Nord Stream
The new gas supply route for Europe

Nord Stream Environmental Impact Assessment
Documentation for Consultation under the Espoo Convention

Nord Stream Espoo Report: Annex
National EIA Summary - Denmark

February 2009

English version | National EIA Summary
Denmark

ENG

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1 Introduction

This summary aims to provide the Reader with an insight into environmental issues related to the Danish part of the Nord Stream offshore pipelines for transmission of natural gas from Russia to Germany.

The summary gives information on the general quality of the environment in the project area and the different existing interests and already planned use of the sea to the east and south of Bornholm. It describes how the route corridor for the pipelines has been chosen, and the anticipated impacts from the installation and operation of the pipeline system.

The summary also includes a list of advisors and suppliers to Nord Stream AG, and how they have contributed to the overall planning and assessments.

All here described information is part of Nord Stream AGs application for a permit according to the Danish Continental Shelf Act, which is managed and coordinated by the Danish Energy Agency.

Detailed information can be found in the reference list (see section 5), and by visiting the Nord Stream website www.nord-stream.com.

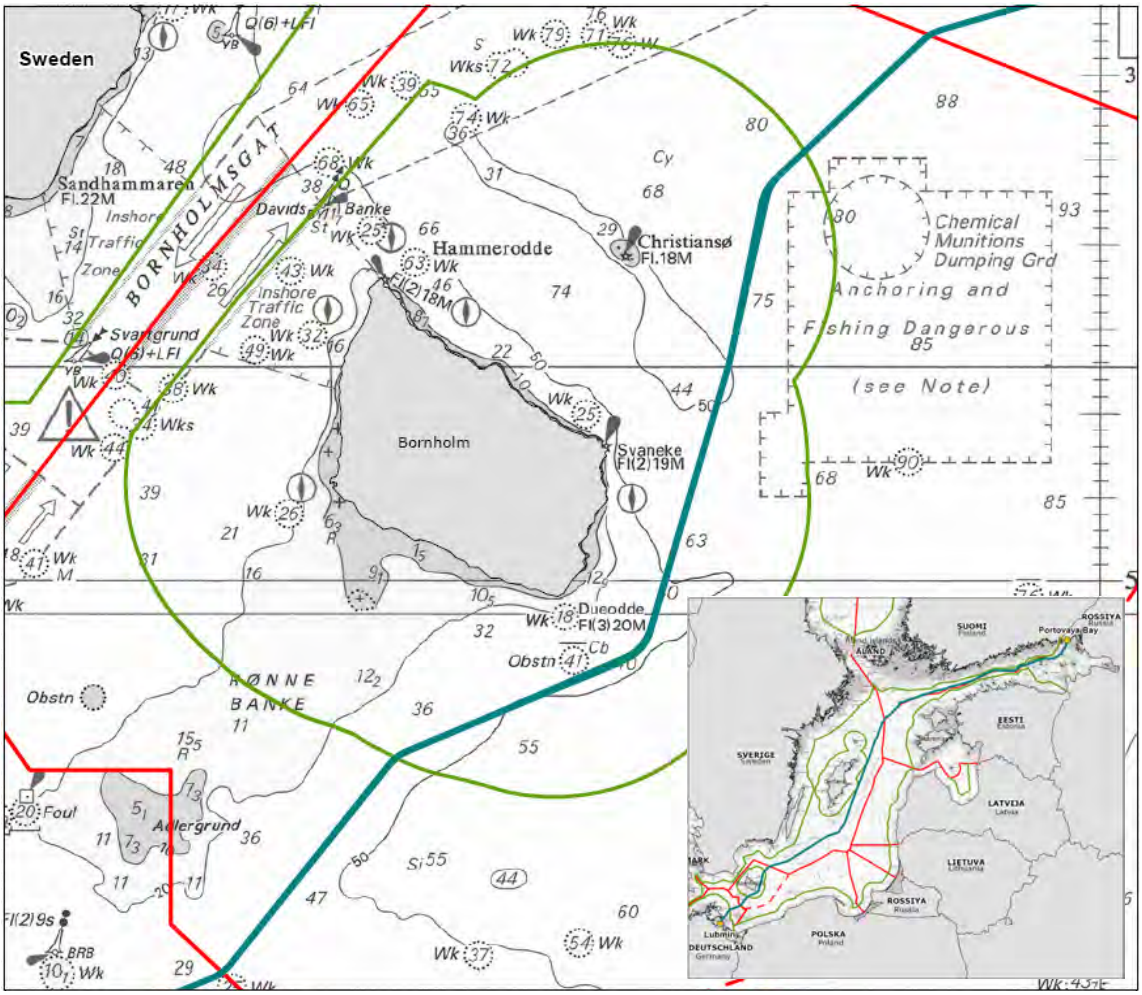


Figure 1.1 The Nord Stream route in the Danish section

2 Non-Technical Summary

2.1 The Nord Stream Project

Europe has an ever-increasing demand for energy and needs to find a variety of ways to meet that demand. The European Commission's Directorate-General for Energy and Transport (2007) says that, by 2025, Europe's gas imports are projected to grow by 195 billion to 509 billion cubic metres (bcm). Europe's own gas supplies are decreasing, as are other fossil fuels, and renewable energy alternatives cannot yet meet its needs. The Nord Stream project will meet about 25 per cent of Europe's additional demand for natural gas.

Currently, pipelines through the North Sea and the Mediterranean carry about 45 per cent, or more than 130 bcm, of Europe's total natural gas imports. Offshore pipelines are tried-and-tested technology.

Of the fossil fuels (oil, coal and gas), natural gas is the most environmentally friendly, producing about 40 per cent fewer carbon dioxide emissions than coal. Natural gas from the Nord Stream project can provide enough energy for 26.5 million households each year. This is the equivalent of the energy from about 39 average nuclear plants, or 50 coal-fired power stations, or about 600-700 tanker trips carrying liquefied natural gas (LNG). For now, as the UN Intergovernmental Panel on Climate Change has stated, natural gas is seen as a "bridge" between phasing out fossil fuels and developing renewable energy sources in the future.

With more than 47,000 billion cubic metres of natural gas, Russia has the largest, proven reserves in the world. And it is on the EU's doorstep. Russia has provided gas to Western Europe for decades - even during the Cold War. There are already extensive pipelines delivering Russian gas across Europe. A new gas source feeding into this system is a logical and economically sensible proposal.

Nord Stream AG is fully committed to the environmental protection goal for the Baltic Sea's unique ecosystem. Planning for the pipeline has therefore taken into account the major concerns of interested parties including authorities, scientists, NGOs and the public. The project complies with all applicable national, international requirements.

2.1.1 Survey Results Reflected in Project Design

Research for a pipeline across the Baltic Sea began in 1997. Since then, more than 2,500 square kilometres have been thoroughly surveyed. More than 150 monitoring stations have been used to investigate water quality, sediment contamination, plankton composition, bird habitats and marine life.

During the past four and a half years alone, more than 40,000 kilometres have been travelled along the seabed to conduct research and surveys of the seabed. The results are integrated in the project design, which ensures long-term safety of the pipeline system while minimising impact on the physical, biological and socio-economic environments. Nord Stream AG shares naturally these results with all the relevant authorities.

40% fewer CO2 emissions than coal

When converted to energy, gas produces less harmful carbon dioxide than either coal or oil, making gas better for the environment.

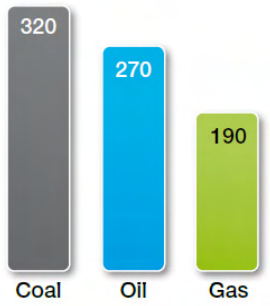


Figure 2.1 Carbon dioxide emissions in grams/litre

25% of Europe's projected import gap

When fully operational, the Nord Stream pipeline will be able to meet a large portion of Europe's future gas import needs.

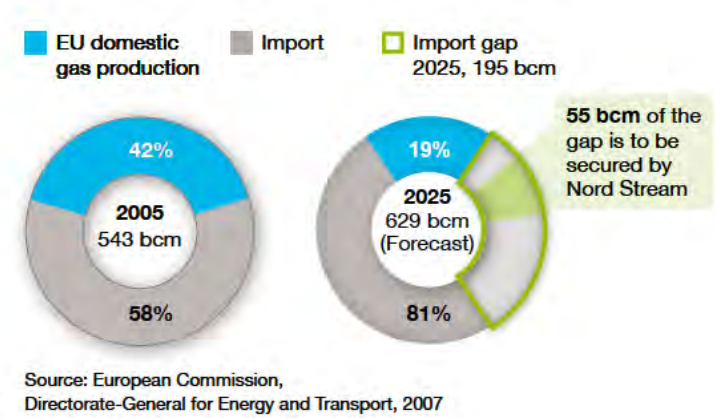


Figure 2.2 Gas import needs in 2005 and projected forecast in 2025

2.2 Consultation with Competent Authorities and Other Stakeholders

International and national legislation require Nord Stream AG to enter into a dialogue with the projects stakeholders (the public, special interest groups, governments) in order to ensure that all relevant concerns are taken into consideration for the final layout and technical design. Between 2006 and 2008, Nord Stream AG therefore sent representatives to meetings, consultations, public hearings and conferences on the average of one per week. Many of the resulting suggestions have been incorporated into the project.

