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

Moscow Branch
Nord Stream AG
ul. Znamenka 7, bld. 3
119019 Moscow, Russia
Tel. +7 (0) 495 229 65 85
Fax +7 (0) 495 229 65 80

Irina Vasilyeva
Communications Manager

Please contact us for more information about the Nord Stream Pipeline:
contact@nord-stream.com or visit our website at **www.nord-stream.com**

Nord Stream
The new gas supply route for Europe

The Project & The Environment

The Natural Gas Pipeline Through the Baltic Sea

Why We Are Building The Nord Stream Pipeline

Nord Stream is an international consortium of four major companies: OAO Gazprom of Russia, BASF/Wintershall Holding AG and E.ON Ruhrgas AG of Germany, and N.V. Nederlandse Gasunie of the Netherlands. The combined experience of these energy companies ensures the best technology, safety and corporate governance for this project, which aims to provide a secure energy supply for Europe.

Nord Stream's shareholders have a great deal of experience in the business of extracting natural gas, building transport networks and bringing gas reliably and safely to the markets where it is required. The expertise of these four leading companies translates into having advanced technology and materials for the pipeline, as well as the highest security and environmental protection standards.

Nord Stream has 150 employees, including specialists recruited from 20 countries working in a variety of fields. The international staff at the headquarters in Zug, Switzerland, represent a valuable combination of resources that will enable the Nord Stream Pipeline project to be a technical, environmental and commercial success.

The company's challenge is both exciting and vitally important. Exciting, because pipeline developers have long held the vision of transporting gas across the Baltic Sea, linking the plentiful resources in Russia to European markets. And it's important because demand for gas is rising, and Europe urgently needs to secure new sources. Nord Stream will enhance Europe's security of supply by delivering 25 percent of the additional import demand expected in 2025. Years of studies have brought Nord Stream to the conclusion that the offshore pipeline project represents one of the safest, most economical, and most environmentally friendly ways to increase gas supplies to Europe.

Building the pipeline is a major feat of engineering. Because it passes through the waters of five countries, and could affect others, an extensive permitting and consultation process is underway. An important part of this process focusses on the environment and the procedures developed to investigate and mitigate all potential impacts.

This brochure outlines the special characteristics of the Nord Stream project and of the Baltic Sea ecosystem. It defines the steps being taken not only to ensure that the pipeline will be built with as little impact on the environment as possible, but also that it will operate safely for years to come. <

THE NORD STREAM CONSORTIUM MEMBERS

GAZPROM
Russia (51%)

wintershall
BASF Group
Germany (20%)

e.on Ruhrgas
Germany (20%)

gasunie
Netherlands (9%)

The Nord Steam Pipeline will be laid in a continuous string at the rate of up to 3 kilometres a day.

The Project

The Nord Stream Pipeline project through the Baltic Sea provides a direct link between the vast gas reserves of Russia and the European energy markets.

A Pipeline to Secure Energy For the European Union

Researchers began studying the feasibility of an offshore pipeline in the late 1990s. Today, the Nord Stream Pipeline represents the best alternative for bringing large volumes of natural gas directly and safely to Europe.

> page 8

A Pipeline Through the Waters of Many Nations

The pipeline passes through the territorial waters or Exclusive Economic Zones of five nations. Extensive studies and consultations have taken place as part of the process of securing permission for construction and operation.

> page 14

What Would Happen Without the Pipeline?

Gas consumption in Europe is increasing, and the Nord Stream Pipeline is one of the fastest and safest ways to meet Europe's energy needs. There are alternatives, though they will not be operational as quickly as Nord Stream.

> page 17

Building an Undersea Highway for Natural Gas

The basic technology for building offshore pipelines has been around for decades. Rigorous certification procedures are in place to ensure that all aspects of construction meet the highest international standards.

> page 20

The Environment

Environmental concerns are central to the Nord Stream project. The company has conducted numerous studies to reduce potential impacts on the Baltic Sea.

The Importance of the Baltic Sea

Its ecosystem and its strategic location make the Baltic Sea truly unique. The significance of the sea as a thoroughfare for global trade contrasts with its fragile state, and so Nord Stream places a high priority on environmental responsibility.

> page 26

Comprehensive Studies for Ecological Compatibility

A vast number of scientific investigations carried out by contracted suppliers have helped define both the design of the pipeline as well as an optimal route across the Baltic. The studies help to keep environmental impacts to a minimum.

> page 34

Protecting Baltic Sea Wildlife Is at The Forefront of Surveys

The Baltic Sea is home to several threatened marine mammals and is a primary route for migratory birds. Findings from studies show that marine wildlife will be only temporarily affected during pipeline construction.

> page 48

Managing the Environment at Every Stage of the Project

National and international agreements require that all work on the pipeline be carried out safely and responsibly. To have the safest pipeline possible, Nord Stream will operate it with the same concern for the ecosystem that guide its construction.

> page 52

The Project >

The European economy is increasingly dependent on reliable and secure energy supplies, and the privately financed Nord Stream Pipeline will provide Europe with a much-needed energy supply infrastructure at no cost to the European taxpayer. Nord Stream's shareholders are investing 30 percent of the 7.4 billion euros required for the pipeline, and the remaining funds will be secured from financial markets.

The European Commission predicts a growing natural gas import gap. It is expected to be about 200 billion cubic metres (bcm) a year by 2025, resulting from rising demand at a time of declining domestic production. Nord Stream will provide about 55 bcm of gas annually when fully operational; that's 25 percent of the gap currently projected for gas imports. It is enough to satisfy the energy demand of more than 26 million households.

Nord Stream is not the only import gas pipeline planned for Europe, but it is one of the most advanced. No other major new pipeline with a capacity of over 10 bcm is expected to be operating before 2015. The Nord Stream Pipeline is scheduled to come on stream in late 2011. Recognising the importance of Nord Stream to the European energy mix, the European Parliament and Council designated the project as being of "European interest".

The pipeline will pass through the territorial waters or Exclusive Economic Zones of Russia, Finland, Sweden, Denmark and Germany. These five nations must give their approval before construction can begin. Nord Stream is involved in discussions with four other Baltic Sea nations that could also be affected. Because of its transboundary nature, the Nord Stream Pipeline is subject to international conventions which provide for extensive consultations with authorities and members of the public. Nord Stream began this international consultation process in 2006, and has held and participated in well over 200 public meetings and seminars since then.

The proposed route through the Baltic Sea is the most direct connection between the vast gas reserves in Russia and markets in the European Union. The offshore route has many other advantages, most of them for the environment. The corridor has been studied for nearly five years, and the route has been optimised to steer clear of all known munitions dump sites. Already 100 million euros have been invested in surveying and planning the optimal route and studying potential environmental impacts. The surveys have contributed to one of the most comprehensive investigations of the ecosystem of the Baltic Sea, involving an international team of scientists and engineers.

The Project >

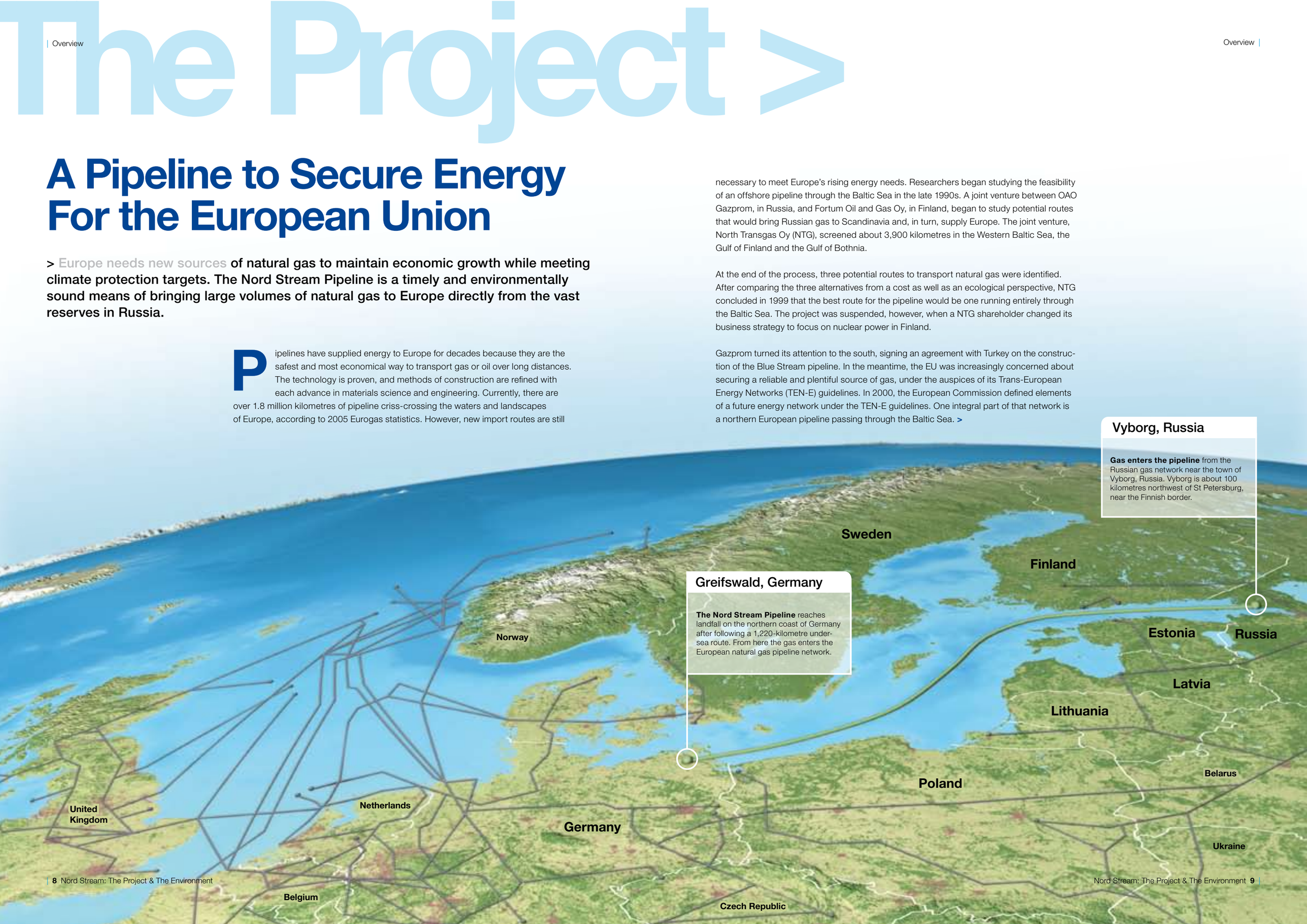
A Pipeline to Secure Energy For the European Union

> Europe needs new sources of natural gas to maintain economic growth while meeting climate protection targets. The Nord Stream Pipeline is a timely and environmentally sound means of bringing large volumes of natural gas to Europe directly from the vast reserves in Russia.

Pipelines have supplied energy to Europe for decades because they are the safest and most economical way to transport gas or oil over long distances. The technology is proven, and methods of construction are refined with each advance in materials science and engineering. Currently, there are over 1.8 million kilometres of pipeline criss-crossing the waters and landscapes of Europe, according to 2005 Eurogas statistics. However, new import routes are still necessary to meet Europe's rising energy needs. Researchers began studying the feasibility of an offshore pipeline through the Baltic Sea in the late 1990s. A joint venture between OAO Gazprom, in Russia, and Fortum Oil and Gas Oy, in Finland, began to study potential routes that would bring Russian gas to Scandinavia and, in turn, supply Europe. The joint venture, North Transgas Oy (NTG), screened about 3,900 kilometres in the Western Baltic Sea, the Gulf of Finland and the Gulf of Bothnia.

At the end of the process, three potential routes to transport natural gas were identified. After comparing the three alternatives from a cost as well as an ecological perspective, NTG concluded in 1999 that the best route for the pipeline would be one running entirely through the Baltic Sea. The project was suspended, however, when a NTG shareholder changed its business strategy to focus on nuclear power in Finland.

Gazprom turned its attention to the south, signing an agreement with Turkey on the construction of the Blue Stream pipeline. In the meantime, the EU was increasingly concerned about securing a reliable and plentiful source of gas, under the auspices of its Trans-European Energy Networks (TEN-E) guidelines. In 2000, the European Commission defined elements of a future energy network under the TEN-E guidelines. One integral part of that network is a northern European pipeline passing through the Baltic Sea. >



The Project >

Energy created from the gas originating in the Nord Stream Pipeline will be used in small towns and huge capitals across the European Union.

In September 2005, Gazprom, BASF, and E.ON signed a letter of intent for a natural gas pipeline system through the Baltic Sea. A month later, those companies established a consortium – the North European Gas Pipeline Company. In October 2006, the company was renamed "Nord Stream AG", which is headquartered in Zug, Switzerland, and has a branch office in Moscow. Nord Stream's mission is to build and operate an additional gas transportation system. Gasunie, the Dutch gas-infrastructure company, joined the consortium in 2007, reinforcing the pan-European nature of the venture.

Today, the four shareholders are OAO Gazprom, Wintershall Holding AG (a BASF subsidiary), E.ON Ruhrgas AG, and N.V. Nederlandse Gasunie. Total investment in the offshore pipeline is projected at 7.4 billion euros. The shareholders will provide about 30 percent of the project costs through equity contributions proportionate to their shares in the joint venture. Some 70 percent will be financed externally, by means of project financing from banks and export credit agencies.

Demand for Gas Is Rising

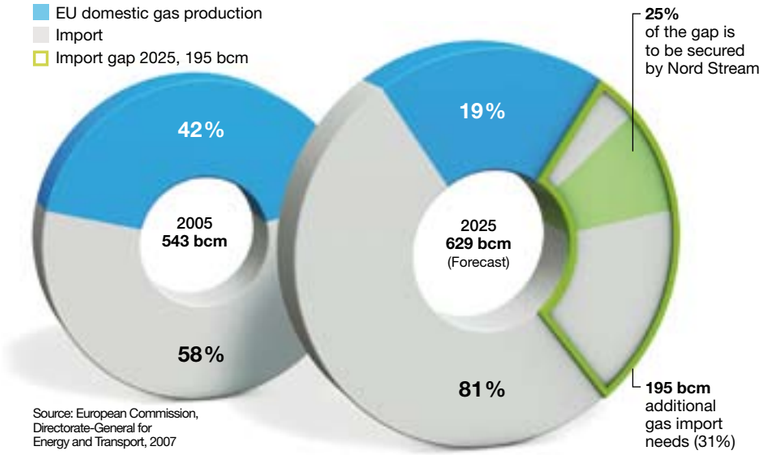
The Nord Stream Pipeline has become a priority for two main reasons. The first is that domestic supplies of natural gas in the EU are dwindling. The second is that demand is rising. These are the chief reasons for the current debate about securing future natural gas supplies from Russia, which is close to Europe and some of the world's largest known reserves. Natural gas already meets about a quarter of the EU's primary energy needs.

