Nord Stream
The new gas supply route for Europe

Supplying Gas to Europe while Protecting the Environment

Initial Environmental and Socio-Economic Monitoring Findings

June 2012

Dr. Dirk von Ameln, Nord Stream Permitting Director

Monitoring – A Worthwhile Investment

> Monitoring Nord Stream's potential environmental and socio-economic impact on the Baltic Sea is a requirement from authorities in the countries whose waters the pipelines pass. Furthermore, it is a demand placed on the company by the commercial banks and institutions that are financing the project. Nonetheless, in our opinion environmental and social monitoring has its own added value.

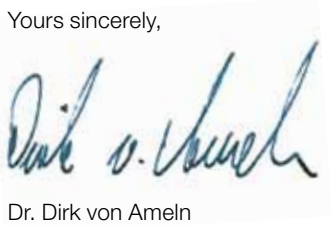
Whereas market analysis, credit availability and regulatory frameworks are naturally key areas of concern for an international infrastructure project such as Nord Stream, socio-economic and environmental monitoring add a new dimension to our understanding of the sustainable success of the project.

As Permitting Director, I have personally been involved in discussions with the permit-issuing authorities in Russia, Finland, Sweden, Denmark and Germany to decide how to manage potential environmental and socio-economic risks. Nord Stream's permit applications included Environmental Impact Assessments (EIAs) which were based on our extensive seabed surveys and examinations in the Baltic Sea.

The documentation, in fact, convinced the relevant authorities in each country that the potential impact of the construction and operation of the Nord Stream Pipelines is temporary, local and minor. Our monitoring programme is currently in the process of providing evidence of this. Importantly, should any unexpected results occur, the monitoring programme is also a tool for mitigation measures and, if needed, corrective actions.

In addition, Nord Stream's Environmental and Socio-Economic Monitoring Programme provides new and valuable data about the status of the Baltic Sea environment. This data will also become available to the wider research community – as Nord Stream has committed to make our findings publicly available. Are you interested in Nord Stream's environmental and socio-economic monitoring programme? Do not hesitate to contact us at: info@nord-stream.com

Yours sincerely,



Dr. Dirk von Ameln
Permitting Director

A Comprehensive Monitoring Programme

From the start, focusing on the environment has played a key role in the largest infrastructure project to date in the Baltic Sea – Nord Stream's twin natural gas pipelines from Russia to Germany. The pipelines, which connect the immense Russian gas fields to Europe, will have the capacity to transport 55 billion cubic metres of natural gas annually. This is enough to meet the energy needs of more than 26 million European households each year. The pipelines are planned to deliver gas for at least 50 years.

Nord Stream – owned by a consortium of five major energy companies – is thereby supporting the EU in attaining two important goals: a secure, long-term energy supply, as well as the increased use of low-carbon fuel. As the cleanest of the fossil fuels, natural gas plays a key role as a bridge fuel in society's shift away from more carbon intensive fossil fuels, and toward renewable energy sources.

The natural gas pipelines were planned and constructed so as to minimise harm to the sensitive Baltic Sea environment. Nord Stream therefore carried out a number of studies to determine the optimal route – one identified as having the least environmental impact. A comprehensive environmental monitoring programme provides data about the environmental impact of the construction and operation of the pipelines. By the end of 2016, Nord Stream will have invested 40 million euros in this programme.

The following chapters provide an insight into how Nord Stream, its environmental monitoring contractors, and national regulators have provided for the sustainable delivery of natural gas to Europe.

Contents

CHAPTER 01 **The Monitoring Programme**

Environmental Reporting to Five Countries **07**
Interview: Project manager Samira Kiefer Andersson explains Nord Stream's monitoring programme **09**

CHAPTER 02 **Water Quality**

Impacts on Water Quality Are Strictly Monitored **13**
Infographic: How water quality is monitored along the entirety of the pipelines **14**
Interview: Marine biologist Marina Magnusson explains how mussels are used to determine water quality **17**

CHAPTER 03 **Water Flow**

Vital Water Flow Is Safeguarded **21**
Infographic: How and where seabed conditions are monitored to assess water flow **22**
Interview: Environmental engineer Fokko van der Goots explains the importance of seabed restoration **25**

CHAPTER 04 **Fish, Marine Mammals and Birds**

Protecting Wildlife Is at the Forefront of Surveys **29**
Infographic: How and where fish, marine mammals and birds are monitored **30**
Interview: Aquatic ecologist Tomas Didrikas explains the process of fish monitoring **33**

CHAPTER 05 **Benthic Flora and Fauna**

Safeguarding Seabed Animals and Plants **35**
Infographic: How and where the landfall areas, and seabed flora and fauna are monitored **36**
Interview: Marine biologist Anja Schanz explains how the pipelines have become an artificial reef system **39**

CHAPTER 06 **Stakeholder Views**

Stakeholders Involved in International Consultations **41**
Interview: Senior Scientific Officer Sverker Evans explains the involvement of Swedish authorities in Nord Stream **43**
Interview: Fisherman Thomas Thomsen explains the cooperation between Nord Stream and commerical fisheries **47**
Interview: Director of the Baltic Fund for Nature Roustam Sagitov explains how Nord Stream works with NGOs **49**
Map: How Nord Stream handles its monitoring activities **50**
Nord Stream by the Numbers **51**

CHAPTER 01

The Monitoring Programme

Cultural heritage is important to Nord Stream. Therefore, we support the Heritage Underwater Maritime Archaeology (HUMA) programme. HUMA explores wrecks and examines artefacts around the Island of Gotland, Sweden. Here, HUMA divers prepare for their search for relics.

16 Subjects Are Monitored

- Water quality
- Seabed sediment
- Hydrography and seabed topography
- Onshore soil
- Landscape and topography
- Air quality
- Noise and pressure waves
- Fish
- Birds
- Marine mammals
- Benthic flora and fauna
- Terrestrial flora and fauna
- Fisheries
- Cultural heritage
- Conventional munitions
- Chemical munitions

Environmental Reporting to Five Countries

> Nord Stream developed national environmental monitoring programmes for the five countries – Russia, Finland, Sweden, Denmark and Germany – whose waters its natural gas pipelines pass. These programmes were developed to meet the specific requirements of each country outlined in the national permits granted to construct and operate the pipelines. Each of the five programmes documents environmental impacts in the respective country – from construction through to operation of the pipelines.

Why We Are Involved

The Baltic Sea is a sensitive ecosystem, stressed by extensive human activities. Consequently, the precautionary environmental requirements from the national authorities on Nord Stream's installation and operation of the pipelines have been particularly stringent and extensive. The environmental monitoring programmes were preceded by thorough environmental impact assessments to find a suitable route and to minimise environmental impacts.

How We Are Responding

The five national environmental monitoring programmes cover a total of 16 different subjects, with data gathered from approximately 1,000 locations along the route. Nord Stream is assisted in these studies by more than 20 renowned expert companies and research institutes. The collected samples are being analysed by internationally recognised experts and certified laboratories.

The results from the investigations – summarised in Nord Stream's overall annual environmental monitoring report – confirm that thus far we are meeting the criteria set out in the national permits. These also serve as a reference for corrective measures if such are needed. National annual environmental monitoring reports are sent to the national regulatory authorities in each of the five countries, whereas the overall report (with summaries from all five countries) is distributed to all nine Baltic Sea countries. The reports are also available on our website (www.nord-stream.com).

The monitoring was initiated prior to the start of construction to collect baseline data. Since then, it has been focused on the potential impacts from construction activities. Monitoring will continue during the operational phase of the pipelines until the end of 2016, or in some cases longer.

The Overall Result to Date

The environmental monitoring carried out by Nord Stream through May 2012 confirms that the environmental impact of the construction of the pipelines is in line with or below the values assessed in the Environmental Impact Assessment (EIA). In some cases, the prior assessments have proven conservative, meaning that the impact has been less than anticipated.

Samira Kiefer Andersson coordinates the comprehensive Nord Stream environmental monitoring report.

“Monitoring provides vital ecological data”

> The authorities in the countries through whose waters the pipelines pass have placed broad demands on Nord Stream, which the company is pleased to have met, says Samira Kiefer Andersson, project manager for Nord Stream’s environmental monitoring programme. The overall results to date confirm that impacts are either within the anticipated values, or in some cases even lower.

Nord Stream’s gas pipelines constitute the largest infrastructure project ever undertaken in the Baltic Sea region. The authorities have placed considerable weight on environmental stipulations. Have they been difficult to meet?

Samira Kiefer Andersson: Yes and no. It has taken a great deal of time and investment on the part of Nord Stream, but the authorities have been very clear about what they want, and we have responded with a with comprehensive programme. We explored the seabed and alternative routes extensively before arriving at an optimal route for the pipelines, one that would minimise environmental impacts and yet also be technically feasible.

Permits to build and operate the pipelines from the various national bodies from five countries included many requirements that differ from country to country.

How is Nord Stream ensuring these requirements are fulfilled?

SKA: To meet them, we developed our environmental monitoring programme, which actually encompasses five different programmes, one for each country whose waters the pipelines cross. The authorities in each country have reviewed and approved the programmes, which are based on the findings from the national Environmental Impact Assessments and environmental studies where potential areas of concern were identified. The monitoring began in 2010 and will in most cases run through 2016, with a possibility to extend, if required. Baseline monitoring started earlier, as did munitions clearance monitoring, which began in Finland in 2009.

What kind of impacts were anticipated during the construction of the pipelines?

SKA: The actual laying of the pipelines on the seabed was not expected to cause any critical or lasting impacts. However, during seabed intervention work, such as trenching, rock placement, dredging at the landfalls, and munitions clearance, the disturbance of the seabed results in dispersion of sediment. This temporarily increases turbidity, or cloudiness that could have had an impact on marine flora and fauna. Therefore, water quality was the biggest subject monitored. Our studies have shown that the impact on water quality was minor and short term only. For example, monitoring of water quality in Germany showed that turbidity values which resulted from seabed intervention works were in line with predictions >

“The majority of environmental impacts were expected during the construction phase; however, our monitoring has shown that until now the impacts have been temporary and local.”

In the Bay of Greifswald, Germany, Nord Stream built several rock banks for seals. These were established as part of the mitigation measures agreed with authorities prior to the start of construction. The rocks will remain in the bay and serve as habitats for grey seals.

outlined in Nord Stream's Environmental Impact Assessments (EIAs). National legislation requires an EIA to be completed as a prerequisite for a national permit. Extensive surveys and studies initiated by Nord Stream on the Baltic seabed and ecosystem are the basis of the EIAs.

Have the gas pipelines had an impact on the environment thus far?
SKA: The majority of environmental impacts were expected during the construction phase; however, our monitoring has shown that until now the impacts have been temporary and local. The impact on the environment during the operation of Line 1 is currently being monitored, and the data we have collected so far suggests that the impacts have been minimal.

How can one be sure that what Nord Stream claims is true?
SKA: From the beginning, the project has been open and transparent – from when we presented our EIAs and environmental monitoring programmes, through to reporting on their progress. We have taken great care to ensure that we comply with the requirements of all authorities involved. In order to reach our goals, and to keep our reporting balanced, we have brought in respected international and independent specialist companies.

According to your annual report, results have been positive. How would negative results be dealt with?
SKA: If we have a negative or inconclusive result, we would discuss it with the responsible authorities. They might, for example, suggest extending the monitoring programme and adding mitigation measures if necessary. Secondly, in order to maintain best practice, we are constantly reviewing or measuring and analysing methods together with our environmental contractors and improving them whenever possible.

What would be the environmental impact of a damaged pipeline and a subsequent gas leak?
SKA: The pipelines are virtually impenetrable. They're made of high-tensile steel that meets the standard for DNV certification (DNV, Det Norske Veritas, is an independent foundation, and a global risk management service provider). Methane, the main component of natural gas, is naturally found in the atmosphere. Should a leak occur – although highly improbable – the non-toxic gas would rise to the surface and dissipate, as gas is lighter than air. Introducing natural gas into water does not pose a threat to fish, other marine life, or vegetation. In the very unlikely event that a large leak should occur, it would be discovered due to the falling gas pressure. This would be identified by the operators of our Control Centre. The facility is manned 24 hours a day, 365 days a year. The operators can remotely open or shut the pipeline valves when necessary.

The pipelines should be operational for at least 50 years. How can you ensure that they will work properly throughout that time?
SKA: That the pipelines work as they should means everything. That's why we study them so thoroughly. We have inspection programmes whereby the pipelines are checked both inside and out. For the internal inspections, we use several large, linked robotic devices that travel the length of the pipelines between Russia and Germany. The pipeline exterior is checked using remotely operated underwater vehicles filming what they see. The exterior of the pipelines also has anodes that protect it from any corrosion. We do continuous monitoring to detect any faults. Should one become apparent, we send out our contracted inspection companies immediately.

What types of impacts are expected during the operation of the twin pipelines?
SKA: In this phase, we monitor the recovery of the environment. For example, in the scope of the fish monitoring programme, we will review the quantitative changes in populations adjacent to the pipelines, and we compare the results with those for the fish communities of the surrounding seabed. The intention of the monitoring is to determine whether the pipelines have an artificial reef effect and become a habitat for fish, and also for flora that could grow on them.

What will happen to the pipelines at the end of their expected lifetime?
SKA: Our permit to operate the pipelines is for 50 years. As yet, we have no plans for what exactly will occur after that. Nord Stream, will have to fulfil the laws and regulations which will be in place at the given time. But there are really only two alternatives: Either we bring up the pipelines, or we let them stay where they are. In the latter case, the pipelines would be filled with water and sealed.