The here summarised Environmental Impact Assessment (EIA) for Denmark is a central part hereof. Together with EIA materials covering cross-border aspects it is submitted to the Energy Agency and all construction-related permits must be obtained before construction can begin.

The Danish EIA is together with the transboundary EIA prepared to inform decision-makers and other stakeholders about the pipelines' potential impact on the Baltic Sea ecosystem, while guiding cooperation among all relevant countries. All Baltic Sea countries participate in the international consultations according to the Espoo Convention.

The documentation prepared by Rambøll is based on data acquired by e.g. Marin Mätteknik of Sweden, and DHI. The Italian engineering firm Snamprogetti was responsible for the pipeline design.

2.2.1 Public participation in Denmark

The Danish Energy Agency is responsible for the permitting procedures in Denmark, including the environmental impact assessment procedure. The Ministry of Environment (Agency for Spatial and Environmental Planning) is responsible for the transboundary EIA process according to the Espoo convention.

According to the requirements in the Espoo Convention, the Nord Stream project was jointly notified by the countries who will host the pipelines, i.e. Russia, Finland, Sweden, Denmark and Germany.

A project information document was announced on 6 December 2006 and posted on the website of the Danish Energy Agency. The public was able to make comments until 26 January 2007. During the same period, the documentation was available at the libraries of Copenhagen, Rønne (Bornholm) and in the cities of Esbjerg, Odense, Aalborg and Århus,

Comments were received from the following authorities/institutions:

- Danish Maritime Safety Administration (Farvandsvæsenet), 4 January 2007
- Regional Municipality of Bornholm (Bornholms Regionskommune), 25 January 2007
- Danish Maritime Authority (Søfartsstyrelsen), 23 January 2007
- Environmental Protection Agency (Miljøstyrelsen), Ministry of Environment (Miljøministeriet), 25 January 2007
- The Forest and Nature Agency (Skov- og Naturstyrelsen), Ministry of Environment (Miljøministeriet), 26 January 2007

The comments related mainly to the route of the pipelines, and the issues raised have been addressed during subsequent route planning and have been integrated in the technical design, as described in the EIA report.

A public meeting on Bornholm was held on 11 January 2007. In response to concerns expressed by the Bornholm and Christiansø Fishery Association at the meeting, Nord Stream AG stated that it would endeavour to organise the construction of the pipelines in a manner that would minimise impact on fishery activities around Bornholm, and that the company would accept to compensate affected parties for losses caused by construction of the pipelines in the vicinity of Bornholm. Follow-up meetings with the fishery organisation are still ongoing.

A number of meetings have since the notification been held between the Danish authorities and Nord Stream AG to clarify outstanding questions, and to discuss the routing in Danish waters. The Danish Energy Agency (DEA) has conducted supplementary internal authority hearings regarding the preferred route south of Bornholm. Recommendations and comments were provided by the authorities in question, and there is a common understanding of the Nord Stream route being the technical and environmentally best route through Danish waters.

3 Process of the Project

Over the past forty years, the offshore industry has developed widespread expertise in designing, constructing and operating pipelines. Offshore pipelines are accepted as the safest, most efficient, and most environmentally friendly means of transporting gas and oil across long distances. Consequently, developers comply with demanding international standards and certification processes, covering every aspect and stage of the project.

Between 1997 and 1999, pipeline and environmental planners investigated four potential routes, combining offshore and overland pipelines. The offshore option was chosen for technical, environmental and economic reasons. Further route optimisations were then considered to reduce the environmental impact even further. Minimising the need for seabed intervention works remained a central consideration throughout the process.

3.1 Pipeline Dimensions and Construction

The pipeline is made of individual 12-metre steel pipes with a constant inner diameter of 1,153 millimetres and a wall thickness of up to 41 millimetres. The pipeline is coated internally to reduce friction and externally to provide corrosion protection. An additional outer layer of concrete is applied to the pipeline with a maximum thickness of 110 millimetres. This layer is for weight and insures stability on the seabed.

The 12-metre pipes for the first pipeline are initially built at steel mills in Germany and Russia. From there, they are taken to specialised coating yards. Next, they are either transported for immediate use, or are stored in marshalling yards, dispersed around the Baltic Sea coast.

No interim stockyards are planned in Denmark. The supply base for pipe-laying in Denmark will be Karlskrona in Sweden or Mukran in Germany.

The pipes are delivered by specific carrier ships to the pipelay vessel. This is a floating platform, crewed around-the-clock, laying up to three kilometres of pipeline a day. On board, the pipes are welded together in an enclosed, industrial facility, in which the pipelines' welded joints are automatically and 100% inspected by ultrasonic-sound. Finally, after protecting each weld, the pipeline is fed out onto a ramp structure (the 'stinger') and lowered down to the seabed in one continuous process.

To ensure the integrity of the pipelines over their entire lifetime, secondary protection will be provided by sacrificial anodes of a galvanic material (cathodic protection) in order to prevent any corrosion of the steel pipe.

Saipem S.p.A. of Italy has been contracted to lay the Nord Stream pipeline. Saipem has substantial experience, constructing large-scale offshore pipelines for the oil and gas industries.

Anchor-handling vessels and survey vessels will support the pipe-laying barge, when it moves ahead with a speed of approx. 3 km/day. Two to six anchor-handling vessels are required per anchor-positioned lay vessel, as the vessel is kept in position by 12 anchors.

To ensure minimum interference with pipe-laying operations from other sea traffic, a temporary exclusion zone (typically 2000-3000 mtrs.) will be established around the lay vessel. The actual pipelay activities will be monitored carefully by Farvandsvæsenet, in particular in areas with heavy traffic near the Bornholmsgat.

The pipelines will cross existing power and telecom cables. Three cables will be crossed in Denmark. The owners of the cables have been approached with the aim of reaching mutual crossing agreements covering liabilities and crossing methods. According to the agreements, Nord Stream AG will provide crossing designs and installation procedures to the satisfaction of the cable owners prior to pipeline installation. At present there are no other pipelines to be crossed. If pipelines will cross Nord Stream in future, the crossings will be designed and agreements will be reached.

3.2 Testing the Pipeline

Once constructed, the pipeline is dry inside and filled with air. For pressure-testing, it is flooded with seawater which is then pressurised for at least 24 hours to a level higher than operational gas pressure. Only after demonstrating its integrity will the pipeline be put into service. It is currently foreseen that the test water will be discharged to the sea in the vicinity of the landfall site near Vyborg in Russia. After that, the pipeline is dried with air and filled and pressurised with natural gas.

3.3 Operating the Pipeline

During normal operation, pressurised gas is continuously introduced at Vyborg and taken out, at an equal rate, at Lubmin, near Greifswald, Germany. Pressure and gas flow are continuously monitored. Around-the-clock computer monitoring also balances the intake and extraction volumes, ensuring that maximum allowable pressure is never exceeded. The whole pipeline is remotely monitored, 24 hours a day. Specialists are always on hand, prepared to take direct control to ensure safety in an emergency. The entire operational procedure is certified by the independent certification agencies, Det Norske Veritas (DNV) and, in Germany, SGS/TÜV Nord. The operational procedure must before the pipelines can be taken into operation also be approved as part of the Danish approval process.

Maintenance and inspection are performed regularly throughout the pipelines' operation. Internal inspection is carried out by a remote-controlled intelligent device, a Pipeline Inspection Gauge (PIG), which travels inside the entire length of the pipeline to check for irregularities. Also the outside of the pipeline and its support structures, as well as the seabed corridor, are regularly surveyed by a Remotely Operated Vehicle (ROV). Based on the outcome of these surveys, any necessary changes are assessed.

The pipeline is designed for at least 50 years of service. Its condition will be evaluated continuously to ensure safe operation. Thus, the service period might be prolonged, depending on the pipeline condition. When the pipeline is taken out of use, it might be entirely removed, partially removed, or left in place, unused. This will largely depend on the international regulations for decommissioning at that time.

Pipes receive many coatings

Pipe sections have a variety of coatings to improve strength and efficiency. They are relatively small in height (1.4 mtrs) considering the volumes they transport.

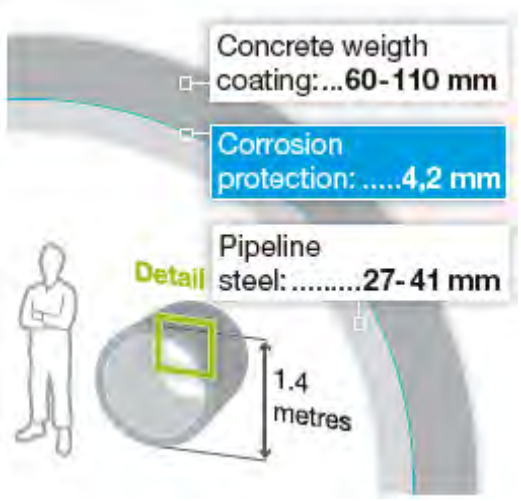
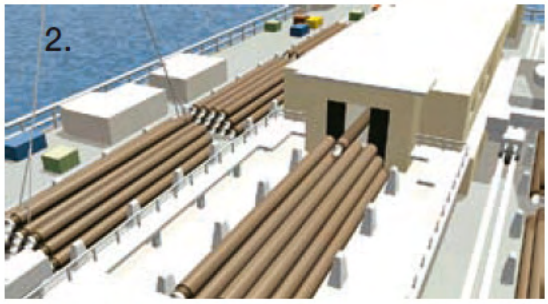


Figure 3.1 Pipeline coatings
100,000 pipes must be welded and lowered on the seabed for each of the twin pipelines

Pipes delivered to pipe-laying vessel
Barges provide a steady stream of pipes to the pipe-laying vessel. The Nord Stream supply chain is efficient as well as environmentally friendly.



