
Section 11

Conclusions and comparison of alternatives

11 Conclusions and comparison of alternatives

This chapter summarizes the significance of the environmental impacts of the Nord Stream project. It presents the assessment results for planned activities, as described in Chapter 8, and for unplanned events, as described in Chapter 9. Please refer to Chapter 3 for a project description and Chapter 6 for a presentation of the alternatives.

11.1 Environmental impacts of the Nord Stream project in Finland

The Nord Stream pipelines extend through the Baltic Sea. The impact assessment has concentrated on the Finnish project area, which primarily comprise of the Finnish EEZ in both the Gulf of Finland and the Northern Baltic proper. Some of the assessed impacts also extend to the territorial waters. The impacts in transboundary context have not been assessed in this report. For transboundary impacts, please refer to the Nord Stream Espoo Report.

11.1.1 Environmental impact assessment

The possible impacts that may be attributed to the construction and operation phase of the Nord Stream project have been assessed. Based on analyses of the technical design and construction methods, the possible impacts of the environment have been identified (see Chapter 7). The impacts have been compared with the present environmental baseline conditions (see Chapter 5) to assess the significance of the individual impacts (see Chapter 8 and 9).

The impacts are categorized according to:

- the physical and chemical environment (see Chapter 8.1)
- the biotic environment (see Chapter 8.2)
- protected areas (see Chapter 8.3)
- the socioeconomic environment (see Chapter 8.4).

Unless specifically mentioned, the impact assessments combine the impacts during construction and operation.

The decommissioning of the pipeline has not been assessed here because it will take place some 50 years in the future and will be carried out according to the prevailing regulatory and industry standards at that time. As such, it is impossible to assess the specific impacts of decommissioning activities. See more in Chapter 10 Environmental Considerations of Decommissioning.

11.1.2 Overall significance of impacts

The assessed impacts have been characterized as follows:

- Quality of impact (negative/positive/both)
- Type of impact (direct/indirect/both)
- Reversibility of impact (reversible/partly reversible/irreversible)
- Importance of specific impact (low/moderate/high)
- Extent of impact (local/regional/national)
- Duration of impact (short/medium/long/permanent).

An overall assessment of the significance of the impacts on the environment has been divided into the following assessment categories depending on if it is regarded as negative (-) or positive (+):

Significance category	Grade
No impact	0
Minor impact	- or +
Moderate impact	-- or ++
Significant impact	--- or +++

OVERALL IMPACT SIGNIFICANCE

No impact: The impact target is not affected or changed by the project.

Minor: Impact with low importance, magnitude, and/or short duration. The impact is typically reversible.

Moderate: Impact with medium importance. The impact is local/regional and the duration is medium or long-termed. The impact is typically partly reversible or irreversible.

Significant impact: Impact with high importance and is significant for the impact target. The extent is typically regional/national and duration long-termed or permanent. The impact is irreversible.

11.2 Summary of impacts on the physical and chemical environment

The impacts on physical and chemical environment have been assessed in chapter 8.1.

11.2.1 Alternative 0

No impacts will occur in alternative 0.

11.2.2 Alternative 1, C14

Construction of the pipelines through the Finnish EEZ requires seabed intervention works in some areas to protect and support the pipelines. The seabed intervention works in the Finnish EEZ comprise of rock placement. In addition, munitions found in the vicinity of the pipeline corridor needs to be cleared by blasting.

The pipeline has together with rock berms been estimated to occupy a relatively small permanent footprint (1.1 km²; which comprise 0.013% of the seabed area deeper than 40m water depth in the Finnish EEZ. The weight of the pipeline does not cause significant pressure effect on the seabed. The impact of the pipelines on the water movements have been assessed and the effect remains local and do not extend beyond 200 m from the pipelines.