As a fuel, natural gas has some environmental advantages over coal or oil. Natural gas has a higher hydrogen-to-carbon ratio than do other fossil fuels, translating into a 30 percent to 50 percent reduction in pollution and greenhouse gas emissions. Following the United Nations' Framework Convention on Climate Change, and the Kyoto Protocol of 1992, the reduction of carbon dioxide emissions has become a top priority for most organisations. >

Gazprom
Gazprom of Russia is the largest gas-producing company in the world. Gazprom owns some 60 percent of Russian natural gas reserves, as well as a pipeline network of some 155,000 kilometres. Through subsidiaries, Gazprom operates a total of 463,000 kilometres of pipeline. Gazprom constructed the Blue Stream pipeline across the Black Sea from Russia to Turkey.

E.ON Ruhrgas
E.ON Ruhrgas is Germany's largest supplier of natural gas. The company builds and operates long-distance pipeline networks. It is also involved in pipeline projects in the North Sea, including the Interconnector UK and the Balgzand-Bacton Line.

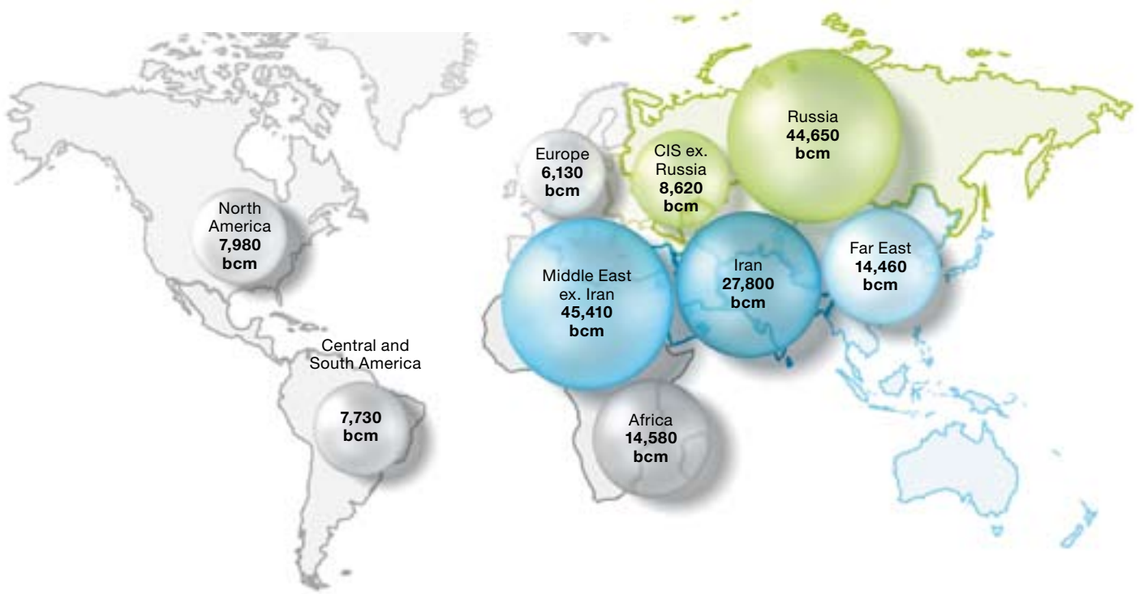
The Import Gap



Source: European Commission, Directorate-General for Energy and Transport, 2007

The Project >

Global Gas Reserves



Source: BP-Statistical Review of World Energy 2008;
bcm = billion cubic metres

Individual nations achieve greenhouse gas reductions in various ways. The European Parliament and Council decided that EU greenhouse gas emissions should be reduced by at least 20 percent below 1990 levels by 2020. In Europe, one way to reduce total emissions is by increasing the ratio of natural gas in the energy mix. The European Commission's forecast report, "European Energy and Transport Trends to 2030", suggests that the share of natural gas in the EU's primary energy mix will rise to 26 percent by 2025.

Filling Europe's "Import Gap"

Europe's increasing demand is accompanied by a decline in the domestic production capacity and reserves of EU Member States. Currently, the total volume of proven natural gas reserves within the EU is about 2,800 billion cubic metres (bcm). This is low compared to the annual demand of 629 bcm projected for 2025. Production for existing natural gas reserves in the EU will decline from around 229 bcm annually in 2005 by about a half, to 120 bcm in 2025, according to the "European Energy and Transport Trends to 2030" forecast published by the EC. This means that imports must play an increasingly important role in meeting Europe's energy needs. Gas imports of about 314 bcm in 2005 met 58 percent of the EU's demand for natural gas. At projected usage rates, gas imports must grow to 509 bcm annually by 2025 to make up for declining EU production and increased demand. At that point, imports will represent 81 percent of the EU's demand. If existing imports were only maintained at their current levels, there would be an "import gap" between projected demand and import volumes of about 200 bcm. This is why the EU has made the development of new infrastructure supplying natural gas a priority. When fully operational by the end of 2012, the Nord Stream Pipeline project will provide Europe with about 55 bcm annually, or enough to fill more than a quarter of Europe's natural gas import gap by 2025.

Developing renewable energy sources, such as solar and wind power, is also a priority for the EU. Europe's share of non-fossil-fuel energy, however, is forecasted to rise to only 10 percent by 2020, and 12 percent by 2030. This means that for some time to come, Europe will require natural gas as a less-polluting alternative to other fossil fuels; as a lower-impact fossil fuel, it will bridge to the time when cleaner, renewable energy sources are more widely available.

Advantages of the Offshore Route

The current estimation for the total cost of building the Nord Stream Pipeline is 7.4 billion euros. As large as this sum appears, it still represents the most cost-effective way of transporting gas from Russia to markets in Europe. A number of onshore routes were investigated, for example, and were assessed to be significantly longer and substantially more expensive than the optimised 1,220-kilometre offshore Nord Stream route, according to Nord Stream's 2009 Espoo Report, an environmental impact assessment.

The Nord Stream Pipeline enters the sea near Vyborg, Russia, and reaches land near Greifswald, Germany. This route is the result of years of research and represents the optimal path from technical, environmental and economical standpoints. Several options were studied for routes in the territorial waters or Exclusive Economic Zones of Russia, Finland, Sweden, Denmark and Germany. Each of these options was rated, applying the same safety, environmental, socioeconomic and technical objectives. Nord Stream has dedicated many resources and much time to optimising the route to ensure the pipeline's structural integrity and to minimise its impact on the environment. More information on Nord Stream's environmental surveys and information on how the pipeline could potentially impact the environment is contained in "The Environment" section in this brochure. <

Wintershall
Wintershall is based in Germany and has explored and extracted oil and natural gas all over the world for more than 75 years. Part of Wintershall's competency in offshore pipeline engineering comes from its work extracting gas in the North Sea, off the coast of the Netherlands.

Gasunie
Gasunie, of the Netherlands, specialises in natural gas infrastructure projects. Gasunie built the Balgzand-Bacton Line, running 230 kilometres across the North Sea. In 2006, Gasunie was responsible for transporting 96 billion cubic metres of natural gas for its customers. It operates 15,000 kilometres of pipeline in Europe.

Nord Stream Is Europe's Most Advanced Gas Pipeline Project

1997 — 1 Finnish-Russian consortium North Transgas Oy (NTG) founded to explore possibilities to transport gas from Russia to Europe via a combination of offshore and onshore routes. A feasibility study is commissioned. Kyoto Protocol signed by industrial nations who agree to reduce harmful CO_2 emissions. Reducing emissions becomes a priority in the energy business.

1998 — 2 NTG screens vast areas of land and the Baltic Sea, and identifies three possible routes.

1999 — 3 NTG analyses data and concludes the offshore route through the Baltic Sea is the most feasible from ecological, technical and economic standpoints.

2000 — 4 The European Commission recognizes a pipeline through the Baltic Sea as an element of its Trans-European Network for Energy (TEN-E) guidelines.

2001 — 5 Peter-Gaz re-surveys a potential route along the Baltic Sea.

2002 — 6 Gazprom takes over the project from NTG, and changes project's name to North European Gas Pipeline.

2003 — 7 Gazprom, BASF and E.ON sign a letter of intent to build a pipeline through the Baltic Sea. North European Gas Pipeline Company founded.

2004 — 8 North European Gas Pipeline Company renamed Nord Stream AG. International consultation process according to "Espoo Convention" begins, including all countries bordering the Baltic Sea.

2005 — 9 Final shareholder agreement signed for Nord Stream.

2006 — 10 Gasunie of the Netherlands joins the Nord Stream consortium.

2007 — 11 Nord Stream submits Environmental Impact Assessment (EIA) as documentation for consultation under the Espoo Convention.

2008 — 12 First string of pipeline between Vyborg, Russia and Greifswald, Germany will be completed with an annual capacity of 27.5 bcm.

2009 — 13 Second string of pipeline to be completed. At this point, the Nord Stream Pipeline will deliver 55 bcm of gas to Europe annually.

2010

2011

2012

The Project >

A Pipeline Through the Waters of Many Nations

> The Nord Stream Pipeline passes through the waters of five countries. That makes the pipeline subject to national laws and international conventions, which ensures that all safety and environmental issues are thoroughly examined and discussed.

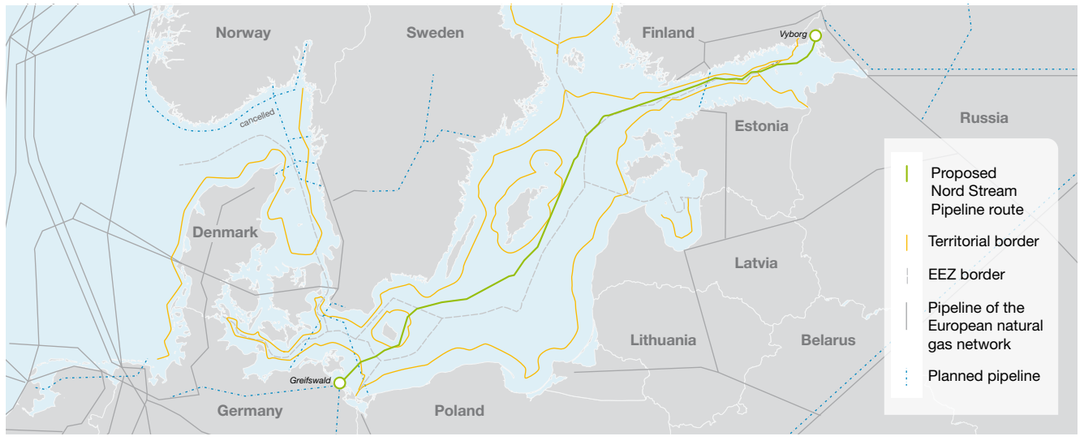
A fisherman inspects his day's catch in territorial waters off the coast of Sweden. The economies of many nations are bound to fishing and other commercial activities on the Baltic Sea.

The transboundary nature of the Nord Stream Pipeline is one of its most unique aspects. The pipeline passes through the territorial waters or Exclusive Economic Zones of Russia, Finland, Sweden, Denmark and Germany. Permission of these nations is required before the pipeline can be built, so Nord Stream has been involved in extensive consultations with each of them to be certain the pipeline complies fully with the national legislation. In addition to these five nations, the pipeline may affect Estonia, Latvia, Lithuania and Poland. These four nations are also part of the consultation process.

Hundreds of Meetings
From 2006 to 2009, Nord Stream held and participated in public hearings, meetings or conferences in the Baltic Sea region at the rate of about one a week.

The United Nations Economic Commission for Europe adopted a convention in the Finnish city of Espoo in 1991, which sets out obligations for parties to assess the environmental impact of projects at an early stage of planning. The so-called Espoo Convention binds signatory nations to notify and consult one another on major projects likely to have a significant environmental impact across boundaries.

Consultation with Nine Baltic Sea Nations



The international consultation process according to the Espoo Convention has the purpose of giving all countries possibly affected by the Nord Stream Pipeline the opportunity to review the project's potential impact. Nord Stream has submitted an extensive report which summarises the transboundary impacts that the pipeline could have on the environment – the Nord Stream Espoo Report. This environmental impact assessment in a transboundary context promotes a coordinated approach to protecting the environment and enables the public and other stakeholders to respond.

Extensive Analysis of the Baltic Sea Ecosystem

The Espoo Report represents the results of years of extensive research, field studies and surveys. The report is not only a milestone in the history of the project; the knowledge it contains provides an exhaustive analysis of the Baltic Sea ecosystem and the seabed along the pipeline route. The information in the second half of this brochure is based largely on the findings highlighted in the Espoo Report. It is published in ten languages, and can be downloaded from www.nord-stream.com. <

The Project

Nord Stream Is Part of The EU Energy Policy

> The Nord Stream Pipeline through the Baltic Sea is one of the most important trans-European infrastructure projects. It is recognised by the European Union (EU) as being of European interest within the framework of the Trans-European Energy Networks (TEN-E) guidelines.

The EU has been concerned for many years about meeting its future energy needs. In 1996, the EU established the TEN-E guidelines as part of its overall energy policy objectives of increasing competitiveness in the electricity and gas markets, reinforcing security of supply and protecting the environment. The TEN-E guidelines reflect the three main objectives of the EU's energy policy – sustainability, competitiveness and security of supply.

Recognising Europe's steadily increasing dependence on natural gas imports in the next 20 to 30 years, the TEN-E policy aims to secure and diversify additional gas import capacity by, among other things, increasing pipeline import capacity.
In 2000, the European Council and the European Commission designated the Nord Stream Pipeline as a "project of European interest". This ranking is given to priority projects that strengthen markets and reinforce security of supply.

European Partners

The Nord Stream Pipeline is a major infrastructure project, designed to provide Europeans with secure additional sources of natural gas. The project's size and international nature make it unique among commercial infrastructure projects being carried out today. The volumes and logistics involved with the construction will create hundreds of jobs.

