe. The latter process has particularly marked effects along the Skagerrak coast, but also influences the coastal waters of Western Norway. The input of nutrients to coastal waters are expected to rise with climate change, which will entail higher erosion rates and more leaching of nutrients from soil, because precipitation is expected to rise, especially in winter; and winter temperatures are expected to fluctuate more, resulting in repeated freezing and thawing of agricultural areas. Both of these factors are likely to increase the amounts of nutrients leached from soils and transported to coastal waters.

Norwegian coastal waters can be divided into four main areas: the Skagerrak, the North Sea, the Norwegian Sea and the Barents Sea, with different levels of nutrient inputs. Fish farming is the largest source of nutrient inputs to the North Sea, the Norwegian Sea and the Barents Sea. Discharges are highest in the Norwegian Sea, where fish farms account for almost half of Norway’s total phosphorus releases. The absolute rise in inputs has also been highest in the Norwegian Sea, as phosphorus inputs have tripled since 1998. The situation in the Skagerrak is different, with agriculture and municipal wastewater being the largest sources of nutrient inputs, and they have been fairly stable since 1990.

Norway's marine areas cover approximately 2 million km^2, including areas surrounding the Svalbard archipelago and the island of Jan Mayen. In addition to this, the Norwegian coastline is among the longest of any country in the world. The coastal waters are rich in flora and fauna, and the adjacent marine areas are some of the most productive in the world. The state of Norway's marine areas is generally good, but they are under growing pressure from human activities such as aquaculture,

extensive fishing and oil and gas production. Climate change and ocean acidification are emerging threats, but so far little research has been done on the possible impacts of these changes. Norway has developed an integrated and ecosystem-based approach to the management of marine areas, addressing the Norwegian part of the Barents Sea/Lofoten area (presented in 2006 and updated in 2011), the Norwegian Sea (2009) and the Norwegian part of the North Sea/Skagerrak area (to be finalised in 2013). The development of marine strategies in EU member countries, in accordance with the EU Marine Strategy Framework Directive, provides excellent opportunities for cooperation.

Because Norway is a long and narrow country, it has extensive transport needs. The use of private cars has increased fivefold over the past 40 years. Journeys by public transport only accounted for 8 percent of the population's travels in 2005. Norwegians also fly more frequently and further, especially abroad. Emissions from journeys abroad are not included in the Norwegian emission inventory. Because of global warming, which results in more fairways, there is an increased risk of oil spills along the Norwegian coast.

NETHERLANDS

Despite continuing economic growth, environmental pressure in the Netherlands decreased significantly between 1990 and 2010, or, in the case of greenhouse gas emissions, remained more or less stable. The emission of many substances to air, water and land were halved during this period. At the same time, gross domestic product (GDP) increased by over 50 percent during the same period. In recent years, therefore, the Netherlands has succeeded in uncoupling economic growth from environmental pressure.

In adhering to its Kyoto commitment, greenhouse gas emissions in 2011 in the Netherlands were about 8 percent lower than 1990 levels. Compared with 1990, there was an increase in CO_2 emissions and a decrease in emissions of non-CO_2 greenhouse gases. The purchase of emission rights contributed to the Netherlands achieving its Kyoto target, which is a reduction in greenhouse gas emissions of 6 percent, averaged over the 2008–2012 period, compared with 1990 levels. The Netherlands is also on track to achieve its 2020 target for greenhouse gases that do not fall under the European Emissions Trading System (EU ETS).

With regard to nature and biodiversity, the global target to reduce biodiversity loss has been achieved in the Netherlands. The expansion of nature areas and nature management has made it possible to halt biodiversity decline for many species groups. Recovery is even being seen in marsh areas, although biodiversity decline is still taking place in open dune areas and heathland. Outside the nature areas, however, biodiversity is still continuing to show strong decline. Overall, therefore, biodiversity loss in the Netherlands has slowed, but not stopped.

Considerable progress has been made in recent decades in various water policy areas and the Netherlands is now much better protected against flooding. Surface water quality has also increased considerably, both chemically (nutrients, pesticides) and ecologically. There is sufficient fresh water available in normal and dry years for an adequate water supply to most users. Water drainage floods, swimming water and drinking water are also well managed. Nevertheless, serious policy tasks remain regarding water security, water quality, aquatic nature and future freshwater supply.

In terms of traffic and accessibility, investments in roads have limited the increase in travel time losses. The number of vehicle kilometres on the primary road network increased slowly but surely between 2001 and 2007, after which it levelled off at about 11 percent to 12 percent above the 2001 level. Concentration and compaction of residential and employment functions have contributed to the limited growth in mobility. However, the total loss in travel time on the primary road network in 2010 was over 25 percent higher than in 2001. There was a clear increase in travel time loss between 2002 and 2008, followed by a decrease (probably under the influence of the recession), after which it increased again slightly in 2010. There was also a slight decrease in average commuting distances over the last 10 years, because the number of jobs and the population in urban areas have grown more than in rural areas. Increasing proximity (for example of homes and work locations) is an effective way of improving accessibility.

In the *Energy Agreement for Sustainable Growth* of September 2013*,* more than forty organisations have laid the basis for a robust, future-proof energy and climate policy enjoying broad support. They include central, regional and local government, employers' associations and unions, nature conservation and environmental organisations, and other civil-society organisations and financial institutions. The parties will pursue the Dutch Government's objective of generating 16 percent of the country's energy from renewables. The basic premise is a cost-effective rollout that provides certainty for investors, creates additional employment, triggers innovations that reduce costs, and contributes to boosting the competitiveness of Dutch companies in this sector. Combined with ambitious energy-saving measures, the parties hope that this approach will allow them to achieve the target of 16 percent renewables by 2023 and 14 percent by 2020.

Environmental pressures on nature prevent targets from being achieved. Problems with water stress and excessive use of fertiliser and plant protection products (in particular with respect to water) undermine the biodiversity of natural ecosystems. The decrease in environmental pressure has levelled off, but even if emission targets were achieved, this would still be insufficient to adequately protect nature. In the case of over-fertilisation, there is a lack of economically feasible solutions to the manure surplus problem. In the case of water stress, the main problems consist of insufficient land acquisition, a lack of local support, insufficient financial resources and a lack of administrative drive.

There are very few instances of the ecological quality of surface waters meeting the objectives of the Water Framework Directive. It is often impossible to achieve the water objectives and corresponding nature objectives, given the criteria that the measures required must not result in extra costs for agriculture. In large areas of the Netherlands, land-use is planned around agricultural use, which involves necessary unnatural drainage, unnatural water level management and unnatural flows, resulting in water stress in nature areas. In addition, as long as fertiliser levels remain too high, investments in land development measures will not be effective. In areas for which the objectives for water quality, nature and a healthy agriculture cannot be reconciled, a specific choice must be made at the spatial level between either agriculture or nature and water, in order to achieve the effective implementation of resources

The policy targets for safety and surface water quality have not been achieved. New policy is currently being drawn up and includes targets for 2027. In the short term, better prospects for water quality and safety could be achieved by improving compliance with obligatory emission reduction technologies, better matching the authorisation procedure to the practice setting, replacing the most polluting substances with those that are less polluting or with non-chemical alternatives, and by improving

safety instructions for employees. For the longer term, the focus should be on investment in more systems innovation and the development of more environmentally friendly resources and methods, such as organic pesticides.

