

Over 200,000 pipe segments need to be delivered along the 1,230-kilometre route of the Nord Stream 2 Pipeline. The entire supply chain was optimised to meet the project requirements. Nord Stream 2 is implementing a customised, green site logistics solution.

The project follows the award-winning "green logistics" concept of its predecessor, Nord Stream, which is based on using low-emissions means of transport to move pipes across the shortest possible distances from pipe mills to the coating plants, to the storage yards and to the pipeline vessels. More than 2,400 kilometres' worth of steel pipes will be concrete weight coated in two of four logistics hubs in Baltic Sea harbours close to the pipeline route and distributed across the four ports for storage. Coated pipes will then be fed from these four hubs to the moving

construction site, aboard the pipelay vessel, along the different sections of the planned pipeline route.

To ensure that the construction phase of the project runs smoothly on such a large scale, pipe logistics must also be highly efficient and precisely timed. Wasco and Blue Water Shipping, the logistics partners, work closely with Nord Stream 2 and local suppliers in the harbours to prepare the pipes and deliver them to the right place, at the right time, at each stage of the project – right up until the last pipes have been shipped to the pipeline vessel and welded together.

6 PIPELAY VESSEL

Aboard the pipelay vessel, the pipes are welded together and the pipeline string is gradually lowered to the seabed at a rate of about three kilometres per day.

1 TRANSPORT

Pipes are transported from the pipe mills in Germany and Russia to the concrete weight coating plants by rail. 100 percent of all pipes are transported by ship or train.

2 CONCRETE WEIGHT COATING

Pipes are concrete weight coated to double their weight to add stability and to protect the pipes from external damage. In total, 4.8 million tonnes of materials will come through the coating plants – half in pipes, half in weighting materials.

3 STORAGE

Concrete weight coated pipes are stored right outside the coating plants in the harbours of Kotka in Finland and Mukran in Germany, which are located close to the starting and ending points of the planned pipelines. In total, 200,000 pipes needed for the two pipelines will be rolled, quality tested, coated and eventually stored.

5 PIPE DELIVERY TO PIPELAY VESSEL

4 STORAGE YARDS

Timeline

Nord Stream 2 follows a challenging project timeline. To support its ambitious construction schedule, logistics operations need to be executed in just about three years' time. Over half of the 24-tonne, concrete coated pipes will need to be readily available at the logistics sites when construction begins.

Right place, right time

Capacities available in Baltic Sea ports are limited – that's why Nord Stream 2 and Wasco ultimately selected four different harbours to serve as logistics hubs for the project. This choice has resulted in a demanding logistics

schedule as well, to ensure that 200,000 pipes are moved, stored and made available at the right places in time for when they are needed.

A head start

Preparations for this, such as pipe deliveries to the concrete coating plants, already began in 2016. Concrete weight coating operations started at all of the plants in 2017, with pipe transshipment to the other storage and logistics sites following later in the year. The project's logistics operations will only come to an end, however, once construction work on the pipeline is completed.

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Logistics: All Hands On Deck

Implementing the Nord Stream 2 logistics concept is a large-scale undertaking that employs hundreds of workers and local suppliers in the Baltic Sea region for the duration of the project.

Wasco Coatings Germany GmbH is responsible for concrete weight coating, transporting and storing 200,000 large-diameter pipes on behalf of Nord Stream 2. The pipes are delivered by rail to the harbours of Kotka, Finland, and Mukran, Germany, where Wasco refurbished existing coating plants from the Nord Stream project. The company has hired up to 400 people at each site – almost entirely from the local communities – to operate the plants and run pipe handling and storage.

Wasco also relies on the services of various local companies to support its activities in the ports, thereby providing indirect employment to over 100 additional workers. It even sources many of its material supplies

directly from the Baltic Sea region: For instance, the sand, cement and iron ore for the concrete coating are shipped in from Norway, Finland, Germany and Sweden to be mixed at the coating plants.

Once concrete weight coated, half of the pipes will be transshipped to storage yards in Hanko's Koverhar, Finland, and Karlshamn, Sweden, to be stored until the construction of the pipeline begins. The Danish company Blue Water Shipping manages this transshipping process for Wasco and runs the two interim storage facilities, which each employ up to 100 workers for the duration of operations there.



Four Hubs by the Baltic Sea

With limited capacities available in Baltic Sea ports, Wasco and Nord Stream 2 chose four harbours along the pipeline route to serve as logistics hubs for the project.