The contractors reflect the scope of the project. In the field of engineering and pipeline design, Saipem S.p.A Services (formerly, Snamprogetti) of Italy was selected, along with PeterGaz of Russia. EUROPIPE of Germany and Russia's United Metallurgical Company are making the pipes for the first pipeline. EUPEC of France is responsible for pipe coatings and logistics. The UK firm Environmental Resources Management and the Danish company Rambøll were contracted to provide detailed reports required for environmental impact assessment and permitting.

Marin Mätteknik, a Swedish company, is responsible for most of the seabed surveys along the pipeline route. Institutes from a variety of countries have provided environmental and field studies.

Among these are the Institute for Applied Ecology and Fugro OSAE in Germany; the Geological Survey of Sweden; PeterGaz in Russia; the Finnish Institute of Marine Research; and DHI in Denmark. Det Norske Veritas, of Norway, will be certifying that all international offshore construction standards are met. <

To produce the same amount of electricity from wind as will be provided by the pipeline, wind farms the size of a third of Belgium would be required.

What Would Happen Without the Pipeline?

> Gas provided by Nord Stream is one of the fastest and safest ways to meet Europe's future energy needs. There are alternatives, but none of them measure up to Nord Stream from either a cost or an environmental perspective at this time.

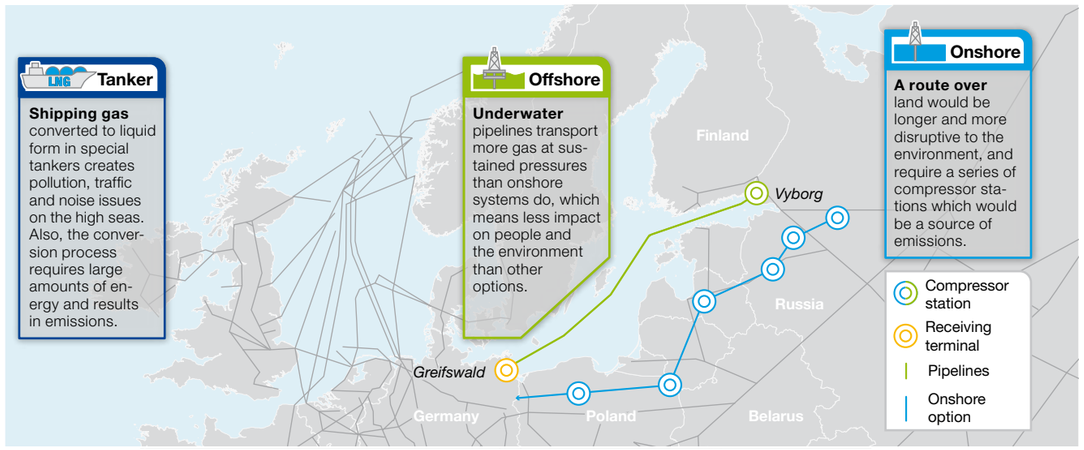
If the Nord Stream Pipeline is not realised, European gas supplies, and energy security, could be put at risk. Once fully operational, the pipeline will deliver 55 billion cubic metres (bcm) of gas to the European Union (EU) each year. That's more than a quarter of the EU's additional gas import demand, estimated at about 200 bcm annually by 2025. Most of the remaining required import capacity is planned to be covered by other gas import projects, complementing the Nord Stream Pipeline. The supply gap that would result from not implementing the Nord Stream project would have to be covered by projects that are only now under consideration, though they are not sufficiently developed to fill the gap in the meantime as no other pipeline with a capacity of over 10 bcm is expected to be operating before 2015. Nord Stream can be fully operational by 2012.

Today, there are few better alternatives to Russian gas imports. Russia offers Europe two distinct advantages: it is closer than many other potential sources, and its reserves are matched only by the Middle East. Other potential sources are farther away. They include transmission systems in the Caspian and pipelines across the Mediterranean from Algeria and Libya, and pipelines through the North Sea from Norway. None of these offer the immediate advantages of the Nord Stream Pipeline, linking the EU directly to Russian gas fields. >

The Climate Change Challenge
The European Union is committed to reducing greenhouse gases by 20 percent from 1990 levels by 2020. Gas from Nord Stream will help meet this ambitious goal.

The Project >

Advantages of an Offshore Route



Equivalents of Gas from Nord Stream

55 bcm natural gas in terms of transportation

280 more oil shipments
via tankers a year on the Baltic and North Seas would be needed

600–700 LNG tanker
shipments per year would put a higher burden on the Baltic Sea

77 bcm bioethanol
or more than 320,000 km² of fields of corn, which is almost the size of Finland

The Logic of Offshore Pipelines

An alternative land route for Russian gas has been the subject of substantial discussion. Part of the challenge posed by an overland route is the need for compressor stations, at regular intervals of about 100 to 200 kilometres, to keep the gas flowing. These compressor stations require fuel to operate, adding to costs and creating carbon dioxide emissions as well. With a maximum input pressure of 220 bar for the offshore Nord Stream Pipeline, no intermediate compression is needed to transport the gas a distance of more than 1,200 kilometres.

Building a pipeline on land also involves overcoming many obstacles such as roads, lakes and nature preserves and crossing public properties. The example of other overland pipelines shows that environmental impacts following land construction are greater, requiring longer recovery periods, than offshore construction.

Transporting gas in tanker ships, in the form of liquefied natural gas (LNG), would also be a transport option; however, the LNG process is complex, involving high-pressure liquefication of gas at the point of export. Specialised gas-liquefication, shipping and re-gasification technologies are necessary. Shipping lanes on the Baltic Sea already are experiencing a dramatic rise in traffic, and the transportation of Russian gas to Europe in LNG tankers would result in additional burdens to sea lanes. Each part of the process involves significant energy loss, as well as further carbon dioxide emissions, making LNG a poor alternative to transporting gas via an underwater pipeline. Nord Stream's planned transmission capacity, by contrast, is the equivalent of 600 to 700 LNG specialised tankers travelling back and forth across the Baltic Sea each year.

Natural Gas: An Important Part of the Energy Mix

Growing demand for energy has sparked much discussion in Europe about the future ideal mix of fuels that can best satisfy the community's expanding need. The EU is working to adhere to its year 2020 "20-20-20" target of cutting greenhouse gas emissions by 20 percent from 1990 levels.

Observers and analysts compared costs, feasibility and potential environmental impacts of various energy-mix options – including natural gas, oil, LNG, coal, hydropower, nuclear power and renewable resources such as biofuels, wind and solar power. Each of these energy sources has its own practical and economic implications. Oil creates about 25 percent more emissions than does gas. And gas is more efficient: the energy equivalent of 55 bcm of gas – the amount to be transported annually by the Nord Stream Pipeline – is almost 50 million tonnes of oil, or over 280 more oil tankers annually than the number currently crossing the Baltic and North seas.

Renewable Energy Holds Great Promise

Carbon dioxide emissions from traditional power plants make coal even more problematic than oil. Coal produces about twice as much CO_2 as natural gas. So-called clean coal technologies do exist, but their costs are prohibitive. Furthermore, Europe is already being forced to increase coal imports to meet its energy demands. Nuclear power was once thought to be the answer to a world with limited energy supplies, but many questions remain about nuclear safety, security and the disposal of nuclear wastes. The energy made available through the Nord Stream Pipeline is the equivalent of 39 new nuclear power plants, costing about 100 billion euros. These plants would produce about 880 million tonnes of radioactive waste every year. While many emerging energy technologies based on renewable resources hold great promise in reducing our dependence on fossil fuels, the costs involved versus the energy yielded make them problematic as immediately viable alternatives to gas from the Nord Stream Pipeline. Furthermore, natural gas can be used flexibly in power generation alongside other sources of energy, such as renewables, and thus gas has a role to play as the EU further develops renewable sources of energy, such as wind, solar and tidal power, to meet its 2020 goals. However, as it will be several years before the EU has established secure alternative energy supplies, Nord Stream will be vital in supplementing the region's growing need for energy. <

Costly Coal
Clean coal technologies exist, but substituting them for Nord Stream gas would require at least 36 billion euros, compared to the 7.4 billion euro investment for the pipeline.

Equivalents of Gas from Nord Stream

55 bcm natural gas in terms of energy production

50 coal-fired power plants
burning 100 million tonnes of hard coal and ignite per year

39 nuclear power plants
require huge investment to build and put pressure on water supplies

10,200 km² of land
to build enough wind turbines for the same energy output

This is enough energy
to satisfy the total energy demand of 26 million European households annually. It is also enough to provide 38.2 million gas-using households with gas for heating water and their living space for one year.

Gas plays an important role as a cleaner source of energy to "bridge" the period until sustainable sources, such as solar energy, become widely available.

The Project >

Building an Undersea Highway for Natural Gas

> A pipeline is a major infrastructure project, much like building an interstate highway or a major bridge. Hundreds of engineers work on the planning and design, at pipe production, marshalling and coating yards, and on specialised vessels to make the pipeline a reality.

Keeping track of pipes before delivery to the coating yards is part of a sophisticated supply chain that ends with the construction vessel out at sea.

The basic technology for constructing offshore pipelines has been developed over the last 40 years. The designers and engineers responsible for the Nord Stream Pipeline have advanced these procedures on major projects around the world. Because the technology is extensively in use, a rigorous certification system has been created to ensure all procedures are carried out to a high standard.

What is commonly referred to as “the Pipeline” actually consists of two pipelines, built one after the other. Each pipeline will be made up of about 100,000, 12-metre pipe sections, which are welded out at sea, and lowered to the seabed by special pipelay vessels. These vessels are equipped to assemble and lay pipes around the clock, so that up to 3 kilometres can be built per day. Each completed pipeline will be about 1,220 kilometres in length, but it will be built in sections, which are then joined in a process known as a “tie-in”.

The Pipes

Nord Stream pipes are made of a carbon grade steel. Pipes for the first pipeline are produced at plants in Germany and Russia, and have a constant internal diameter of 1,153 millimetres and a wall thickness of up to 41 millimetres. The insides are coated with an epoxy-based, high-gloss paint as an antifriction measure to increase flow capacity of the system. An external coating consisting of three layers of polyethylene is applied to prevent corrosion. Each pipe also receives a final coating of reinforced concrete enhanced with iron ore. This concrete coating adds weight to the pipeline so that it remains stable on the seabed, and gives it added protection.

Construction requires onshore support facilities. Here bare pipes are off-loaded at the coating yard in Sassnitz-Mukran, Germany.

The Logistics

Construction of large-scale offshore pipelines requires substantial support from onshore facilities of various types. A primary focus of the supply chain for the Nord Stream project has been minimising environmental impact and lowering costs. This has been accomplished by economising on transport routes and favouring the use of existing facilities to avoid new construction.

The majority of the stockpile of pipes are then transported by rail to concrete coating plants in Sassnitz-Mukran, Germany, and Kotka, Finland, where they receive the reinforced concrete coating. Once coated, the pipes are stored close to the concrete plants and transported either directly to a pipelay vessel at sea or to interim stockyards (in Hanko, Finland, and Slite and Karlskrona, Sweden) which will supply the carrier vessel via pipelay vessels. The average load of one of these supply barges is about 250 pipes per shipment.

Welding and Pipe Laying

Individual pipes are welded to the pipeline in an automated process on the pipelay vessel. Once completed, these welds are >

The Project >

Pipe sections are welded and inspected on the pipelay vessel, and lowered to the seabed in a continous string.

tested with an automatic ultrasonic device, which provides superior results to x-ray examination. The test results are reviewed by a quality control team, and inspected by an independent certification agency.

The pipelay vessel is moving forward during the welding sequence, so that welded and coated pipes exit the rear of the ship in a continuous motion, with joints being created to extend the pipeline. A submerged construction at the rear of the pipelay vessel supports the descending pipeline to avoid buckling or other damage.

To prevent collisions with other ships, about a 3-kilometre exclusion zone will surround the pipelay vessel as it proceeds on its course. Coast guards will also be informed about vessel movement. Once the various completed sections of the pipeline have been linked into a continuous string, the entire system is tested thoroughly prior to commission. For pressure testing, the pipeline is flooded with seawater, and then pressurised for at least 24 hours to check for leaks. If the pipeline passes this important examination, the water will then be discharged at the landfall area off the coast near Vyborg, Russia.

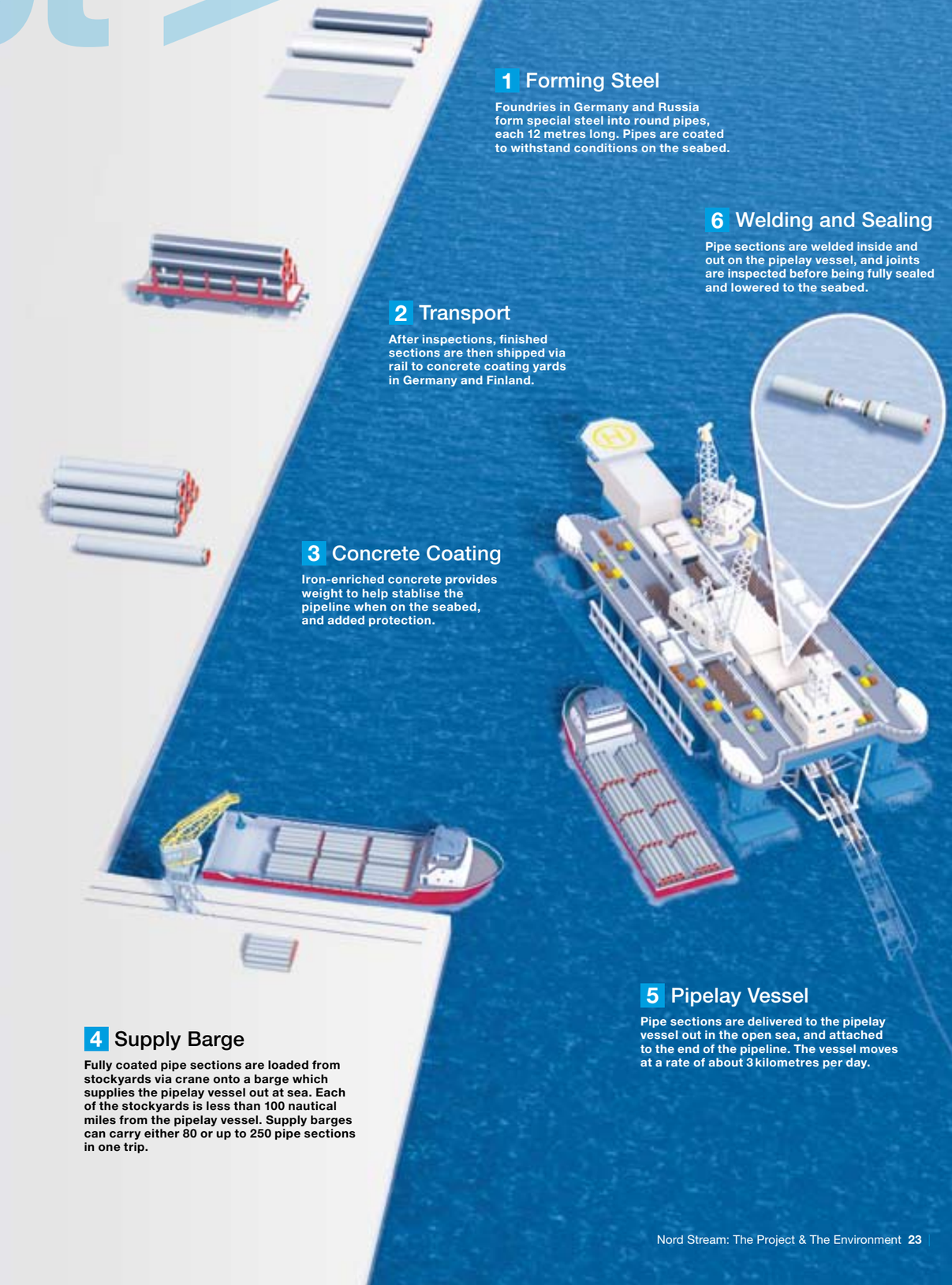
The next step is to force air into the system to drive out moisture. Once the pipeline has dried, it is filled with gas and pressurised for transport.