BELGIUM

Whereas the production index of industry in Flanders increased by 13 percent in the 2000-2007 period, environmentally friendly measures such as the use of less environmentally harmful fuels, end-of-pipe techniques and process improvements, meant that industry reduced its environmental pressure. However, in the 2008-2010 period, environmental pressure followed changes in industrial activity, which were influenced by the financial-economic crisis, indicating that environmental impact is not yet decoupled from industrial production. Consequently, the economic recovery in 2010 led to an increase in the environmental pressure in comparison with 2009.

In 2010, despite previous decreases in energy consumption, gross domestic energy consumption increased by more than 10 percent in Flanders. Due to the combination of the recovery of business activities after the financial-economic crisis and the exceptionally severe winter months in 2010, all sectors recorded increased energy consumption and increased greenhouse gas emissions, equalling the level of the period before 2006. The total net production of green power increased in 2010 by 21 percent with respect to 2009. Within domestic primary energy production, biomass made a contribution that was 16 times higher than the electricity generated from wind, water and sun.

Agriculture achieved a decrease in greenhouse gases of 8 percent in the 2000-2010 period, while Flanders overall registered a decrease of 2 percent. However, since 2008 greenhouse gas emissions increased by 5 percent. At 11 percent, agriculture is responsible for a larger share of the total greenhouse gas emissions than the economic size and energy consumption of the sector would suggest, due to the relatively high levels of nitrous oxide and methane emissions.

Transport activity increased in the 2000-2010 period, with passenger transport growing by 12 percent (passenger-kilometres) and freight transport by as much as 24 percent (tonne-kilometres). Passenger transport achieved an absolute decoupling between the emissions from passenger transport and the number of passenger-kilometres. However, although trucks are also becoming more energy-efficient, the greenhouse gas emission from freight transport was greater in 2010 than in 2000 due to an increase in activity. In 2010, the transport sector had a share of 11 percent in the total energy consumption of Flanders.

The total Natura 2000 area in Flanders comprises 166,187 hectares (12.3 percent of the Flemish territory). Between 2003 and 2010, the spatial coverage of nature areas with conservation management increased by 50 percent. The major part of this increase comprised officially recognised and funded nature reserves managed by non-governmental organisations and other nature reserves managed by the Agency of Nature and Forest.

For some habitat types, environmental pressures such as eutrophication and acidification are too strong to comply with the conservation goals of the Habitats Directive. For example, phosphorus concentrations in nutrient-poor brooks and rivers are often too high for aquatic habitats and species. As far as nitrogen-sensitive Natura 2000 habitat types such as forests, species-rich grasslands and

heathland are concerned, current critical loads prevent restoration towards a favourable conservation status.

With regard to nature, 33 percent of the species in Flanders have a favourable conservation status and 37 percent a poor conservation status. Relatively speaking, the situation is worst for aquatic species, where only 10 percent score favourably. 25 percent of the species are on the Red List and are vulnerable to extinction if necessary measures are not taken. The decline of species is the result of the decreasing habitat area and its decline in quality. Three-quarters of habitats have a poor conservation status, all water-related habitats score poorly, and to most habitats are threatened by water and air pollution. Farmland birds in Flanders have been declining markedly during the last decade due to agricultural intensification and scale consolidation. For a small number of species, the conservation status is inadequate, and for more than one-third the status is bad.

An overall assessment of the 21 reported biodiversity indicators suggests that biodiversity loss in Flanders continued in 2011. It is important to tackle the various negative influences more thoroughly (such as detrimental land use, nitrogen, phosphorus and greenhouse gas emissions and the import and export of species). The Flemish Government has developed several instruments In order to protect and develop biodiversity in the countryside and to integrate this into modern management. Whereas schemes for field margin management and for the management of small landscape elements are very successful, agri-environmental schemes aimed at the development, conservation and restoration of specific farmland species and communities show varying success. The organically farmed area remained more or less stable between 2002 and 2010, accounting for 3.822 hectares in 2010.

Economic damage caused by flooding has increased in recent decades as a result of population growth and increasing prosperity. The floods in November 2010 caused substantial damage, and the subsequent evaluation revealed a need for a better application of the principle of holding back the water, storing it, and then discharging it slowly. Furthermore, there is a need for new flood areas to accommodate peak flows from watercourses. Additional buffer capacity is needed for large asphalted areas such as car parks, housing estates and regional roads.

Current policy scenarios predict a great leap forward as far as water quality is concerned, but the goals of the European Water Framework Directive to achieve ‘good ecological status’ in all natural surface waters by 2015 is hardly achievable even by 2027. This is also illustrated by the indicator ‘defragmentation of rivers’ in which, if the present trend continues, fish migration barriers on the priority network will only be removed after 2027.

In line with the general economies within the Flemish government, expenditure on the environment decreased in 2009 and 2010, but increased again in 2011, representing 4.5 percent of the total Flemish budget.

ENGLAND

For the United Kingdom as a whole, total greenhouse gas emissions in 2008 were 19.1 percent lower than in 1990. Carbon dioxide (CO_2) accounts for about 85 percent of the total UK greenhouse gas emissions, with average emissions per capita of CO_2 in the UK comprising between 6 and 12.5 tonnes; the programme area within the UK falls within this range. From a sectoral perspective,

emissions from the industrial, commercial and domestic sectors and from road transport have declined consistently with the national trend.

Sea levels around the UK rose by 1mm/year during the 20th century, accelerating in the 1990-2000 period. In South East England, the sea level at Sheerness, Kent, rose by 250 millimetres between 1834 and 2006, while actual sea-level change (minus land-level change) around the Thames Estuary was between +0.9 to 1.2 mm per year. In terms of flood risk, almost 900,000 properties in South East England are at risk of one or more forms of flooding, whereas in the Anglian region (20 percent of which is within the flood plain), 400,000 properties are at risk as well as 30 percent of the most productive agricultural land.

With regard to energy, the UK Low Carbon Transition Plan was launched in 2009 together with the publication of the UK Renewable Energy Strategy and the UK Low Carbon Industry Strategy. In South East England, electricity generated from renewable sources in 2008 was equivalent to 9.4 percent of domestic sales and 6.5 percent of commercial and industrial sales. There has been an overall increase in electricity generated from renewable sources since 2003, despite a slight decline in 2007 and 2008. Nevertheless, renewable energy produced within the programme area makes only a small contribution to meeting total energy demand.