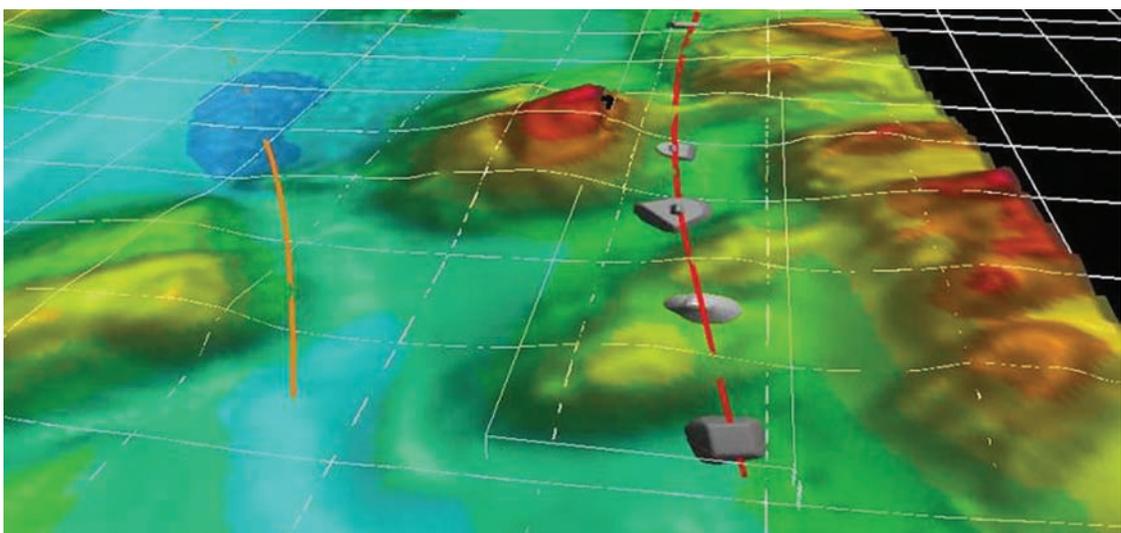


Figure 11.1. Section of Alternative 1 (C14) with both pipelines and rock berms occupying the seabed in the Kalbådagrund area.

The construction works will cause resuspension of seabed sediments. Model calculations of the spreading and sedimentation of mobilized sediments indicate that the sediment spreading from construction activities will have only local and short-termed impacts, usually for less than a day, on the water quality in the area of construction. Contaminants in sediments are expected not to cause negative effects in the water. For example, Natura 2000 areas will not be affected by the activities.

The direct impacts from the munitions clearance will be noise (pressure waves) and sediment spreading. However, the impacts are considered minor e.g. because the munitions are located solely in the outer sea, far from sensitive objects and are not expected to cause significant changes in the present status of the water environment. The clearance of munitions in the vicinity of the pipeline is assessed also to cause positive impacts, because it will reduce potential future threat. Munitions surveys have been carried out in a 50 m wide corridor to ensure that no munitions objects are present where the pipeline will be laid. The width of the corridor takes into account the accuracy with which the pipeline will be laid.

Noise emissions to the air will not reach inhabited areas due to the distance from the Finnish coast. The noise levels are comparable to those caused by ship traffic in the Finnish project area in general. It is also not expected that disturbance caused by noise and physical activities will reach any important seal haul-out or bird area. Pressure waves will be caused due to munitions clearance, but impacts will however be short-termed and minor. Permanent and low noise is created by the gas flowing during the operation phase. However, it is assessed that impacts are minor and close to negligible.

Emissions of air pollutants from the construction works contribute to the greenhouse effect. The air emissions, however, have been assessed to contribute only to small part of the background emissions.

11.2.3 Alternative 2, C16

The route of Alternative 2 is to ca 90% identical to Alternative 1 (C14). Routes differ at Kalbådagrund with a route deviation of about 40 km (see table 8.1). The difference of the length of the alternatives is within a few kilometres. The numbers of identified munitions are almost similar in all alternatives resulting in no remarkable difference between them. Thus there are only small differences concerning impact on seabed and water quality. With respect to noise impacts and air emissions no significant difference is expected between the alternatives.

