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Ref.: Position of Estonia on the transboundary environmental impact assessment of the proposed Nord Stream gas pipeline

In accordance with the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) the Estonian Ministry of the Environment has received the environmental impact assessment (EIA) reports of the Nord Stream gas pipeline for statements and comments, and for evaluation of the need for possible consultations.

Estonia has received the Nord Stream Espoo EIA report and the national EIA reports of Finland, Sweden, Denmark and Germany (some of them only in an electronic version). The Estonian Ministry of the Environment has not received the national EIA report Russia. Russia is on the position that they are not obliged to submit their national report. Moreover, in their opinion all the important information has already been provided in the Espoo EIA report. However, in Estonia's view the Espoo EIA does not include all of the important information.

Estonia would like to stress that all of the information concerning the project and the impacts must be provided to all countries concerned. This is especially important in the current situation where all important impacts have not been considered in the Espoo EIA report (for example, information about the munitions in Russia's area).

Estonia has organised a public display and hearing of the EIA documentation. The Espoo EIA report and the national EIA reports (except the Russian national EIA report) were available at the Ministry of the Environment and on Internet. The public hearing was held on 29. April 2009 in Tallinn. The public had an opportunity to comment and make proposals on the materials until 10 May 2009. The comments were received from e.g. the University of Tartu, AS Eesti Gaas, National Heritage Board, Estonian Ministry of Foreign Affairs, Estonian Fund for Nature, Estonian Ministry of the Interior, Environmental Board, Ministry of Social Affairs, Estonian Ministry of Defence and Health Protection Inspectorate.

The Estonian position on the Nord Stream EIA is primarily based on the expert group report[1] prepared by an ad hoc working group. This advisory working group was established by the Estonian Ministry of the Environment and consisted of scientists and experts from many different institutes. The Ministry also took into consideration opinions received from the public. The letters received from the public[2] and the ad hoc working group report are enclosed.

Based on the comments received, the evaluation given by the ad hoc working group and reflecting its own views, the Estonian Ministry of the Environment would like to state the following:

1. General comments on the completeness of the report:

The most relevant major gaps of information within the EIA include (but are not limited to):

- missing information on the Russian Exclusive Economic Zone (EEZ), in particular, on all the data concerning munitions and chemicals that may be released from the seabed in the course of the seabed intervention works;

- missing studies on the impact of dioxins that potentially would be released from the seabed, in particular, from the Finnish and Russian EEZ-s, especially in the context of the pollution of the Gulf of Finland through the Kymi River from 1940 to 1984;

- missing studies on all the hazardous substances on the HELCOM list in the sediments deeper than 6 cm;

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1 The analysis of the Nord Stream EIA report by the expert group

2 17 letters sent by the public

- inadequate evaluation of the long-term remobilization of nutrients and hazardous substances, both as a consequence of the changes in the properties of near-bottom currents owing to continuous changes in the seabed due to the pipeline construction and maintenance, and owing to specific features of hydrodynamic activity in the vicinity of the pipelines that will form new barriers;

- incomplete and inaccurate information on the conventional and chemical munitions in the EEZ-s of all parties of origin and mercury containers in the EEZ-s of Sweden and Denmark;

- controversial information on certain aspects of the project presented in the Espoo EIA report and at the public hearings, in particular, missing environmental impact assessment of the higher pressure pipeline after abandoning the platform near Gotland, the number and location of conventional munitions to be exploded and the missing of an assessment of environmental impact and risks of using the dynamic lay barge in the Gulf of Finland;

- unclear and controversial risk analyses, including the consequences of the break-up of the pipeline, due to the incomplete or obsolete data on seabed geology, tectonics and seismicity, and owing to interaction with ship traffic;

- incomplete evaluation of cumulative risks in the context of potential crossing of the pipelines in question with the planned Baltic connector pipeline;

- incomplete evaluation of cumulative risks in the context of the EU habitat and bird directives, including, but not limited to cumulative effects of nutrient and toxic matter released to the food chain, impact of toxic contamination of fish to piscivorous birds and mammals, potential future Natura 2000 areas within the 20 km impact corridor.