How can the public and stakeholders keep abreast of the progress of the project?
SKA: Every year, up to and including 2016, we will be reporting the results of our environmental monitoring programmes and other inspections to the authorities that issued the permits. Nord Stream has been very open about sharing information with the public throughout the construction phase, on our website and in other ways. This will continue in the operations phase of both pipelines. Line 1 has been transporting gas since November 2011, and Line 2 will be operational at the end of 2012.

"In order to reach our goals, and to keep our reporting balanced, we have brought in respected international and independent specialist companies."

CHAPTER 02

Water Quality

Researchers working for Nord Stream closely monitor water quality to ensure that construction activities have not negatively affected the marine environment.

Our Findings to Date

- **In summary, the results** so far indicate that construction activities have had only minor and short term impacts on water quality.
- **In Sweden, turbidity close** to sensitive areas caused by construction activities was much below the threshold value set by the environmental authorities. The average recorded value was 2 mg/litre, which is considered to be normal conditions. The threshold level is set at 15 mg/litre above normal conditions. In comparison, a normal winter storm leads to turbidity levels of 10-15 mg/litre.
- **Turbidity in shallow coastal** lagoons resulting from seabed intervention work appeared to be comparable to re-suspension resulting from strong winds. No effects on herring larvae occurred.
- **The sediment release due** to munitions clearance in Finnish waters was just 10 percent of the predicted amount. After clearance, minor increase in turbidity (< 10 NTU) was observed in the deepest water layer, but no increase in the concentrations of harmful substances was recorded.
- **Monitoring of mussels, mainly** during trenching activities, shows no negative effects to the water quality in the sensitive Natura 2000 nature protection areas close to the pipelines.

Impacts on Water Quality Are Strictly Monitored

> The water quality in the Baltic Sea affects every life form in the area as well as their habitats. Parameters, such as currents, salinity, temperature and oxygen content are among the factors that influence the quality of the water. These parameters vary greatly from the open sea, to shallow areas or along the coastline. Ensuring water quality has been a top priority for Nord Stream. Therefore, within water quality alone, we monitor roughly 20 different parameters from over 50 locations.

Why We Are Involved

There has been concern that the construction of the Nord Stream Pipelines could affect the water quality in the Baltic Sea. This could happen when sediment is dispersed as the seabed is disturbed during construction, which involves trenching by dredging and ploughing, along with pipelaying, and rock placement. There have also been concerns that pollutants and nutrients bound to the sediment could be released into the water, which could result in eutrophication – a major problem in the Baltic Sea. Eutrophication is the overloading of water with nutrients – nitrogen and phosphorus from, for example, farm fertilisers and sewage. These nutrients cause an overabundance of algae and other plant life, robbing other aquatic organisms of oxygen.

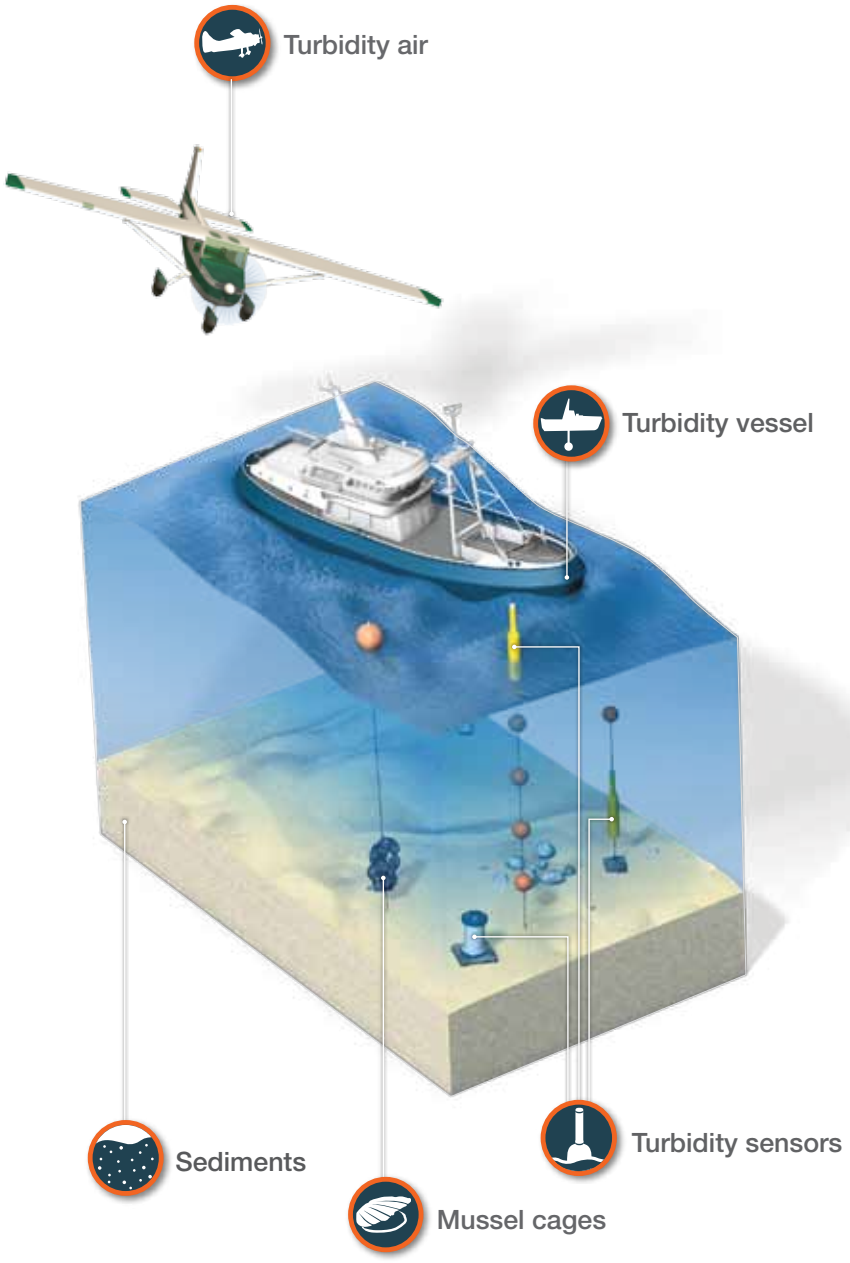
How We Are Responding

Water quality has been a central issue throughout the project. Nord Stream monitored water quality before, during, and after the various construction activities. This takes place in numerous locations and in all countries whose waters the pipelines cross: Russia, Finland, Sweden, Denmark and Germany. Nord Stream collects data from over 50 different locations; 23 are fixed stations for long-term measurements, and other selected stretches are monitored from vessels and aircraft in all the five countries.

The studies include direct measurements of sea currents, turbidity, conductivity, temperature and oxygen concentration. Water samples are collected at selected locations along the pipeline route and subsequently analysed. Additionally, sediment plumes from the seabed are monitored by reconnaissance aircraft and vessels. During construction, blue mussels were studied to measure any dispersion of pollutants in the water.

Nord Stream commissioned the surveys in order to document and ensure that set threshold values for turbidity are complied with, and that the release of particle-bound nutrients and pollutants remains within the limits agreed with environmental regulators during construction and afterward. Nord Stream is also taking this step to ensure that mitigation measures are in place should the threshold values approach their limits. The studies to date indicate that the construction activities had only minor and short-term impacts on the water quality of the Baltic Sea.

Water quality is monitored along the entire route of the pipelines



Water Quality

The spreading of sediment and contaminants in the water due to construction is monitored during all activities by air, vessel, fixed sensors, and through water and sediment sampling. In Russia, Finland, Sweden, and Germany, it is handled with turbidity sensors. Impacts on Finnish waters from construction activities in Russian waters are also monitored.

Turbidity Air

In German waters, turbidity was monitored from the air near the seabed intervention work in shallow waters (e.g. dredging). The results indicate that no measurable impacts on the pelagic environ-ment occurred, since sediment plumes resulting from dredging or backfilling operations were restricted to rather small areas for short periods of time.

Turbidity Vessel

The purpose of the water quality monitoring programme in Denmark is to assess the level of suspended sediment concentrations during post-lay trenching in order to verify that the assumptions in the Environmental Impact Assessment (EIA) are valid. The monitoring programme includes transect measurements from a survey vessel of the sediment plume during periods of trenching activities.

Turbidity Sensors

Monitoring of water quality in Sweden was initiated in 2010 by deployment of four fixed, long-term monitoring stations at the two Natura 2000 areas considered sensitive with regard to impacts on the water environment. Two stations were placed at the south-east border of each of the two Natura 2000 areas at Hoburgs Bank and Norra Midsjöbanken. No negative impact on the water quality has been detected.

Mussel Cages

Monitoring of contaminants in mussels was carried out before, during and after trenching of the first pipeline. Monitoring was carried out by measuring the impact on common mussels (Mytilus edulis) in net bags at six fixed stations at each of the two Natura 2000 areas at Hoburgs Bank and Norra Midsjöbanken. No negative impact on the offshore banks has been detected.

Sediments

Construction activities might affect the contaminant concentrations in sediment if the contaminants are resuspended and relocated as a result of the activities. Potential changes in contaminant concentrations are monitored by taking sediment samples before and, for example, after rock placement, trenching and munitions clearance.


Vyborg
FINLAND
RUSSIA
ESTONIA
LATVIA
LITHUANIA
RUSSIA
SWEDEN
Exclusive Economic Zone border
Territorial border
POLAND
Lubmin
GERMANY

Marine biologist Marina Magnusson is a project manager at the research and consultancy company Marine Monitoring. There, she is responsible for the Nord Stream environmental monitoring programme.

“No high-pollutant contents were discovered”

> Mussels are important for water quality research because they filter seawater to gain nutrients from plankton, explains marine biologist Marina Magnusson. She is also the project manager for the Sweden-based research company, Marine Monitoring AB, which carried out tests on mussels to monitor their development and determine if the construction of the pipelines affected water quality.

There are two Swedish Natura 2000 areas near the route of the pipelines. Was that a source of concern during construction of the pipelines?

Marina Magnusson: The fear was that environmental toxins in the sediment would be released and spread through the water near the banks at Norra Midsjöbanken and Hoburgs Bank as a consequence of the construction of the pipelines. These two banks are unique and important bird sanctuaries, and classified as Natura 2000 areas under European Community legislation. Hoburgs Bank is also registered as a protected area by Helcom, the Baltic Marine Environment Protection Commission.

You carry out tests on mussels within Nord Stream’s environmental monitoring programme. In what way are mussels useful for tracing pollutants in water?

MM: Mussels are specialists in filtering everything in water, and they filter large volumes. The advantage of mussels compared with artificial membranes is that mussels are organisms that can show how pollutants are absorbed into the food chain.

What was the methodology involved in measuring pollutants in the mussels?

MM: Sampling went on from December 2010 until May 2011 — before, during and after construction. We had three stations on each bank near the pipelines, as well as three reference stations in order to have something with which to compare. At every station we placed a wooden frame with approximately 200 blue mussels attached to a net hanging freely so that exposure would be the same for each mussel. The mussels were left for about eight weeks, after which we replaced them with new ones. Then, in the laboratory, we analysed their tissue for pollutants and also looked at their growth.

“In studying the mussels, we discovered no high-pollutant content that could be related to Nord Stream’s construction activities, and judge that the shallow banks have not been negatively impacted in this respect by the gas pipelines.”

What were the results of the tests?

MM: We discovered no high-pollutant content in the mussels that could be caused by the construction work, and judge that the banks have not been negatively impacted in this respect by the pipelines. Only a few parameters indicate possible effects on the mussels, but these are most likely due to temperature or access to food rather than construction work on the pipelines.

>

What has been the greatest challenge on this project?

MM: The weather was cold and icy. Several of our measuring stations disappeared because of wind or ice. Instead of six weeks, the sampling period became eight weeks, since we were not able to work due to the bad weather and heavy seas. It was also hard to sample enough mussels, and mussels of the right size.