In terms of water resources, 21 percent of the surface water bodies in South East England are classified as of 'good ecological status' and 26 percent of the groundwater bodies have 'good status', whereas regions in Eastern England have only 18 percent of surface waters meeting the 2015 target of 'good ecological status'. In particular, substantial groundwater areas in Norfolk, Suffolk, Lincolnshire and Essex are classified as 'poor'. Pressures on this resource, which include discharges of pollutants, have generally decreased in recent years, but nevertheless, pollutants including phosphates, nitrates, metaldehyde, clopyralid and ammonia still threaten the safety of drinking water. Water over-abstraction is also an issue, especially with the additional pressures anticipated due to climate change. At present, 60 percent of Anglian surface freshwaters are either over-abstracted or over-licensed, and water is regarded as a scarce and often over-committed resource in the South East.

Air Quality Management Areas (AQMAs) have been set up in the UK where pollution levels exceed standards. In South East England, five AQMAs were declared in 2009, and 29 of the 52 local authorities in Anglian regions have declared AQMAs, with the majority targeting nitrogen dioxide, and in some cases also particulate matter.

English waste statistics mainly refer to municipal waste, which is waste collected by local authorities and mainly domestic in nature. Since 2007, England has recorded a year-on-year fall to reach 431 kilograms of household waste per person in 2011. In 2009, 47.9 million tonnes of waste were generated by businesses. The industrial sector accounted for 24.1 million tonnes and the commercial sector 23.8 million tonnes, of which 12.3 million tonnes were mixed waste and 11.6 million tonnes were non-metallic waste. Overall, 43 percent of household waste was recycled in 2011, representing the highest recycling rate recorded for England. In 2011, for the first time, the amount of waste recycled, composted or reused outweighed the amount of landfilled waste.

4. STRATEGIC ENVIRONMENTAL ISSUES

4.1 Introduction

This section identifies environmental issues considered to have a strategic dimension in the context of the North Sea Region Programme. This refers to the scope for significant effects, which could be either positive or negative in character, requiring investment to prevent or mitigate negative impacts or to support and secure positive impacts.

The range of themes, which is drawn from the environmental baseline and trends described in the previous section, is categorised under four headings:

- Biodiversity/ecosystems
- Energy and resource efficiency
- Climate change
- Marine pressures

Examples of potential activities under each theme are drawn primarily from responses to the environment questions related to the Key Challenges in the NSRP Online Consultation Survey.[13]

4.2 Biodiversity/Ecosystems

In a number of countries within the programme area, biodiversity continues to decline. In some cases, such as Denmark, even though major efforts have been initiated, water resources, natural resources and ecosystems continue to be under stress, because Denmark is relatively densely populated and the land is used intensively. In Sweden, where halting the loss of biological diversity is a major objective, and despite an extensive network of Natura 2000 sites, the loss of species, natural habitats, and ecosystem services is increasing. The factors behind these impacts include land-use pressures, exploitation of natural resources and the landscape, pollution of air, water and land, and the effects of climate change. In Scotland, agriculture is also a key source of diffuse pollutants, potentially impacting on the quality of rivers, lochs, coastal and transitional waters. The excessive use of fertiliser and plant protection products also undermines the biodiversity of natural ecosystems in the Netherlands, as agricultural practices involve necessary unnatural drainage, unnatural water level management and unnatural flows, resulting in water stress in nature areas. Investment in more systems innovation and the development of more environmentally friendly resources and methods, such as organic pesticides, has been highlighted as useful for longer-term consideration.

Action under this theme would be designed to reverse the decline in degraded ecosystem services such as water quantity and quality, soil and air quality, and halt the loss of biodiversity, delivering greater resource efficiency, for example following the milestones in the European Roadmap, which point towards a resource-efficient, green and competitive, low-carbon economy. Other features might include a wider body of reliable research data providing new information about the natural environment and allowing more informed planning and future decision-making.

[13] INTERREG IV North Sea Region Programme (2013) Environment – Results and findings of the Online Consultation Survey regarding the future North Sea Region Programme (2014-2020).

Potential Activities

Examples of possible activities under this theme include:

- developing climate-neutral business parks/urban projects, not only taking into account energy management but also water management, biodiversity, green structures and waste management

- Assessing pathways, extent of pollution and environmental risks posed by litter (macro and micro) on the living resources and biodiversity of the North Sea ecosystem through transnational cooperation

- Transnational action to promote innovation to enable growth by removing impasses to development, such as biodiversity offsetting, and work to create settings for investment at the supra-regional scale.

- An ecosystem services approach, through which sustainable development is measured throughout the ecosystem not just by the advancement of technologies at certain points. For example, the Living North Sea project helps to quantify the area of lost habitat related to man's activities, using fish – which readily respond to habitat improvements – as indicators of environmental health.

- Promoting ecosystem services by strengthening the soil´s capacity to absorb CO_2, by improving knowledge in this area, and by developing suitable agricultural methods of 'carbon farming'.

- Introducing the idea of green infrastructure as a holistic planning tool to help deal with ecosystems in the day-to-day planning process.

4.3 Energy and Resource Efficiency

The energy sector is one of the largest contributors to greenhouse gas emissions, and there is an evident need for increased renewable energy generation, effective promotion of energy efficiency and changes in travel choices. Whereas the share of energy generated from renewable sources (biomass, wind, sun and water) is increasing, the speed of development in the Netherlands, for example, is insufficient to meet the European target. And in Norway, emissions from the oil and gas industry are expected to remain at the current level up to 2020. A long-term vision for a low-carbon energy system should take into account the strategies of neighbouring countries and build on four elements of energy savings, wind at sea, carbon capture and storage (CCS) and innovative biomass technologies

Potential Activities

Examples of possible activities under this theme include:

- Reducing the carbon emissions of business parks through developing low carbon business parks (energy planning, awareness raising for energy efficiency, use of renewables)

- Implementing energy efficiency and renewables for the existing housing stock through awareness raising with the owners, through training of businesses in low-carbon construction, involving colleges and universities to promote new techniques

- Developing localised carbon capture and utilisation, energy storage and waste-to-energy projects and infrastructure

- Promoting knowledge transfer to develop, design and manufacture materials, goods and services with embedded low-carbon technologies

- Supporting social innovation as cooperative solutions for energy production, including more cooperatives in wind energy, solar and bio-energy

- Building up learning factories for resource efficiency in each country in the North Sea Region, which could act as competence centres for energy and resource efficiency and could provide knowledge and lessons for companies to reduce energy consumption and carbon dioxide emissions. The Lower Saxony Learning Factory for Resource Efficiency (NiFaR) in Wolfenbüttel, Germany, could be a model for these learning factories.

- Exchanging best practice and support uptake between different regions of initiatives such as smart cities with low carbon transport, urban design/land use, energy efficiency, low carbon energy, smart meter/smart grid programmes, waste infrastructure development

- Including elements of social research in INTERREG projects that specifically address the human aspects of a low-carbon energy transition.