Construction begins
Each of the pipes is inspected after transport and fed into an enclosed production facility for joining to the pipeline string.

Welding inside and out
Each of the pipes is fused to the string through a so-phisticated welding process. Each weld is inspected by ultrasonic-sound and sealed.

Lowering to the seabed
As the pipeline grows, the pipe-laying vehicle moves forward and the string is lowered to the seabed. Up to three kilometres of pipeline can be built each day.

Figure 3.2 Pipelay process

3.4 Alternatives

Globally, the Nord Stream project offers distinct advantages in terms of energy efficiency and environmental protection, compared to other options for natural gas transportation: Liquefied Natural Gas (LNG); using overland gas pipelines and using offshore gas pipelines. In addition there is, of course, the “zero option”- not building any means of gas transport at all. Each option for natural gas transportation is considered here.

3.4.1 LNG Tankers

A year’s gas supply from the Nord Stream project is about the same as would be achieved by 600 to 700 trips across the Baltic Sea by LNG tankers. Shipping involves high pollution and noise factors. Converting natural gas to and from its liquid form also requires energy and produces unwanted emissions. LNG conversion and transport is the most carbon-intensive method of delivering natural gas. A pipeline, once constructed, avoids all of these disadvantages.

3.4.2 Overland Pipeline

An overland pipeline also has disadvantages compared to an offshore line, going through the sea. An overland route would be longer, causing more disruption to the environment, and also must negotiate towns, cities, roads, railways, canals, rivers, surface landforms, agricultural land, as well as sensitive ecosystems and cultural heritage sites. An overland pipeline also requires many compressor stations to maintain gas pressure, and these constantly use energy while creating noise and atmospheric emissions.

3.4.3 Offshore Pipeline

An offshore pipeline has none of the above disadvantages and, in addition, is able to transport more gas at sustained and greater pressures than overland. Being a shorter route, an offshore line is also more cost-effective to construct and maintain. Furthermore, there is no disruption to towns, agriculture or other infrastructure. The most significant disadvantage, as with any pipeline, is the impacts which arise during construction. Development of other offshore pipelines, however, tells us that these disadvantages are generally not extensive and mostly only of short-term duration. There is also less impact on people and the natural environment than with the other two options. During operation, impacts are mainly limited disruptions to commercial fishing activity and, to a lesser extent, some restrictions on shipping and navigation.

3.4.4 Zero Alternative

The “zero alternative” implies not building the project at all. There would, of course, be no environmental impact whatsoever along the pipeline corridor. However, the other ways of meeting Europe’s growing energy demand i.e., burning coal or oil would produce much more CO_2 emissions meaning far greater environmental impact Ð as opposed to natural gas. The Nord Stream project also will bring socio-economic benefits, such as increased local employment, particularly during construction.

3.4.5 Choosing the Route

The alignment of the Nord Stream route between the appointed landfall locations is based on the consideration and investigation of several different route options. The selection criteria were:

- Avoiding areas of special concern. These include nature protection areas, areas with sensitive flora and fauna and areas with cultural heritage
- Avoiding areas where other marine activities may conflict with the installation and operation of the pipelines. These include areas for fishery, areas for extraction of raw materials, areas of military activity, areas with dumped munitions, planned offshore wind farm areas and designated anchoring areas
- Respecting ship traffic routes. This minimises risks from surface vessels (dropped anchors, sinking or grounding ships)
- Avoiding areas with unsuitable seabed conditions and/or bathymetry. These conditions may influence the stability of the pipelines as well as increase the need for trenching into the seabed and/or supporting the pipelines with rock berms
- Respecting routing of existing cables
- Minimising overall length. In a global view, this will ensure a minimised permanent occupation of the seabed and thus a minimised environmental impact during installation and operations. It furthermore maximises the overall performance of the pipeline system

3.4.6 Alternative routes in Denmark

Nord Stream AG has conducted investigations into a number of route options around the Danish island of Bornholm. Possible pipeline corridors were surveyed, including geophysical and geotechnical investigations and mapping of the constraints to the pipeline route, in order to assess each corridor in relation to the route-selection criteria. The investigations have been carried out especially in response to concerns related to:

- Presumed risks associated with the chemical munitions dumpsite east of Bornholm
- Increased risks of interference with maritime traffic during pipeline construction and operation
- Potential negative impacts on the nature and environment, particularly in relation to dumped chemical munitions

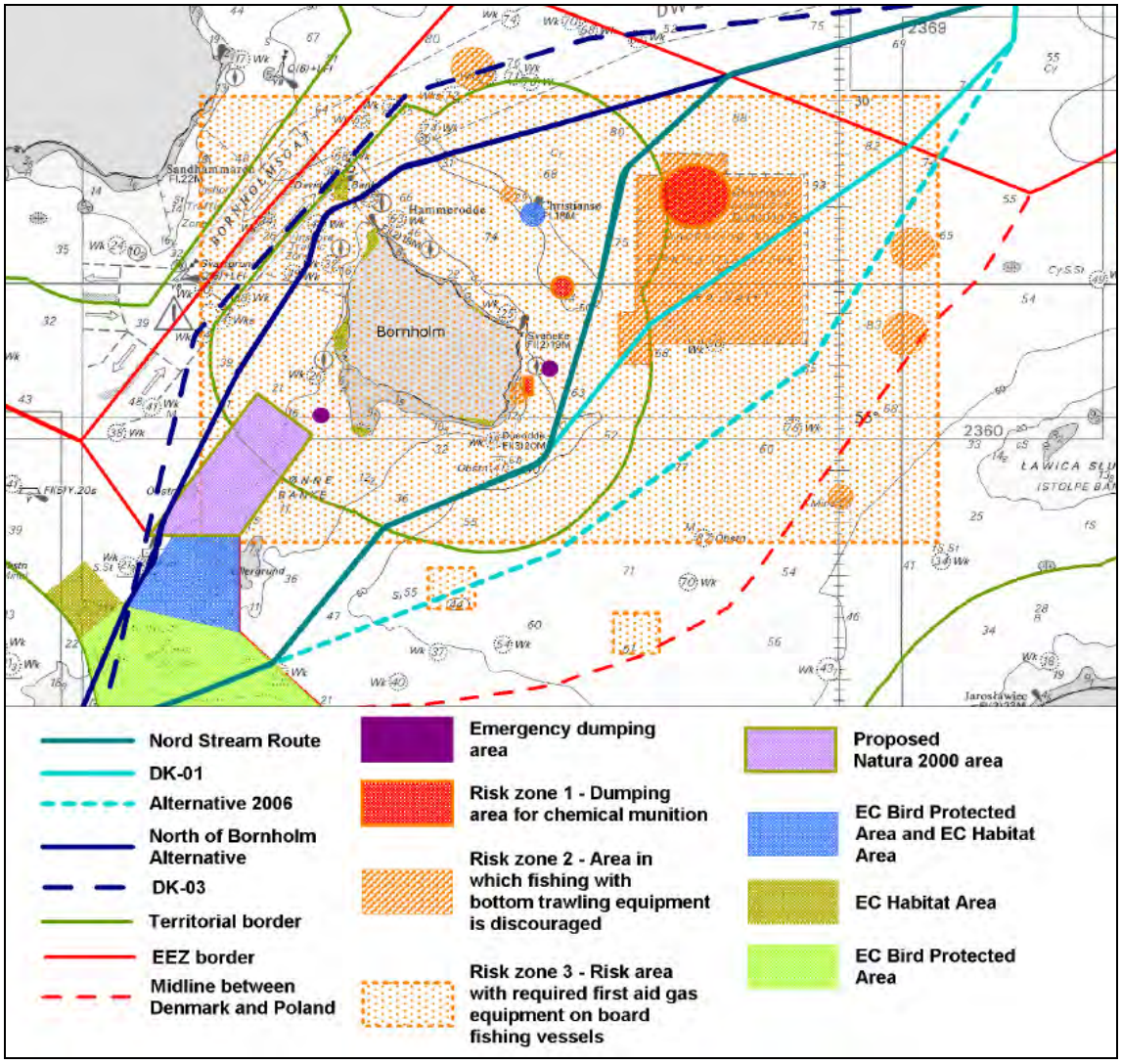


Figure 3.3 Alternative routes in the Danish Section

The Baltic Sea is one of the most trafficked sea areas in the world, and a traffic separation scheme (TSS) has been introduced in the Bornholmsgat, where the main portion of the ships going in and out of the Baltic sea is passing. The Swedish and Danish maritime authorities have expressed their concern about the installation of pipelines between Sweden and Bornholm,

regarding risks to maritime traffic during construction and risks of pipeline damage from ships during operation and a route south of Bornholm has therefore been chosen.