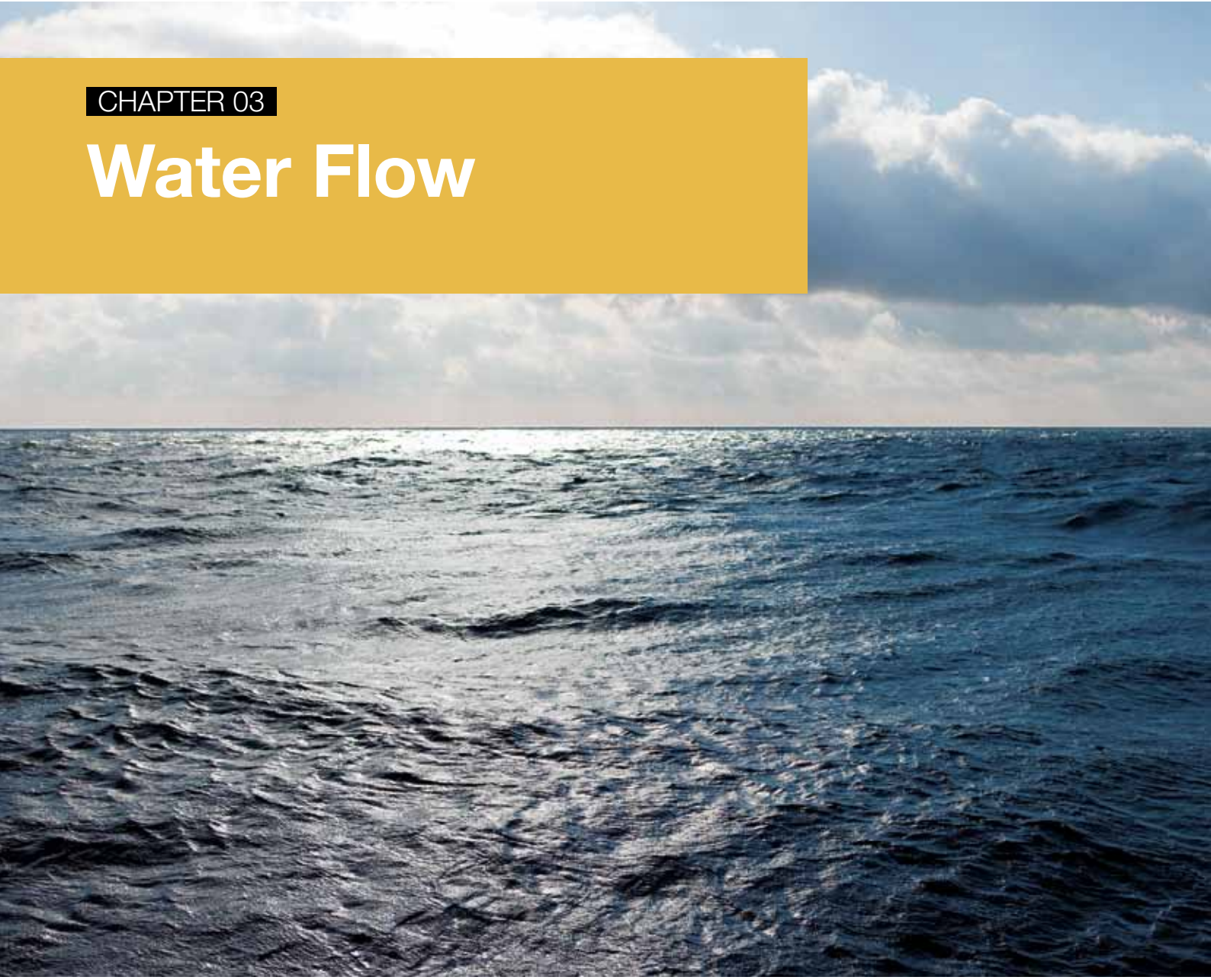
However, this was a very interesting study, one that raised some interesting questions about the environment in the Baltic Sea.

Blue mussels are filter feeders. A single mussel can filter five litres of water in just one hour.

Marina Magnusson tests mussels in the laboratory. Part of this analysis includes weighing them in their shells, and in wet and dry states with the tissue removed from the shells.

CHAPTER 03

Water Flow



Water movement around the pipelines is monitored to verify that natural currents are not disturbed by their presence on the seabed.

Our Findings to Date

- **The monitoring in the** Bornholm Basin has provided a better understanding of the bottom currents in the area. The new observations suggest that possibly as much as half of the deepwater inflows might be transported well above the sea-bed; without contact with the seafloor as previously assumed. The impact of the pipelines is therefore far lower than what had been estimated.
- **The height of the** pipelines over the seabed in the Bornholm Basin is less than estimated; 0.7 m instead of 1.0 m, meaning that the embedment of the pipelines is greater than anticipated and the effect on deepwater flows is even smaller.
- **Vessel-based measurements together with** monitoring stations confirm that the pipelines will have no blocking effect on the inflow of salt water to the Baltic.

Vital Water Flow Is Safeguarded

> Monitoring of hydrography is done in Finland, Sweden and Denmark. Ultimately, this monitoring is being conducted to ensure that natural currents are not disturbed or changed by the presence of the pipelines. Measurements have been taken before and after construction to provide a basis for comparison. To date, monitoring results indicate that the impact of the pipelines on water flow is lower than estimated, as the average height of the pipelines above the seabed is less than in the design.

Why We Are Involved

The Baltic Sea is virtually an enclosed body of brackish water. The health of its ecosystem is strongly dependent on the oxygen-rich and salty water flowing from the North Sea. Therefore, authorities in the five countries through whose waters the pipelines pass expressed concern that the presence of the Nord Stream Pipelines on the seabed could potentially affect the salt water flow into the Baltic Sea. Another concern was whether the patterns of bottom currents in the vicinity of the pipelines would change and thereby have an impact on the environment.

How We Are Responding

Nord Stream established a hydrography (water flow) monitoring programme in consultation with all relevant authorities. To monitor the potential environmental impact the pipelines or rock berms might have on water flow, Nord Stream, using specialist consultants, monitored the flow and the condition of the seabed both before and during construction, and will continue to do so through 2016.

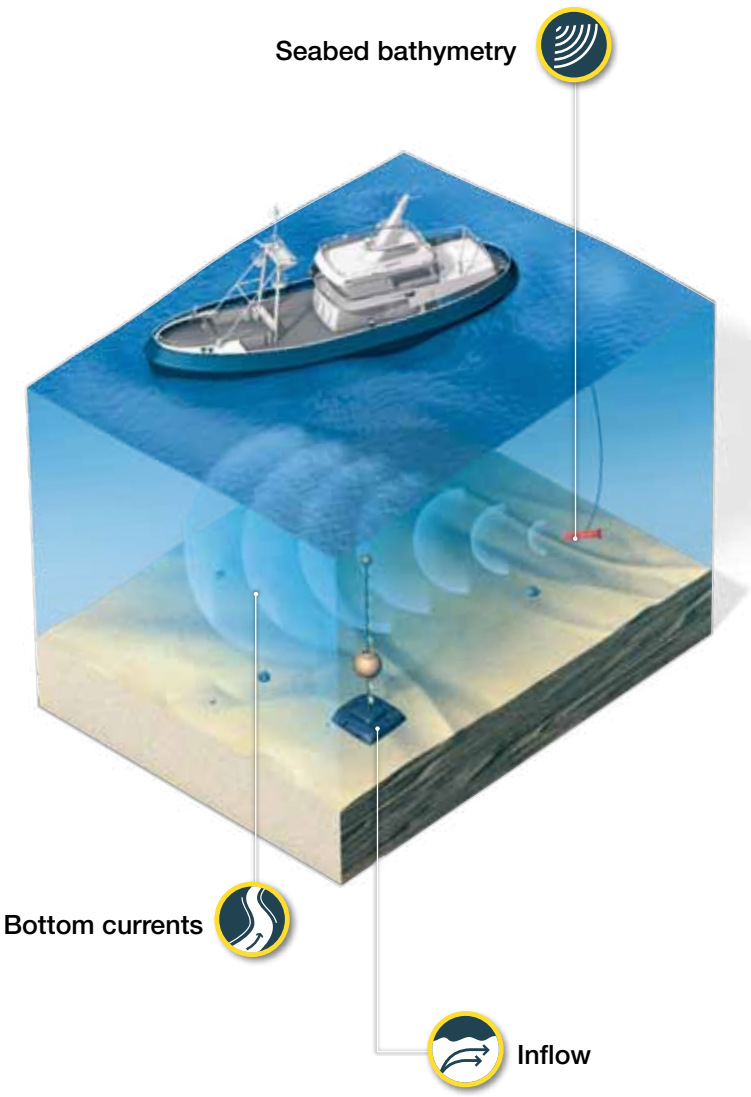
Monitoring Water Flow

Monitoring of hydrography is done in Finland, Sweden and Denmark. Ultimately, this monitoring is being conducted to study if and to what extent the natural currents are disturbed or changed by the presence of the pipelines. To date, monitoring results from Denmark and Sweden indicate that the impact of the pipelines on water flow is lower than estimated, as the average height of the pipelines above the seabed is smaller than in the design. In Finland, the impact of the pipeline on nearby currents has been minor and as predicted in the environmental impact assessment.

Studying the Seabed

In Russia and Germany, seabed topography was monitored for changes due to the extensive seabed intervention work, as changes in seabead topography could potentially impact current patterns.

Monitoring of water flow and seabed conditions



Water Flow

Water movements around the pipelines are monitored to verify that natural currents are not disturbed or changed by the structures. Deep water inflows to the Baltic Sea are measured, along with bottom currents in the Gulf of Finland. In areas where extensive work on the seabed has taken place, the seabed will be restored to its previous condition.

Seabed Bathymetry

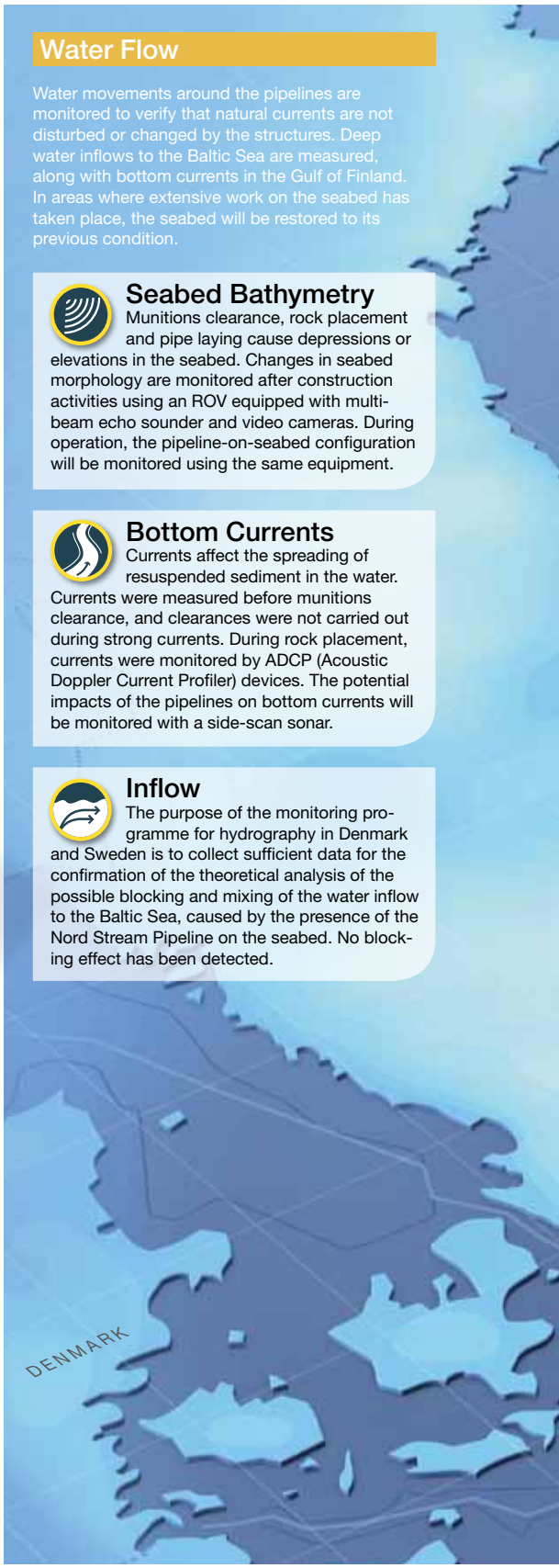
Munitions clearance, rock placement and pipe laying cause depressions or elevations in the seabed. Changes in seabed morphology are monitored after construction activities using an ROV equipped with multi-beam echo sounder and video cameras. During operation, the pipeline-on-seabed configuration will be monitored using the same equipment.