4.4 Climate Change

A range of impacts are anticipated in the programme area as a result of climate change. In Scotland, an increase in frequency and severity of flooding is likely as a result of climate change, and sea-level rise is anticipated for almost the whole coastline, with the highest levels of change on Shetland, Orkney and the Western Isles. In Sweden, is estimated to be considerably greater risk of flooding, landslides and avalanche; whereas in Norway major changes are expected to occur in future, as climate change reinforces the negative consequences of other pressures resulting in the destruction of habitat, the spreading of alien species, pollution and overuse of natural resources. More frequent and intense precipitation is also expected to cause problems for agriculture and may cause erosion. In general, floods are expected to increase, but with great local variations. Sea acidification is also likely to accelerate.

Potential Activities

Examples of possible activities under this theme include:

- Creating synergies, for instance by taking measures in order to adapt to climate change by developing 'building-with-nature' technologies that also promote biodiversity.

- Establishing a broad partnership across the region which includes industry, to further develop new technological approaches, including CCS
- Enhancing climate-modelling capacity, with an emphasis on investment in regional initiatives
- Exchanging and roll-out of mechanisms to raise awareness of climate risks to development, and opportunities for new adaptation goods and services with range of local players, including local authorities and stakeholders
- Exchanging and roll-out of how regions have identified how climate risks may affect the spectrum of business functions from sourcing materials, logistics and transport to product-manufacturing and service delivery
- Promoting and sharing case studies where businesses have taken advantage of the opportunities of climate change, e.g. build capacity in local businesses to deliver novel adaptation/resilience solutions to extreme weather, heat and drought; retro-fitting products to existing buildings and developments
- Preparing and delivering measures to identify locations and types of climate change resilience required to protect communities and industry. Assessment of landscape-based options for climate-change resilience. Managed retreat of coastal and riparian zones at risk from effects of climate change
- Facilitating cooperation and coordination among affected countries affected by flooding, because the adverse effects are often trans-boundary adverse effects, and this will increase resilience and reduce vulnerability.

4.5 Marine Pressures

For the marine environment in Scotland, the key pressures include climate change and acidification, source and diffuse pollution (particularly coastal and transitional waters), marine litter and invasive species. In the Swedish context, eutrophication, heavy fishing and the emission of pollutants have had a major impact on the seas, and although emissions of the eutrophying substances of nitrogen and phosphorus have declined, there has been no noticeable change in the marine environment

Similarly, in Norway, eutrophication in coastal waters and fjords is caused by discharges of nutrients particularly from fish farming, but also through runoff from agricultural areas and inputs from industry and municipal wastewater treatment. The input of nutrients to coastal waters is expected to rise with climate change, which will entail higher erosion rates and more leaching of nutrients from soil, because precipitation is expected to rise, especially in winter. Overall, Norway's marine areas are generally of good quality, but they are under growing pressure from human activities such as aquaculture, extensive fishing and oil and gas production. Climate change and ocean acidification also represent emerging threats. As a result of global warming, which in effect opens more fairways, there is also an increased risk of oil spills along the Norwegian coast.

Potential Activities

Examples of possible activities under this theme include:

- Restoring and safeguarding rivers, estuaries and coasts and securing improved ecological status

- Utilising integrated coastal zone management (ICZM) to cope with demands on the coastal area made by different economic sectors and the environment. New tools are being developed to facilitate decision-making, and their use around the North Sea may operate as a common language for planners and the exchange of ideas.

- Developing a toolkit/procedure/manual on how to achieve an improvement in the efficiency of ICZM in the North Sea region, accompanied by associated demonstration projects (e.g. exchange of resources/waste between companies-cities-inhabitants), illustrating how waste for one is a resource for the other

- Developing protection systems to handle the increasing pressure on ecosystems and water resources. Water quality and quantity must be improved, and landowners have to be aware that the input quality must be the same as the output.

- Developing strategies, policy and technical measures to prevent/reduce litter input to the North Sea and for clean-up operations through transnational cooperation

5. ENVIRONMENTAL ASSESSMENT

5.1 Introduction

At this stage in programme development, the exact locations, nature and impacts of actions cannot be identified, as this depends on specific projects that will support the delivery of the strategy. Accordingly, the approach of this report is to provide an indication of the range of potential impacts and suggest ways in which negative impacts can be minimised.

The methodology of environmental assessment divides the task into several components. Following a description of how environmental factors were considered in the programme's evolution, the Vision and Priorities are assessed for environmental conformity with the Europe 2020 Strategy and the EU Seventh Environmental Action Programme, with additional reference to other environmental initiatives. This extends into an appraisal of the programme Objectives within the Priorities, in each case reviewing a range of effects from potential positive impacts resulting in environmental gain through to potential negative outcomes requiring mitigation.

Thereafter, consideration is given to likely significant effects, the scope for mitigation measures, and corresponding indicators that would facilitate monitoring of environmental effectiveness.

5.2 Alternatives

As part of the programme-drafting process various initiatives supported the consideration of alternative perspectives from an environmental point of view, as follows.

The on-going evaluation of the 2017-13 programme included an online survey in which projects were asked to point out the opportunities and threats which they thought would most determine the development of the North Sea Region. In the list that emerged, some of the factors identified were in keeping with those in the programme's SWOT, but new or emerging trends that have become more important since the development of the INTERREG IVB programme were also visible. Examples included adapting to climate change and promoting sustainable transport, scarce resources for drinking water, economic and societal impact of flooding, and societal and economic impact of natural resources such as fisheries, minerals and energy.[14] Nevertheless, it was acknowledged that these themes represented the views of a small group of project managers and not necessarily the broader partnership. These opportunities and threats were then compared against the 11 new thematic objectives as proposed by the European Commission.

The question of whether any of the new issues raised had a potential impact that is significant and widespread enough across the whole programme area to merit inclusion in a new SWOT was addressed at the second strategic meeting for the programme's internal stakeholders ('Billund 2'). During this event, workshops were held to discuss the status quo and the future relevance of the SWOT analysis, as published in the Operational Programme. The discussions were arranged in four workshops sessions, each of them focusing on one of the programme priorities. The three central questions were whether the SWOT analysis was still relevant, whether any new topics should be added to the thematic scope of the programme, and whether any topics in the SWOT analysis should

[14] The full list can be found in Annex 4 of the Strategic Orientation Report, 2013.

be prioritised in the future. Accordingly, the discussion encompassed the 2007-2013 programming period as well as perspectives for INTERREG V.

The previous SWOT analysis under Priority 2 was considered to be still relevant and not in need of change, and the topicality and importance of this environment priority was highlighted repeatedly. At the time, considering the fact that most of the funds had been allocated, consideration was given to reinforcing environment as a cross-cutting theme relevant for all priorities. Against the background of the financial crisis, there was a general concern that environmental issues might be neglected because of the associated financial costs. It was resolved that this threat should be turned into an opportunity by focusing on the environment as an economic factor – boosting the eco-efficient economy as a means to tackle the financial crisis. Topics discussed under Priority 1 and Priority 4 included climate change and eco-efficient solutions, which have recently become highly relevant, especially in the light of the financial crisis, and under Priority 3 new topics included eco-driving, environmentally friendly fuels and energy logistics.