11.2.4 Sub-alternative 1a/2a

Sub-alternative 1a/2a (South of Gogland in Finnish section) has no significant difference from alternatives 1 and 2 without sub-alternatives. Alternative 1a/2a is causing no significant difference to the airborne or underwater noise impacts as compared to impacts of alternative 1 or 2.

11.3 Summary of impacts on the biotic environment

The impacts on biotic environment have been assessed in chapter 8.2.

11.3.1 Alternative 0

The project does not cause any impacts in alternative 0.

11.3.2 Alternative 1, C14

Impacts on the biotic environment will result mainly from noise emission and visual disturbance, occupation of the seabed, sediment spreading from installation activities (munitions clearance, rock placement and anchor-handling). Most of the impacts are closely associated with the assessed impacts on water quality described above.

Direct impact on e.g. benthic vegetation and recognized bird areas of special importance has been avoided as a result of route-optimization.

Installation activities will lead to some impacts on the benthic fauna. In the construction phase, there is some small-scale disturbance and loss of benthos mainly due to direct disturbance of the seabed and re-sedimentation of re-suspended sediments. Depending on the nature of the benthic communities and their regeneration potential, the impact is mostly reversible. It is assumed that rapid re-colonization will take place over a period of months to a few years depending on the type of community. Long-lived species whose regeneration lasts significantly longer were not observed along the route in the Finnish section.

Most construction activities will be carried out in deeper waters (> 60 m), where the oxygen conditions at the seabed presently are, and have often been poor. The field survey carried out by Finnish Institute of Marine Research (FIMR) showed that benthic fauna in many of these deeper water areas were absent or characterized by only few species. Impacts on marine fauna in these areas are assessed to be very limited. In the operating phase only minor impact will occur due to additional rock placement (if required).

Impact on the planktonic environment mainly due to resuspension of sediments and therefore increasing turbidity (which may result in reduced phytoplankton activity) and due to release of nutrients (which may result in increasing phytoplankton activity) and contaminants will be small scale and minor.

No significant impact caused by the Nord Stream project is expected on the fish and fish stocks in the Finnish EEZ. The main impact during construction will be avoidance reaction of the areas where suspended sediment plumes will arise due to the installation activities. The impact is reversible, local and short termed. Impacts during construction do not reach herring

spawning sites and impacts stay in areas where pelagic sprat eggs won't get affected significantly. No impacts on fish and fish stocks during operation are foreseen.

The largest potential impact on marine mammals is caused by munitions clearance by blasting. However, the impact is considered to be of minor significance, because mitigation measures will be implemented to assure that blasting will be only performed if no individuals are inside the safety zone. The radius of the exclusion zone will be 2 km. The radius should be adjusted according to e.g. type of munitions and sound propagation conditions based on the most recent knowledge and the precautionary principle. Impact due to other activities during construction as well as operation leading to resuspension of sediments and release of contaminants from sediments is assessed as minor. The construction of the pipelines will be conducted at a great distance from all known seal haul-outs.

The impact on birds in the construction phase will be mainly the driving out of birds from an area with a radius of up to 2 km from the lay barge. However, it will last only from hours to days at the same location. In the same area small increase of turbidity due to sediment resuspension may reduce feeding success of diving birds. However, as mentioned above, the area will be mostly avoided due to visual disturbance and noise emissions and the fact that most of the pipeline is located in areas too deep for feeding birds (> 60 m). Thus significance of the impact on birds due to the construction activities is assessed as minor, also if, taking the somewhat greater importance of the shallower Kalbådagrund area into account. However, in the Kalbådagrund area too, impact on birds is only short-term. There will be no direct impact neither on International Bird Areas (IBAs) nor Finnish Important Bird Areas (FINIBAs) located within the Finnish territorial borders. In the operating phase no impact on birds will result from maintenance activities.

Indirect impacts as a result of impact on other compartments of the ecosystem, such as fish fauna or birds as a result of impairment of the benthos are not foreseeable for the Finnish EEZ.