Monitoring the Flow

The pressurised gas enters the system in Russia and exits in Germany. Pressures and flows within this undersea highway for gas are monitored constantly so that the balance between intake and extraction volumes is maintained. Engineers oversee operations, and they can take direct control over the pipeline in the event of irregularities of any kind. All operations will comply with established international standards, and are subject to certification. The pipeline will be maintained according to a regular schedule. Periodic inspections of the inside of the pipeline are carried out by a remote-controlled device called a pipeline inspection gauge, or PIG. This machine runs inside the length of the pipeline, searching for any irregularities.

When required, optical inspections outside the pipeline can also be undertaken. This is performed by another device known as a remotely operated vehicle.

The Nord Stream Pipeline is designed to be in service for at least half a century. Its condition will be evaluated continuously to ensure safe operation. Therefore, the service period might be prolonged, depending on the condition of the pipeline. How the pipeline is taken out of use will largely depend on the regulations for decommissioning about 50 years after the pipeline's construction. <



1 Forming Steel

Foundries in Germany and Russia form special steel into round pipes, each 12 metres long. Pipes are coated to withstand conditions on the seabed.

2 Transport

After inspections, finished sections are then shipped via rail to concrete coating yards in Germany and Finland.

3 Concrete Coating

Iron-enriched concrete provides weight to help stablise the pipeline when on the seabed, and added protection.

4 Supply Barge

Fully coated pipe sections are loaded from stockyards via crane onto a barge which supplies the pipelay vessel out at sea. Each of the stockyards is less than 100 nautical miles from the pipelay vessel. Supply barges can carry either 80 or up to 250 pipe sections in one trip.

5 Pipelay Vessel

Pipe sections are delivered to the pipelay vessel out in the open sea, and attached to the end of the pipeline. The vessel moves at a rate of about 3 kilometres per day.

6 Welding and Sealing

Pipe sections are welded inside and out on the pipelay vessel, and joints are inspected before being fully sealed and lowered to the seabed.

The Environment — Introduction |

The Environment >

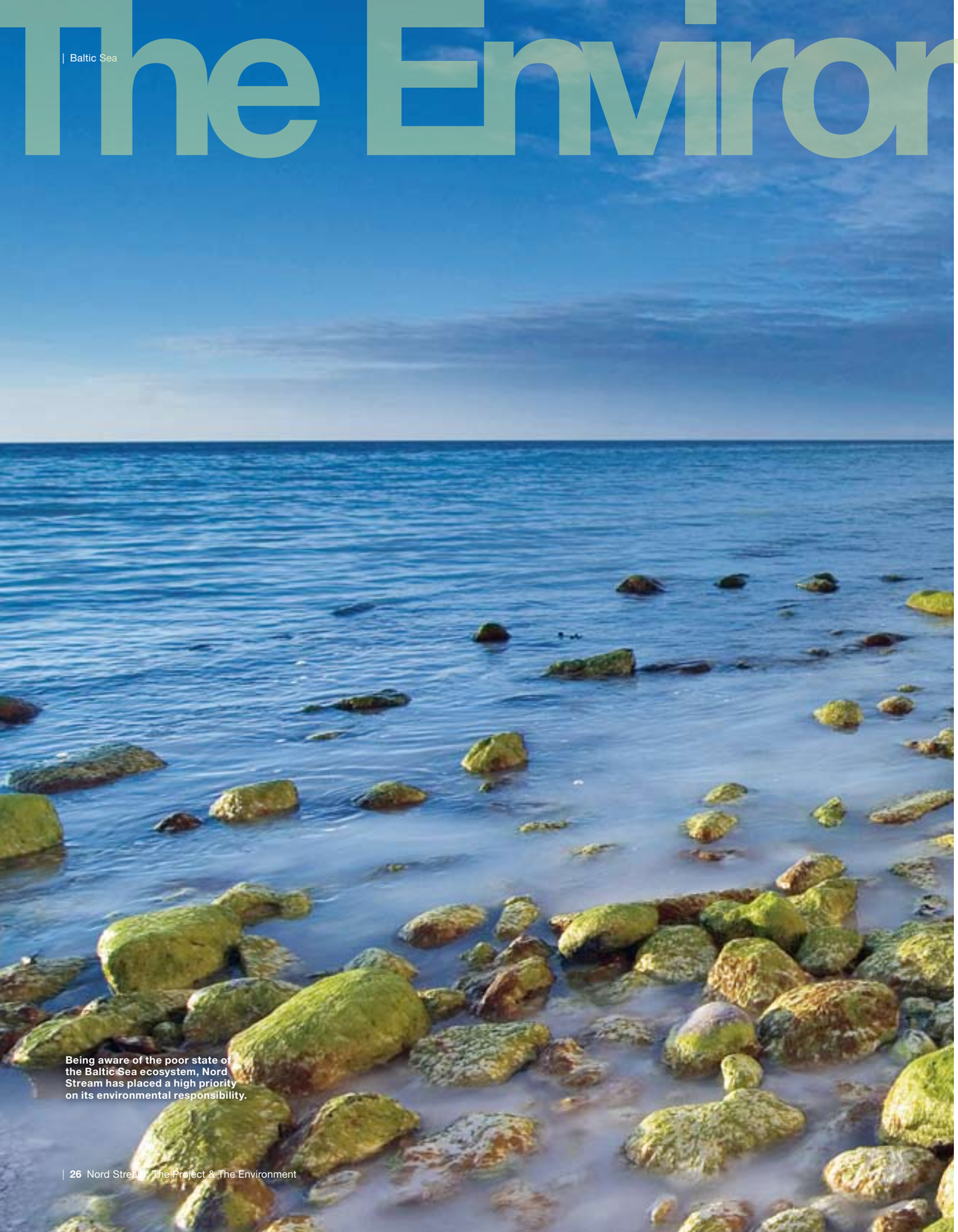
The Baltic Sea is an extraordinary natural resource which has played a vital role in the development of the culture of northern Europe. It is the largest body of brackish water on the planet, and home to many species of plants and wildlife. Because of its strategic location as an inland sea, it has been an integral part of European trade since the Viking Age. Today, with the reemergence of markets in eastern Europe, it has become home to some of the busiest shipping routes on earth. Millions depend upon the Baltic Sea for their livelihood and for recreation, so preserving its delicate ecosystem is a high priority.

Environmental concerns are central to the Nord Stream project. By increasing the amount of natural gas available to European markets, the pipeline will help reduce harmful greenhouse gas emissions. Transporting the gas underwater prevents the need for additional shipments by seagoing tankers, at a time when increasing ship traffic on the Baltic Sea is already a major cause for concern for ecologists. Though reducing emissions and ship traffic are clear environmental benefits, building a 1,220-kilometre pipeline across the seabed raises complex issues.

Will the pipeline project affect spawning areas for fish, seal breeding grounds or migratory patterns for birds? Could munitions dump sites be disturbed, and what impact will mine clearance have? To answer these and many other questions, Nord Stream, over several years, has undertaken comprehensive ecological studies of how the project could potentially impact the Baltic Sea. The studies show that the greatest effects are limited to the construction phase only, and that through carefully planned mitigation measures, all of the risks are acceptable according to international environmental standards.

The route of the pipeline was planned to steer clear, where possible, of nature reserves important to wildlife. And the pipes are designed to withstand a lifetime of service on the seabed. Areas known to contain munitions have been largely avoided, and 50 conventional munitions identified on the route will be removed. All contractors are obliged to comply with Nord Stream's planned Health, Safety and Environmental Management System. Finally, a maintenance scheme ensures that the pipeline will be operated to high standards of safety and environmental compatibility.

The Environment



Being aware of the poor state of the Baltic Sea ecosystem, Nord Stream has placed a high priority on its environmental responsibility.

The Importance of the Baltic Sea

> The Baltic Sea's ecology and prime location make it unique among the planet's seas. This brackish sea connects western and eastern Europe, Scandinavia, and Russia making it an essential thoroughfare for global trade.

The Baltic Sea has a rich heritage, second only to the Mediterranean as an origin of European culture and commerce. Nine countries border the sea, including Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden. Historically, people and nations fought for control of the Baltic's strategic trade routes, and the economic dominance that came with it. At the same time, history also includes examples of extended cooperation and shared prosperity. From the 13th to the 17th centuries, for example, an alliance of more than 200 cities, known as the Hanseatic League, maintained cooperative trade routes from the Baltic Sea to the North Sea.

Today, international collaboration in the Baltic Sea region is strong, and several organisations are in place to reinforce the well-established intergovernmental agreements among the countries. Among them is the Council of the Baltic Sea States, founded in 1992 to oversee the intergovernmental cooperation of the 11 states of the Baltic Sea Region (BSR), which includes Norway, Iceland and the European Commission. The council is concerned with regional issues of common interest, including social and economic development.

The Economic Situation

The BSR has a population of about 100 million people, and is one of the fastest-growing areas of Europe. In fact, the region has recorded higher gross domestic product (GDP) growth rates than the EU, according to a 2007 Baltic Development Forum report. In 2006, the BSR recorded a 4.5 percent GDP growth rate – 92 percent above the average for all EU Member States.

Although the global financial crisis has left its mark in 2008, the region has still fared better than other parts of the EU, as described in a 2008 Baltic Development Forum report. The economy has slowed in the BSR, but the prospect for maritime transport continues to rise. The Baltic Sea currently has some of the busiest shipping routes in the world, with container traffic expected to triple, and oil transportation estimated to increase by 40 percent by 2017, according to the Helsinki Commission, or HELCOM, an organisation that focusses on protecting the marine environment of the Baltic Sea. It must be said, however, that the cultural significance of the region, combined with its role in global trade, contrast with the weak state of the Baltic Sea ecosystem. >

A Fragile Ecosystem

Limited exchange of water with the North Sea is one of the many characteristics that make the Baltic Sea ecosystem especially vulnerable. The narrow and shallow waters of the transitional Sound and Belt waters around Denmark means the same water – along with all the organic and inorganic matter it contains – can remain in the Baltic for up to 30 years. At the same time, the Baltic is replenished with lighter fresh water through rainfall, rivers and streams, stemming from a catchment area that is four times the sea itself. Salt water flowing in from the North Sea does not mix thoroughly with the less dense water waiting in the Baltic, creating a horizontal boundary called the halocline. The halocline acts as a cap, and oxygen levels in deeper areas decline as a result. As a consequence only a limited number of animal and plant species can thrive in the Baltic Sea's brackish environment.

Some species of marine mammals, plankton, fish, marine plants and other creatures that have adapted to these brackish conditions are now under threat from the increased pollution caused by the rapid economic growth of the Baltic countries, according to HELCOM. Extensive research has helped increase scientific understanding of these worsening conditions, including climate change, the effects of chemical run-off, salinity and sediment, toxic contamination, and the introduction of harmful non-native species. Substantial research, for example, has been done on the rise of chemical nutrients and algae growth since the 1960s, and the subsequent effect on biodiversity. Environmental organisations, including the WWF, count this issue as one of the Baltic's most urgent and difficult to address.

HELCOM has made it a priority to combat excessive nutrient loads from agricultural and industrial run-off. An opinion poll conducted by the Forsa market research company for Nord Stream in 2008 shows that general pollution, such as from industry and agriculture, is a common public concern. More than three out of five people (61 percent) polled in the eight EU Baltic Sea states say industrial waste from the land poses the chief threat to the waters of the Baltic. By comparison, only a minority view the construction of the Nord Stream Pipeline as a bigger threat to the Baltic Sea than sewage and shipping, varying from 3 percent in Germany and Finland, to 5 percent in Denmark, 6 percent in Sweden, 8 percent in Poland, 13 percent in Lithuania and 15 percent in Estonia.

Increased Maritime Traffic Can Be Harmful

The Baltic may be small, but it is one of the world's busiest seas. At any given time in the Baltic, an average of 2,000 sizeable ships, including passenger ferries and cargo ships such as oil tankers, are en route, HELCOM reports. To ensure maritime safety, various measures are in place at the global level by the International Maritime Organization, at the regional level by HELCOM, and at the national level by the Baltic Sea states. Though shipping is deemed by the WWF to be a relatively environmentally-friendly means of transporting goods and people due to its lower carbon emissions relative to trucks, for example, the organisation also stresses it has the potential to harm the environment through the release of oily waste or oily water. HELCOM studies reveal that more oil is released intentionally rather than accidentally. This dumping is illegal according to international laws. In total, 238 intentional oil spills were observed by HELCOM through aerial surveillance in 2007.