During the Billund II event, there was a general consensus that the SWOT analysis of the programme was still relevant and formed a good starting point for the 2014-20 programming period. From an environmental standpoint, climate change and its impacts remained in focus, including the issues of flooding and resource shortages.

Other factors considered by the subsequent Strategic Orientation Report included that climate change remains very much on the agenda. There is greater vulnerability to rising sea levels and the storm tides of the North Sea Region could be significantly higher than today. The maritime environment is a central feature of the North Sea Region and it is under extensive pressure, with Kattegat and Skagerrak subject to widespread commercial and leisure uses. Amongst other things, they are criss-crossed by substantial maritime traffic corridors, are crossed by oil, gas, electricity and communications network infrastructures, are the centre of fishing and mineral extraction industries, and are the location of wind and wave power schemes. The risks of these activities producing damaging impacts on the coastlines and the marine eco-system are well known. It was acknowledged that actions to protect the functionalities of the coastlines – and response measures should those preventative measures not succeed – are an area of common transnational concern. Consequently, the programme seeks to support transnational cooperation efforts among the regions around the North Sea in developing effective preventive and response measures to tackle risks of climate change.

In another initiative, the authorities responsible for the North Sea Region Programme in Germany contracted the Institute of Urban Affairs to carry out a study on 'Transnational cooperation in the German North Sea Region'.[15] The study considered the activities of the programme until autumn 2011 and focused on transnational cooperation and its added value and unique features, conditions after 2013, and the thematic future of the programme. The authors recommended continuing with the thematic priorities of the programme and listed a number of thematic topics to be considered for the future. Amongst others (and particularly from an environmental perspective), these included maritime policy and integrated coastal zone management, renewable energy and resource efficiency, and climate-proof urban and regional development. In order to take these topics into account, the study suggests continuing with successful approaches, such as regional energy concepts in the field of energy production and efficiency, and considering relevant EU policies for the environment.

[15] http://www.interreg-nordsee.de/ergebnisse_interreg_b.html

5.3 Appraisal of Programme Elements

Table 8: NSRP Programme Environmental Conformity and Potential Impact

PROGRAMME ELEMENT	CONFORMITY WITH EUROPE 2020 STRATEGY & 7th ENVIRONMENTAL ACTION PROGRAMME (EAP)	POTENTIAL IMPACT ON STRATEGIC ENVIRONMENTAL ISSUES
Vision & Strategy		
The North Sea Region Programme 2014-2020 will allow the regions around the North Sea to join forces and work together on developing and testing more efficient and effective solutions to the main economic, environmental and transport challenges facing the region. The NSRP 2014-2020 is a programme for experimentation and innovation with a view to changing the NSR through the power of good examples. By evaluating impact through the extent to which non-partner organisations take up new methods, the programme aims to define a transnational agenda for future-proofing the programme area against the most important challenges awaiting the NSR.	Conforms with the Europe 2020 strategy for smart, sustainable and inclusive growth, facilitating a greener, resource-efficient and competitive economy, appropriate for a low-carbon scenario, and offering scope to prevent environmental degradation, biodiversity loss and the unsustainable use of resources. Links directly with Europe 2020 Flagship initiatives for Innovation Union, Resource-efficient Europe, and Industrial Policy for the Globalisation Era. Supports the 7th Environmental Action Programme's pursuit of an inclusive green economy and the regional dimension of cooperation between neighbouring countries, including international, regional and bilateral processes that increase EU effectiveness in addressing regional and global environmental and climate challenges. Also contains scope to ease pressures on the environment while introducing increased competitiveness and new sources of growth and jobs through improved efficiency, commercialisation of innovation, and better management of resources.	The programme vision of facilitating the development and assessment of solutions for the main challenges facing the region allows wide scope for addressing the identified strategic environmental issues. **Biodiversity/ecosystems** could be supported through actions that address the loss of species and natural habitats, assisting recovery, while also promoting greater understanding of an ecosystem services approach, encouraging environmental management that operates within sustainable limits. **Energy and resource efficiency** could be attained through projects that support a green economy, realising opportunities for investment and employment-creation, for example in renewable energy, energy efficiency and low-carbon transport. Promoting business-resource efficiency can generate financial savings and competitive advantage for entrepreneurs, while reducing environmental impacts. **Climate change** could be addressed through pursuing a low-carbon economy, reducing the reliance on fossil fuels and avoiding the unsustainable use of natural resources, supporting the development of renewable energy resources and appropriate innovations through knowledge exchange and technology transfer. **Marine pressures** could be addressed through better management and by specific measures to reduce impacts on marine and coastal waters, lessening and preventing eutrophication by focusing on issues within industries and industrial practices, and through supporting transnational cooperation in coastal zone management and the development of effective integrated maritime spatial planning and strategies.

Priorities and associated Objectives		
1. Thinking Growth: Supporting growth in North Sea Region economies	Reflects the Innovation Union Flagship in efforts to re-focus innovation and R&D on challenges facing society, including climate change, energy and resource efficiency, while turning innovative ideas into products and services that create growth and jobs. The Priority also reflects the Industrial Policy Flagship's support for the development of a strong and sustainable industrial base able to innovate and compete globally. Furthermore, Horizon 2020, the financial instrument for the Innovation Union Flagship, is intended to focus research efforts and deploy Europe's innovation potential by bringing together resources and knowledge across different fields and disciplines within the EU and internationally. Innovation with regard to resource efficiency was highlighted in the consultation for the 7th Environmental Action Programme. Innovation to improve resource efficiency is required across the EU economy to improve competitiveness in the context of rising resource prices, scarcity and supply constraints. Although the business sector is the prime driver of innovation, government action at EU and Member State levels is essential to provide the right framework conditions for eco-innovation, stimulating the development of sustainable business or technological solutions to environmental challenges. Emphasis is to be placed on public and private research and innovation efforts required for rolling out innovative technologies, systems and business models that will speed up and lower the cost of transition to a low-carbon, resource-efficient economy.	Addresses the issues of: • *Biodiversity/ecosystems* • *Energy and resource efficiency* • *Climate change* • *Marine pressures*