Bottom Currents

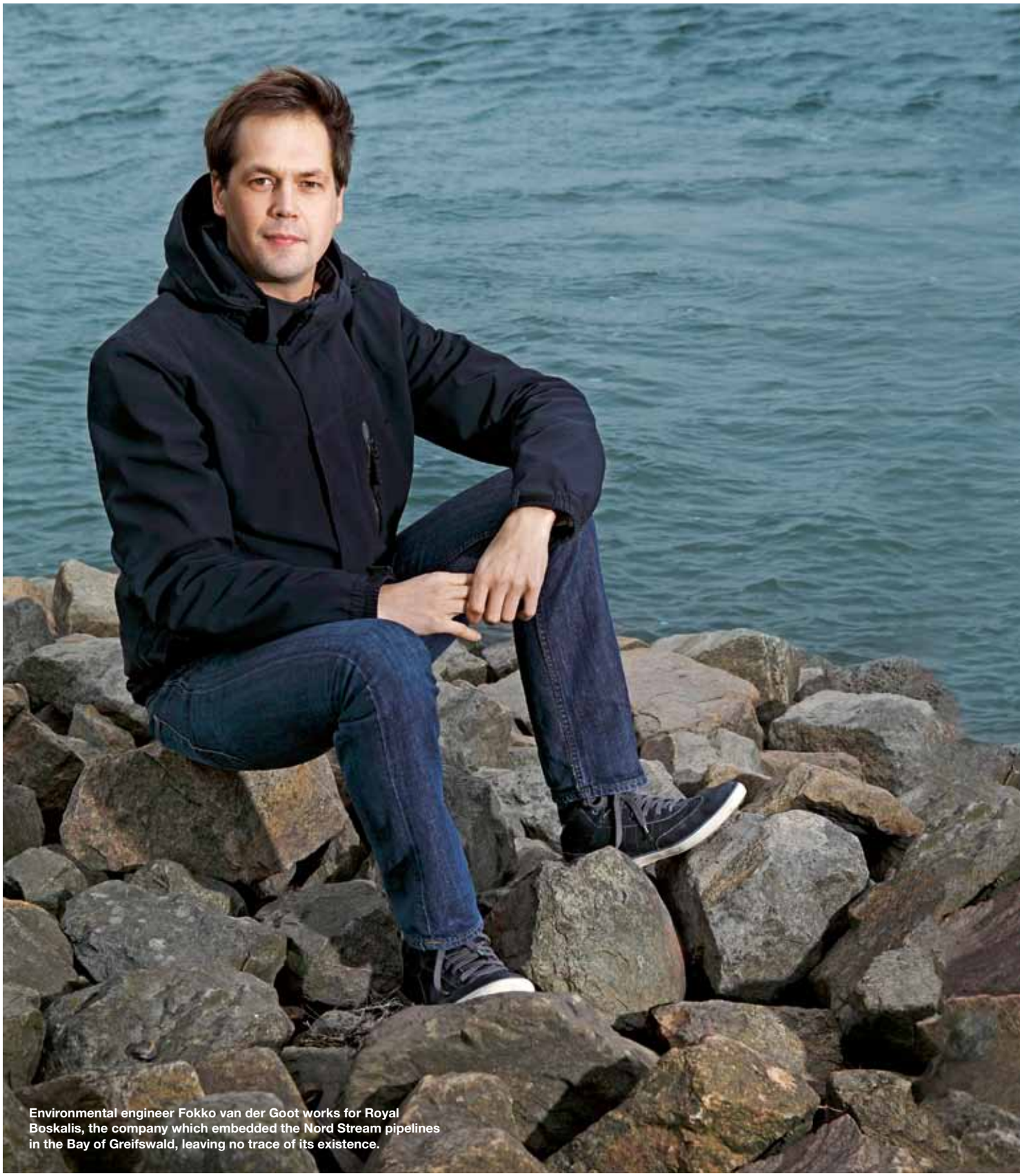
Currents affect the spreading of resuspended sediment in the water. Currents were measured before munitions clearance, and clearances were not carried out during strong currents. During rock placement, currents were monitored by ADCP (Acoustic Doppler Current Profiler) devices. The potential impacts of the pipelines on bottom currents will be monitored with a side-scan sonar.

Inflow

The purpose of the monitoring programme for hydrography in Denmark and Sweden is to collect sufficient data for the confirmation of the theoretical analysis of the possible blocking and mixing of the water inflow to the Baltic Sea, caused by the presence of the Nord Stream Pipeline on the seabed. No blocking effect has been detected.




Vyborg
FINLAND
RUSSIA
ESTONIA
LATVIA
LITHUANIA
RUSSIA
SWEDEN
Exclusive Economic Zone border
Territorial border
POLAND
Lubmin
GERMANY



Environmental engineer Fokko van der Goot works for Royal Boskalis, the company which embedded the Nord Stream pipelines in the Bay of Greifswald, leaving no trace of its existence.

“Dredging: No turbidity limits were breached”

> Where the construction of the pipelines passed sensitive nature reserves and shallow waters, they were embedded. No traces were left, and the original seabed was completely restored, says Fokko van der Goot, environmental engineer at the dredging company, Royal Boskalis Westminster N.V., responsible for embedding the pipelines in the Bay of Greifswald in Germany.

Describe your company’s assignment for Nord Stream. What were you doing specifically?

Fokko van der Goot: Our job involved dredging a 28-kilometre trench to allow for two pipelines to be laid at the required route and depth, overseeing pull-in operations (for the primary pipeline construction contractor Saipem), followed by backfilling and reinstating the seabed.

The project took place within an environmentally sensitive and shallow Natura 2000 region, in and around the Bay of Greifswald. To protect the pipelines in these shallow waters, and to minimise the impact on the sensitive marine environment, both pipelines were placed in a single trench. Part of the dredged soil was considered unsuitable for stabilising the pipelines in the trench, so suitable coarse sand was imported from an offshore area nearby. Furthermore, the top layer of the seabed was reinstated with the original dredged material, which had been temporarily stored offshore. Dredging and backfilling was carried out between May and December 2010, to avoid negative impacts on spawning herring and the displacement of wintering waterfowl.

What specific environmental concerns and considerations did you have in this assignment?

FG: The German authorities had various environmental requirements. Firstly, that the trenched topsoil had to be returned to its original state. So we developed an extensive soil management plan dividing the entire trench route into similar sections. Each section had to be dredged layer by layer based on the specific soil characteristics and location. Each layer was stored separately at an offshore storage site. After the pipelines were installed, the stored material was dredged again and returned to its original location. Secondly, dredging was restricted to specified water quality limits. Dredging operations stir up fine seabed sediments that can affect marine life.

“The developement of such a detailed soil management plan was new for us. Often the focus is on quantity, but here it was on quality.”

We designed a water quality monitoring program using 14 floating monitoring stations measuring real-time suspended sediment concentrations along the entire trench route and offshore storage site. In addition, waves, currents and tides were measured at various locations. All real-time turbidity data collected at the monitoring stations were transmitted to an onshore online database and were >

Environmental monitoring buoys released into the Baltic Sea check that dredging for the Nord Stream Pipelines at the German landfall did not negatively impact the environment.

immediately available for both contactor and client via a web-server. A turbidity response procedure was set up with Nord Stream, allowing preventive measures to be taken swiftly if water quality threatened to exceed limits.

During the six and a half months of construction activities, no damage was done to the sensitive receptors in the immediate vicinity of the site, and no turbidity limits were breached.

How did these considerations affect your work?

FG: The project requirements for the soil management called for specific equipment – smaller dredging equipment that could work accurately. As a result, project execution took longer and was more expensive, but this had been projected in scenarios prior to the start of the work.

Comparing this assignment with others you have carried out previously, what was the biggest difference?

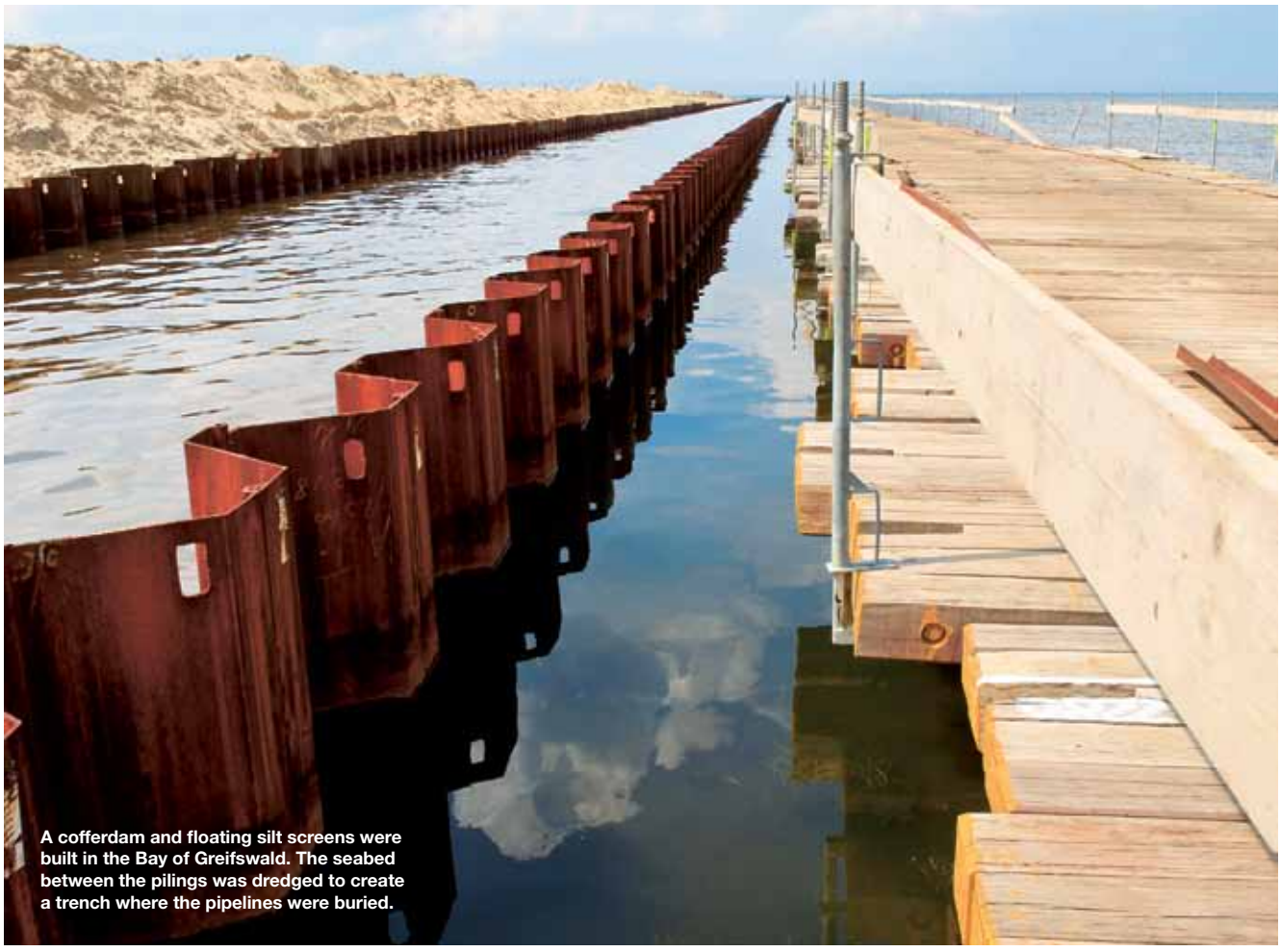
FG: The development of such a detailed soil management plan was new for us. It also made the operation complicated and challenging to plan and manage. Often the focus is on quantity, but here it was on quality.

Can you draw any lessons from the project?

FG: We have seen we can work under stringent environmental conditions. As far as soil management goes, we found that even such complex work was possible. But strict planning, that everyone is bound by and follows in detail, is needed.

What was it like to participate in this project?

FG: Because the planning was so tight, we had to start the project with more than 40 floating units on the first day, which was a huge challenge and very impressive to see it happen. Although we have been involved in other major dredging projects with strict environmental restrictions, it was great to see that everyone involved in the project was aware of the environmental issues regarding soil management and water quality, and worked hard to meet relevant requirements.



A cofferdam and floating silt screens were built in the Bay of Greifswald. The seabed between the pilings was dredged to create a trench where the pipelines were buried.

CHAPTER 04

Fish, Marine Mammals and Birds

Fish populations are monitored in various ways. For example, fish are caught to determine which species are most prevalent before and after construction activities.

Our Findings to Date

- **So far, studies of** fish and bird fauna show little or no impact from the construction activities. However, along the coast of Portovaya Bay in Russia early construction activities have temporarily reduced the number of nesting birds in a limited area. Several years of monitoring are necessary in order to answer the questions as to how short term or localised these factors are.
- **No harm to seabirds** or marine mammals was reported during clearance of munitions in Finnish and Swedish waters.
- **Hydroacoustic monitoring gave no** indication of any displacement effect on harbor porpoises caused by construction activities in the Pomeranian Bight, Germany.
- **The number of grey seals** in Bay of Greifswald, Germany, did not change during construction.
- **No specific displacement of** staging seabirds was detected during offshore construction works in the Pomeranian Bight, Germany, because the existing disturbance by commercial shipping spatially increased by only about 5 percent.

Protecting Wildlife Is at the Forefront of Surveys

> The Baltic Sea is a vital habitat for many animals. Over a hundred species of fish live in its brackish waters. Cod, herring and sprat dominate. The Baltic is also home to a number of marine mammals including: harbour porpoises; and harbour, grey and ringed seals. For many seabirds, the Baltic is an important winter habitat. Nord Stream recognises the importance of wildlife in the Baltic Sea and therefore took measures to ensure that impacts were temporary and localised.

Why We Are Involved

There has been concern that the Nord Steam project could affect animal life in different ways. For fish, the problems are dispersion of sediment, noise and physical disturbance during construction. For birds, the effects are connected to sediment dispersion and sedimentation, noise, physical disturbance and collisions with pipelay vessels during construction. For marine mammals, the concern is that construction can cause noise and physical disturbance.

How We Are Responding

Nord Stream is monitoring animal life with the help of specialist environmental consultancy firms, watching for possible construction-related impacts, but also to be able to prepare necessary mitigation measures should they be needed.

Fish Surveys

Monitoring of fish is taking place in Russia, Finland, Sweden, Denmark and Germany. The technique used to monitor the species selected is a combination of trawls, gill nets, echo-sounders (during munitions clearance) in areas agreed with the respective authorities in each country. In Sweden, more than 80 stations are employed for fish monitoring alone. The pipelines have the potential to create a new habitat for the fish in the form of an artificial reef, one purpose of the monitoring programme is thus to establish whether the pipelines attract fish.

Monitoring Marine Mammals

Marine mammals are being monitored at both landfalls. In Russia through vessel-based observations, and in Germany from fixed stations as well as visual observations. Seals are counted from ships or aircraft. Porpoises are traced using hydrophonic equipment. To avoid harm to mammals during munitions clearance activities in Finland and Sweden in 2010, marine mammal observers were deployed and seal scrammers were used to scare animals away from the blast zone.

Bird Watching

Monitoring of birds is done at the Russian and German landfalls. On the German side, there is also an important bird habitat and the gas pipeline passes through a protected Natura 2000 area. Observations of birds are made from land, at sea and from the air.