Aware of the poor state of the Baltic Sea ecosystem, Nord Stream has placed a high priority on environmental responsibility. It has invested heavily in research and studies to fully assess the impact of its pipeline on the environment, and does its utmost to mitigate these potential impacts. These mitigation measures are the results of painstaking studies. More information on these studies and measures is detailed over the following pages of this brochure. <

High-Level Threats to the Baltic Sea Ecosystem

> The Baltic Sea is one of the world's most threatened ecosystems. Surrounded by land and with just a narrow link to the North Sea, its waters are slow to regenerate, making it particularly vulnerable to pollution. Years of ship traffic, and sewage and agricultural waste draining into the sea, have left a lasting mark.

The dangers to the Baltic Sea ecosystem are identified by HELCOM according to severity: severe threats, medium-level threats and low-level threats. HELCOM lists five "severe" threats to the environment, including eutrophication, bottom trawling, overfishing, large oil spills and heavy metals. The Nord Stream Pipeline will aggravate none of these, and therefore is considered a low-level threat. In the case of the threat posed by oil spills from ship traffic, the pipeline could actually play an important mitigating factor, as future liquefied natural gas tanker traffic from Russia could decrease or be made unnecessary.

Pipelines and cables generally are viewed as low-level threats because they lie inert on the seabed and have no long-term effects on the ecosystem. The Nord Stream Pipeline is no exception. The project's construction and operation have been designed with minimal environmental impact as a priority.

Five Severe Threats

Eutrophication is overloading water with chemical nutrients – largely nitrogen and phosphorus from farm fertilisers. The nutrients create an overabundance of algae and other plant life, robbing other aquatic organisms of oxygen. The resulting "dead zones", areas devoid of oxygen and animal life, comprise up to 100,000 square kilometres of Baltic seabed.

Bottom trawling – using drag nets along the sea floor – is particularly destructive to marine ecosystems. Daily, dozens of fishing trawls drag for fish and shrimp along the Baltic seabed, stirring up tonnes of sediment. Several leading environmental institutions consider this activity one of the most harmful for the Baltic Sea ecosystem, churning up to 15,000 square kilometres of seabed each year. Construction for the pipeline, by comparison, will impact only about 36 square kilometres during two years of construction – less area than is disturbed by a single day of bottom trawling.

Scientists also have defined overfishing as a problem, and have warned that fish catches must be reduced to restore balance to the Baltic food chain and ecosystem. Comparitively, the Nord Stream Pipeline will have little or no effect on fish populations.

Oil spills are also a severe threat according to HELCOM, as they contaminate the surface water and suffocate marine animals and plants. Over 100 tonnes of oil are leaked into the sea each year from ship accidents. The Nord Stream Pipeline will provide enough energy from gas to eliminate the need for an additional 280 oil tanker journeys per year, which is equal to the 55 billion cubic metres of gas that the pipeline will provide annually. Though accidents happen, HELCOM studies reveal that during most years, more oil is released intentionally than is spilled accidentally. Every year national surveillance aircraft detect several hundred illegal oil discharges into the Baltic Sea.

HELCOM also ranks the presence of heavy metals and organic substances in the Baltic as a high-level threat. The sea contains substantial concentrations of toxic heavy metals from soil run-off and industrial and municipal waste. Heavy metals represent a health risk to marine organisms and humans. <

Intense algae growth is one consequence of eutrophication, a top threat to the Baltic Sea.

Rising ship traffic threatens the environment with the likelihood of more collisions.

Industrial pollution is one source of the high concentrations of heavy metals in the Baltic Sea.

Preserving Regional History For Future Generations

> From submerged settlements to thousands of shipwrecks, the floor of the Baltic Sea boasts a historic treasure trove. Nord Stream's comprehensive seabed surveys to define the pipeline route have also located about 60 wrecks so far, and are aiding preservation efforts by sharing this information with national authorities.

The Baltic Sea is cold and dark, and low in oxygen and salinity. This is ideal for preserving organic materials such as shipwrecks, and means they can be found looking virtually untouched by time. A shipwreck does not have to be fully intact to be of archaeological interest. Even some highly degraded wrecks can yield valuable information. Nord Stream is very aware of the impacts that the pipeline project might have on the wrecks and settlements that underscore the Baltic region's cultural heritage.

In order to ensure that all cultural heritage sites are considered appropriately in the planning and construction of the pipeline, Nord Stream established a rigorous baseline of actual seabed conditions through surveys (pages 38–40) of the proposed route, including the two 15-metre-wide installation corridors. This detailed knowledge gained through surveys will enable Nord Stream to avoid cultural heritage sites wherever possible, or when this is not feasible, to work with national authorities to find an acceptable solution. Along with its own seabed surveys, Nord Stream also carried out a comprehensive investigation of cultural heritage sites by assessing previously published information databases, evaluating prior seabed surveys and consulting closely with relevant authorities and other organisations.

Russian Sector

Portovaya Bay and the north-eastern part of the offshore section of the pipeline in Russian waters is where the Battle of Vyborg took place in 1790. Within 50 metres of the pipeline two wrecks were found. Between 50 and 250 metres from the pipeline, eight wrecks were found, and beyond that another seven.

Finnish Sector

Several wrecks were discovered in the Finnish sector, including a World War II destroyer, an aircraft and several wooden sailing vessels of varying ages. Three wrecks have been found within 50 metres of the pipeline route together with a scattering of brown objects that a palaeontologist believes to be a whale skeleton. Within the anchor corridor, another 13 wrecks were found. The pipeline route is about 7.5 kilometres from the protected area around the wreck site of the passenger ferry *Estonia*, which sank in 1994.

Swedish Sector

No wreck sites were found within the pipeline corridor. During the Mesolithic Age (8,000–4,200 BC), parts of the Södra Midsjöbanken, located south of Öland and Gotland, were land areas. There might be remains of settlements and seasonal hunting stations in the presently submerged area. The pipeline route crosses the southernmost part of Hoburgsbanken, and just between Norra and Södra Midsjöbanken in depths between 25 and 45 metres, but the chance of finding standing remnants of Stone Age settlements is slim.

Danish Sector

Seven wreck sites or possible wreck sites were identified during the 2007–2008 side scan surveys along the pipeline route in Denmark. Two wrecks are within 50 metres of the pipeline; five are in the anchoring corridor. An 8-metre-long rudder estimated to be from the 17th or 18th century was identified along the route itself. It was lifted and brought to the preservation facility of the Danish National Museum in September 2009. The archaeological significance of the wreck sites, as well as a general review of the survey data, have been assessed by specialists at the Viking Ship Museum in Roskilde.

German Sector

The pipeline route passes through the Bay of Greifswald, or Greifswalder Bodden, close to the German coast. Here, 20 ships were sunk during the Great Nordic War (1700–1721). The wrecks are historically important and represent a rich source of information on maritime technology of the period. The pipeline crosses through the line of shipwrecks, so the controlled removal of one of the smaller wrecks from the barrier is necessary.

Supporting Preservation

Nord Stream also supports research and preservation of the Baltic Sea's cutural heritage by sponsoring the research project Heritage Underwater – Maritime Archaeology Gotland (HUMA), which sheds new light on the unexplored wrecks and artefacts lying on the seabed around the island of Gotland, Sweden. Historical sources indicate that more than 2,500 ships sank along the coast of Gotland. About 100 of these wrecks have been found; only a handful of the 100 have been archaeologically excavated. A ship's cannon dating from 1566 was recovered in September 2007. Following restoration, the cannon will be exhibited in the County Museum of Gotland. <

Recovering artifacts takes a talented team, including divers, engineers and researchers.

A 16th-century cannon is recovered off the coast of Sweden.

Restoration work on a 4.3-metre-long cannon began in 2007.

The Environment

Assessing Risks and Minimising Their Impact

> Pipelines can only be built after a thorough analysis of all potential risks, and the Nord Stream project is no exception. The procedures governing risk and safety assessments have been developed over years of experience by contractors around the world, and are set out in industry codes and standards.

Suppliers Worldwide

Engineering

- **IMPaC** Engineering
- **PeterGaz** Engineering/seabed survey
- **Saipem Energy Services** Engineering/design

Environment

- **DoF** Seabed survey
- **ERM** Environmental consultancy
- **IfAÖ** Environmental consultancy
- **Marin Mätteknik** Seabed survey
- **Rambøll** Environmental impact assessment and permit applications

Logistics

- **EUPEC** Coating and logistics

Production and Pipelaying

- **EUROPIPE** Pipe production
- **OMK** Pipe production
- **Saipem** Pipeline laying

Safety

- **D.N.V.** Quality certification

Nord Stream's focus is to build and operate its pipeline safely. To achieve this, a comprehensive and far-reaching risk assessment has been undertaken. The company recognises that risks and their impacts will vary over the lifecycle of the project. Some risks will remain constant, while others arise and diminish. Changes will be monitored and acted upon by Nord Stream throughout the life of the pipeline.

Nord Stream works with experienced marine, offshore and engineering partners to ensure that high safety standards are met during design, construction and operation. The risk assessment and mitigation procedures used by Nord Stream ensure that risk exposure to third parties, people, the environment and equipment remains As Low As Reasonably Practicable (ALARP). For a risk to be considered ALARP, it must be possible to demonstrate that the effort involved in reducing the risk further would be grossly disproportionate to the benefit gained. For Nord Stream, these levels of risk are calculated in accordance with Det Norske Veritas (DNV) codes, standards and recommended practices, which are designed to safeguard life, property and the environment. DNV is a respected, independent Norway-based foundation working across a number of industrial sectors.

To ensure the safety of its staff and contractors, Nord Stream and its partners continually train them in health, safety and environmental protection measures and standards to minimise human errors on pipeline safety and reliability. The procedures governing all risk and safety assessments have been developed through international agreements. Under the control of DNV, the Nord Stream project also meets all International Maritime Organization risk-assessment criteria. Risk assessments are made to cover every aspect of every stage of the project. The work is allowed to take place only if a risk is finally assessed as acceptable. A main objective of an environmental assessment is to identify means to reduce risks and the expected impacts of a construction project. To this end, so-called mitigation measures have been integrated into the design of the project in response to impacts that are anticipated to be of significance. These measures have been established through legal requirements, best-practice industry standards, or environmental input from specialist suppliers and from stakeholders.

Impacts assessed to be of major significance after the application of the intended mitigation measures are considered unacceptable and are required to be further mitigated to a lower level of significance. For moderate impacts, the focus of specific mitigation measures has been to reduce these to an acceptable level by best practical means. Minor impacts are generally controlled through the adoption of best-practice management measures.

A Case Scenario: Ship-to-Ship Collision

During pipeline construction the most significant risk to people is from a ship collision, although HELCOM reports that ship-to-ship collisions in the Baltic Sea have decreased significantly since 2005. This reduction in collisions is attributed to the HELCOM Automatic Identification System, traffic separation schemes and ship reporting systems. In good weather the pipelay vessel moves at up to 3 kilometres per day, with survey ships and anchor-handling tugs regularly coming and going to it. A collision with another vessel, though unlikely, would endanger lives on all vessels and also raises the probability of an oil spill.

Industry practice shows that the most important collision mitigating procedure is to establish exclusion zones around construction vessels. In addition, the relevant maritime and coastguard authorities will be informed of all vessel movements which will also be broadcast on Navtext. A collision in itself would, of course, be very serious and rate as a high-risk significance and therefore as unacceptable, but the exclusion-zone procedure incorporated into the project makes this a risk of only minor significance, and thus broadly acceptable. Because the mitigation measures have greatly minimised the risk of a collision, the oil-spill risk is also greatly minimised. To further minimise oil-spill risk, every vessel will carry an oil-pollution emergency plan. As a result, this risk of an oil spill is regarded as being of minor significance.

Even though a risk may be regarded as being of minor significance and therefore broadly acceptable, it is not ignored. For example, the probability of a full pipeline rupture is very low and considered unlikely to occur during the lifetime of the pipeline. In fact, a full-bore pipeline rupture is estimated to occur once every 24,400 years. The dominant potential cause of pipeline failure is a large ship's anchor catching it and causing a rupture. This risk is significantly minimised through the construction methods and route selection. Pipes are made from high-tensile steel and coated with concrete to give them extra weight and to ensure their stability. As extremely unlikely as a rupture is, procedures are designed into the project to deal with its effects in order to prevent any harm and further risk to vessels in the area. <

Understanding Hazard and Risk
Although the terms hazard and risk are often used interchangeably in everyday speech, they have different meanings.

Hazard
An object or situation that may cause harm. For example, hazards identified for Nord Stream include trawler nets getting snagged, objects dropped from passing ships, or corrosion.

Risk
A combination of "how likely" and "how harmful" an event is considered to be. For example, risks associated with construction include structural failure of the pipeline due to poor construction, damages from anchors, or other risks associated with shipping or fishing.

During the construction of the pipeline there is a minor threat of collision with other vessels. To mitigate this risk, an exclusion zone has to be established.

Comprehensive Studies For Ecological Compatibility

> Nord Stream, with the help of independent companies, has conducted a vast number of studies of the Baltic Sea seabed to date. The studies have helped to define the pipeline's technical design and optimum route, in order to keep environmental impacts to an absolute minimum.

Pristine coastlines on the Baltic Sea are part of a complex ecosystem and are important for tourism and recreation.

Proven Safety
Offshore pipelines for natural gas have been in operation around the world for decades without any notable safety incidents, or the need for major repairs.

More than 100 million euros have been invested in environmental impact studies and environmental planning by Nord Stream to ensure that the design and routing of the pipeline through the Baltic Sea will be safe and environmentally sound. Nord Stream arranges its surveys and studies with respected organisations, all of which are internationally acknowledged as experts in their fields. Rambøll of Denmark, the Institut für Angewandte Ökologie (Institute for Applied Ecology) and Fugro OSAE of Germany, and the Danish Hydraulic Institute carried out environmental impact studies and route surveys, for example. Marin Mätteknik of Sweden, PeterGaz of Russia and DOF of Norway carried out seabed surveys. Italy-based Saipem Energy Services (formerly Snamprogetti S.p.A.) was responsible for the pipeline design, and UK-based Environmental Resources Management compiled the Espoo Report, a transboundary environmental impact assessment. Their findings are available to the public.

The research conducted for the Nord Stream Pipeline covers three broad areas. First is the physical environment, meaning the seabed, the water column and the atmosphere. For example, the geological engineering survey covered more than 40,000 kilometres over the course of four campaigns, with 6,400 kilometres of gradiometer surveying. Second is the biological environment, such as marine, plant and animal life, and nature conservation areas. Environmental field studies included analysis of over 1,000 water and soil samples collected from 96 monitoring stations as well as the observation of the behaviour of fish, marine mammals and birds from 77 monitoring stations. The third area of research is focussed on the socioeconomic environment, which includes fisheries, shipping and navigation, tourism and recreation, maritime cultural heritage, military operations and offshore industries, such as wind parks.