Kotka, Finland
Kotka is near the pipeline's starting point in Russia and receives pipes from the Russian pipe mills. With a water depth of 14 metres, an existing coating plant, quays of sufficient length and an area of 520,000 square metres, the Port of HaminaKotka offers excellent resources for the project. Wasco will concrete weight coat 101,800 pipes for Nord Stream 2 in its Kotka plant and use existing infrastructure for storage and shipping, providing additional business and jobs for the region.

Koverhar in Hanko, Finland
Hanko is a port city in southwestern Finland, near the pipeline route in the western part of the Finnish section. Koverhar, the city's old industrial port, will be used to store 61,300 concrete weight coated (CWC) pipes. Most of them will be shipped from Kotka, but 200 kilometres of CWC pipes will arrive directly from Russia by rail. Nord Stream 2 serves as a ramp-up project for Koverhar, enabling the Port of Hanko to develop its infrastructure and storage area more rapidly.

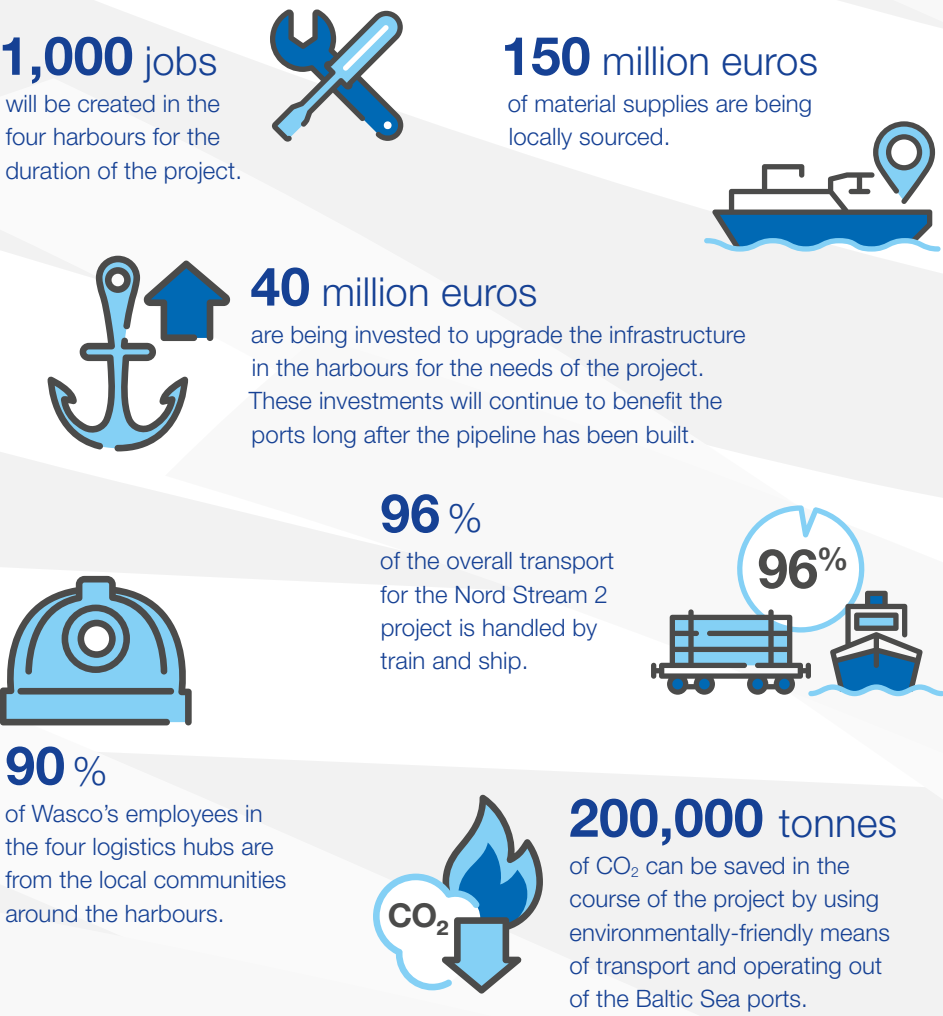
Karlshamn, Sweden
The Port of Karlshamn is one of the leading industrial ports in southeastern Sweden, ideally located to supply the pipelay barges along the southern part of the route. It's accessible all year round, 24 hours a day, and has water depths of up to 10.5 metres. Nord Stream 2 is a major project for the port of Karlshamn, supporting its continued expansion and upgrades to its infrastructure: 52,600 coated pipes will be stored there.

Mukran, Germany
The port of Mukran on Rügen receives pipes out of German production. Close to the pipeline's German landfall, it spans 200 hectares and is directly linked to the railway network. Wasco will use the extensive resources available there to coat, store and transship 83,500 pipes. Helped by the additional infrastructure upgrades made for Nord Stream 2, the port continues to develop into a major regional logistics hub, enriching the local economic and industrial fabric.