Wildlife has been monitored since construction began

Fish, Marine Mammals and Birds

In addition to monitoring the wildlife described below, monitoring of fisheries is carried out in Finland and Sweden. The monitoring will describe and evaluate possible changes in commercial fishery patterns and fish catches after installation of the pipelines. Furthermore, the performance of the trawl board developed for trawling in the vicinity of the pipelines will be evaluated as part of future monitoring.

Seabirds

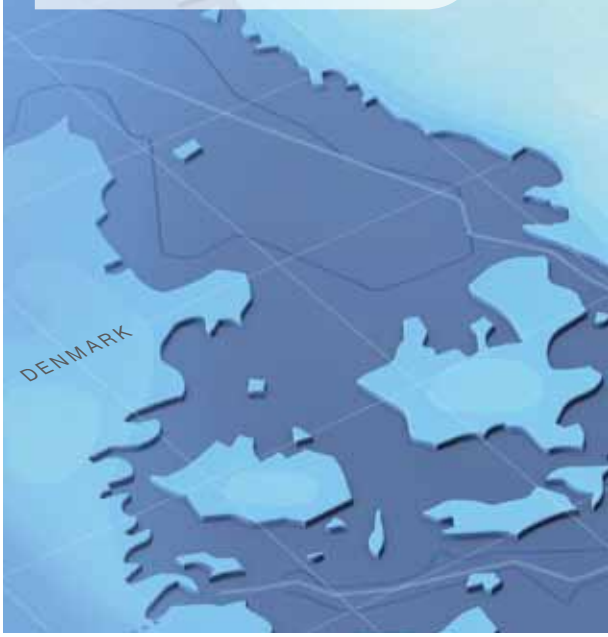
Seabird populations are monitored in the coastal areas of the landfalls. The landfall area in Germany in particular is an important area for birds, and the pipeline route passes through a Natura 2000 area in German waters. Bird populations are observed from land, sea, and air to determine if they have been affected by construction activities. The resulting data regarding the distribution of birds and their population trend will be used to determine any impact.

Fish & Fisheries

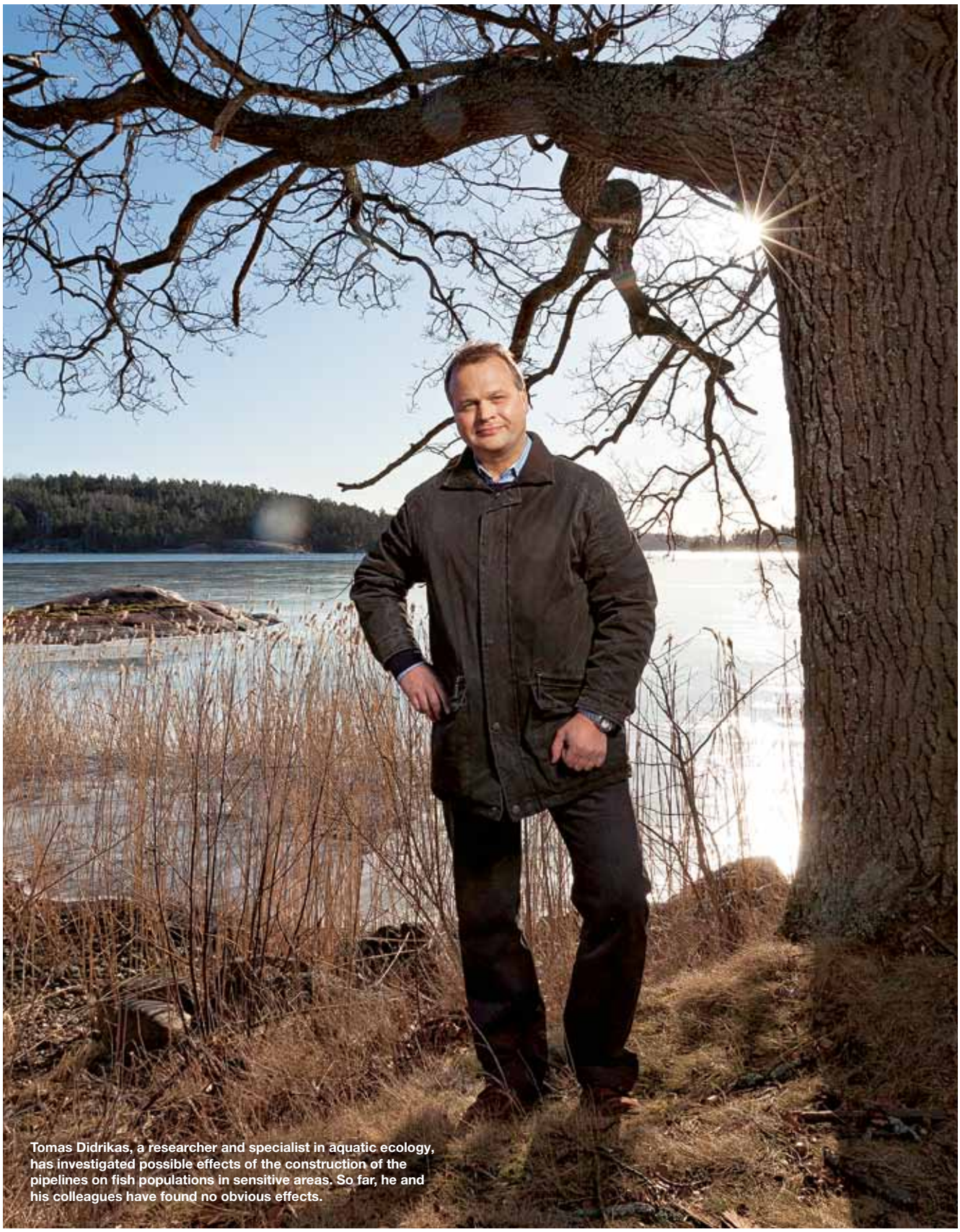
The pipelines could become a new habitat for fish, and therefore their numbers are monitored to determine if they do, in fact, use them as an artificial reef. In areas near the route and at the landfalls, fish are counted to determine if turbidity increases might have impacted their populations.

Marine Mammals

Marine mammals are monitored at the landfall areas to determine if increased turbidity and vessel activity during construction have had any impact on their populations. The monitoring activities include a combination of vessel-based counts of seals and the use of hydrophones to detect harbour porpoises.




Vyborg
FINLAND
RUSSIA
ESTONIA
LATVIA
LITHUANIA
RUSSIA
SWEDEN
Exclusive Economic Zone border
Territorial border
POLAND
Lubmin
GERMANY



Tomas Didrikas, a researcher and specialist in aquatic ecology, has investigated possible effects of the construction of the pipelines on fish populations in sensitive areas. So far, he and his colleagues have found no obvious effects.

“So far, we have seen no obvious effect from the gas pipelines on fish”

> Researcher Tomas Didrikas, who holds a Ph.D. in aquatic ecology has studied fish in two Swedish Natura 2000 areas to analyse whether their populations have been affected by the construction of the pipelines. He and his colleagues at AquaBiota Water Research, based in Sweden, established survey stations near the pipelines to monitor their impact on bottom dwelling fish. Their surveys for Nord Stream have also shed new light on fish reproduction in areas that had scarcely been studied.

What are the potential risks to fish populations from the Nord Stream project?

Tomas Didrikas : The biggest probable effect can be increased water turbidity and suspended sediment in the water during the construction. This happens, for example, during ploughing of the seabed for the pipelines. In other locations, coarse gravel and rock are laid on the seabed to create a stable base for the pipelines. Higher than usual intensity of marine traffic and construction itself results in increased noise and might also physically disturb fish.

What are you doing in practical terms to monitor fish stocks in the Natura 2000 areas?

TD: At the Norra Midsjöbanken and Hoburgs Bank, which are near the route of the pipelines, we studied the possible impact on fish living on or near the bottom.

Monitoring impact stations were selected close to the pipelines on the slopes of both offshore banks, where possible impact from the pipelines can be expected. Reference stations were also selected on the same banks further away from the pipelines, where no effects from the pipelines can be expected.

> “The project gives us a good opportunity to study remote areas that previously had little attention and to fill in gaps in our knowledge.”

And in particular for fish in the Natura 2000 areas?

TD: The same again. Fish living on, or near the sea bottom, such as flounder, turbot and cod – and that feed and possibly reproduce there – can be affected negatively. The two Natura 2000 areas that we surveyed, the offshore banks at Norra Midsjöbanken and Hoburgs Bank, are in remote locations and were not surveyed previously in such detail. Within the framework of our assignment, we study fish at these banks to get a more general picture. We have discovered, among other things, that they seem to be important reproduction areas for flatfish such as flounder and turbot.

At each of these monitoring stations we fished using standard gill nets and filmed seabed and bottom organisms using underwater cameras. Caught fish were analysed in detail. In order to detect possible changes, we started studies prior to construction. The results from the impact stations are compared with the reference stations, before and after the ploughing.

What have you found from the survey results so far?

TD: We have been working on this since 2010, when we were given the job by Nord Stream. It is too early to draw any conclusions. But so far, we have seen no obvious effect from the gas pipelines on fish.

Did anything in the results surprise you?

TD: The fishes’ reproduction. It is known that flounder, turbot and herring generally spawn in or close to coastal areas in the Baltic Sea. Few studies have been made at these offshore banks, and it was not known whether fish were reproducing there. In June 2010 and 2011 we observed mature and spawning flounder and turbot in the catches at both offshore banks. Spawning herring were caught at Norra Midsjöbanken in June 2011.

Are there also any positive effects on the fish populations, particularly in the Natura 2000 areas?

TD: We can’t see any yet. But the project gives us a good opportunity to study remote areas that previously had little attention and to fill in gaps in our knowledge.

CHAPTER 05

Benthic Flora and Fauna

Nord Stream's environmental monitoring programme will ensure that seabed animals and plant life close to the pipelines will not suffer long-term harm as a result of construction and operations.

Our Findings to Date

- **Monitoring of seabed recovery** in German shallow waters after trenching work confirmed an impact, as trenching, in fact, means that the benthic biotope has been removed. However, recovery, though slow, has started. Monitoring will continue until 2014, with an option to extend if necessary.
- **Data obtained during surveys** in Russian waters indicates that construction activities have not affected the great quantity of seabed living animals in the eastern Gulf of Finland.
- **In connection with munitions** clearance and rock placement in Finnish waters, the number of seabed animals was generally very low before and after the activities, due to low oxygen levels. Any minor changes observed were likely caused by the natural variation of the seabed composition.

Safeguarding Seabed Animals and Plants

> About 100 invertebrate species along with some macroalgae and spermatophytes inhabit the seabed of the central and eastern Baltic Sea in the waters above the halocline (a vertical gradient in seawater salinity). Their occurrence is generally related to the presence of oxygen, which is often depleted in the waters below the halocline. Where oxygen is depleted, seabed life is virtually absent. Hindering the amount of oxygen present in Baltic is the build-up of toxic hydrogen sulphide, which is abundant in deeper waters.

Why We Are Involved

The majority of the seabed in the vicinity of the Nord Stream Pipelines is, in fact, without benthic fauna. Benthic monitoring, therefore, is limited to the landfall areas and offshore banks with shallow water depths. There was concern that seabed animals and plants (or benthos, as they are known) can be affected by the dispersal of sediment and the sedimentation that follows the construction of the pipelines. There is also a need to know in what way, for example, rock placement and pipeline installation could affect the animals and plants living on the seabed.