1.1 Develop new or improved knowledge partnerships between businesses, knowledge institutions, public administrations and end-users with a view to long-term cooperation (post project) on developing specific products and services		Developing and improving knowledge partnerships has the potential to generate new networks and clusters that focus on projects and services with an environmental dimension. The objective highlights the aim of creating partnerships around a specific technology or need, such as regional potentials identified in smart specialisation strategies or similar documents, which could clearly focus on environmental issues. There may be transnational potential in the exchange of experience related to successful environmental techniques and exchange of specialist contacts between regions working on similar environmental challenges. It is important that partnerships should be based on a thorough understanding of the characteristics and assets of the region and its competitive advantages, and that they should engage a wide cross-section of regional stakeholders. In addition, projects oriented towards environmental products and services should reflect market-based needs and focus on deriving innovative solutions.
1.2 Enhance regional innovation support capacity so that it will allow regions to effectively increase innovation levels after the end of the funding period and particularly in line with smart specialisation strategies		The enhancement of regional innovation support capacity could be utilised to differentiate regions according to environmental sector specialisms, building on existing expertise and following a development path based on existing assets. Again, in some instances, this will be in line with potentials identified in smart specialisation strategies, where transnational cooperation can identify regions with complementary skills and assets with scope for modernising, diversifying and developing new economic activities through technological change and breakthrough innovations. This might include environmental specialisms in educational courses, linked to industry needs, support for start-ups in the environmental sector, development of environmental skills and a new sectoral expertise.
1.3 Stimulate the public sector in generating innovation demand and innovative solutions for improving public service delivery		New demand for improved public sector products or services could encourage the development of more efficient and effective solutions in the area of environment. Green procurement could be used to set demands related to the environmental performance of goods and services, and other aspects of procurement may offer opportunities to incorporate an environmental dimension.

2. Eco-Innovation: Stimulating the green economy	This Priority reflects the Europe 2020 drive for a more resource-efficient, greener economy, and specifically the Resource-efficient Europe Flagship's aim of decoupling economic growth from the use of resources. That Flagship also stresses the need for an urgent and significant transition to a low-carbon economy, increasing the utilisation of renewable energy sources and the promotion of energy efficiency. This Priority also mirrors Resource-efficient Europe's support for creating a circular economy in the EU, based on recycling, reducing waste generation, and using waste as a resource. In addition, the Industrial Policy Flagship supports the transition to greater energy and resource efficiency, promoting technologies and production methods that reduce natural resource use and increase investment in the EU's existing natural assets, whereas the Innovation Union Flagship facilitates a strategic agenda focused on challenges such as energy security. Within the 7th Environmental Action Programme, Priority Objective 2 addresses resource efficiency especially through meeting 2020 climate and energy targets, reducing the environmental impact of industry, reducing waste generation, and limiting energy recovery to non-recyclable materials.	Addresses the issues of: • *Energy and resource efficiency* • *Climate change*

2.1 Promote the development and adoption of products, services and processes to accelerate greening of the North Sea Region economy		Steps to green the North Sea economy could encompass much greater use of renewable energy, energy-efficient buildings and improved land-use planning, potentially piloting a major shift in current patterns of production and consumption and utilising renewable natural materials. In pursuing regenerative circular economies, the majority of materials should be returned to the biosphere and products are designed so that non-natural materials can be reclaimed at the end of a product's lifetime. A factor supporting positive implementation is that this approach represents an extension of concepts that have already been successfully pioneered in North Sea Region businesses. Whereas no negative environmental impacts would be envisaged, care would need to be taken to ensure that this effort to boost competitiveness through the bio-economy utilises local, sustainable materials and that the resource base in each region is fully understood. The experimentation and transformative actions to consolidate the North Sea Region's leading position in the global greening market should fully comply with environmental regulation, and new greening initiatives should have clear potential for transferability.
2.2 Stimulate the adoption of new products, services and processes that reduce the environmental footprint of regions around the North Sea		This objective should support the energy transition, for example by encouraging projects related to increasing green energy supply and demand at local level, local energy storage and building local flexibility into energy systems. Action designed to provide low-cost, short-term ways of reducing energy use as well as retro-fitting existing building stock should directly assist in reducing carbon emissions. In addition, supporting new research for agriculture and forestry could make them more resource-efficient and resilient and reduce their carbon footprint. No direct negative impacts would be envisaged from new products, services and processes designed to reduce carbon emissions. Nevertheless, there is a general need to ensure long-term environmental conformity, so that projects addressing improvements in energy efficiency are based on realistic and sustainable renewable energy scenarios, preferably utilising low-energy building materials based on natural products from the programme area. In addition, some energy sources may bring other problems, such as wind farms and their association with aesthetic impact, operational noise and social unacceptability, and disturbance to habitats and biodiversity during construction.

3. Sustainable North Sea Region: Protecting against climate change	This Priority supports the Europe 2020 aim of securing sustainable recovery and sustainable growth, which recognises that climate challenges require immediate action and acknowledges the increasing global competition for natural resources and pressure on the environment. Accordingly, sustainable growth should prevent environmental degradation, biodiversity loss, and the unsustainable use of resources. Correspondingly, the Innovation Union flagship seeks to address climate change and land management, seeking to strengthen economies' resilience to climate risks and improve the capacity for disaster prevention and response. Innovative technology solutions are envisaged as potential catalysts in boosting competitiveness and returning the EU to its first mover position with respect to green solutions. In parallel, the Resource-Efficient Europe flagship supports a climate-resilient economy by 2050, which will allow biodiversity targets to be achieved, as well as phasing out environmentally harmful substances. Within the 7th Environmental Action Programme, Priority Objective 1 seeks to protect, conserve and enhance the EU's natural capital, which includes ecosystems that provide essential goods and services, flood control, climate regulation and protection against natural disasters. Priority Objective 3 aims to safeguard EU citizens from environment-related pressures and risks to health and wellbeing, stating that dedicated action should be taken to ensure that the EU is adequately prepared to face the pressures and changes resulting from climate change. In addition, Priority Objective 6 aims to secure investment for environment and climate policy, and Priority Objective 9 seeks to increase EU effectiveness in addressing regional and global environmental and climate challenges.	Addresses the issues of: • *Biodiversity/ecosystems* • *Marine pressures* • *Climate change*

3.1 Develop new and/or improved methods for improving the climate resilience of target sites		Developing methods for adapting to climate change impacts could address themes such as coastal flooding and erosion, freshwater shortages and salination, river and lake flooding (including in urban areas), pollutants and increased algal blooms due to temperature rises. This usefully draws on the evidence base gathered through the WaterCAP project, which applies knowledge and experience on water and climate change adaptation. Going beyond simple cooperation on flood defences, the benefits could extend to a range of sectors including agriculture, forestry, tourism, health, fisheries, energy and water provision. There is a need to ensure that actions are harmonised with national Adaptation Strategies, where these exist, and, to gain maximum benefit, projects should use green infrastructure and adopt an ecosystem-based approach, with selection processes particularly favouring transferable projects.
3.2 Develop and/or implement new methods for the long-term sustainable management of North Sea ecosystems		With its holistic approach to protecting and restoring ecosystems, this objective should combat biodiversity decline, addressing loss of species, habitats and ecosystem services, and maintaining impacts within sustainable limits. Special attention to the marine environment, acknowledging its central role as an ecosystem binding the NSR, has the potential to minimise conflict and maximise synergies. Offering expertise to others and developing commercial potential as a spin-off benefit should help to mainstream successful approaches. No direct negative environmental impact would be envisaged from developing new methods for long-term sustainable management. The most likely non-positive scenario would be missed opportunities to initiate significant improvements, losing the associated beneficial impacts in environmental protection and export potential.