11.3.3 Alternative 2, C16

The impacts of alternative 2 are very similar compared to alternative 1 in the Finnish EEZ. The route of Alternative 2 (C16) is approx. 90 % identical to alternative 1 (C14), but differs at Kalbådagrund with a route deviation of about 40 km (see Chapter 8.1). Differences in impacts are caused mainly by the route deviation (the route alternative 1 and 2 are at max located 5 km from each other) of resulting in smaller differences in the necessary scope of intervention work and differences in the water depth.

The main difference with respect to birds is the section at the Kalbådagrund area. Alternative 2 will be laid in deeper water and the distance to known breeding colonies is somewhat longer. Due to deeper sea area and longer distance to breeding colonies, the impact of alternative 2 on birds may be slightly lower compared to alternative 1. The other parameters for comparing the alternatives (intervention work, sediments, etc.) differ only slightly and are of minor relevance with respect to birds.

It can be stated that the overall impact on birds with alternative 2 may be slightly lower than the overall impact of alternative 1 mainly due to the differences in water depth in the Kalbådgrund area. However, the impacts in both alternative 1 and 2 are assessed to be minor.

11.3.4 Sub-alternative 1a/2a

Sub-alternative 1a/2a (South of Gogland in Finnish section) has no significant difference from alternatives 1 and 2 without sub-alternatives.

11.4 Summary of impacts on protected areas

The impacts on protected areas have been assessed in chapter 8.3.

11.4.1 Alternative 0

The project does not cause any impacts in alternative 0.

11.4.2 Alternative 1

Impacts on the protected areas have been assessed primarily with respect to impacts on water quality and noise disturbance from construction works.

Because of the large distance between the project in the Finnish EEZ and Natura 2000 and other protected areas (>9 km), no significant physical impacts, e.g., sedimentation, noise impacts on biota, are expected.

For birds migrating outside of protected areas, the construction area is in general too deep for feeding (>60 m) and noise and visual disturbance will in general keep them away. No impacts on mammals are expected either, assuming no mammals will be present inside the exclusion zone during munitions clearance as the result of effective mitigation measures.

No conservation values of any protected area will be significantly affected.

11.4.3 Alternative 2

Alternative 2 is on the Kalbådgrund section in deeper waters and the distance to protected areas and known breeding areas is somewhat longer, therefore the impacts are may be

slightly lower than in Alternative 1. However, it must be stated that no or minor impacts are expected from both alternative 1 and 2.

On other sections the impacts are the same as for Alternative 1.

11.4.4 Sub-alternative 1a/2a

Sub-alternative 1a/2a has no significant difference in impacts from Alternative 1 and 2.

11.5 Summary of impacts on economic life and human conditions

The impacts on economic and human conditions environment have been assessed in chapter 8.4.

11.5.1 Alternative 0

The project does not cause any impact on economic life or human conditions.

11.5.2 Alternative 1, C14

The construction of the Nord Stream pipelines will need the establishment of a safety zone around the construction fleet. The duration of the construction in the Finnish EEZ will last several months in several different intervals. Because the construction area is located in the open sea and not near narrow fairways, the general ship traffic will not be required to sail into risky areas, e.g., shallow areas. Therefore, it is expected that minor impacts will occur on the ship traffic in the project area.

Fishery is assessed to be affected at the construction site due to spreading of sediment. This will likely result in short-term avoidance reactions by fish species in the area. In the operation phase bottom trawling activities are restricted due to the presence of freespan in seabed areas with uneven seabed and Intervention Works that support the pipelines. The actual impact is minor because most of the fishing activities in the Finnish Gulf are mid-water trawling where the trawls (nets) remain well above the seabed. In the light of the permanent character of the pipeline and the uncertainty of status of fishery during the lifespan of the pipeline, it is assessed that the overall impacts on fishery will be moderate.