Route planning east of Bornholm is constrained by the presence of a dumping area for chemical munitions. Special precautions for fishing are imposed in three risk zones; The dumping ground (risk area 1) and risk area 2 and 3 are shown on the figure above.

A route south of Bornholm will bring the Nord Stream pipelines closer to the WWII chemical munitions dump. Seabed sampling and analyses for chemical munitions have therefore been conducted as background for an assessment of potential impacts from the dumped chemical munitions. The results of the investigations and assessments confirm Nord Stream AG's route south of Bornholm as a possible route.

Four marine protection areas (reefs at Davids bank, Ertholmene, Bakkebraedt Bakkegrund and Hvideodde) have been designated according to the EC directives on nature protection (flora, fauna, habitats, birds), and an additional marine protection area (Adler Grund) has recently been proposed. None of these areas will be impacted from the pipeline project.

The pipelines on the sea bed may interfere with the commercial fishery, and Nord Stream AG is in a close dialogue with the Bornholm's and Christiansø's Fishery association in order to find optimal solutions for the main fishing grounds where the pipelines traverses the Bornholm deep.

Of the three options for transporting gas, the offshore pipeline is the best.

Figure 3.4 Transport options for gas from Russia
Alternatives were carefully considered before arriving at the proposed optimal route along the seabed.

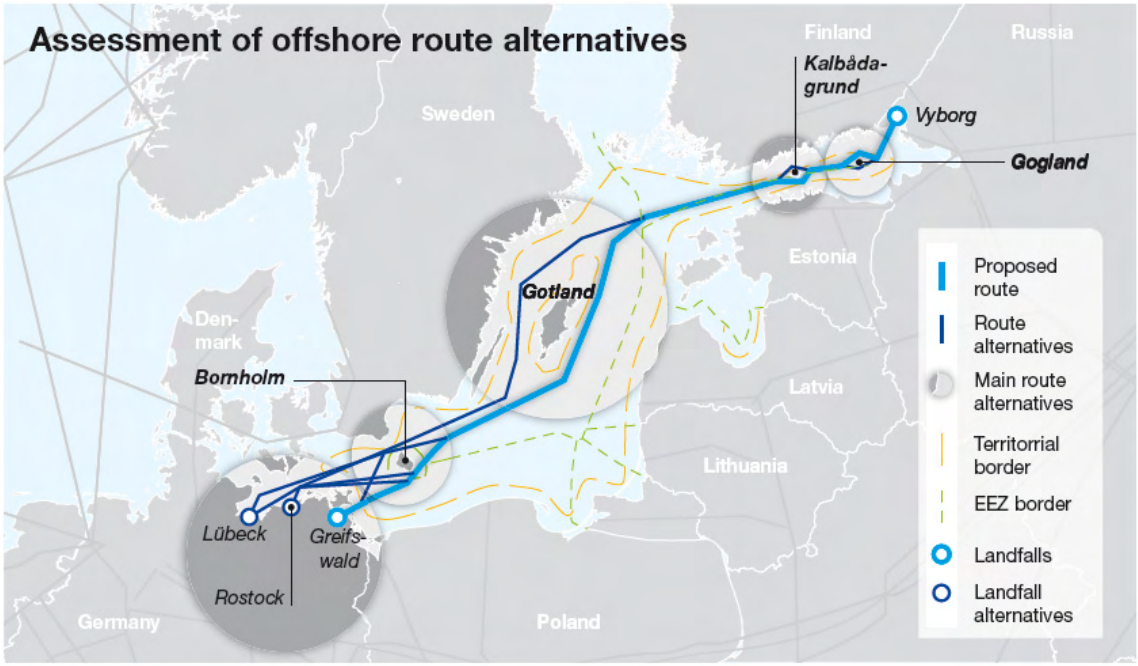


Figure 3.5 Determining the best route

3.5 Assessment of Potential Risks

Thorough risk assessments are normal practice in the pipeline industry and the Nord Stream project is no exception. The procedures governing all risk and safety assessments have been developed over years of experience, and through international agreement. Under the control of Det Norske Veritas (DNV), the Nord Stream project meets all relevant International Maritime Organisation (IMO) risk-assessment directives and criteria. Risk assessments are made to cover every aspect and every stage of the project, from planning, construction and operation to taking the pipeline out of service - i.e. decommissioning. Only if a risk is finally assessed as acceptable, by these standards, then the work under consideration is allowed.

In general terms, then, an identified risk must be categorised for its potential seriousness or “significance” (which is a combination of its potential consequence and its likelihood of occurrence). Possible options are then explored to reduce or, better still, to eliminate the risk. Once procedures have been identified to achieve this, they are incorporated into the project design.

Assessments have been made of risks both to people and to the environment. The most likely periods of risk have been determined to occur during construction and, to a lesser extent, operation of the pipeline. The most likely risks during construction are of shipping collisions with passing vessels and oil spills during refuelling. Due to the planned mitigation measures (exclusion zone and oil pollution emergency plan) both risks are considered to have been reduced to an acceptable level.

3.5.1 Example Case Scenario

During pipeline construction, the most significant risk to people is from a shipping collision. The pipe-laying vessel is moving at about three kilometres a day, in good weather, and supply ships carrying pipeline sections are going to and fro regularly. A collision with a passenger, fishing, military or freight vessel would endanger lives on all vessels, while raising the threat of oil spillage.

Standard industry experience shows that the most important mitigating procedure is to impose an exclusion zone around the construction vessels, making the risk of a shipping collision negligible. In addition, the relevant maritime and coastguard authorities will be informed of all vessel movements, which will also be broadcast on appropriate media such as Navtext. Maritime collision poses a very serious risk, and, by itself, rates as a high-consequence event, and therefore unacceptable. The exclusion zone procedure incorporated into the project makes this event improbable and hence the risk now of only minor significance, and thus broadly acceptable. If a collision did nevertheless occur then there are procedures in place to deal with this. The mitigation measures described above have greatly minimised the risk of a collision, consequently minimising the risk of an oil spill. At the same time, every vessel will carry an oil-

pollution emergency plan, approved by the authorities. Thus, the risk of an oil spill is regarded as being of minor significance.

A risk may be regarded as being of minor significance, and therefore broadly acceptable; this does not mean that it is forgotten. Risk-assessment data tell us, for example, that full pipeline ruptures are so rare, one is unlikely to occur during the life of the pipeline. The principal potential cause of pipeline failure is a large ship's anchor catching it. Unlikely as this event is, the Nord Stream project design does include procedures for dealing with the risk. Procedures will be in place, for example, to warn vessels to avoid the vicinity of a rupture, while immediate action is taken to isolate and depressurise the defective pipeline and thereby end the danger.

3.5.2 Conclusion

Risk-reducing measures are implemented for all risks that are assessed as unacceptable. In addition, the whole safety and risk assessment of the project is independently verified and approved by the experts of DNV and SGS/TÜV. This third-party assessment process covers all stages of construction - such as preparation work, pipe-laying and testing - as well as the eventual operation and decommissioning of the pipeline.

3.6 Impact Assessment Methodology

An impact assessment works out what environmental, or social and socio-economic, impacts a course of action will have. Having identified any potential impact, mitigation procedures are designed into the project.

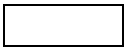
A potential impact is analysed and given a "significance" rating.

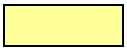
Factors Used to Assess the Level of Significance of an Impact:

- **SOURCE** - the activity that gives rise to the impact
- **TEMPORAL SCOPE** - whether the activity giving rise to the impact takes place during construction, pre-commissioning and commissioning, operation or decommissioning of the pipelines
- **SPACIAL SCOPE** - the locations or areas along the pipelines route where the initiating activity will take place
- **DURATION** - how long the impact continues
- **SCALE** - the physical range over which the impact may be experienced

- **INTENSITY** - the effect or level of damage that is suffered
- **ENVIRONMENTAL VALUE OR SENSITIVITY** - any part of an environment that will be affected is known as a “resource” or a “receptor”. (Three environments are identified - physical, biological, social and socio-economic) - resources and receptors differ in their value and/or sensivity to the impact under consideration
- **MITIGATION** - measures introduced to minimise or eradicate (“mitigate”) the impact

Finally, the potential impact must be assessed in terms of how seriously any parts of the environment might be affected. The “significance” of the potential impact is assessed after taking into account measures that will be put in place to minimise or “mitigate” that impact. An impact arising from a planned activity will, depending on its magnitude and the environmental sensitivity, be given a significance rating as follows:

 : No impact

 : Minor impact

 : Moderate Impact

 : Significant impact

- No impact: There will be no impact on structure or function in the affected area
- Minor impact: The structure or functions in the area will be partially affected, but there will be no impacts outside the affected area
- Moderate Impact: The structure or function in the area will change, but there will be no significant impacts outside the affected area
- Significant impact: The structure or function in the area will change, and the impact will have effects outside the area as well

All the Environmental Impact Assessments are thoroughly carried out and no impact from the Nord Stream project in the Danish section has been categorised as “significant impact”.