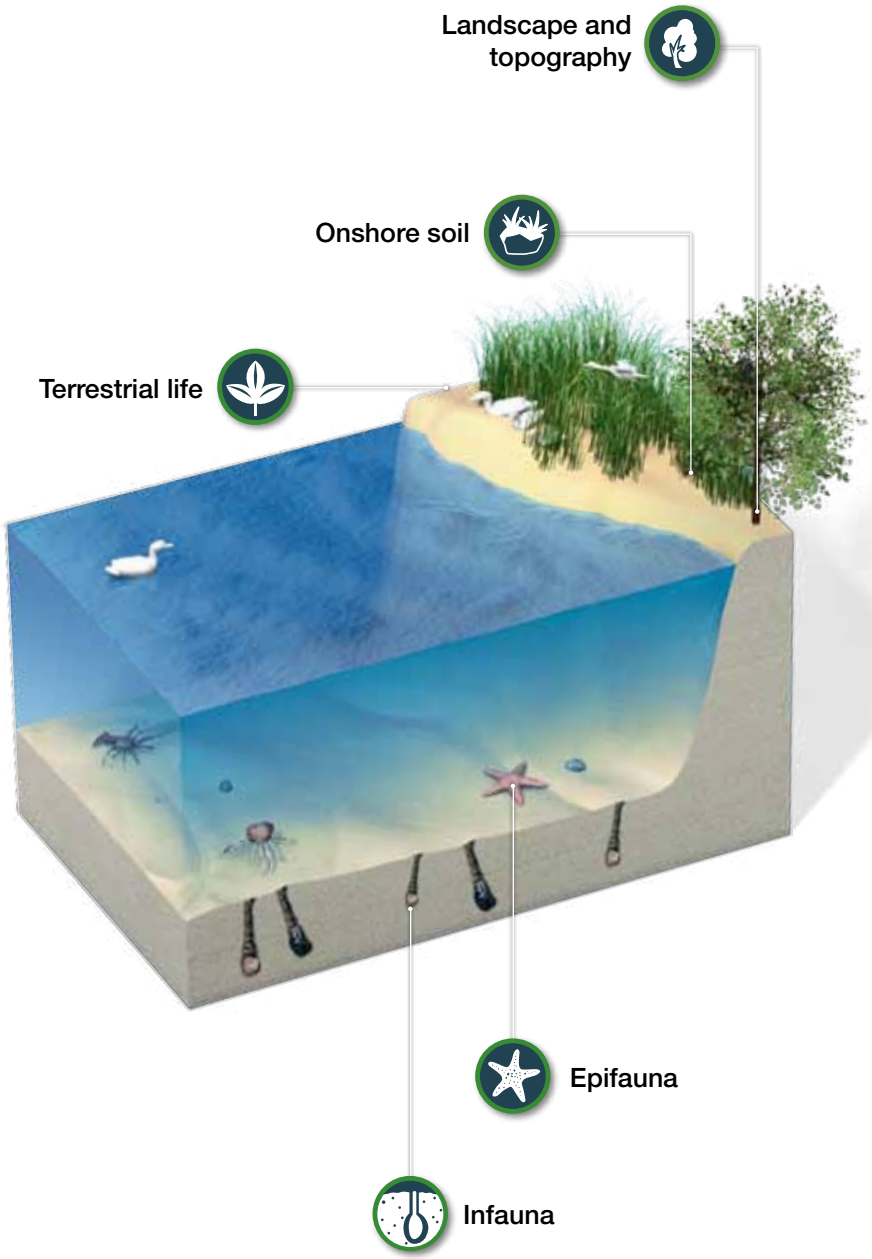
How We Are Responding

Nord Stream relies on a variety of methods to monitor how seabed animals and plants are affected by the pipelines along the entire route – that is, in Russia, Finland, Sweden, Denmark and Germany. Monitoring was done before construction began, and again following construction of the pipelines. Recovery of bottom dwellers around the pipelines will be monitored through 2016.

The investigations focus on documenting conditions around the pipelines close to Natura 2000 areas. Additionally, changes caused by the munitions clearance and by rock placement are monitored, along with the regeneration of existing organisms. The development of seabed organisms that establish themselves and live on the actual pipelines is also checked. The methods used for monitoring are mainly sample collection from the seabed, observations by underwater video and aerial photography.

The purpose of Nord Stream's studies is to document any changes to the plant and animal populations on the seabed caused by sediment dispersal and other effects of the construction of the pipelines.

Seabed plants and animals are monitored in all countries



Benthic Flora and Fauna

Benthic, or aquatic fauna, is monitored along the entirety of both pipelines. Terrestrial flora and fauna are monitored at the two landfalls in Russia and Germany, as are potential impacts on landscape and topography. Monitoring of the landscape and topography in Russia is related to the landscape alterations which are caused by construction works. The occurrence of erosion, swamp formation, ice gouging and flooding is monitored, and new topographic maps of the area are produced.

Terrestrial Life

Potential impacts on terrestrial flora and fauna may result from the removal of soil, vegetation, and fauna cover during construction works at the landfalls in Russia and Germany. At the German landfall, coastal, sandy and neglected grasslands have been developed to compensate for the disturbance of protected biotopes in the landward landfall corridor of the Nord Stream Pipelines.

Landscape & Topography

Intensive ecological supervision combined with a number of mitigation measures were conducted during onshore construction works at landfall Germany, a part of the Natura 2000 site “Greifswalder Bodden” (Site of Community Interest and Special Protection Area). The purpose of the landscape monitoring programme in Germany is to observe the reinstatement of the dune habitats.

Onshore Soil

A total of six monitoring stations were taking samples of concentrations of metals, phenols, and petroleum products as well as bacteriological and parasitological indicators in 2010. Those findings of the soil monitoring compared with the results of the baseline survey conducted prior to the start of construction showed that the impact from construction activities on the onshore soil at the Russian landfall is minimal.

Epifauna

Epifauna growth on the pipelines themselves is also expected, and will be recorded. Monitoring will take place for several years following project completion. These studies take place along the entire length of the pipelines. Data is collected via samples and also recorded visually by remotely operated vehicles (ROV).

Infauna

Infauna, fauna living in the seabed, is monitored where dredging or trenching has disturbed the seabed. Monitoring is conducted by taking benthos samples before and after the construction activities. The recovery of benthic infauna will be monitored at the same locations after the completion of the pipelines.


Vyborg
FINLAND
RUSSIA
ESTONIA
LATVIA
LITHUANIA
RUSSIA
SWEDEN
Exclusive Economic Zone border
Territorial border
POLAND
Lubmin
GERMANY

Anja Schanz is a researcher with a Ph.D. in Marine Biology, and project manager at the Institute for Applied Ecology (IfAÖ) in Germany.

“We are carrying the responsibility for a total of 11 different assessments”

> Studying the effects the pipelines have on bottom dwelling animals and plants is an important task. Marine biologist Anja Schanz at the Institute for Applied Ecology (IfAÖ) is among those engaged in this work in the coastal waters off Germany. It did not take long before the pipelines, which form an artificial reef, were covered by moss animals, mussels and barnacles, she explains. Her job is to assess the effects this artificial reef has on the ecosystem and the structure of the plant and animal populations living there.

Could you briefly describe your mission in the Nord Stream project? What does it involve?

Anja Schanz: We have a broad and comprehensive assignment lasting from 2011 until 2014, during which time we will be monitoring how the environment recovers after the pipelaying on land and at sea in Germany. In 2011 we documented the environmental conditions at the final stage of pipelaying.

From now on, we will focus our investigations on how the environment recovers in the protected Natura 2000 areas. We are carrying the responsibility for a total of 11 different assessments — everything from geophysical and chemical sediment conditions and fauna living in the sand, fauna and flora growing on the pipelines in the exclusive economic zone, to monitoring of breeding birds in the vicinity of the gas receiving terminal.

How do you and your team operate when you investigate seabed plants and animals on the pipeline?

AS: In what’s known as the exclusive economic zone, the pipelines are installed on the seabed. They form an artificial reef in an area dominated by fine sand. Our job is to assess the effects this artificial reef has on the ecosystem and the structure of the plant and animal populations living there. We have developed two methods for this: video surveillance using a remotely operated underwater vehicle (ROV), and scraping samples collected by scientifically qualified divers.

In the summer of 2011, we scrutinised the first pipeline using an underwater video camera, studying five selected locations along the pipeline at depths ranging between 16 and 25 metres. At every site, we filmed and recorded at least 100 metres of the pipelines on video, from above as well as from either side. Scrapings from the pipelines were also collected by two divers from a depth of about 18 metres. They each took six random samples from the top of the pipelines using tools that were specially developed for this purpose. The collected material was then carefully rinsed after the dive, and stored in laboratory containers for preservation and subsequent species determination in the lab.

“Different animals and plants have begun to cover the first pipeline after only eight months on the seabed — more so on sections that are located closer to land.”

Why is it important to look at plant and animal life on the seabed in the areas surrounding the pipeline?

AS: Plant and animal life is disturbed by the construction of the pipelines. So it is important to assess possible changes to habitat and species constellations. To do this, conditions before and after pipelaying must be documented. What is special here is that the seabed – earlier dominated by fine sand – now also provides a hard surface on the pipelines for plant and animal life. This means that other species that thrive on hard substrates will colonise these new areas.

What have you come up with so far in the surveys?

AS: After only eight months different animals and plants have begun to cover the first pipeline – more so on sections closer to land. We have observed early stages of colonising moss animals, small amphipods, young blue mussels and barnacles.

What has been the biggest challenge in this project?

AS: It was definitely the weather. We needed calm, good weather conditions for three reasons: so we could get out there by boat; so the divers would have sufficient visibility underwater; and so that our underwater video recordings would be of good quality. It was a challenge for me to put together a comprehensive scientific team and a diving team, and also to have a boat on standby for the right moment.

CHAPTER 06

Stakeholder Views

With nearly 250 consultation meetings, public hearings, discussion events and a mobile exhibition in nine countries, Nord Stream generated a good understanding of the project and answered people's most common questions about the construction and operation of the pipelines.

Monitoring Socio-Economic Impacts

- **The maritime cultural heritage** in the Baltic Sea primarily consists of ship-wrecks. Monitoring of cultural heritage was carried out in Russia, Finland, Sweden, Denmark and Germany. Monitoring includes visual inspections by underwater video cameras of selected wrecks along the pipeline route. The wreck selection has been done in close cooperation with the relevant authorities in all five countries.
- **Commercial fishing is important** to a number of coastal communities in the countries around the Baltic. Monitoring of fisheries is carried out in Finland and Sweden.
- **Maritime traffic could have** been impacted by the Nord Stream construction activities, and therefore maritime safety precautions were taken. The number of vessels en route during the construction phase of the pipelines was held to a minimum.
- **Chemical Warfare Agents (CWA)** were dumped into the Baltic Sea during WWII. Sediment samples for chemical analysis were collected in Danish waters to document levels of changes to the CWA in the sediment.

Stakeholders Involved in International Consultations

> According to the United Nations Espoo Convention, countries under the jurisdiction of which a proposed project is envisaged must inform neighbouring countries about potential transboundary environmental impacts. Nord Stream therefore prepared an Espoo Report, covering the potential transboundary environmental impacts of the project in the Baltic Sea states. The report followed intensive dialogue with authorities and stakeholders throughout the Baltic Sea region.

In March 2009, Nord Stream provided the nine Baltic Sea countries (Russia, Finland, Sweden, Denmark, Germany, Poland, Lithuania, Latvia and Estonia) with a transboundary environmental report in the nine languages of the Baltic Sea states, and also in English. Two months later, in June 2009, representatives of the responsible ministries and authorities of the nine countries met in Stralsund, Germany, and informed each other about the statements submitted by the public and stakeholders on Nord Stream's environmental report. This meeting marked the official end of the international consultations according to the Espoo convention. On its own initiative, Nord Stream, however, distributes the annual results of its the environmental and socio-economic monitoring programmes to all the countries that participated in the Espoo process.

Socio-Economic Monitoring

The monitoring programme focuses heavily on environmental aspects. However, the socio-economic part of the monitoring programme aims to collect relevant information about Nord Stream's potential impact on aspects such as cultural heritage, commercial fisheries, and maritime traffic. Public opinion polls were also carried out in Finland. Furthermore, monitoring of potential impacts on dumped chemical munitions is also considered a socio-economic monitoring activity, although there are potential environmental implications as well.

Example: Chemical Warfare Agents

In connection with the construction of the pipelines passing east of Bornholm, in Danish waters, concerns have been raised regarding potential re-suspension of dumped chemical warfare agents (CWAs) in a nearby dump site and potential risks associated with this. The monitoring of CWAs is twofold; first of all, interference with dumped chemical munitions should clearly be avoided; secondly the trenching work (where the pipelines are buried into the seabed) should not lead to increased levels of CWA in seabed sediment. Nord Stream has made an agreement with the Admiral Danish Fleet regarding expert advice and surveillance of the activities regarding CWA in the seabed.

Monitoring results are reassuring, as impacts are in line with the prior assessments, meaning there were no increased risks to human or animal life. In addition, a scientific article published in a peer reviewed magazine for environmental engineers, "Journal of Hazardous Materials" shows that the impact of the pipelines on the potential resuspension of historically dumped CWAs is insignificant.

Sverker Evans, Senior Scientific Officer at the Unit for Environmental Monitoring and Data Collection at the Swedish Agency for Marine and Water Management, has been involved in the assessments of Nord Stream's environmental monitoring programme in Sweden.

“It is important to have the approval of the public”

> One of the regulatory officials overseeing that Nord Stream meets all requirements set for environmental care is Sverker Evans, Senior Scientific Officer at the Swedish Agency for Marine and Water Management. Swedish authorities have been involved in the project since 2007, to help develop and continually assess the environmental programme.

In general terms, how has the Swedish regulatory inspection of the Nord Stream project been carried out?

Sverker Evans: In 2007, Nord Stream submitted its application to the government to build the natural gas pipelines. Since then, all relevant authorities in Sweden have been involved in the project, as the Swedish permit requires that a programme of regulatory environmental control is established.

A total of 11 Swedish regulatory bodies have been involved. The follow-up to the environmental monitoring programme was divided into two parts: maritime safety, and environment. Subsequently, the company’s proposed monitoring programme was circulated among official referral bodies to gather views from several areas. The first referral round brought in an unusually high number of views – about 80 submissions, chiefly from regulators and volunteer groups.

Another part of our collaboration with authorities has been the international approval process within the framework of the Espoo Convention regarding transboundary environmental impact assessment. In this instance, the Swedish Environmental Protection Agency was responsible for coordinating the Swedish regulating bodies. Together with the general public and authorities of all the other Baltic-bordering countries, we took part in a process reviewing opinions on Nord Stream’s monitoring programme in other countries. Much work preceded the actual construction that began in 2010.

What collaboration have you had with other authorities in this extensive international project?

SE: At our new Agency for Marine and Water Management, we have been involved in the environmental part of the monitoring programme, primarily together with the Swedish Environmental Protection Agency, the Geological Survey of Sweden (SGU), the Swedish Meteorological and Hydrological Institute (SMHI) and the National Board of Fisheries, which is now part of the Agency for Marine and Water Management. The Environmental Protection Agency has had overall responsibility for the assessment of the environmental impacts in the Swedish exclusive economic zone, where the other regulators have specific focus areas. As regulators, we have had two coordinating meetings a year with Nord Stream

“Nord Stream’s environmental monitoring programme meets all the demands that can be made on a monitoring programme for this type of construction.”