The impacts on military areas are assessed to be local because the pipeline route will run through only one firing danger area. The Defence Force will be informed of the moving con-

struction area as it will shortly move through only one and close to a few military exercise areas. The pipeline will not interfere with the military exercises during operation phase. The impacts will therefore be minor.

The pipeline will not hinder the possibility to use or maintain existing cables. The pipelines are at safe distance from planned wind park areas and existing raw material extraction areas and do not therefore interfere with them. There is no known existing or planned exploitation of natural resources on the continental shelf within the alignment of the planned pipeline route except for one recent claim for mineral extraction area (see Chapter 5.6.7.5).

The pipeline route passes close to a number of cultural heritage sites of which one wreck site in the exact path of Alternative 1. The wreck has been assessed by the Finnish National Board of Antiquities to be dispensable. Cultural heritage sites within the anchoring corridor will be avoided and protection zones established during anchor-handling operations.

The spreading of contaminants during construction works will cause only small and local increase of contaminant concentrations in water. The contaminant intake poses no health hazard to humans.

The project might have moderate impacts on peoples well-being, mostly in the form of how they sense their common security. The concern derives apparently from the projects history. Mitigation of possible impacts may be to increase open and transparent communication with different parties.

No impacts on tourism or recreation is expected, mostly due to the fact that interference of the pipelaying with surrounding traffic is assessed to be minor and therefore do not hamper either the surrounding passenger or recreational vessel traffic.

11.5.3 Alternative 2, C16

Regarding ship traffic Alternative 2 has locally a higher impact on ship traffic in the Kalbådagrund area since the shipping lane is crossed almost perpendicular. However, Alternative 2 is impacting ship traffic a shorter period of time and therefore the impact has been assessed to be slightly less than Alternative 1.

The route Alternative 2 (C16) crosses more of the known trawling sites than Alternative 1, but the overall difference between the two alternatives concerning the fishery is of no significance.

The impacts on the military areas for Alternative 2 are the same as those for route Alternative 1. The majority of the two alternatives follow the same route, and the military areas are not in the vicinity of the area where Alternative 2 diverges from Alternative 1

The assessed impact on existing/planned infrastructure differs only regarding two additional cable crossings on Alternative 2. The cable crossing agreement procedure will ensure that there is no negative impact on cables.

Compared to Alternative 1 there is one additional small wreck part situated close to the Alternative 2. The wreck has been assessed by the Finnish National Board of Antiquities to be dispensable.

There is no significant difference between Alternative 1 and 2 with respect to human health or tourism.

11.5.4 Sub-alternative 1a/2a

There is only one less cable crossing with both of the pipelines on Sub-alternative route 1a/2a compared with route Alternatives 1 and 2. The Russian military cable UCCBF does not cross the planned Sub-alternative 1a/2a route.

At present the potential presence of cultural heritage sites along this sub-alternative has not been assessed by the FNBA. However the impacts on cultural heritage sites can be expected to be identical to those of route Alternative 1 (C14). The area will be surveyed before construction.

There are no other notable differences in impacts between sub-alternative 1/2a compared to route of Alternatives 1 and 2.

11.6 Summary of environmental consideration of decommissioning

A separate study of options for decommissioning will be carried out in due time before decommissioning commences. The study will include a review of the technical and economic feasibility of the various options, together with an analysis of the environmental impacts. At the time of decommissioning, experience from other projects, experience with respect to the environmental impact of the Nord Stream pipelines, the existing legal framework and industry practice will determine which decommissioning strategy should be implemented.

It is expected that the authority requirements and best practice at that time will imply a minor or even insignificant environmental impact from decommissioning. The limited experiences available at present suggest that a decommissioning strategy implying abandonment of

a pipeline is the most likely scenario with no overall significance of impact. Removal of the pipeline after the end of its lifetime will most likely cause minor environmental impacts comparable to the impacts from installation of the pipeline.

11.7 Summary of assessment of risks from unplanned events

The impacts from unplanned events have been assessed in chapter 9.