3.7 Assessment of Potential Impact of the Nord Stream Pipeline

This section summarises the impact assessment findings along the pipeline route in Denmark during construction, pre-commissioning and commissioning as well as operation.

Planned activities are the normal process of engineering the project. Provisions are in place to minimise the likelihood of unplanned, but foreseeable events; and procedures are in place to deal with them should they happen.

There are three categories of environment, “resources” or “receptors”, which might be affected by these activities:

- **THE PHYSICAL ENVIRONMENT** - such as the seabed, the water column, the atmosphere
- **THE BIOLOGICAL ENVIRONMENT** - such as marine plant and animal life and nature conservation areas
- **THE SOCIAL AND SOCIO-ECONOMIC ENVIRONMENT** - such as fisheries, shipping and navigation, tourism and recreation, cultural heritage, offshore industries and military operations

3.8 Impact assessment and mitigation measures

3.8.1 Sources of impacts

Activities associated with the project may result in impacts on the receiving environment. Activities causing possible impacts are associated with the major phases during the lifetime of the pipeline:

- Construction phase
- Pre-commissioning and commissioning of the pipeline
- Operations phase
- Decommissioning of the pipeline

During the construction phase, activities that may impact the environment are the pipe-laying vessel, the supply of line pipe, anchor-handling and seabed intervention works, which in Denmark comprises trenching of the pipelines on a relatively short section.

Pre-commissioning includes pressure-testing of the pipelines. During pressure-testing, the pipelines will be filled with water, which will be discharged after testing. Both water intake and water discharge will occur outside Danish waters. Only impacts related to pressurisation are considered a possible impact in Denmark during this phase, as neither inlet nor outlet of pressure testing water take place in Denmark.

During the operations phase, the impacts considered are related to the presence of the pipelines on the seabed and the gas flowing in the pipelines. In addition, occasional inspections of the pipelines will be carried out, impact from inspections are similar included.

Impacts from decommissioning cannot be assessed at the present time, as they will depend on the prevailing decommissioning strategy at the time of decommissioning. The design lifetime of the pipeline system is 50 years.

3.8.2 Environmental impact

Impacts on the physical and chemical environment

Table 3.1 summarises the impacts related to the occupation of physical space by the pipelines and by areas of seabed intervention works.

Table 3.1 Overall significance of impact due to occupation of physical space by pipelines and by areas of seabed intervention works

EFFECT	SCALE/INTENSITY OF EFFECT	OVERALL SIGNIFICANCE OF IMPACT
OCCUPATION OF AREA BY PIPELINES AND SEABED INTERVENTION WORKS		
Area occupied by pipelines in Denmark	~0.4 km^2	Minor
Section directly affected by trenching	10/15 km	Minor
Area of sedimentation > 1 mm following trenching (one pipeline)	<0.1 km^2	Minor
Area of suspended sediment >10 mg/l during trenching	5.9 /8.9 km^2	Minor
Area affected by anchor-handling during construction of the pipelines (one pipeline)	5.5 km^2	Minor

Construction of the pipelines in Danish waters requires seabed intervention works on a 10 km (West Pipeline) and 15 km (East Pipeline) stretch south of Ertholmene and east of Svaneke, where the pipelines will have to be trenched to ensure dynamic stability. The pipe-laying process and the seabed intervention works will cause mobilisation of seabed sediments. The mobilisation of seabed sediments may cause changes in bathymetry and in geological conditions and increased suspended matter in the water column. Nutrients and contaminants may be mobilised due to the suspension of sediment.

The bathymetry will only be significantly influenced alongside the pipelines, where heaps of sediment are pushed up during trenching. Backfilling of the trench will take place over time due to currents. Above this, resettling of sediments is insignificant, as sedimentation > 1 mm has been modelled to occur only over less than 0.1 km^2 for each pipeline.

The amount of sediment that will be mobilised due to the pipe-laying itself is insignificant. The amount of sediment mobilised by anchor-handling and by trenching are of the same magnitude. However, while the trenching is concentrated in a small area, anchor-handling will take place along the entire pipeline route in Denmark, in an approximately 2 km wide corridor. An increase in suspended matter due to each individual anchor has been calculated to be significant (> 10 mg/l) over a very small area. Modelling of sediment spreading from trenching has shown that this operation causes an increase in suspended matter in the lower water column over an area corresponding to maximum 8.9 km^2 (East Pipeline), which is deemed a minor impact.

Table 3.2 presents the overall significance of impacts on the physical and chemical environment.

Table 3.2 Overall significance of impacts on the physical and chemical environment

EFFECT	OVERALL SIGNIFICANCE OF IMPACT
IMPACTS ON THE PHYSICAL AND CHEMICAL ENVIRONMENT	
Impacts on bathymetry and hydrography	
Changes in bathymetry from trenching	No – Minor
Pipelines on the seabed	No
Suspended sediments	Minor
Sedimentation	Minor
Spreading of contaminants	Minor
Impacts on water quality	
Sediment spreading	Minor
Spreading of nutrients, inorganic and organic contaminants	Minor
Temperature difference between pipelines and marine environment	No
Contaminants from pipelines/anodes	Minor
Impacts from noise	
Airborne noise during construction	Minor
Underwater noise during construction	Minor
Noise during operation	Minor
Impacts on air quality	
Pipeline installation and pipe supply	Minor
Seabed intervention works	Minor
Pre-commissioning	Minor
Operation	Minor

Average concentrations of nutrients and contaminants (heavy metals, organic pollutants and chemical munitions) found in samples of the seabed have been related to the amount of sediment brought in suspension by pipe-laying, anchor-handling and trenching. Even if the total amount of these substances were mobilised, the resulting amounts are very small compared with the amount of nutrients and contaminants entering into the Baltic Sea from other sources. In reality, only 10%-15 % of the substances contained in the seabed sediment is expected to actually be bioavailable.

Model calculations of the spreading and sedimentation of mobilised sediments indicate that sediment spreading from construction activities will have only a local and temporary impact on water quality in the area of construction.

Depending on meteorological conditions, noise emissions to the air may reach inhabited areas on south eastern Bornholm. The nearest habited areas are around Snogebæk, where the highest calculated noise levels are between 40 – 41 dB(A) for approximately 4 days. A widely used guideline limit for nighttime noise from construction works is 40 dB(A). The noise levels will be comparable to those caused by other ship traffic close to the coast.

Noise and physical activities in general that occur when birds rest in the area may cause short-term disturbance in the immediate vicinity of the construction activities. It is assessed that underwater noise may cause avoidance reactions in fish and mammals, but this is similarly a short-term impact.

The impacts on air quality are the result of energy consumption by the vessels used for construction and operation activities. The total emissions load has been calculated from the number of vessels involved in the works, and the estimated operating time for each vessel. More than 90% of the emissions will occur during the construction phase. The calculated emissions have been compared with an estimate of the emissions loads from existing ship traffic in the Baltic Sea. The Baltic Sea is very intensely trafficked. There are about 1,800-2,000 ships in the Baltic Sea at any moment. The analyses show that emissions loads during the construction works make up a total corresponding to 0.2 % of the emissions of the existing ship traffic in Danish waters. Air emissions from the construction works contribute to air pollution on a local/regional scale and to global warming. As the air emissions are small compared with the sea traffic in general and are significantly smaller during operation than during construction, the air emissions have been assessed to be minor and temporary.

The Swedish Meteorological and Hydraulic Institute (SMHI) has analysed and modelled pipeline alignments south and north of Bornholm. The analyses showed that the pipelines will not affect the hydraulic flow from the west through the Arkona and Bornholm basins. The increased turbulence around the pipelines might increase the mixing of inflowing saline water. The mixing of the new deep water, in case of a northern route, was calculated to 0 - maximum 2 %, while the possible increase of mixing by the recommended southern route would be lower. Increased mixing of new deep water means lower salinity, increased flow rate and increased transport of oxygen, which tends to improve the oxygen conditions in and below the halocline in the Baltic Proper, thereby increasing the deposition of phosphorus in the deep water.

An additional analysis of the preferred route has been carried out to investigate a possible effect on the deep dense currents from the pipelines. These considerations have shown that the down slope steering effect of the salt water inflow will only be marginal.

Impacts on the biological environment

The impacts on the biological environment are summarised in **Table 3.3**.