>

Sweden has an international responsibility to protect the long-tailed duck in accordance with the EU Habitats Directive.

and their consultants. At these meetings, Nord Stream presented its progress and any changes to its plans. We either granted or denied approval, in certain cases asking for corrections to the company's programme. Nord Stream's environmental monitoring programme meets all the demands that can be made on a monitoring programme for this type of construction.

Is the Nord Stream project different from others that you supervise?

SE: The assessment procedure does not differ. The contrast is the size of this project. The Nord Stream project has been much bigger than anything else in the Baltic – at least at parity with the construction of the Öresund Bridge between Sweden and Denmark. For this reason, and due to its transboundary nature, there has been considerable interaction with the authorities.

What has been the most important issue for the Swedish authorities?

SE: Our primary concern was the two Swedish Natura 2000 areas that the Nord Stream Pipelines were to pass near Norra Midsjöbanken and Hoburgs Bank. We focused on the protection of these two banks from environmental impacts as a result of construction of the pipelines.

"The project has been big and wide-ranging. So there has been a lot of interaction with the relevant authorities in Sweden as well as in other countries."

Among other issues, we were worried that the construction work might cause over-sedimentation of the banks.

These two particular banks are important wintering grounds for a large proportion of the European population of long-tailed duck, which feeds from the abundant mussel stocks on the banks. Sweden has an international responsibility to protect the long-tailed ducks, in accordance with the EU Habitats Directive.

How has cooperation with Nord Stream been?

SE: Excellent. We have had good and frequent contact with the communications staff at Nord Stream. They have also been cooperative in issues concerning the monitoring programme, and have met all our demands for additions without any problems. We receive regular reports, progress reports, and final reports from Nord Stream, as soon as they are finalised.

What lessons have you learnt as a regulator working on this project?

SE: For the authorities involved, a project as big as this involves large resources in terms of manpower over a considerable period. It is important for us as regulators to have an amicable relationship and an open discussion with whoever is implementing the project. To win public approval, it is necessary to initiate consultation and shed light on the project and any expected environmental concerns.

Nord Stream prepared an Espoo report detailing the potential transboundary environmental impacts of the project.

Thomas Thomsen is a fourth-generation fisherman from Bornholm.

“A gas pipeline is better than increased maritime traffic”

> When plans to build the Nord Stream Pipelines were announced, Thomas Thomsen, a fourth-generation fisherman from Bornholm, Denmark, began to worry. Would the pipeline impact fishing in the Baltic Sea, and his livelihood? With construction complete, he and other commericial fishermen are now relieved. The pipelines have not had a negative effect on trawling, and fishermen have come to the conclusion that the offshore solution is far better than dealing with an increase of LNG tankers operating in the Baltic.

In concrete terms, how has the Nord Stream Pipeline project affected you and other commercial fishermen?

Thomas Thomsen: It’s mostly when we trawl near the pipelines, and risk line damage. However, we know its position on the seabed, and we’ve entered that into our GPS, but we still have to get the ship into position so we pass the pipelines head-on if possible, for example at 90 degrees.

This hasn’t always been possible, and the boat jerks and we thereby run the risk of trawl damage. But basically, I think it’s working out. We know where the pipelines are, and that helps us to be careful.

“Without the pipeline, there would have been a huge increase in gas tankers operating in the Baltic, which would be worse.”

Where the seabed is softer, the pipelines will have sunk in anyway, so we don’t have to be quite so careful as originally anticipated – there’s no need.

How has Nord Stream acted toward your trade group?

TT: We’re satisfied with the financial compensation we got from Nord Stream against possible damage to our fishing equipment. In all, 74 Danish boats received compensation per vessel and crew. Some of the money went to our association in Denmark, but it was still a decent remuneration for every boat.

We would have preferred a more easterly route for the pipeline, where the seabed is softer and fishing less intensive. But unfortunately, this does not seem to have been possible for political, technical and ecological reasons.

Have catches been different since the pipeline’s installation?

TT: We don’t notice any difference, but it’s too early to say for sure. But we can see that fish are drawn to the pipelines where they are not embedded.

Has your attitude to the project changed over time?

TT: We weren’t exactly cheering for the pipelines, and not even for the financial compensation. We naturally would rather have kept on fishing the way we’ve always done. But now that that the pipelines are on the seabed, we think the outcome is acceptable.

Are you worried that fishing could be impacted negatively by the pipelines in the future?

TT: The pipes, of course, have to be welded together properly so that the trawls cannot be damaged as we pass the pipelines. So, we are really relying on the fact that Nord Stream has checked everything properly.

Do you see any positive effects from the pipelines for you and other fishermen? What would they be?

TT: We’ve already seen that fish are drawn to the pipelines — they are like an artificial reef. It doesn’t help us trawlers much, but it’s good for gillnetting.

But honestly, Nord Stream isn’t a major topic of conversation for fishermen.

Without the gas pipelines, there would have been a huge increase in gas tankers operating in the Baltic. The increased risk of shipping traffic on the Baltic worries us a lot more. A pipeline is obviously better for us.

Roustam Sagitov, director of the Russian environmental organisation Baltic Fund for Nature, and Associate Professor at St. Petersburg State University.

"Our most important priority is safety for the Baltic"

> For the Russian NGO Baltic Fund for Nature, the invitation from Nord Stream to discuss the routing of the pipelines was a welcome surprise. Roustam Sagitov, Director of the NGO, was not a proponent of the project, believing that Europe should reduce its dependency on fossil fuels. However, he found the cooperation with Nord Stream to be encouraging. As head of an NGO, his priority is to monitor the environmental impacts the pipelines might have on the Baltic Sea. He has found the cooperation with Nord Stream and its willingness to openly exchange ideas, a positive experience.

In what way has the Baltic Fund for Nature been involved in the Nord Stream project?

Roustam Sagitov: It began in about 2008 when we, together with many other Russian volunteer organisations from the St. Petersburg area and Moscow, took part in discussions with Nord Stream about the route the pipelines would follow through the Baltic.

We were invited to participate even though Russia is not a member of the Espoo Convention. It was an encouraging experience. The discussions were extensive and complicated, but the process was completely open to the public. We have never believed that these natural gas pipelines were a good idea, making Europe dependent on a fossil fuel for a long time to come.

Since the construction is now completed, we have to focus on how to avoid negative consequences. Our role as an NGO has been to follow up on the environmental impact of the pipelines on the Baltic. Every now and then, we are in contact with Nord Stream to exchange ideas, which is extremely positive.

Why have you as an NGO been involved in this particular project?

RS: Ever since the Baltic Fund for Nature started in 1995 we have concentrated our work on the Baltic Sea and the various activities that can affect it. So it is completely natural for us to become involved in the Nord Stream project. We are working to create protected areas to preserve biological diversity and the unique ecosystem in the Baltic and the Gulf of Finland. We are developing protected areas close to the pipelines and want to know what is happening. In 2010 and 2011, Nord Stream financed four ecological expeditions for us in those parts of the Gulf of Finland. It was extremely interesting.

> "Usually, it is hard for NGOs like us to approach and cooperate with corporate entities, especially on environmental issues. But Nord Stream has been an exception."

From your point of view, what are some of the more positive aspects of the project?

RS: Our most important priority is safety for the Baltic. Transporting gas in underwater pipelines is far safer than through overland ones. On land, the pipelines are exposed to potential risks such as the human factor and strong temperature fluctuations. Conditions in the sea are clearly more stable.

It is also a great advantage that the pipelines are carrying natural gas, and not oil. If there is a leak, natural gas is much less of a danger to the environment.

How do you think that the Nord Stream project has been implemented thus far?

RS: At the beginning, attitudes toward the pipeline were very negative. But when we checked to see who was really behind the objections, it turned out the opposition was based mostly on political grounds — not environmental. Nord Stream has involved all the affected stakeholders around the Baltic and even, to a certain extent, accepted their views. That was not so common in Russia before. Usually, it is hard for NGOs like us to approach and cooperate with corporate entities, especially on environmental issues. But Nord Stream has been an exception.

Has your view of the project changed over time?

RS: Yes, at the outset we were much more sceptical about Nord Stream than we are today. I find Nord Stream to be open and respectful towards criticism and opposition. They have shown that they too can change. It has been a good experience.

What else could companies, such as Nord Stream, do for the Baltic Sea?

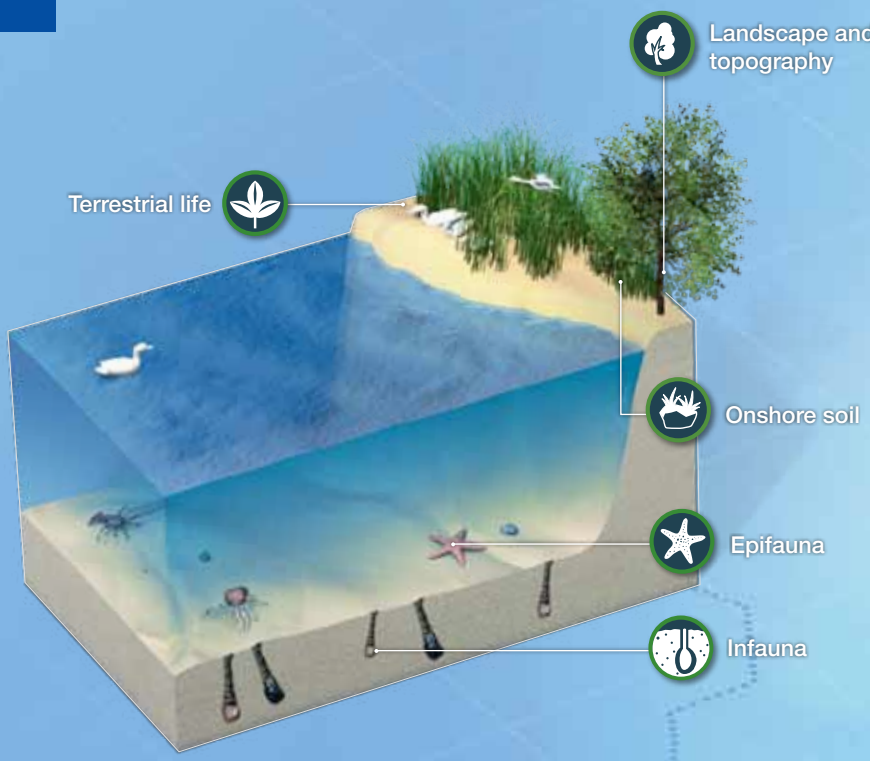
RS: I would suggest they set aside as much money as possible to restore and maintain the ecosystem of the Baltic Sea. That would be great! We have already damaged the Baltic enough, so it needs help. The Baltic is an exceptionally sensitive and fragile ecosystem in which small changes can produce major catastrophies.

Our Monitoring Activities

> Nord Stream's environmental and socio-economic monitoring programme involves investigating how the pipelines impact 16 subject areas – from water and air quality to birds, fish, and seabed vegetation. Approximately 1,000 locations along the entire route of the pipelines are being checked. A brief outline of our activities is given below.

Icons

- Turbidity air
- Turbidity vessel
- Turbidity sensors
- Mussel cages
- Sediments
- Seabed bathymetry
- Bottom currents
- Inflow
- Seabirds
- Fish and fisheries
- Mammals
- Terrestrial life
- Landscape and topography
- Onshore soil
- Epifauna
- Infauna
- Air emissions
- Noise
- Light
- Cultural heritage
- Chemical warfare agents
- Conventional munitions
- Helcom
- Public opinion