The project research has also thoroughly investigated the potential impacts on these three areas from planned activities, such as construction, and from unlikely unplanned events, such as oil spills, pipeline damage and accidental munitions detonations. In all cases, the assessment looks first at how likely an occurrence is; second, at how harmful it might be; and, finally, at how any effects can be mitigated, or even completely avoided, during the planning process. The results of the research are clear, showing that risks at any stage of the project are not acceptable, and also that the project is in line with international certification standards. In other words, nearly all the possible effects are insignificant, and of those that could be significant, Nord Stream is able to mitigate the risks at the planning stage.

The "significance" of a potential impact is assessed in terms of various factors. These are its source, or the nature of the originating activity that gives rise to the impact; its duration; the physical range that it covers; its intensity, considering the value, sensitivity, or both, of the environment where the impact occurs; and finally, the effects of measures taken to minimise or avoid that impact. No impact from the Nord Stream project has been categorised as "major" or "high" by the independent suppliers who carried out the assessments.

Gaining Permission to Build the Pipeline

Since Nord Stream passes through the territorial waters and/or Exclusive Economic Zones of Russia, Finland, Sweden, Denmark and Germany, permits for the project must be obtained from each of these five countries. Other countries around the Baltic Sea could also be affected by the planned activities, so the international consultations also include Poland, Lithuania, Latvia and Estonia. National legislation generally requires an environmental impact assessment (EIA) to be completed as a prerequisite for a national permit. The extensive surveys and studies initiated by Nord Stream on the Baltic Sea seabed and ecosystem form the basis of the EIAs. >

Extensive surveys of the seabed required a variety of high-tech devices, employed by scientists from around Europe.

Quick Summary of Environmental Impacts

1 Moderate
Most impacts of the project are rated "moderate" and will not have a lasting effect. Impacts are also largely limited to specific geographic areas, and they will occur almost exclusively during the construction and testing phases of the project.

2 Localised
The pipelay vessel is the focus of the construction phase, and impact from its activities will be localised and mainly temporary. The pipelay vessel moves along the route of the pipeline at a rate of up to 3 kilometres a day.

3 Risks
Nord Stream's environmental and risk assessments show that it is highly unlikely that unplanned events will occur that could have a significant impact on the Baltic Sea ecosystem. For example, a full pipeline rupture is estimated to occur once every 24,400 years. Also, procedures have been set up to deal with even the most unlikely occurrences.

4 Assessment
The ultimate route of the pipeline is an important factor for ensuring its safety and compatibility with the environment. All route options were assessed in consideration of environmental, social, socioeconomic and technical criteria.

5 Munitions
One of Nord Stream's top priorities is to avoid seabed munitions dump sites. Seabed surveys were carried out over a four-year period and covered a total of 40,000 kilometres, which is equal to the circumference of Earth. Objects uncovered in the surveys include not only munitions, but also washing machines and cars.

ment>

6 Design
The technical design of the Nord Stream Pipeline is a key factor in its safety. The design is the result of findings of extensive environmental studies as well as standards set by international agencies in charge of creating guidelines for the construction of underwater pipelines.

7 Certification
Design of the pipeline, as well as construction and operation activities, is certified by independent, internationally recognised agencies. These institutes are licensed by public authorities to safeguard human life, property and the environment.

8 Fishing
The physical presence of the pipeline on the seabed will have an impact on fishing activities in its immediate vicinity only. Extensive discussions are taking place with representatives of the fishing industry to establish appropriate mitigation measures.

The purpose of an EIA is to identify, predict and evaluate ways to mitigate or eradicate the potential impacts of a proposed project on the biophysical and social environment. Examples of mitigation measures are the avoidance of sensitive sites, the scheduling of activities to avoid the breeding periods of seabirds and spawning periods of fish, and the use of control measures to manage the suspension or re-suspension and spreading of sediments.

There are EIAs carried out for each country through which the 1,220-kilometre pipeline passes and where a permit to construct and operate the pipeline is required. By the beginning of March 2009, Nord Stream had submitted EIA reports under national application procedures. The reports are based on extensive environmental surveys. The Nord Stream Espoo Report was provided to the authorities in the five countries whose waters the pipeline route will cross and the countries which might be affected by the project. <

The Pipeline and Commercial Fishing

Fishing is a culturally important activity for many Baltic Sea states, as it is part of a community's identity and an important source of food and income. Fishermen in the Baltic Sea have raised concerns that it might not be possible to trawl over the Nord Stream Pipeline once it is operational without the risk of hooking gear on it. In cooperation with fishery associations in the Baltic Sea countries, Nord Stream strives to minimise the potential impact on fishery and trawling activities in the vicinity of the pipeline and is undertaking a thorough assessment of how trawling gear might be affected. The results of tests using scale models were analysed and made available to fishing associations, fishermen and authorities.

Possible mitigation measures include adapting trawling gear, establishing restriction zones or compensating for loss or damage caused to fishing gear. For example, the seabed along some portions of the pipeline's route is very uneven. In such cases, the pipeline will create a freespan with space underneath. In some areas bottom trawling gear could become hooked where freespans occur, affecting safe fishing activities. To avoid such a possibility, fishing methods have to be adapted. Solutions have been agreed upon on a national level with Russia, Finland, Sweden, Denmark, and Germany.

Nord Stream is also developing an information programme for all Baltic Sea fishermen to address their questions and give recommendations on fishing in the vicinity of submarine pipelines in order to ensure safe fishing activities. <

Wind farms, like this one off the coast of Sweden, are part of the regional socioeconomic environment investigated by Nord Stream.

Surveying the Seabed For the Safest Route

> More than 40,000 kilometres have been sailed by Nord Stream research vessels along the pipeline routes to conduct research, surveys and underwater investigations. The goal was to find the best possible route in terms of technical feasibility, while minimising impact on the physical, biological and socioeconomic environments.

The Nord Stream Pipeline seabed footprint will occupy less than one-thousandth of one percent of the Baltic Sea floor, and its construction will cause only local and minimal temporary disturbance of the sea floor environment. To minimise the potential of any long-term detrimental effects to the seabed, Nord Stream commissioned reputable independent experts in the fields of marine and hydrographic surveying to perform surveys and investigations to ensure the pipeline will be secure and safe to operate and will remain stable on the seabed throughout its lifetime.

Feasibility research to transit the Baltic Sea began in 1997. Since then more than 2,500 square kilometres along the route have been accurately surveyed. The initial survey covered a wide seabed corridor so that a defined pipeline route could be engineered, then, subsequently, more detailed and specific surveys were performed over a narrower corridor width.

The technology used for the surveys and the methods used were designed to allow objects, artefacts, wrecks and munitions to be located and investigated across a 2-kilometre-wide corridor centred on the designed pipeline routes. The survey of the 15-metre-wide pipeline installation route was intensified so that objects as small as 10 centimetres could be detected and investigated using state-of-the-art sub-sea sensors. Not only items on the sea floor were surveyed and investigated, but the condition and extremely variable topography and underlying structure of the sea floor itself have been accurately surveyed using various technologies and methods.

Nord Stream employed current modern technology, equipment and methods to gather the most comprehensive set of data for the Baltic Sea ever.

The remotely operated vehicles that Nord Stream uses are equipped with highly accurate positioning systems, cameras, intense underwater lighting, sonars, cable detectors and gradiometers (metal detectors). The survey vessels are equipped with highly accurate global positioning systems, underwater positioning systems, multi-beam echo sounders, sub-bottom profilers, shallow seismic recorders, single-beam echo sounders and side scan sonars.

Other vessels were equipped with sampling equipment used to establish the geotechnical properties of the sea floor (strength, condition and type of material). The technology used to survey the seabed is capable of locating and identifying objects in detail; these can be as small as a paint can, or as large as a battleship or sunken munitions. A key consideration of the surveys was to avoid munitions dumps and to identify mines along the corridor that will have to be cleared. However, many harmless objects were also located and investigated, ranging from shopping trolleys, cars, bicycles, washing machines, refrigerators and much more.

2005 Survey

Establishing the pipeline route was one of Nord Stream's principal tasks in 2005. North Transgas had previously conducted the first feasibility survey in 1998, which focussed on defining possible route alternatives through the Baltic; this survey included some routes which were not feasible, but also included major sections of the current proposed route.

The first detailed screening of Nord Stream's provisional route was carried out by PeterGaz in 2005. This was principally a geophysical reconnaissance survey to establish the 2-kilometre-wide research corridor. The results of this survey were then used to plan a more detailed survey and investigation programme along the preferred route to take account of the sea floor terrain, shallow geology and cultural heritage sites.

2006 Survey

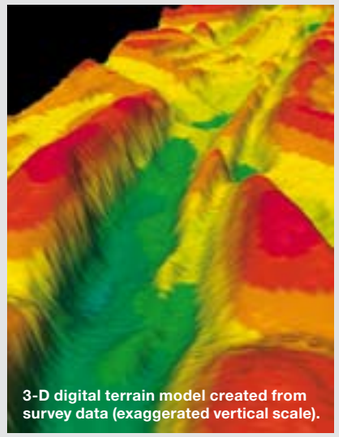
In 2006, a detailed geophysical survey was performed along the preferred route, across a 180-metre-wide corridor. The purpose of this survey was to allow the pipeline to be engineered in detail and to define the position and condition of all items on the sea floor in high resolution so that munitions and other obstructions could be identified and categorised into a full and complete database and checked against the results of the 2005 surveying. Nord Stream then deployed an ROV to visually inspect each target within 25 metres of the engineered route. Nord Stream recorded the locations of these targets and passed the data on to the relevant authorities.

2007 – 2008 Survey

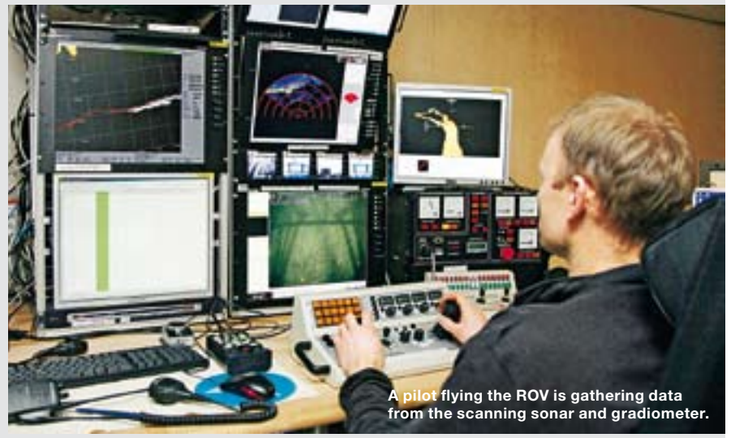
A route was selected based on the results of these earlier surveys, one which was free from obstacles that might impact on the construction and safe operation of the pipeline. Once the installation corridor was determined, Nord Stream began preparations to conduct another major geophysical survey of the corridor. This would provide even more detailed information about munitions and other >

State-of-the-Art

Multisensor high-resolution surveys of the seabed and automated data analysis make it possible to gain an accurate picture of the seabed. The instruments and techniques employed by Nord Stream experts are state-of-the-art.

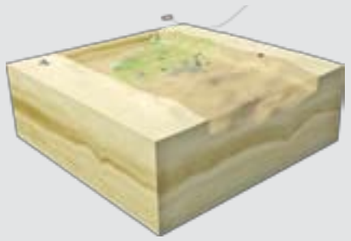


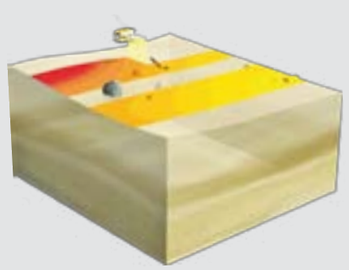
3-D digital terrain model created from survey data (exaggerated vertical scale).



A pilot flying the ROV is gathering data from the scanning sonar and gradiometer.

Surveying in Stages
After the initial survey a more detailed sweep took place, covering narrower portions of the potential route (below). The second survey checked for munitions and seabed features, and covered a corridor of about 250 metres for each of the twin pipelines. In the final stage (bottom), an area of about 50 metres was carefully examined with ROVs.





objects. Consequently, in July 2007, Nord Stream launched a final survey campaign divided into three distinct stages.

Stage One

The first stage of the final survey included the use of multi-beam echo sounders, high-resolution side-scan sonars, sub-bottom profilers and towed magnetometers. Multi-beam echo sounders and side-scan sonars provide a detailed picture of the sea floor. The sub-bottom profiler can penetrate the material at the sea floor to show a cross-section of the shallow geology that makes up the seabed. Experts can then identify sequences of mud, silt and bedrock layers. The magnetometer provides information on ferrous materials. The side-scan sonar provides an accurate acoustic picture of the seabed.

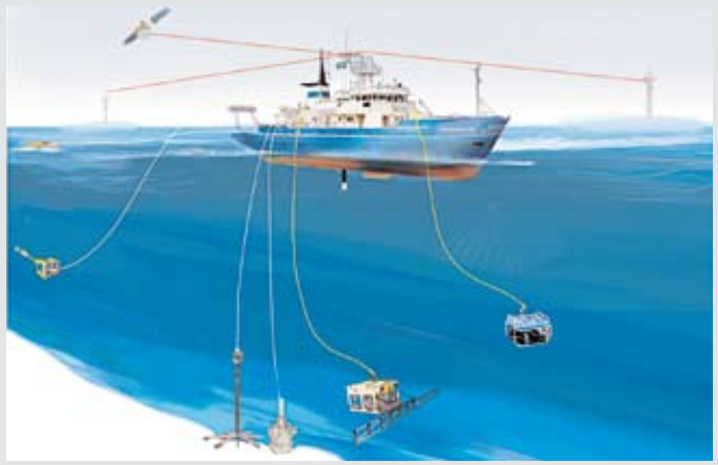
Stage Two

The second stage of this survey used a 6.5-metre-wide, 12-sensor gradiometer array mounted on an ROV to detect any ferrous metals on the seabed along the engineered pipeline route. The gradiometer array provided the position of all metallic objects within the installation corridor after two passes of the ROV. The capability of the gradiometer array enables the detection and positioning of objects that might have been covered by the soft sediments on the seabed. In addition, visual coverage of the seabed terrain was also achieved using the ROV's underwater cameras. The multi-beam echo sounder data is used to create an accurate digital terrain model of the seabed. The digital gradiometer array data is used to form a 3-D model of metallic objects found on the seabed.