Table 3.3 The overall significance of impacts on the biological environment

EFFECT	OVERALL SIGNIFICANCE OF IMPACT
IMPACTS ON THE BIOLOGICAL ENVIRONMENT	
Impacts on the pelagic environment	
Sediment spreading	Minor
Spreading of nutrients, inorganic and organic contaminants	Minor
Difference in temperature between gas and environment	No
Contaminants from pipelines/anodes	Minor
Impacts on benthic flora and fauna	
Sediment spreading	Minor
Spreading of nutrients, inorganic and organic contaminants	Minor
Occupation of area on seabed by the pipelines	Moderate
Contaminants from pipelines/anodes	No/Minor
Difference in temperature between gas and environment	No
Impacts on fish	
Sediment spreading and sedimentation	No
Physical disturbance and noise during construction	No/Minor
Occupation of seabed and changes of the bathymetry	Minor
Impacts on marine mammals	
Sediment spreading and sedimentation	Minor
Physical disturbance and noise during construction	Minor
Impacts on birds	
Sediment spreading and sedimentation	Minor
Physical disturbance and noise during construction	Minor
Impacts from non-indigenous species	
Transport with ballast water in vessels	No
Migration along the pipeline structure	No
Impacts on protected areas (Natura 2000, Ramsar, BSPA areas)	
Sediment spreading and sedimentation	No
Noise and Physical disturbance during construction	No

Impacts on the pelagic environment are closely associated with the assessed impacts on water quality. Modelling of sediment spreading from pipe-laying and anchor-handling have demonstrated that this may be considered insignificant. Only trenching is assessed to cause local sediment concentrations in the vicinity of the pipeline alignment that may influence

phytoplankton or zooplankton due to shading. Contrary to the shading mechanism, nutrients and contaminants may be released from the sediments and marginally stimulate production of phytoplankton. The water depth is approximately 50 m where the trenching will be carried out, and sediment spreading primarily will take place in the lower part of the water column. In addition, the duration of these impacts will be short. The ploughing activity will be carried out in approximately 2 weeks for the east pipeline and the sediments will resettle in few hours. Therefore, it has been concluded that no, or only minor impacts, on the pelagic environment are foreseen.

There will be no impacts on benthic flora, as the pipelines are laid at depths without benthic flora.

Impacts on marine benthic fauna are assessed to be limited to the areas in which the pipelines are laid directly on the seabed and areas in close vicinity to trenching activities. In the areas where the pipelines are laid on the bottom, the infauna beneath the pipelines will disappear. However, in shallower water, epifauna communities may emerge on the concrete coating of the pipelines, but the species composition will change compared with the fauna community on the undisturbed seabed. Impacts on benthic fauna in areas that are directly affected by seabed intervention works will last until the fauna community is re-established. Depending on oxygen conditions, it is assessed that benthic fauna species will begin re-colonise areas shortly after the trenching works have been finished.

Figure 3.6 Marine benthic fauna: *Sanduria entomon*

The sediment structure in sandy bottom areas could change to softer seabed texture in the immediate vicinity of the pipelines, because the pipelines will act as a lay belt for transverse currents and also as an artificial reef. As a consequence, the fauna composition could change to species that are more tolerant of occasional coverage by sediments.

Impacts on habitats for fish, including nursery areas, are assessed to be small, and the duration of the impacts will be short. This is due to the fact that the increased sedimentation from sediments brought into suspension will be significant only over small areas in the immediate

vicinity of the pipelines, in particular on the stretch where trenching is carried out. Fish eggs and fish fry are more sensitive to sediments in suspension than adult fish, but the calculated concentrations of suspended matter are not nearly that high that they, according to experience, will cause death of fish or fish eggs. Pelagic fish will most likely flee from an area with suspended matter, while demersal fish are more habituated to occasional increase in suspended sediments.

Fish are receptive to noise with their hearing ability and also due to their ability to detect the vibrations connected with noise. Avoidance reactions from almost all fish species will occur in close proximity to the pipe-laying and trenching operations. Fish larvae are not expected to suffer any injuries due to noise, and long-term effects on fish from noise are not envisaged.

Several articles in “Artificial reefs in the European Seas” has demonstrated that pipeline structures may lead to the development of new habitats on the seabed, resulting in an increased number of fish species. The occupation of the seabed by the pipelines and changes in sediment structure around the pipelines is therefore not expected to negatively impact the fish stock.

The Baltic Sea mammals use their hearing ability efficiently and are used to hunting in darkness; therefore, increased turbidity due to sediment spreading from trenching is not expected to cause negative impacts on their ability to feed. Above this, the physical disturbance will most likely make mammals temporarily flee from the construction area. The duration of increased content of contaminants from suspended sediments in the water column will be short, and a possible increase of contaminants in the food chain is expected to be insignificant.

In addition, as the construction area is close to busy shipping fairways, marine mammals are most likely to be habituated to noise and vibration from ship traffic. The only expected impact from the works will be temporary avoidance reactions.

Possible impacts on birds are solely related to foraging or resting birds at sea. The appointed bird area Ertholmene, some 11 km from the pipeline route, will not be impacted by the pipelines. The route also passes Rønne Bank, another important bird area, but also far from the pipeline route. Birds are not restricted to the appointed bird areas, but it is assessed, that there are no major bird feeding areas within a 2 km distance of the pipeline route.

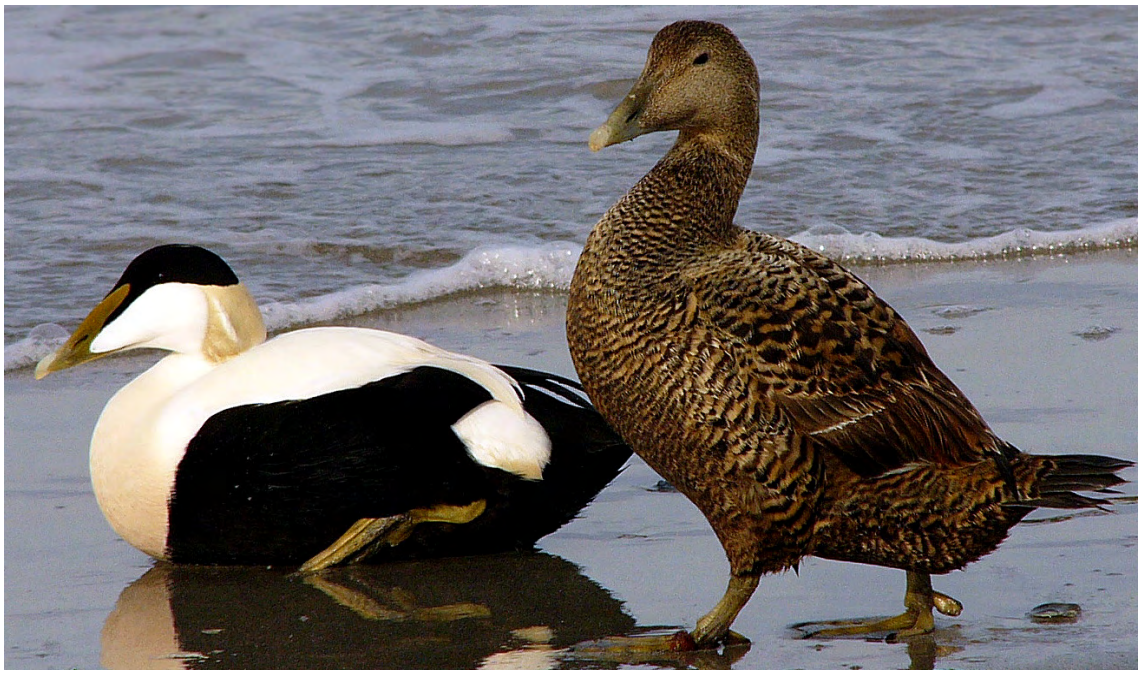


Figure 3.7 Common eider (*Somateria mollissima*) male and female

Impacts from sediment spreading can be problematic for the vision of diving seabirds. Significant sediment spreading may be caused by trenching and anchor-handling, primarily trenching. Suspended matter above a problematic level will occur only close to the seabed, below the maximum dive depth of most birds as the water depth at locations close to intervention works is around 50 m. Furthermore, the duration of increased turbidity will be very short Similar to marine mammals, it is assessed that no toxicological impacts on birds from the release of contaminants are expected.

Studies of visual and noise impacts on birds from ship traffic have revealed that impacts are limited to a distance of 1-2 km from the lay barge.

The ship traffic, just as noise and light associated with construction works, may disturb birds within a short distance of the lay vessel (1 - 2 km). The duration of the disturbance at a specific location will be short, as the lay vessel will move 2 - 3 km a day.

It is assessed that there may be minor disturbance of birds if pipe-laying and trenching are carried out during winter. However, no impact on birds is foreseen outside this season. Impacts will be short-term (days or a few weeks) and limited to the area where pipe-laying is carried out.

During operation, it is assessed that no or insignificant impacts to fish, marine mammals and birds are caused by the presence of the pipelines and the occasional surveys along them.

The pipelines will not impact any Natura 2000 protected areas in Denmark.

Impacts on the socioeconomic environment

Impacts on the socioeconomic environment are summarised in **Table 3.4**.