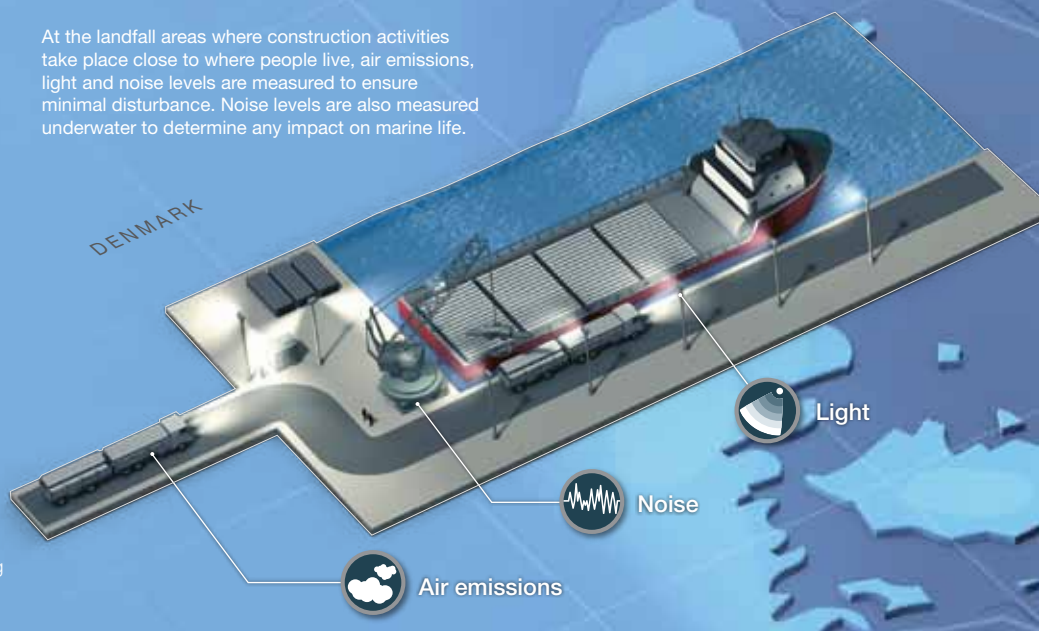


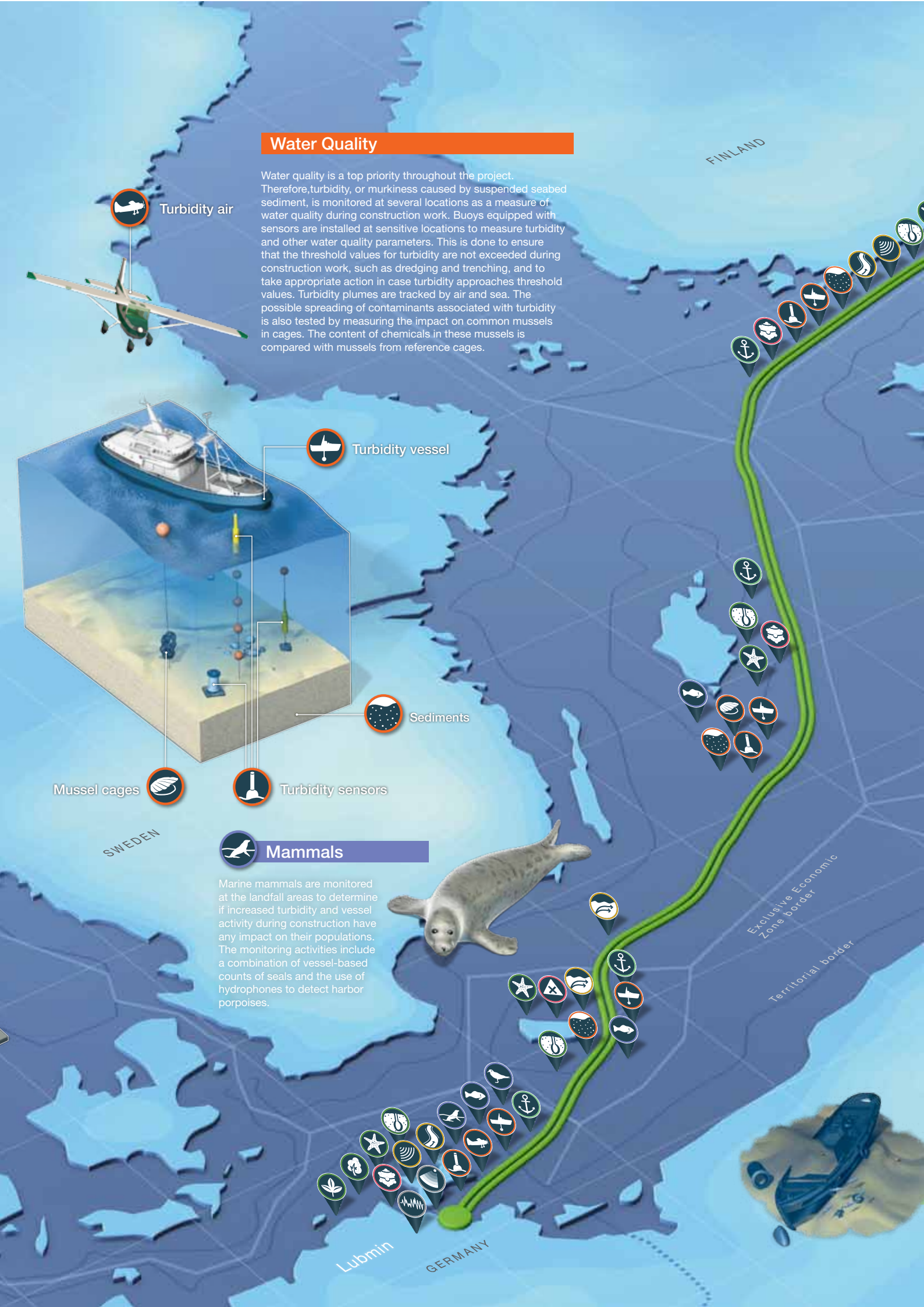
Benthic Flora & Fauna

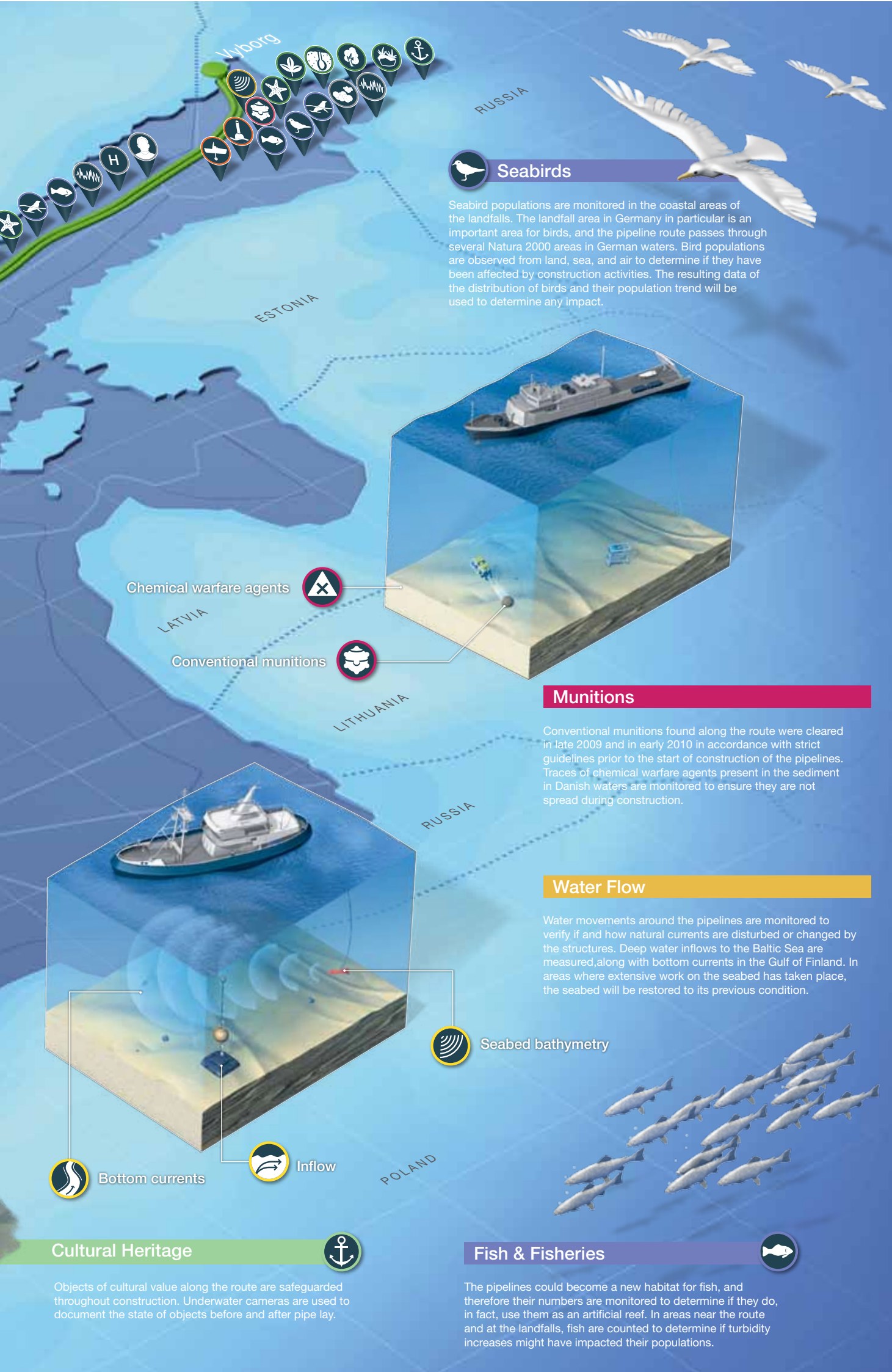
Benthic, or aquatic fauna, is monitored along the entirety of both pipelines. Where dredging or trenching has disturbed the seabed, infauna is monitored in order to follow the rate of its regrowth. Epifauna growth on the pipelines themselves is also expected, and will be recorded. Recovery studies will take place for several years following project completion.

Air, Light & Noise

At the landfall areas where construction activities take place close to where people live, air emissions, light and noise levels are measured to ensure minimal disturbance. Noise levels are also measured underwater to determine any impact on marine life.




Water Quality
Water quality is a top priority throughout the project. Therefore,turbidity, or murkiness caused by suspended seabed sediment, is monitored at several locations as a measure of water quality during construction work. Buoys equipped with sensors are installed at sensitive locations to measure turbidity and other water quality parameters. This is done to ensure that the threshold values for turbidity are not exceeded during construction work, such as dredging and trenching, and to take appropriate action in case turbidity approaches threshold values. Turbidity plumes are tracked by air and sea. The possible spreading of contaminants associated with turbidity is also tested by measuring the impact on common mussels in cages. The content of chemicals in these mussels is compared with mussels from reference cages.
Turbidity air
Turbidity vessel
Sediments
Mussel cages
Turbidity sensors
Mammals
Marine mammals are monitored at the landfall areas to determine if increased turbidity and vessel activity during construction have any impact on their populations. The monitoring activities include a combination of vessel-based counts of seals and the use of hydrophones to detect harbor porpoises.
FINLAND
SWEDEN
GERMANY
Lubmin
Exclusive Economic Zone border
Territorial border



Seabirds

Seabird populations are monitored in the coastal areas of the landfalls. The landfall area in Germany in particular is an important area for birds, and the pipeline route passes through several Natura 2000 areas in German waters. Bird populations are observed from land, sea, and air to determine if they have been affected by construction activities. The resulting data of the distribution of birds and their population trend will be used to determine any impact.

Munitions

Conventional munitions found along the route were cleared in late 2009 and in early 2010 in accordance with strict guidelines prior to the start of construction of the pipelines. Traces of chemical warfare agents present in the sediment in Danish waters are monitored to ensure they are not spread during construction.

Water Flow

Water movements around the pipelines are monitored to verify if and how natural currents are disturbed or changed by the structures. Deep water inflows to the Baltic Sea are measured,along with bottom currents in the Gulf of Finland. In areas where extensive work on the seabed has taken place, the seabed will be restored to its previous condition.

Cultural Heritage

Objects of cultural value along the route are safeguarded throughout construction. Underwater cameras are used to document the state of objects before and after pipe lay.

Fish & Fisheries

The pipelines could become a new habitat for fish, and therefore their numbers are monitored to determine if they do, in fact, use them as an artificial reef. In areas near the route and at the landfalls, fish are counted to determine if turbidity increases might have impacted their populations.

Nord Stream by the Numbers

Facts and Figures

- **1,224 kilometres:** the length of each of the twin gas pipelines, or approximately the length of the Rhine River
- **101,000:** the number of individual pipe segments per pipeline
- **12 metres:** the length of each pipeline segment
- **1,153 millimetres:** the diameter of each pipeline segment
- **24 tonnes:** the weight of each concrete-coated pipe segment, which is about the weight of 343 average-size people
- **2,424,000 tonnes:** the total amount of steel used to build the Nord Stream twin pipeline system. This is about 242 times the weight of the steel used for the Eiffel Tower
- **5 years:** the time from the start of detailed planning by Nord Stream AG to the start of operation of Line 1
- **50 years:** the minimum planned operational life of the pipelines
- **55 billion cubic metres:** the combined maximum transport capacity of the pipeline system. This amount is equivalent to the yearly energy output of 148,000 wind turbines, or 33 German nuclear power plants
- **26 million:** the number of European households that can be supplied each year with energy transported through Nord Stream
- **200,000,000 tonnes:** of CO_2 emissions will be saved over 50 years due to the design of the pipelines, which require no intermediate compressor stations
- **100 million euros:** the investment in performing surveys of the Baltic Sea prior to construction
- **40,000 kilometres:** of the seabed along the Baltic Sea that was geophysically surveyed prior to construction. This is equal to the circumference of the earth at the equator
- **100:** the number of munitions removed from the seabed to ensure a safe routing
- **2,585 pages:** the scale of the Espoo Report informing about potential transboundary impacts
- **10:** the number of languages in which the Espoo Report was published
- **40 million euros:** the total investment planned for environmental monitoring along the route
- **22:** companies are currently involved in the ongoing environmental monitoring
- **1,000:** the number of environmental monitoring sampling locations
- **16:** the number of parameters (physical, chemical, biological & socio-economic) analysed within the monitoring programme

More information at www.nord-stream.com

Nord Stream
The new gas supply route for Europe

Contacts

Head Office
Nord Stream AG
Grafenauweg 2
6304 Zug, Switzerland
Tel. +41 (0) 41 766 91 91
Fax +41 (0) 41 766 91 92

Jens D. Müller
Deputy Communications Director

Please contact us for more information about the Nord Stream Project:
info@nord-stream.com

or visit our website at:
www.nord-stream.com

Nord Stream wishes to thank all of the experts who have contributed to this brochure.

Document No. G-GE-PRC-PRI-000-ENMONCOM-00