The results of analyses of the risks to people and the environment during the construction and operation of the Nord Stream pipelines show that no risks are considered unacceptable when compared to the risk acceptance criteria. During pipeline construction, the risk to third parties is limited to the crews and passengers of passing vessels that could collide with construction vessels. These risks are well below the criterion for risks to members of the public. The most significant risks to the environment during construction arise from the potential for oil spills as a result of tanker collisions with the construction vessels. The exclusion zones enforced around the construction vessels will minimise the occurrence of this scenario.

Munitions clearance activities have been assessed in chapter 8. The remote possibility of finding unexpected munitions during the actual pipeline installation activities will be dealt with by detailed safety and munitions clearance procedures.

During surveys several barrels, drums etc. objects were identified. Most of these findings are assessed not to be a hazard to the environment, because the objects have been open already for a longer period of time. Objects that needs additional investigations and are assessed as risk objects, will if possible be avoided during construction by re-routing of the pipeline. See chapter 13 for mitigation measures and chapter 14 for further planning.

During pipeline operation the risk to third parties arises as a result of the potential for pipeline failure, gas release and ignition, impacting people on vessels in the impacted area. This risk has been shown to be very low. The dominant cause of pipeline failure is dragging anchors (or sinking ships for some sections). However, the pipeline will be marked on the relevant nautical charts to ensure shipping in the vicinity of the pipeline is aware of its location.

When fishing above freespans there exists a remote risk that the gear gets hooked under the free span due to malfunctioning equipment or navigation errors. The probability of this unplanned event happening is as low as reasonably practicable (ALARP). To further minimise the risk the pipeline and its positions including information on free spans will be integrated into charts that will be made available to the fishermen through appropriate distribution channels. Furthermore in order to guarantee that fishermen will know how to fish in areas near the pipelines, Nord Stream will ensure there will be professional training of all Baltic fishermen and information material available for all areas around the pipeline.

11.8 Summarized comparison of environmental impacts of route alternatives

The environmental impacts of the different route alternatives are summarised in the Table 11.1 below for both construction and operation phase. No major differences between the route alternatives in terms of environmental impacts have been identified throughout the EIA.

Table 11.1. Comparison of impacts from route alternatives in the Finnish EEZ. Values in the table represent the highest score assessed to impact target in question. The evaluation of Sub-alternative 1a/2a also includes impacts of Alternative 1 and Alternative 2.

Scale of the impact : +++ = Significant positive impact, ++ = Moderate positive impact, + = Minor positive impact, 0 = No impacts, - = Minor negative impact, -- = Moderate negative impact, --- = Significant negative impact. (X) = Mitigation already done, (*) = Additional mitigation required

SCALE		---	--	-	0	+	++	+++
		0-Alternative: non-implemen- tation	Alternative 1 (C14)	Alternative 2 (C16)	Sub-alternative 1a/2a			
Physical environment	Seabed	0	-(X)	-(X)	-(X)			
	Water quality	0	-(X)	-(X)	-(X)			
	Air quality	0	0	0	0			
	Noise	0	0	0	0			
	Visual aspects	0	0	0	0			
Biotic environment	Benthic environment	0	-(X)	-(X)	-(X)			
	Planktonic environment	0	0	0	0			
	Fish and fish stocks	0	-(X)	-(X)	-(X)			
	Marine mammals	0	-(X)(*)	-(X)(*)	-(X)(*)			
	Seabirds	0	-(X)	-(X)	-(X)			
Protected areas	Protected areas	0	0	0	0			

SCALE		----	--	-	0	+	++	+++
		0-Alternative: non-implemen- tation	Alternative 1 (C14)	Alternative 2 (C16)	Sub-alternative 1a/2a			
Socio-economic environment	Ship traffic	0	0	0	0			
	Fishery	0	-- (*)	-- (*)	-- (*)			
	Military areas	0	0	0	0			
	Infrastruktuuri	0	0	0	0			
	Natural resources	0	0	0	0			
	Cultural heritage	0	0 (X)	0 (X)	0 (X)			
	Human health	0	0	0	0			
	Tourism and recreation	0	0	0	0			
	Social impacts	0	-- (*)	--(*)	--(*)			