Table 3.4 Overall significance of impacts on the socioeconomic environment

EFFECT	OVERALL SIGNIFICANCE OF IMPACT
IMPACTS ON THE SOCIOECONOMIC ENVIRONMENT	
Impacts on fishery	
Protection zone around the lay vessel	Minor
Sediment spreading and sedimentation	Minor
Restriction zone around pipelines	[1]
Occupation of area on the seabed	Minor
Impacts on shipping and navigation	
Physical disturbance/activities during construction	Minor
Physical disturbance/activities during operation	No
Impacts on tourism and recreational areas	
Physical disturbance and noise during construction	No
Sediment spreading and sedimentation	No
Impacts on cultural heritage	
Physical impact of anchor-handling	No
Physical impact of trenching	No
Physical impact of the pipeline itself	No
Changes in bathymetry	No
Impacts from waste	
Impacts from waste and sewage	No
Impacts on infrastructure	
Impact on cables	No
Impact on wind farm areas	No
Impact on extraction areas	No
Impacts on military areas	No
IMPACTS OF DECOMMISSIONING	
Impacts of decommissioning	Minor/None[2]

[1] Depends on results of the Nord Stream study on overtrawlability and possible mitigation measures to be agreed upon with Danish fishery authorities.

[2] Impacts from decommissioning and closure of the pipeline will depend on the situation at the time of decommissioning. Therefore, mitigating methods for decommissioning and closure of the pipeline will be conducted according to the situation (legislative requirements, technology available, knowledge of environmental impact, degree of burial of the pipeline) at the time of decommissioning.

During construction, there will be impacts on fishery inside the construction area because a protection zone will have to be established around the slow-moving lay vessel.

During construction works, and in particular during trenching works, fishery will also be affected in the vicinity of the construction works due to spreading of sediment. As mentioned above, an increased amount of suspended sediments will likely result in avoidance reactions by fish species in the construction area. Trenching will take place in the fishery area “Pladen”, an important cod fishery area. It is assessed that avoidance reactions occur when suspended sediments significantly exceed the normal level, assessed to be > 10 mg/l. Modelling has indicated that this will occur within in a distance of around 1 km from the pipeline, which amounts to around 6 km2 (West Pipeline) and 9 km2 (East Pipeline). The duration of this impact for each individual location will be only a few hours.

Preliminary discussions with fishermen’s associations in Denmark have taken place. Representatives from these associations recognise the necessity of a protection zone during construction and acknowledge that a ban of all fishing activities in a specific area most likely will last for only a very short period of time (a few days). The fishermen’s associations have expressed that their members would appreciate having observers onboard the pipe-laying vessel for shorter periods in specific areas, in order to warn and support fishermen during the pipe-laying period.

Permanent restrictions for fishing across/along sections of the pipelines can not be completely ruled out. The pipelines are designed to be overtrawlable and resistant to impact loads from fishing gear. However, at present the design revealed a few freespans above a height considered critical for the trawling in Danish waters. Through the continuously ongoing optimisation process it will be sought to limit the freespans to secure overtrawlability. In case mitigation measures in relation to overtrawlability should be required, they will be implemented in cooperation with the fishery authorities.

The protection zone around the lay vessel or the trenching activities will cause disturbance to ship traffic, but awareness of such activities at sea and keeping clear of these activities is common practice for commercial ships. Therefore, the impacts on commercial ship traffic are assessed to be minor.

The noise distribution from the lay vessel and the additional vessels involved has been modelled. When using a conservative model, the calculations showed that noise limits for construction works may be exceeded briefly at the south-eastern coastline at Snogebæk when the lay vessel passes Bornholm at the shortest distance. Above this, it is assessed that the physical disturbance by motion and visibility will cause no inconvenience to tourism and recreational areas on the coast of Bornholm.

Precautions have been taken to avoid damage to cultural heritage artefacts on and below the seabed. A cultural heritage survey of the pipeline corridor has been carried out, and the routing

of the pipeline has been selected to avoid conflicts with shipwrecks and possible submerged settlements. Neither the pipeline on the seabed nor the trenching is expected to damage any objects. An anchor survey will be carried out before the construction works to ensure that anchoring does not cause impacts on cultural heritage artefacts.

Waste onboard all vessels will be handled in accordance with the MARPOL Convention and additional regulations according to HELCOM. Waste and untreated sewage will not be disposed of at sea, but will be handled by licensed operators from one of the supply bases (Sweden or Germany). Household waste, according to HELCOM, may not be incinerated within Danish territorial waters. No impacts from waste are foreseen.

The pipeline will cross a number of cables out of which three telecom cables in Denmark. Crossing agreements will be entered with the cable owners, and the crossings will be established according to a design established in these agreements. The crossings will not hinder the use or future repair of existing cables. There are no existing pipelines to be crossed, but the Baltic Pipe connecting Poland and Denmark is scheduled. A crossing agreement will be entered including a design of the crossing.

There is no known existing or planned exploitation of natural resources on the continental shelf within the alignment of the preferred route.

Impacts from conventional munitions and dumped chemical munitions

Impacts from conventional munitions and from dumped chemical munitions are shown in **Table 3.5**.

Table 3.5 Overall significance of impacts from conventional munitions and from dumped chemical munitions

EFFECT	OVERALL SIGNIFICANCE OF IMPACT
IMPACTS FROM MUNITIONS	
Contact with chemical munitions during construction	No
Contact between pipelines and munitions during operation	No
Spreading of chemical munitions	No
Impacts from conventional munitions	No

Munitions surveys have been carried out along a 15 m wide installation corridor, 7.5 m on each side of the pipeline, to ensure that no munitions objects are present where the pipelines will be laid. The width of the corridor takes into account the accuracy with which the pipelines are laid. The pipelines are laid with an accuracy of at maximum few meters from the designed route. No munitions objects have been identified from the surveys within this installation corridor in the

Danish waters. Three chemical munitions objects were identified 16 – 19 m from the east pipeline. Nord Stream has notified The Danish Admiral Fleet about these findings and they have in a letter (ref. 001329-22553, date 30.01.2009) replied that the munitions are best left where found and that they should not pose a risk to the pipeline. However the Danish Admiral Fleet has pointed out that human contact with chemical munitions should be avoided during the construction.phase Nord Stream will follow these guidelines and will leave the munitions on the seabed and avoid contact during the installation.of the pipelines.

Figure 3.8 Examples of munitions catch: A corroded gas bomb (left) and lump of mustard gas (right)

Dumped warfare agents – the chemical substances - may be found in seabed sediments along sections of the pipeline alignment. Such chemical agents may be recovered during anchor-handling or trenching. The investigations of samples of the seabed sediment and pore water samples from the risk area 3 did not indicate a general occurrence of warfare agents.

A study of the possible risk to the marine environment has been carried out on the basis of the concentrations in the analysed sediment and pore water samples. There are no indications that the biological abundance is influenced by the presence of CWA in the seabed. A risk estimate based on the highest measured concentrations have not indicated that sediment spreading due to the construction works will cause a significant risk to the marine life.

The risk of human exposure is comparable to risks during ongoing fishing activities where lumps of in particular mustard gas are occasionally met. The risk can be eliminated by washing all equipment before it is brought on deck.

3.8.3 Impacts of decommissioning

A separate study of options for decommissioning will be carried out in due time before decommissioning commences. The study will include a review of the technical and economic feasibility of the various options, together with an analysis of the environmental impact.

At the time of decommissioning, experience from other projects, experience with respect to the environmental impact of the presence of the Nord Stream pipelines, industry practice and the existing legal framework will determine which decommissioning strategy should be implemented.

It is expected that best practice supported by the authority requirements at that time will imply an insignificant environmental impact from the decommissioning. The limited experiences available at present suggest a decommissioning strategy of abandonment of the pipelines as the most likely scenario, with no overall significance of impact. Removal of the pipelines after the end of their design lifetime will most likely cause minor environmental impacts comparable to the impacts from construction of the pipeline.

3.9 Transboundary Impacts

3.9.1 Impacts for Denmark caused by installing pipelines within Danish waters

The type and scope of environmental impacts within Danish waters, caused by activities in German and Swedish waters, will correspond to, but be considerably less than, the impacts caused by the same activities in Danish waters.

During operation, there may be impacts on Danish fishery (bottom trawling) outside the Danish EEZ. This will preliminary be at locations where the freespan height of the pipelines result in a safety zone around the pipelines where fishery is prohibited for safety reasons.

During construction, pipe-laying outside the Danish EEZ will result in energy consumption, and thereby emission of substances. It is assessed that the impact inside Danish waters due to energy consumption and atmospheric deposition will be insignificant.

3.9.2 Impacts in other countries due to establishment of pipelines inside Danish waters

No parts of the Nord Stream Project area within the Danish EEZ are close to environmentally critical areas outside the Danish EEZ. The nature and magnitude of environmental impacts caused by activities within the Danish EEZ on the EEZs of Sweden and Germany will be similar to but significantly less than the impacts caused by the same activities within the Swedish and German EEZs.

Fishery inside Danish waters by other countries, especially Sweden, Poland and Germany, is very important to these countries. Fishery by these countries may be affected during the construction period from the safety zone around the lay vessel.

Impacts on the fishery (bottom trawling) by other countries during operation will depend on whether safety zones around the pipelines may be required for safety reasons, because of freespan heights.

Emissions of substances from energy consumption during pipe-laying inside Danish waters will, as described above, result in atmospheric deposition of substances inside other countries.

In general, it is assessed that the impacts from activities within Danish waters on other countries will be insignificant, and that construction and operation of the Nord Stream pipelines within Danish waters will have no impact on internationally protected areas (Natura 2000 areas, Ramsar areas) in other countries.