Stage Three

In the third stage Nord Stream visually inspected the targets located during the previous two stages using the ROV. This enabled experts to examine and identify objects of particular interest.

Where appropriate Nord Stream has liaised with and continues to be in contact with a team of experienced navy personnel who help identify objects that might be munitions-related. The 2007 – 2008 survey produced a small number of conventional munition finds in the installation corridor. About 50 mines along the route will be cleared. In consultation with the responsible authorities, Nord Stream has established procedures for the safe handling of all objects that have to be disposed of before construction work can start. Safe and proven clearance methods, similar to those previously used to dispose of munitions in the Baltic Sea, will be used. <



The survey ship (right) can be outfitted with a variety of technologies for gathering information about the seabed.

Nord Stream examined some 1,000 water samples from the Baltic Sea to gauge the impact of construction on the ecosystem.

Studying Sediment to Reduce Environmental Impact

> The sediment of the Baltic Sea reveals a great deal about the effects of human activity on its ecosystem. In some areas, the sediment is polluted, and if stirred up, contaminants could be released. Through studies Nord Stream has determined that the sediment disturbed during pipeline construction will have only limited, short-term impacts on the environment.

Scientists have predicted how sediments will behave during pipeline construction through a computer-based process called numeric modelling. In general, the worst-case scenario is modelled so that the maximum potential impact is predicted. In reality, the effects are far less than this. By knowing how much of each compound is present in the sediment along the route of the pipeline, it is possible to calculate how much of an active compound could theoretically enter the water and if it could conceivably have a negative impact.

The characteristics of the sediment particles along the route have been determined by analysing around 1,000 samples. When the pipeline is being constructed, sediment will be agitated, causing cloudiness, or turbidity; contaminants could be released, though the pipeline and construction technology has been selected to mitigate disturbance of sediment and disruption to the environment. The pipeline itself will not contribute to the contaminants in the sediment because it is coated with a layer of concrete, and only limited amounts will be released through the construction. Around 1 million tonnes of nitrogen and 35,000 tonnes of phosphorus enter the Baltic Sea each year. By contrast, during offshore construction an estimated 436 tonnes of nitrogen and 66 tonnes of phosphorus will be released through the pipeline construction. This is equivalent to 0.04 percent and 0.2 percent, respectively, and therefore extra growth of algae will not result. <

Measuring Pollutants
When sediment is stirred up, some heavy metals and organic pollutants will detach from sand and enter the water. But not all of them will have a biological effect. About half of metal compounds and one-tenth of organic pollutants will become free from sediment particles.

The Environment >

Choosing the Final Route To Help Preserve Nature

> The planning of the Nord Stream Pipeline was carried out with respect for the Baltic Sea environment. More than 100 million euros have been invested in environmental impact studies and planning to that ensure the design and the routing of the pipeline through the Baltic Sea will minimise any environmental impact.

Close cooperation with fishermen ensures minimisation of the impact of the pipeline on the local fishing industry.

Detailed surveys and research of potential environmental and socioeconomic impacts are part of a process that started in 1998. The surveys began across a 2-kilometre-wide corridor and were progressively narrowed to a corridor only 15 metres wide. In April 2007, Nord Stream commissioned additional studies to investigate areas where the pipeline route could be further optimised to minimise environmental impact. This decision followed analysis of the statements received from the authorities and the general public during international consultations with the Baltic Sea countries, in accordance with the Espoo Convention, which sets out obligations for all nine Baltic Sea states to assess the transboundary environmental impact of projects at an early stage of planning. The Espoo Convention also binds signatory nations to notify and consult one another on major projects likely to have a significant environmental impact across boundaries.

The general aim when planning the pipeline route has been to achieve the shortest route, while respecting or avoiding certain areas, such as topographically disadvantageous regions, environmentally sensitive areas, military exclusion zones, munitions dump sites and major navigation traffic lanes. Over a decade, Nord Stream has conducted many studies, and on the basis of results from these studies, the Nord Stream Pipeline will connect the Russian Baltic Sea coast near Vyborg in the Leningrad Region with the German Baltic Sea coast near Greifswald. The route crosses the Exclusive Economic Zones of Russia, Finland, Sweden, Denmark and Germany, as well as the territorial waters of Russia, Denmark and Germany.

Three Primary Criteria Ensure Optimal Route

Selection of the optimal route was the result of in-depth research, and alternatives were measured against three main criteria, with safety being a constant, overarching concern. The first criterion is environmental, and focussed on avoiding protected or sensitive designated areas, or areas with ecologically sensitive species of animal or plant life. Also taken into account was minimising any seabed work that might disrupt its natural composition. The field studies included analysis of water and soil samples as well as observation of the behaviour of fish, marine mammals and birds. The second criterion looks at socioeconomic factors to minimise any contact with shipping, fishing, dredging, the military, and tourism – and with sea installations, such as existing cables or wind turbines. Avoiding known areas with discarded conventional and chemical munitions was also a top priority in the route selection process.

The third criterion covered technical considerations, such as minimising construction time, and therefore any disruptions, as well as reducing the technical complexity of the operation to keep the use of resources as low as possible. These criteria were applied to five main routing choices. Following the route from Russia to Germany, these choices were between:

- North or south of Gogland, in Russian waters
- North or south of Kalbådagrund, in Finnish waters
- East or west of Gotland and around Hoburgs Bank, in Swedish waters
- Around Bornholm, in Danish and German waters
- Bringing the pipeline ashore at Lübeck, Rostock or Greifswald in Germany

North or South of Gogland

The northern route around the island of Gogland has been proposed because it is furthest from any protected areas and proposed mineral extraction sites; requires no crossing of existing cables nor of shipping lanes and is shorter by 13 kilometres.

North or South of Kalbådagrund

The southern choice has slight advantages, being technically less complex in requiring less seabed intervention work, and it will have less effect on marine organisms.

East or West of Gotland and Around Hoburgs Bank

Around the island of Gotland the eastern route was chosen because it avoids major shipping routes, is furthest from military and munitions sites and is shorter. Around Hoburgs Bank a mid-route is preferred between the EU Natura 2000 area (page 50) and a major shipping lane because there will be no impact on protected sites. An alternative which is further south-east is closer to munitions dump sites as well as cod and sprat spawning grounds and would also require crossing a major shipping lane for a longer distance as well as undersea cables.

Around Bornholm

A southern route was chosen around the island of Bornholm because it avoids shipping traffic; it also requires less seabed intervention work and only three cable crossings. The Nord Stream route was developed and investigated following a request in 2008 by the Danish authorities to evaluate an alternative route south of Bornholm; it is the result of a careful assessment of several factors, among others, safety in relation to ship traffic and environmental impact.

Lübeck, Rostock or Greifswald in Germany

Greifswald was chosen over Lübeck and Rostock as the optimal landfall area, as it means the pipeline passes through fewer Natura 2000 sites and also requires much less seabed intervention work. This route is shorter, requiring less construction time, and thus minimising the duration and amount of disruption caused. With the lower risk of disturbing shipping, there is also much less risk of shipping causing any pipeline damage. Additionally, there is less risk to marine mammals and organisms here than elsewhere. This coastal stretch also has far less tourism and residential use. <

Protected areas on the island of Gogland will be avoided by the route of the pipeline.

Options
Alternative routes were carefully considered before arriving at the proposed optimal route.

The Best Route
The 1,220-kilometre route proposed from Vyborg on Russia's coast to Greifswald on Germany's coast minimises environmental impact and commercial disruption.

Socioeconomic factors such as tourism helped determine the route of the pipeline.

Developing a Plan for The Disposal of Munitions

> The Baltic Sea was a dumping ground for unused munitions after World War I and II, and up until the 1960s. While marine scientists already know a lot about the whereabouts of munitions, Nord Stream's seabed survey results add awareness about their condition, improving the chances for informed handling in the future.

After WWII, Allied countries took munitions confiscated from Germany and dumped them in the Baltic Sea, which at the time was considered the best means of disposal. This situation was later compounded by the disposal of chemical warfare munitions by some Baltic Sea states, including former East Germany in the early 1960s.

Although much is known about where mines were laid and where chemical and conventional munitions, such as grenades, aerial bombs and torpedoes, were dumped, some information is still held in secret by national authorities.

Avoiding Dump Sites

These munitions, contrary to popular belief, do not carpet the entire seabed. Instead, they are concentrated in relatively small areas, in particular in the Gulf of Finland (mines) and munitions dump sites off the Danish island of Bornholm.

Nord Stream is aware of the multitude of munitions that have been disposed of in the Baltic Sea, and it takes the potential threat that they pose to the environment very seriously. As the operator of a future offshore pipeline through the Baltic Sea, Nord Stream gives highest priority to the identification, evaluation and, where required, clearance of munitions.

Its overall aim is to ensure safe installation and operation of the pipelines while minimising risks and impacts on the environment. The proposed Nord Stream Pipeline route, including the 15-metre-wide installation corridor, has been planned to avoid known dump sites.

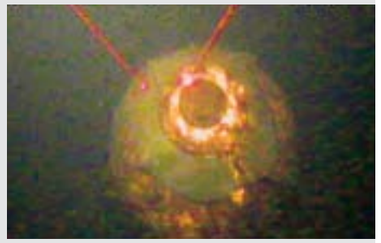
Sharing Survey Findings

Detailed surveys have been conducted since 2005 to verify that the installation corridor provides safe alignment for the installation and operation of the pipeline system, and a specific chemical munitions screening survey was conducted in 2008. Only small traces of three chemical warfare agents were found, and therefore the probability of disturbing chemical munitions along the route is considered very low.

Nord Stream's extensive surveys augment the vast knowledge gained by authorities and institutions over time, mostly in connection with fishing and from the navies of NATO members. HELCOM has also produced several reports on the locations and dangers of dumped munitions. To ensure that its survey techniques follow and generally exceed recommended best practice, Nord Stream organised seminars with experts from the national authorities, inviting them to evaluate the compiled data in order to discuss the best means of munitions clearance. >

A high-tech ROV is deployed from a research vessel to screen for munitions.

Collected data is analysed and mapped. This information was used to select a secure route.



A mine is located through a detailed side scan sonar survey.

A gradiometer array with 12 magnetometers mounted on an ROV was used to detect ferrous objects in the installation corridor. The gradiometer was specially developed for Nord Stream.

The Environment >

Journalists visit the Pollux research vessel to learn more about munitions surveys.

A Coordinated Process

In total, 50 conventional munitions that must be cleared have been identified in the 50-metre-wide security corridor along the Nord Stream Pipeline route.

Clearing munitions is nothing new. For example, it is a task that the Baltic navies undertake regularly. Over the last decade, the collective navies of the Baltic States have developed safe and effective methods for the clearance of mines. According to the German navy, between 1996 and 2008, more than 500 mines were cleared from the sea floor.

The majority were cleared during the Baltic Sweep and Operation Open Spirit in which all Baltic Sea nations took part. Operation Open Spirit continues to this day. It focusses on Estonian waters in 2009 and involves 16 warships from 10 countries. Smaller mine clearance operations include Squadex (since 2001), commissioned by and consisting of the Baltic countries, MCOPLAT (since 1997) and Cleanex. Munitions clearance, performed by other parties apart from Nord Stream, do not always include mitigation measures. For example, no safety measures concerning marine mammals or fish are applied during Operation Open Spirit.

Nord Stream works closely with the relevant authorities on mine clearance activities and in strict accordance with the applicable legislation. Nord Stream's detailed clearance procedures are risk-assessed. Its mitigation measures are implemented on the basis of the prior experience of the mine-sweeping units of the various Baltic navy fleets. <

Certain areas of the Baltic Sea were used as munitions dump sites during the 20th century.

Leaving Nothing to Chance With Maritime Precautions

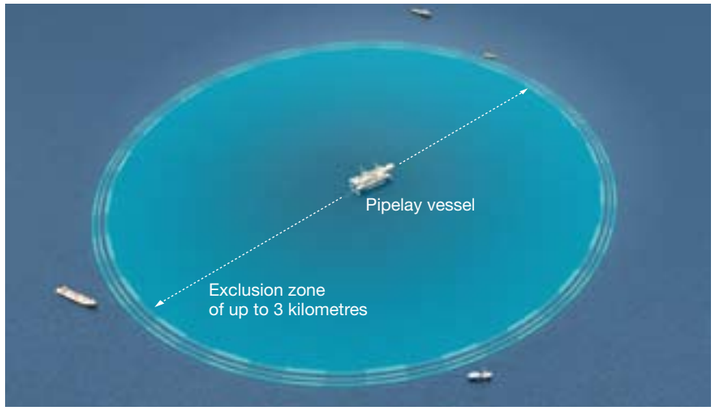
> The Baltic Sea is bustling with ship traffic for trade, leisure or military purposes. In fact, at any given moment, as many as 2,000 vessels are on the sea, with 80 percent shipping cargo. In contrast, the number of Nord Stream vessels en route during the construction phase of the pipeline is minimal and short-lived.

Nord Stream pipelay vessels not only will be restricted to a few specific locations, but also will be operating for just a short period of time during construction. The slow-moving pipelay vessels also operate on a fixed route, travelling a maximum of just 3 kilometres a day. Construction vessels, such as pipe carriers and supply vessels going to and from the pipelay vessel, present no more risk than other vessels already in the area.

There are also two to six anchor-handling vessels travelling with the pipelay vessel. These operate at a maximum distance of 2 kilometres from the pipelay vessel, creating an exclusion zone of up to 3 kilometres for additional safety. This localised zone accompanies the pipelay vessel on its route to profoundly reduce the risk of potential collisions with other vessels on the busy Baltic Sea. All of these activities are coordinated with maritime and coastguard authorities, and Nord Stream will also issue a "Notice to Mariners" so that routes for all other shipping can be planned in advance.

The exclusion zone procedure incorporated into the project makes the event of a maritime collision improbable. If a collision should occur, there are procedures in place to deal with this in order to minimise the risk of an oil spill. <

Exclusion Zone for Safety



The pipeline is lowered to the seabed from a pipelay vessel. Up to 3 kilometres can be built each day.

Besides pipe laying there are other activities associated with the project that will have some impact on ship traffic, including seabed surveys and monitoring and mine clearance. Restrictions on navigation for all vessels will be in place during munitions clearance.