Nord Stream 2 Coating and Logistics



Facts and Figures



Wasco and Nord Stream 2: A Close Cooperation

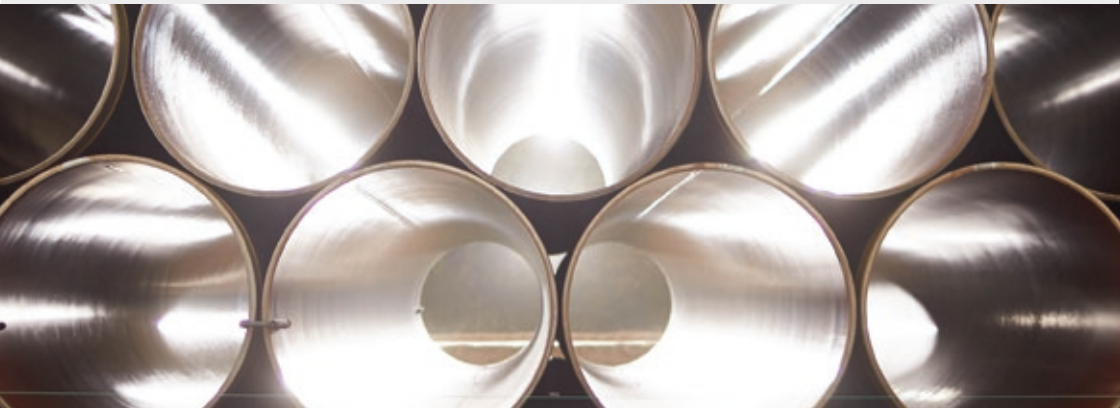
The contract awarded to Wasco by Nord Stream 2 covers the concrete weight coating of the pipes as well as logistics from storage to transshipping.

Wasco Coatings Germany GmbH belongs to the Malaysian-based group Wasco Energy, which provides solutions to oil and gas players all over the world. The company brings with it years of experience in offshore pipeline projects, and has been able to refurbish and use the coating plants that were built in Mukran, Germany and Kotka, Finland during the predecessor project, Nord Stream. Today it even employs some of the same local workers, who have experience from the first pipeline project.

The Nord Stream 2 project is the largest that Wasco has ever taken on, so the pipe coating specialist works closely with Nord Stream 2's experts to ensure that work progresses on schedule and to the required high quality standards.

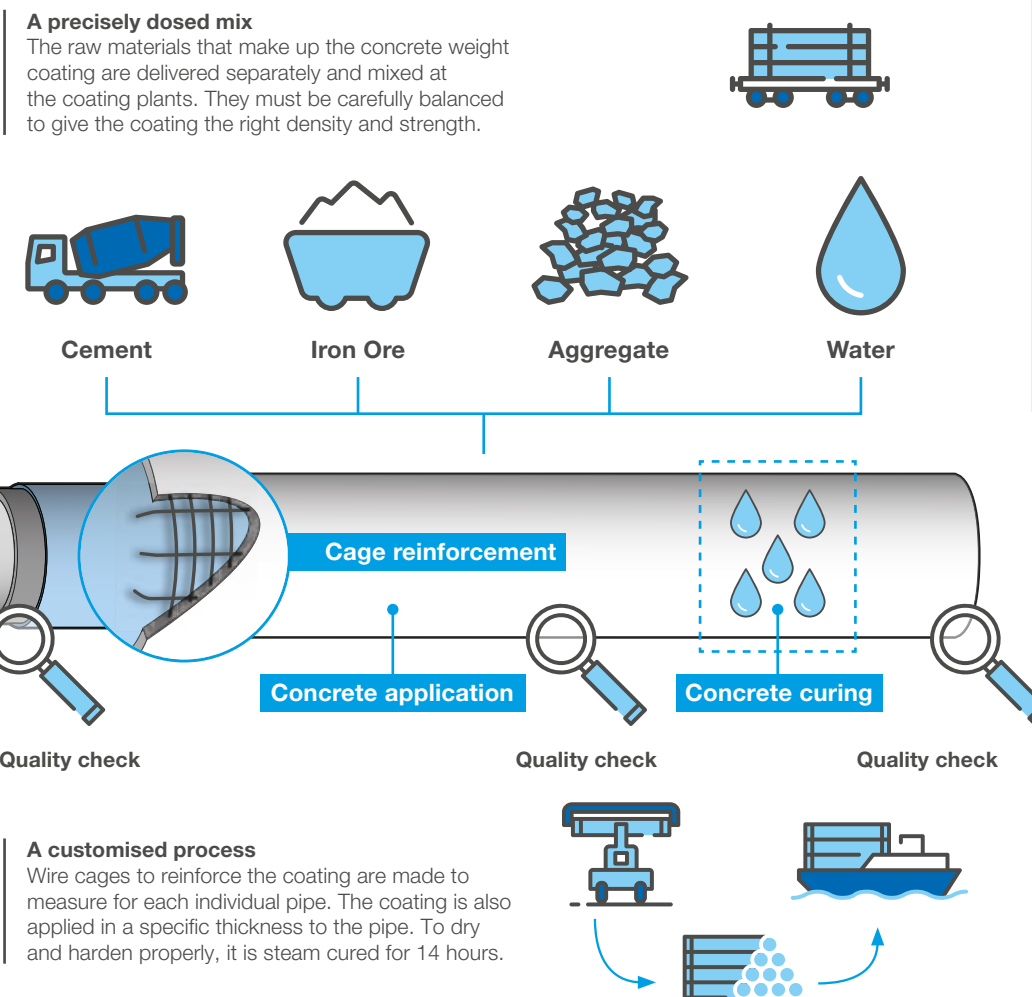
The concrete weight coating, for instance, must meet strict specifications with regard to hardness, density and outside diameter: Wasco's quality teams work hand in hand with Nord Stream 2 inspectors at the plants to check that those criteria are consistently fulfilled.