Furthermore, it is evaluated that there will be no cumulative impacts from the planned Nord Stream pipeline with other projects in other countries.

3.10 Transboundary impacts from unplanned events

3.10.1 Oil spill

It is calculated that the additional annual frequency of ship collisions with oil spill (because of the Nord Stream pipelines) is 2.3×10^{-5} oil spills per year, corresponding to a return period of 44,306 years.

Depending on the location where a ship collision including oil spill occur, inside or outside Danish water, there may be a risk of transboundary impacts. A mayor oil spill inside Danish water may, depending of the spill location, have transboundary impacts on Sweden, Germany and/or Poland, and impacts on the marine environment may be significant.

3.10.2 Gas release

The total gas release frequency within Danish waters is estimated to be 3.77×10^{-6} releases per year, or about once every 265,000 year. It is judged that a gas release is only a safety issue for the ship traffic and will not pose a threat to the safety of people on Bornholm, or at the German, Swedish or Polish coasts.

The transboundary impacts from a gas release will primarily be related to the emission of methane to the air. Methane is a greenhouse gas, and methane released from a potential rupture would have a carbon dioxide equivalence 9 time greater than if the same volume of methane was delivered to customers and burnt. A full rupture would result in methane equivalent to 7% of the annual emission of carbon dioxide in Denmark, or equivalent to approximately 14.5 % of the annual carbon dioxide emissions from total maritime traffic in the Baltic Sea.

3.11 Environmental Management and Monitoring

Nord Stream is committed to carrying out all work safely and in an environmentally responsible manner. A way was required of ensuring and verifying that this remains the case. Hence, Nord Stream has organised a Health, Safety, and Environmental Management System (HSE MS) which conforms to the stipulations of international standards.

This HSE MS provides the framework for developing all the standards, planning, and procedures for every stage of the Project. All contractors, at any stage of the Project, will also have to adopt such management systems, meeting or exceeding them as a core factor in their contracts.

This ensures that those engaged on the Project have a consistent approach towards the environment, social matters, standards and requirements.

Environmental monitoring will be directed at those areas of environmental sensitivity that are predicted to experience significant (moderate significance or more) impacts from the Project or where there is significant uncertainty as to the reliability of the impact assessment. The Environmental Monitoring Programme is a direct response to the environmental impacts and issues that have been addressed in the assessment of impacts, specifically those requiring mitigating measures and monitoring, and the particular reporting requirements on national levels.

Nord Stream AG is committed to share its data with interested parties and make arrangements to facilitate this process.

4 Advisors and suppliers for the Danish section

Nord Stream AG has put emphasise on having national recognised service providers in all the countries involved. The company has therefore contracted a number of recognised Danish companies and institutes ensuring understanding of the national situation when planning and conducting environmental assessments of the Project.

An overview of the consultants and contractors involved in the development of the Project planning is shown in the **Table 4.1** below. The table furthermore gives information of the service providers in the planned construction phase.

Table 4.1 Overview of Nord Stream consultants and contractors

Yr 2005-2012	Scope-of-Work	Country of Origin
Planning, EIA and permit application		
Marin Mätteknik AB	Offshore surveys (incl. munitions and cultural heritage)	Sweden
Ramboll Group A/S	Permit applications Environmental Impact Assessment	Denmark
ERM Ltd	Espoo report (with Ramboll)	United Kingdom
Plesner	Legal issues	Denmark
Technical Design		
Snamprogetti S.p.a.	Detailed design, Operational Risk Assessment	Italy
Det Norske Veritas (DNV)	Project Certification	Norway
SGS/TüV S.A.	Project Certification	Germany
Global Maritime Ltd.	Construction Risk Assessment	United Kingdom
FOGA	Assessment of commercial fisheries	Denmark
SINTEF	Assessment of commercial fisheries.Tests of pipeline trawl ability	Denmark
Construction		
Saipem of the ENI Group	Pipelay offshore/ landfalls onshore	UK
Europipe GmbH	Pipe supply	Germany
EBK	Pipeline buckle arrestors and transition pieces	Germany
SINTEF	ECA welding acceptance	Norway

Yr 2005-2012	Scope-of-Work	Country of Origin
	criteria	
StatOilHydro	Hyperbaric tie ins and emergency repair systems	Norway
EUPEC	Pipe Coating	France
Environmental surveys in Denmark		
000 Petergaz	Environmental baseline investigations (DK-00 route)	Russia
Danish Hydraulic Institute (DHI)	Sea bed sampling for contaminants N-route and S-route	Denmark
Danish Hydraulic Institute (DHI)	Bird Investigations and Assessments (S-route) – Natura 2000 Ertholmene	Denmark
BioConsult	Preparation of habitat maps	Germany
Institute für Angewandte Ökologie	Bird Investigations (Adler Grund-Rønne Banke)	Germany
Danish Biological Laboratory	Macrozoo-benthos assessments for N-route and S-route	Denmark
National Environmental Research Institute (NERI)	Assessment of marine mammals for N-route and S-route	Denmark
Krog Consult	Assessment of fish and fishery	Denmark
National Environmental Research Institute (NERI)	Laboratory analyses of chemical munitions contaminants in sea bed. Risk analysis of dumped chemical munitions	Denmark
VERIFIN, University of Helsinki	Laboratory analyses of chemical munitions contaminants in sea bed	Finland
Centre for Regional Tourism (CRT)	Analyses of Bornholm's tourism	Denmark
Det Norske Veritas (DNV)	Over – trawlability study	Norway
Foundation for Scientific and Industrial Research at the Norwegian Institute of Technology	Over – trawlability modelling	Norway
Public Relations/Communications in Denmark		
Hill & Knowlton	Public Relations	Denmark

5 More Information

5.1 List of Reports

The EIA study is based on numerous sources of information. In the following is included a list of studies carried out. These studies are all available for additional information.

Bellebaum, J., Kube, J., Schulz, A. and Wendeln, H., 2007, "Seabird surveys in the Danish EEZ south-east of Bornholm", Institut für Angewandte Ökologie GmbH, Germany.

Borenäs, K. and Stigebrandt, A., 2007, "Possible effects upon inflowing deep water of a pipeline crossing the flow route in the Arkona and Bornholm basins. SMHI report no. 61".

Bossi, R., Krongaard, T. and Christoffersen, C., 2008, "Nord Stream Offshore Pipelines through the Baltic Sea. Analysis of arsenic compounds in sediment samples and sediment pore water samples from the Baltic Sea.NERI Technical Report, October 2008".

Dansk Biologisk Laboratorium, 2008, "Macrozoobenthos along the Nord Stream Pipeline in the Baltic Sea - the route south of Bornholm".

Dansk Biologisk Laboratorium, 2008, "Macrozoobenthos along the Nord Stream Pipeline in the Baltic Sea in 2006 and 2007.

Dansk Biologisk Laboratorium, 2008, Note concerning macrozoobenthos in the EEZ and territorial water of Denmark South of Bornholm.

DHI, 2008, "Baseline investigations of the use of sea area northeast of Ertholmene by breeding guillemots Uria aalgae and razorbills Alca torda in relation to the planned route of the Nord Stream pipelines".

DHI, 2007, "Field report. Gas pipeline through Danish EEZ", DHI, Denmark.

DHI, 2008, "Gas Pipeline South of Bornholm. Survey South of Bornholm 4 to 13 May 2008. Ramboll Field Report June 2008".

DHI, 2008, "Nord Stream pipeline south of Bornholm. Survey from 4 to 13 May 2008. Results of physical and chemical analyses of surface sediments".

Finnish Institute for Verification of the Chemical Weapons Convention (VERIFIN), 2008, "Nord Stream Offshore Pipelines through the Baltic Sea. Chemical analysis of Sea-dumped Chemical Warfare Agents in Sediment and Pore Water Samples".

Finnish Institute for Verification of the Chemical Weapons Convention (VERIFIN), 2008, "Nord Stream Offshore Pipelines through the Baltic Sea. Chemical Analysis of Sea-dumped Chemical Warfare Agents in Sediment and Pore water Samples. - Discussion of the results of presented in report VER-MS-0162.".

Klingberg, F. 2008. “Submarine slides in south-western Baltic Proper. SGU Report 2008:5”.

Marin Mätteknik, 2008, "Nord Stream. Marine survey 2007-2008. Detailed Survey Danish and German waters. Factual report".

Marin Mätteknik AB, 2008, "Munition Screening and Geophysical Route Survey. Final Report, Rev. 4"

Marin Mätteknik, 2008, "Nord Stream Pipeline, Marine Survey 2007-2008. Detailed Survey, Route revision C-14, General report".

Marcussen, C. H., 2008, "Tourism on Bornholm - with special emphasis on the east coast and Dueodde", Centre for Regional and Tourism Research (CRT), Nexø, Bornholm.

Nord Stream AG and Ramboll, 2008, " Memo 4.3A-6 - Spreading of viscous mustard gas." Nord Stream AG, Zug, Switzerland.

Nord Stream AG and Ramboll, 2008, "Memo 4.3s - Materials". Nord Stream AG, Zug, Switzerland.

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