4. Promoting Green Transport and Mobility	In the Europe 2020 decoupling of economic growth from the use of resources, Resource-efficient Europe supports the shift towards a low-carbon economy, including the development of green technologies and a modernised transport sector. In parallel, the Innovation Union flagship aims to address challenges facing society, with a strategic research agenda that includes the themes of transport and resource efficiency. Within the 7th Environmental Action Programme, Priority Objective 8 seeks to enhance the sustainability of EU cities, including implementing policies for sustainable urban planning and generally improving urban sustainability, which accords with the sectoral transition envisaged for transport. In addition, Priority Objective 2 envisages a competitive low-carbon economy, highlighting how reducing greenhouse gas emissions and enhancing resource efficiency will ease pressures on the environment and bring increased competitiveness and new sources of growth and jobs through cost-savings from improved efficiency.	Addresses the issues of: • *Energy and resource efficiency* • *Climate change* • *Marine pressures*
4.1 Develop demonstrations of innovative and/or improved transport and logistics solutions with potential to move large volumes of freight away from long-distance road transportation		Reducing long-distance road transportation through expansion of multimodal services would directly contribute to reducing emissions, exploring potential for freight to make use of local trains, river transport, metro trains and trams, supported by intelligent transport systems to optimise load weights. ICT tools could be used to better manage urban logistics, assisting routing and consolidating shipments for longer journeys. Demonstrations of innovative solutions would need to be supported by training for transport and logistics managers, to ensure that they could construct effective transport chains using sustainable options. To encourage involvement, there is also a need to demonstrate the viability of the new services developed, both financially and environmentally.
4.2 Stimulate the take-up and application of green transport solutions for goods and personal transport		The environmental costs associated with local and regional freight transportation could be reduced through green transport solutions, especially with regard to CO_2 emissions in urban areas. There is scope to explore new uses for vehicles such as flexi-bus services, combined-use passenger/freight vehicles, freight trams and car-sharing to reduce overall numbers and

		maximise efficiency. In addition, sustainable urban passenger transport planning could integrate electrified rail services, trams and rapid transit systems, and improve conditions for buses, cycling and walking. This objective could also demonstrate the viability of transitional fuels with lower emissions footprints, such as LNG for shipping, potentially through maritime pilot projects, and second-generation biofuels for trucks, derived from waste rather than from food crops.

5.4 Significant Effects

In general terms, environmental outcomes would be significant in scenarios where the momentum of activity generates positive cumulative impacts or alternatively where activities may generate negative unforeseen or mismanaged environmental impact.

The appraisal performed in Table 8 illustrates that the programme demonstrates a clear compatibility with the objectives of the Europe 2020 Strategy and the Seventh EU Environmental Action Programme. The programme is also characterised by a high degree of environmental integration and targeting within the individual Priorities and Objectives. Nevertheless, there are inevitably uncertainties in terms of the form and significance of potential impacts and how effective the programme will be in securing positive outcomes.

With regard to **significant positive environmental effects**, in a scenario where programme implementation is very successful, the potential environmental benefits could be long-term and cumulative in nature, for example as projects designed to support a green economy realise opportunities for investment and employment-creation, in areas such as renewable energy and energy efficiency, reducing carbon emissions by furthering the transformation in the energy system away from fossil fuels. In addition to consolidating the region's leading position in the global market, this outcome offers scope for delivering benefits on some of the main environmental challenges in the region.

Furthermore, the adoption and mainstreaming of a holistic environmental management approach, which ensures that environmental impacts do not exceed sustainable limits for any aspect of the North Sea Region's ecosystem, would allow a natural balance to be maintained in the long term. Other potentially significant impacts could emerge from reorienting businesses towards a more sustainable direction and practices, opening up new growth opportunities, and involving a greater focus on using locally available resources. Such transformative actions could pilot a major shift in current patterns of production, consumption, working and living, aiming for regenerative circular economies where the majority of materials are returned to the biosphere and products are designed in such a way that non-natural materials can be reclaimed in high quality form at the end of product lifetimes.

Improving modal choice in transport also has scope for significant positive impact, supporting the transition of the NSR transport system to much less environmentally damaging practices. Removing large volumes of freight away from road transportation and optimising freight transport operations could reduce traffic volumes and have a downward impact on CO_2 emissions; and there is also scope for green transport solutions to impact on short-distance freight transport and personal travel, especially for urban areas which account for 40 percent of all CO_2 emissions and up to 70 percent of other pollutants from transport. Adoption of alternative fuels could also be environmentally important for the region, if the NSR takes a leading role in implementing new technologies, piloting the newest ideas or supporting the roll-out of proven technologies across the programme area.

Other positive effects may emerge from tackling climate change, as the programme supports the development or improvement of methods for adapting to potential and anticipated impacts, possibly addressing a number of themes in a wide range of industrial sectors. Lastly, bearing in mind that the NSR already has world leaders in environmental technologies, there is potential for significant long-

term impact especially in terms of commercialising innovative output if new niche sectors are created or identified, in which environmental techniques, technologies and other products are promoted and effectively marketed to generate sustainable new activity.

With regard to **significant negative environmental effects**, this would relate for example to a scenario in which programme implementation leads to unanticipated impacts, indirect effects or where projects are mismanaged or environmental conditions not fully observed.

Risks to human health are anticipated as minimal, particularly since the partner countries have robust systems of environmental control and planning, so that projects with environmental implications would be subjected to other filters before obtaining approval. The transboundary nature of the cooperation is also likely to produce a better understanding and exchange of experience with regard to environmental control.

Thereafter, potential negative effects may relate to themes such as energy, materials sourcing, regional knowledge and competitive activity. In the context of renewable energy, a critical factor may concern the form of energy supported and the construction of facilities. Wind farms have attracted considerable criticism in recent years for visual impact and operational noise, generating resistance to the establishment of new facilities and associated critiques of their real contribution to meeting energy demand. In the short term, the construction phase may undermine local biodiversity and habitats, whereas longer-term impacts may result in irreversible change and damage.

Sourcing materials in local and regional locations may offer benefits in terms of reducing transportation emissions as well as both financial and environmental costs, and these factors may be persuasive criteria if cited in project applications. However, if the practice differs from the original description, with materials and products drawn from external areas, there is a danger that the sustainability principles will be compromised and the vision of a regenerative circular economy will never be realised. To avoid this outcome, for example, project monitoring would need to include green accounting to identify the origin of source materials and their characteristics.