An exclusion zone of up to 2 kilometres will be established around the munitions clearance site. The restrictions will be in place for a few hours during each clearance, and all other vessels should be able to avoid the exclusion zone without significantly changing their planned routes.

The threatened harbour seal is found in the Baltic Sea only in southern Sweden and the Danish Straits.

Protecting Baltic Sea Wildlife Is at the Forefront of Surveys

> The Baltic Sea is a major route for migratory birds and home to fish and several protected species of marine mammals. These creatures might be temporarily affected by disturbances caused during pipeline construction, but Nord Stream has planned measures to mitigate these impacts.

Nord Stream recognises the importance of wildlife, and of wildlife sanctuaries. Therefore, in line with environmental legislation, it has carried out comprehensive investigations into the potential impact that the pipeline might have on mammals, birds, fish and environmentally sensitive areas. The findings of these studies point out that once the pipeline is in place and the seabed restored, habitats will completely recover.

Some bird species might be disturbed during seabed intervention works, but they will retun to the area when things settle.

Four species of sea mammal live in the Baltic Sea, including the harbour porpoise, the Baltic grey seal, the ringed seal and the harbour seal. The HELCOM environmental authority designates all of them as threatened, and they are also protected by various national and international agreements. Most of the possible effects on these marine mammals are likely to be temporary and localised during the construction phase of the pipeline. It is possible that during construction the fish upon which they feed might temporarily move away from the area, but these mammals, along with seabirds, hunt and navigate over wide areas and will return once the disturbance has settled.

The Baltic Sea is also home to around 100 species of fish – 70 are saltwater species and 30 to 40 are brackish or freshwater species. The most economically important species are cod, herring and sprat, which make up about 90 to 95 percent of the total weight of the commercial catch. Other species of commercial significance are salmon, flounder and trout. Fish are sensitive to noise and are expected to move away from sources of noise during construction. Underwater noise could have an effect on spawning fish, particularly the herring in shallow waters, but construction is not scheduled to take place during the important spawning periods. A main source of noise will result from mine clearance. However, Nord Stream will use various methods prior to mine clearance to ensure mammals stay clear of the area, such as introducing successively louder noises in the water before the detonation. Devices called seal "scarers" could be used to encourage seals to move away from the area before these noisy activities start. Similarly, devices called "pingers" are used by fishermen to scare dolphins away from fishing nets. These too could be used before piling activities begin to ensure that harbour porpoises are not in the immediate vicinity. Evidence shows that mammals and fish will return to the location when things settle.

Environmental Effects Will Be Temporary and Localised

During the construction of the pipeline, parts of the seabed will be dredged, rocks and gravel will be deposited in designated areas and the pipe itself will be laid. The boats that supply the main pipelay vessel will drop and raise anchors. All these activities will temporarily cause noise and also disturb the seabed, stirring up sediment, causing cloudiness. Years of pollution from agricultural run-off is evident in the sediment. If stirred up, relatively few contaminants could be released into the water; however, any increase would rapidly revert back to normal levels and would ultimately have no significant impact on sea mammals and fish, according to studies.

Stirring up of sediment during seabed construction work will temporarily reduce the feeding area of staging terns and gulls during autumn migration, and also of birds in other areas that feed on fish and need to be able to see in the water. The work will potentially affect feeding areas of ducks that live on organisms on the seabed. However, because these effects will occur for only a relatively short period of time and in restricted locations, they are not thought to have a long-term impact on these bird species.

Construction activities are likely to disturb migrating water birds, which will move further away from an area to avoid the disturbance. However, several measures are being taken to minimise this. For example, no offshore construction will take place during the herring spawning season, which is also the peak breeding period for staging seaducks, grebes and mergansers. As the route of the pipeline is close to existing shipping lanes, birds will be accustomed to a certain amount of disturbance.

Nord Stream has also planned construction of the pipeline so that no ice-breaking will take place around critical breeding periods for seals, which give birth to their pups on ice. A significant proportion of the Baltic Sea freezes during the winter, and ice is important for breeding seals: grey seals and ringed seals give birth on the ice, between February and March, and construction is scheduled around this.

For most of its length, the route of the pipeline is located within or very close to existing shipping lanes in which ice-breaking is a routine activity, and seals tend not to inhabit the areas where ice-breaking occurs regularly. For these reasons, the construction of the pipeline is unlikely to have a major effect on seal populations during their critical breeding times. If in the worst-case scenario any breeding seals are disturbed, the duration and level of disturbances make it unlikely that this would have a long-term effect on the population. <

The lifecycles of many species of birds are linked closely with the Baltic Sea ecosystem.

Over 100 species of fish live in the Baltic Sea, and fisheries are an important economic factor.

ment>

Construction work will not take place during times when it could disturb the patterns of bird movements in the region.

Natural areas attract tourism. Coastal economies of the Baltic Sea will not be impacted by the pipeline.

Natura 2000 Sites and the Pipeline

Natura 2000 is a network of nature protection areas across Europe. In total, there are more than 26,000 Natura 2000 areas across the EU covering some 850,000 square kilometres – more than one-fifth of the area of the EU. The sites are not strictly nature reserves, and therefore human activities are not prohibited. These areas have been identified as important wildlife habitats and should be managed to ensure that biodiversity is maintained. Although Nord Stream will cause temporary disruption to a small number of these sites, once the pipeline is in place the sites will rapidly recover, with no loss to biodiversity.

After discussion with relevant national authorities, the Nord Stream impact assessment team looked in detail at 27 Natura 2000 sites lying within 20 kilometres of the pipeline route. Of these, the pipeline crosses six sites. It lies within 5 kilometres of four other sites, and is within 20 kilometres of 17 sites. The types of habitat in each of these areas vary and include sandbanks, mudflats, shallow inlets, and bays and reefs. Environmental impact assessments have determined that effects on these environments due to pipeline construction will be temporary and contained.

Potential Impact of Nord Stream on the Sites

In shallow waters, the pipelines will be laid in a single trench that needs to be dredged and backfilled in the German landfall area. This will not be done during spawning seasons. The different sediments excavated during dredging will be stored at a different place and tested for organic contaminants. If the contaminants exceed a certain level, they will be disposed of onshore. The healthy sediment will be returned as closely as possible to its original location. When it is returned, close attention will be paid to the natural relief of the seabed so that it follows its original dips, slopes and humps. Additionally, within the bay of Greifswald at Greifswalder Bodden, a “cofferdam” will create a corridor to contain sediment disturbance. The dam will be removed once construction is complete. Creating the dam will require dredging and backfilling of the seabed, a process that will cause temporary loss of habitats in a limited area. Several measures have been put in place to minimise the impacts of these activities. For example, no construction work will take place from January through mid-May, which is the spawning season of herring and when many migrating birds stop in the area.

During dredging work, sediment becomes suspended, causing cloudiness in the water. Computer modelling has shown that only a few locations where dredging will take place will experience cloudiness greater than might be experienced during stormy weather conditions. Any contaminants left in suspension will settle quickly once construction ceases. Seagrass areas will be reseeded and monitored to promote recovery.

Mammals and seabirds hunt and navigate over wide areas and will return once the localised disturbance has settled down again. The noise created by construction activities such as installing the cofferdam and dredging will temporarily disturb fish, birds and mammals. The pipeline route is close to normal shipping lanes, so most animals will have become accustomed to a certain level of noise from human activities. Fish, mammals and birds will probably move away during construction, but experience shows that they will return. In the long term there is expected to be no harm done to these important Natura 2000 sites. <

Pristine coastal areas are a valuable natural resource for millions of people who live on the Baltic Sea or visit its nature reserves.

The Environment

Managing the Environment At Every Stage of the Project

> Nord Stream is committed, through national and international agreements, to carrying out all work safely and in an environmentally responsible manner. The Nord Stream Pipeline will be operated with the same concern for the ecosystem which guided its construction. The company intends it to be the safest pipeline possible.

Checking soil samples in a laboratory during the surveying phase.

Nord Stream is planning to establish a Health, Safety and Environmental Management System (HSEMS) that provides the framework for the standards, planning and procedures for every stage of the project. This ensures that everyone engaged in all the five major stages of the project, including construction, pipeline testing (pre-commissioning), putting the pipeline into service (commissioning), full operation and taking the pipeline out of service (decommissioning) has a consistent approach towards the environment, social matters, standards and requirements. The HSEMS is in line with recognised international standards. Prior to each stage an Environmental and Social Management Plan (ESMP) will be created. Each ESMP will include all of Nord Stream's commitments from the national environmental impact assessments and all obligations defined in the construction permits from each country.

Contractors and Subcontractors Follow the Same Rules

In such a huge project a lot of work is carried out by contractors and subcontractors. A legitimate concern, therefore, is whether these organisations act under the same standards, and the answer is "yes". For each major contract, there will be a Nord Stream-appointed company representative who is responsible for checking the contractor's HSE performance and for verifying that all environmental impact assessment (EIA) commitments and permit conditions are met. (EIA objectives are listed on page 53) Ultimately, Nord Stream is fully responsible for all the work carried out by its subcontractors, including pipe-laying reinstatement; pollution prevention; chemical, waste and vessel management; emergency notification; and response; and precommissioning.

Commercial activity on the Baltic coast, including harbor traffic, will not be disturbed when the pipeline is operating.

The Environmental Monitoring Programme

The Environmental Monitoring Programme (EMP) is a direct response to the EIAs, specifically to those areas requiring mitigating measures and monitoring, and to the particular reporting requirements on national levels. It relates to all five major stages of the project. The EMP will not only ensure that Nord Stream carries out its work as it said it would, but also must ensure that any impact of the work has occurred as planned.

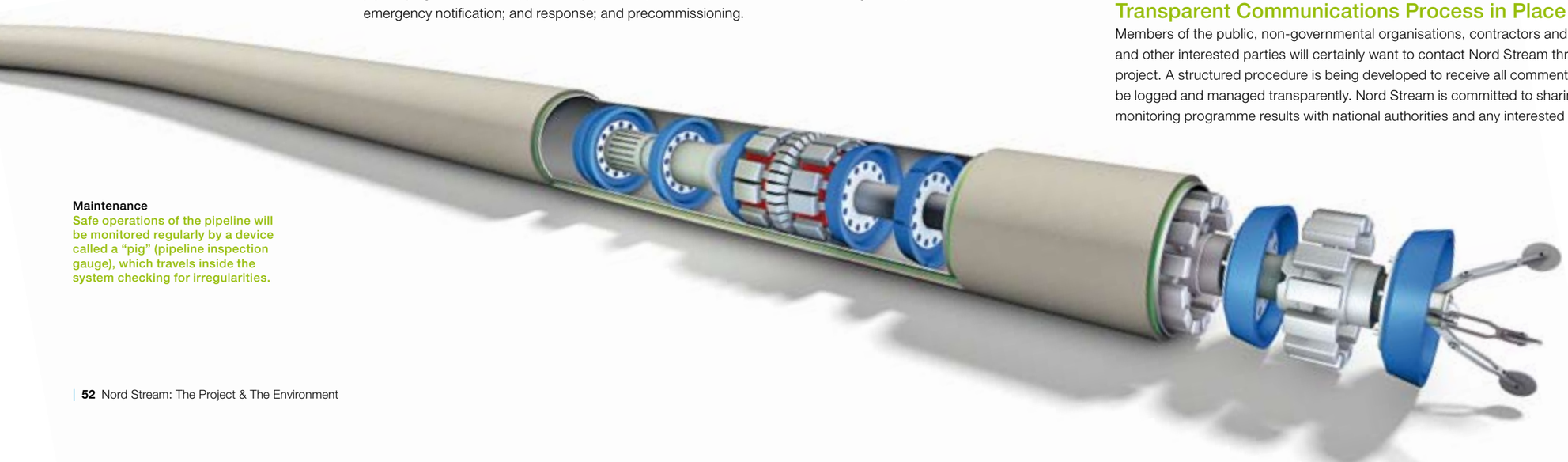
The EMP will verify the effectiveness of mitigation measures that had been anticipated during the EIAs and identify at an early stage anything that might not be going as planned. If the latter occurs, then the EMP must organise remedial action. In relation to any activity that has an environmental effect, the programme must monitor the subsequent rehabilitation of the environment afterward. An overall obligation of the EMP is to make sure that Nord Stream meets all the requirements it agreed to when signing all the national permits granted by each Baltic Sea country involved in the project.

Transparent Communications Process in Place

Members of the public, non-governmental organisations, contractors and their workers, and other interested parties will certainly want to contact Nord Stream throughout the project. A structured procedure is being developed to receive all comments, which will be logged and managed transparently. Nord Stream is committed to sharing its data and monitoring programme results with national authorities and any interested parties. <

EIA Objectives

1. To verify the broad findings of the modelling used to predict the impacts
2. To ensure that the construction and operation of the pipeline are not causing known effects to a greater significance than predicted, or an impact not previously identified in the environmental impact assessment
3. To verify the effectiveness of mitigation measures
4. To identify at an early stage unforeseen adverse effects, and to take remedial action
5. To monitor the rehabilitation of the environment after the construction
6. To collaborate with existing data collection programmes to avoid duplication, providing the opportunity to add value
7. To meet the requirements of the national permits



Maintenance
Safe operations of the pipeline will be monitored regularly by a device called a "pig" (pipeline inspection gauge), which travels inside the system checking for irregularities.

Feel Free to Contact Nord Stream for Further Information

Throughout all stages of the pipeline project, Nord Stream is committed to transparently sharing its knowledge with interested parties. Additional background information on the project can be found on the Nord Stream website: **www.nord-stream.com**

This includes an information library offering white papers, studies and reports on the project, as well as a section dedicated to the environmental impact assessments and the permitting process. Additionally, it is possible to download or order the publications listed below:

Ten Answers
For a brief overview of the project, order or download the Ten Answers brochure from the Nord Stream website. The brochure is available in 10 languages.

Newsletters
For up-to-date information on the Nord Stream project, subscribe to our FACTS print newsletter available in five languages, or e-FACTS, our online English newsletter.

Nord Stream Espoo Report: NTS
The Non-Technical Summary of the Nord Stream Environment Impact Assessment Documentation for Consultation under the Espoo Convention is available in 10 languages.

For specific questions, send your queries to:
contact@nord-stream.com

To subscribe to our newsletter, visit:
www.nord-stream.com/newsletter

Our telephone number is:
+41 41 766 91 91

To contact us by post, write to:
Nord Stream AG
Grafenauweg 2
P.O. Box
CH-6304 Zug

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