11.8.1 Comparison of route Alternatives 1 and 2

Even if all alternatives have been assessed to have minor environmental impacts, it may be stated that small difference, slightly better or worse remain between them in the impact category. It is evident that due to technical differences there are some differences between the alternatives with respect to their impacts. In this EIA small differences have been identified with respect to impacts on:

- seabed,
- benthic fauna,
- marine mammals,
- seabirds,
- protected areas,
- ship traffic,
- fishery and
- infrastructure.

The differences are regarded as "slightly different" which means that they do not affect the overall significance of the impact, summarized in chapter 11.8.

Table 11.2. Conclusions of differences between Alternative 1 and 2. + = Slightly better, - = Slightly worse, 0 = No difference

Impact target	Alt 1	Alt 2	Reasoning
Physical and Chemical Environment			
Seabed	+	-	Alt 2 has a larger footprint
Water quality	0	0	
Air quality	0	0	
Impacts on noise	0	0	
Biotic Environment			
Benthic fauna	-	+	Alt 1 deteriorates more benthic fauna communities
Planktonic Environment	0	0	
Fish and fish stocks	0	0	
Marine mammals	-	+	Alt 2 is further away from seal haul-outs
Seabirds	-	+	Alt 2 is in deeper areas
Protected areas	-	+	Alt 2 is partly further away and in deeper areas
Economic and human conditions			
Ship traffic	-	+	Alt 2 is less trafficked
Fishery	+	-	Alt 1 is less within known trawling areas
Military areas	0	0	
Existing infrastructure and utilization of natural resources	+	-	One cable crosses route Alt 2 three times, whereas it crosses Alt 1 only once
Cultural heritage	0	0	
Human health	0	0	
Tourism and recreation	0	0	
Citizens well-being	0	0	

There is no significant difference in the impacts of sub-alternatives 1a/2a compared to alternatives 1 and 2.

11.9 Transboundary impacts

This report comprises an assessment of impacts solely arising and affecting targets in Finland. Transboundary impacts from Finland to Estonia, from Estonia to Finland, from Finland to Russia and from Russia to Finland, from Finland to Sweden and from Sweden to Finland are addressed in the Nord Stream Espoo Report.

11.10 An account on the viability of the project and the alternatives

The national EIA decree states that the environmental impact assessment report shall contain, on sufficient scale, an account of the viability of the project and the alternatives.

Based on the background of the project, project description, present situation of the project area and the impact assessment presented in this EIA report, the feasibility of the project alternatives for implementation has been assessed.

The route design has been refined in order to mitigate possible negative environmental impact. The pre-cautionary measures taken during the EIA process and the parallel technical design have been:

- avoidance of environmentally sensitive areas
- minimization of intervention works
- to only use rock placement and to avoid peak removal (dredging or blasting of hard outcrops), trenching and dredging.

During the last phase of this EIA Nord Stream has announced that the intention is to use a dynamically positioned laybarge for the first 300 km of both pipelines (south-eastern and north-western). This involves 177 km of the route within the Finnish EEZ. The remaining 198 km for the first pipeline and the total 375 km of the second pipeline are still planned to be laid with the anchored laybarge. The impact assessment is however made according to the worst-case-scenario, which means that assessment is based on the assumption that all pipe-laying would be done with anchored laybarge.

Based on the information of the project area and the performed impact assessment it is predicted, that all project alternatives (alternatives 1 and 2, sub-alternative 1a/2a) are acceptable from the environmental perspective and viable for construction. On the basis of the environmental impact assessment and technical design the developer is regarding alternative 2 (C16) as the preferred route.

The justification of the 0-alternative is presented in the Espoo report in a wider context than the Finnish EEZ only.

Furthermore, the upcoming planned mitigation measures and the proposed monitoring program will verify the acceptability of the EIA.