The two companies also join forces to guarantee that all of the coating and logistics sites in the project offer the safest possible work environment for local employees. Wasco has implemented a standardised health and safety system at each of the facilities. Risk assessments and safety reviews also take place routinely and new protective measures are added as needed in coordination with Nord Stream 2.



How Does Concrete Weight Coating Work?

The steel pipes for the pipeline are coated with a special concrete mix that doubles their weight from 12 to 24 tonnes to protect them from external damage and increase their stability on the seabed.



The Local Impact – Two Assessments

Nord Stream 2 is a signifi cant boost for the local economies around the ports. Terhi Lindholm, Development Director for the city of Kotka, and Frank Kracht, Mayor of Sassnitz, explain why.

"If you count everything – Wasco's operations, the heightened activity in the port and the subcontractors that are involved – the effect of the Nord Stream 2 project is very significant. Approximately 500 people are directly involved. That's a big number for a city of just 55,000 inhabitants.

Developing the port and the industry around the port is a very strategic priority for the city of Kotka. It's one of the key facets of our economic development. For example, it's great that Wasco has been able to use infrastructure that was developed here during the first Nord Stream project. In addition to that, we are gaining experience and knowledge, and that increases the competence base we can sell for future projects. We're always looking for new investments and having discussions with potential investors, and of course references like these – of big projects that have been successful here – are very valuable to us."

– Terhi Lindholm, City of Kotka, Development Director

– Frank Kracht, Mayor of Sassnitz

Green, Efficient Logistics

The environmentally-friendly logistics used in the Nord Stream 2 project build on the award-winning "green logistics" concept of its predecessor.

To minimise the project's environmental impact, transport routes are kept as short as possible on each leg of the pipes' journey to the seabed, which starts aboard trains from the German and Russian pipe mills to the concrete weight coating plants in the harbours of Mukran, in northern Germany, and Kotka, close to the Finnish-Russian border.

Pipes are stored in the immediate vicinity after being concrete coated and can then be transported onward directly by ship. Other, more carbon-intensive means of transportation like lorries are kept to a strict minimum and represent less than five percent of all transport in the project.

Material supplies for Nord Stream 2 are also sourced locally wherever possible: For example, the cement for the coating is provided Kotka and Mukran by the local suppliers in Finland and Germany respectively. Finally, the four logistics hubs of Mukran, Karlshamn, Hanko's Koverhar and Kotka were strategically chosen along different sections of the pipeline route, making it possible to ship pipes to the pipelay vessels from the closest port at every point during construction.

About Nord Stream 2

Nord Stream 2 is a planned pipeline through the Baltic Sea, which will transport natural gas over 1,200 km from the world's largest gas reserves in Russia via the most efficient route to consumers in Europe. Nord Stream 2 will largely follow the route and design of the successful Nord Stream Pipeline. With Europe's domestic gas production projected to halve in the next 20 years, Nord Stream 2's twin pipeline system will help Europe to meet its future gas import needs. It has the capacity to transport 55 billion cubic metres of gas per year, enough to supply 26 million European households. This secure supply of natural gas, with its low emissions, will also contribute to Europe's objective to have a more climate-friendly energy mix with gas substituting for coal in power generation and providing back-up for intermittent renewable sources of energy such as wind and solar power.