To develop a region's environmental strengths, a thorough knowledge is required of existing specialisms and expertise, as well as identifying potential themes for development, whether through clusters or individual support. However, there is a risk that familiar and/or popular themes will be favoured, following existing trends that may have been successful in the past, rather than creating a new development path that generates innovative environmental solutions. Consequently, the region's capacity to realise competitive advantage may be constrained if the fundamental baseline surveys are inadequate.

With regard to competitive activity, the path followed and adherence to ethical operational practices are important factors with long-term implications. In offering environmental solutions, businesses must be able to demonstrate that the practices and techniques utilised and ultimately exported fully comply with regulation. Examples of minimum compliance should not be followed, but instead projects should go beyond compliance in pursuit of environmental excellence. Environmental advantage should not be gained by means of cutting costs or by circumventing environmental legislation.

Potential negative factors require careful management and control, and they are addressed in relation to the individual programme components in the following section.

5.5 Mitigation

Although the Priorities and actions in the North Sea Region Programme have a wide potential to achieve positive environmental impact, there are a number of ways in which projects could produce negative impacts, as described to some extent in Table 8. This section draws further attention to these potential impacts and suggests ways in which significant adverse effects could be prevented, reduced or offset.

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

- *Develop new or improved knowledge partnerships between businesses, knowledge institutions, public administrations and end-users with a view to long-term cooperation (post project) on developing specific products and services*

In this theme, there is a need to ensure that knowledge partnerships obtain a thorough understanding of the characteristics and assets of the region and its potential competitive advantages. Within this scenario, the interpretation of 'competitive' should not be associated with cutting environmental costs, for example by delaying environmental obligations or seeking minimum compliance with environmental standards. The programme must convey a clear message that positive environmental impact is a key element of the programme's approach, and that competition should be based on high environmental standards. Similarly, innovation should be understood as including environment – and potentially prioritise environment – as a means of fulfilling the vision that the NSRP is pursuing.

- *Enhance regional innovation support capacity so that it will allow regions to effectively increase innovation levels after the end of the funding period and particularly in line with smart specialisation strategies*

Although no direct negative environmental impacts would be envisaged from enhancing regional innovation support capacity, programme implementation would need to ensure that the supported initiatives encompassed elements of environmental gain, so avoiding scenarios with missed opportunities to initiate environmental innovation, losing benefits in areas such as energy efficiency & resource use and improved environmental technology, ultimately slowing the transition to a low-carbon economy.

- *Stimulate the public sector in generating innovation demand and innovative solutions for improving public service delivery*

There is a need to ensure that public service delivery includes green procurement that sets demands related to the environmental performance of goods and services, as well as seeking out other aspects of procurement that may offer opportunities to incorporate an environmental dimension.

Priority 2: Eco-Innovation: Stimulating the green economy

- *Promote the development and adoption of products, services and processes to accelerate greening of the North Sea Region economy*

Care would need to be taken to ensure that this effort to boost competitiveness in this bio-economy utilises local sustainable materials and that the resource base in each region is fully explored and

understood. The experimentation and transformative actions to consolidate the North Sea Region's leading position in the global greening market should not use shortcuts, and new approaches should have clear potential for transferability across the North Sea Region.

- *Stimulate the adoption of new products, services and processes that reduce the environmental footprint of regions around the North Sea*

There is a general need to ensure long-term environmental conformity, so that projects addressing improvements in energy efficiency are based on realistic and sustainable renewable energy scenarios, preferably utilising low-energy building materials based on natural products from within the programme area.

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

- *Demonstrate new and/or improved methods for improving the climate resilience of target sites*

Need to ensure that actions are harmonised with national Adaptation Strategies, where these exist, and, to gain maximum benefit, projects should use green infrastructure and adopt an ecosystem-based approach. Selection processes should particularly favour transferable projects.

- *Develop and/or implement new methods for the long-term sustainable management of North Sea ecosystems*

Need to ensure that agreement on management approaches is based on the same understandings, and that agreed thresholds are observed in practice. Participatory processes should also involve a sufficiently broad range of stakeholders to secure sustained support for measures.

Priority 4: Promoting Green Transport and Mobility

- *Develop demonstrations of innovative and/or improved transport and logistics solutions with potential to move large volumes away from long-distance road transportation*

Demonstrations of innovative solutions would need to be supported by training for transport and logistics managers, to ensure that they could construct effective transport chains using sustainable options. To encourage involvement, there is also a need to demonstrate the viability of the new services developed, both financially and environmentally.

- *Stimulate the take-up and application of green transport solutions for goods and personal transport*

Whereas there is considerable scope for positive impacts in the Objective, it is important to bear in mind that the programme cannot single-handedly fund a major transition in technology, but instead should concentrate on demonstrations and showing the way for widespread implementation.

5.6 Indicators for Monitoring Environmental Effectiveness

Under the SEA Directive, there is a requirement to establish a monitoring programme to gauge environmental effectiveness. The series of environmental indicators developed for the NSRP should inform on the impacts of addressing the four strategic environmental issues, as well as on the overall effectiveness of the programme.

The following table provides examples of potential indicators that may be useful in monitoring different aspects of the programme performance, with suggestions for the division between the themes of the four Priorities.

Table 9: Potential Environmental Indicators

Thinking Growth: Supporting growth in North Sea Region economies	• New networks and clusters with an environmental focus • Projects aimed at developing regional environmental potential • Exchange of experience and contacts related to environmental techniques and expertise • Completed capacity-building and environmental knowledge-sharing initiatives • Increase in environmental products and services available within the programme area • Educational courses with an environmental dimension • New start-ups and growth in the environmental sector • Increased in environmental criteria applied in public sector procurement • Adoption of green business models • Utilisation of environmental management tools or methodologies
Eco-Innovation: Stimulating the green economy	• New products, services and processes designed to reduce carbon emissions • Increased demand and/or supply for green energy • Increased use of renewable energy • Incidence of local energy storage • Initiatives to reduce energy consumption • Initiatives to retrofit existing housing stock for greater energy efficiency • Use of low-energy building materials • Increased use of renewable natural materials from the programme area • Evidence of eco-efficiency (enhanced resource productivity, use of longer-lasting materials)

Sustainable North Sea Region: Protecting against climate change and preserving the environment	• Initiatives to support North Sea ecosystem • Changes (net loss/gain) in biodiversity and ecosystem services • Overall reduction in carbon/greenhouse gas emissions • Agriculture and forestry research projects focused on greater resource efficiency and reduced carbon footprint • New methods for coping with climate change impacts (in various sectors) • Uptake of new technology leading to improved resource efficiency and/or reduced climate change impact
Promoting Green Transport and Mobility	• Reduction in volume of freight transferred by road • Engagement of intelligent transport systems • Training courses for transport and logistics managers • Uptake of green transport initiatives • Increase in low-carbon transport • Overall reduction in carbon/greenhouse gas emissions • Integration in urban passenger transport services • Demonstrations of viability of multimodal services • Use of fuels with lower emissions footprints (LNG and biofuels) • Changes in condition of protected coastal and marine waters • Incidence of coastal zone management initiatives