Pending on the EU EIA directive, a key document of the legal basis of implementing the Espoo Convention in the EU, and the EU guidelines linked to the Espoo EIA, the latter should include the aspects that are currently missing:
- assessment of the environmental impact of alternatives, including the overland alternatives;
- assessment of the environmental impact of all subcontracted activities, including the production and preparation of materials, such as parts of the pipeline.

Pending on the Espoo Convention, the EIA should include a comprehensive and adequate analysis of transboundary impacts on Estonia. Such analysis is currently almost missing. The topic is presented only as a list of statements in the Espoo EIA and is not supported by the relevant data, analysis or arguments used for reaching the conclusions. The situation where the statements are not supported by evidence and argumentation is not acceptable.

Although the Espoo EIA report and the national EIA reports are voluminous, several potential impacts are assessed inadequately or the statements on insignificant impacts are not supported by data or are not reproducible. The assessment of transboundary impacts is very superficial and insufficient in both the Espoo EIA report[3] and in the Finnish EIA report.

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[3] For example the Espoo EIA report the assessment of transboundary impacts which can affect Estonia is only 1,5 pages in chapter 11.3.8.

Russia has not sent its national EIA report to Estonia. The Russian national EIA was requested as an important source of underlying information of the Espoo EIA. The reply from the Russian Ministry of Natural Resources and Environment stated that the Ministry has no provisions in the Espoo Convention to include national EIA-s in the Documentation for the Consultations and the Espoo Consultations should be based on the information already provided by the Developer.

On the public consultation of the EIA report which took place on 29 April 2009, the Developer, Nord Stream AG, informed that some of the research work has not been finished yet, e.g. the survey concerning the munition in the Russian area was carried out in 2008[4]. 97% of the research work has been carried out and by mid May 2009 all the research work should have been concluded. We are on the position that this approach is not allowable. The EIA report has to present all the information concerning the substantial questions and this is the reason why it is not acceptable to consider the EIA report appropriate enough to be made available to the public due to the fact that some of the research work has not been concluded yet. Thus, the results of the EIA are not conclusive until all the information has been gathered and analysed.

2. Methodology

The methodology put forward and described by the Nord Stream as a „*precautionary approach*"[5] is neither scientifically sound nor acceptable. In situations of uncertainty, the predicted impact is envisaged on the basis of being „*likely to occur or not*"[6]. A lot of the EIA has to be thoroughly revised. It would be inevitable to drastically elevate some of the predicted impacts to more acute levels. All gaps must be filled in order to be able to reliably estimate the consequences of the pipeline; otherwise assuming a worst-case scenario is the only acceptable way to address these gaps.

3. Consideration of the EU energy and climate package

The explanations of the Developer of the necessity to construct the gas pipeline do not take into account the purposes of the EU energy and climate package. The Developer uses the prognosis of the year 2007 to estimate the EU's need for gas import, but at that time the EU energy and climate package had not been worked out yet. The PRIMES model used by the European Commission in 2008 gave the following result: when implementing the EU's energy and climate package the EU's gas import will decrease by the year 2020[7]. Thus, considering the interests of the EU explanations given for the realization of the project are questionable.

4. Evaluation of alternative routes

Taking into account the size and the impacts of the Nord Stream gas pipeline project the alternatives for the routes presented in the EIA report are insufficient. It is also important to note that the reasons why the overland alternative routes were excluded are not explained enough. The EIA report does not give an adequate answer to the question why construction of the gas pipeline on the already existing gas pipeline roads[8] has not been considered.

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4 Data from the Nord Stream Espoo EIA report.

5 The Espoo EIA report page 1659.

6 The Espoo EIA report page 1659.

7 Impact Assessment. Document accompanying the Package of Implementation measures for the EU's objectives on climate change and renewable energy for 2020. SEC 2008, 85/3.

8 For example on the page 44 in the Finnish EIA report it is said that „... routes through the former Soviet

Description of the project should contain explanations of foreseen procedures when a new structure crossing with the pipeline is being built. What are the possible methods to construct a crossing with a new pipeline or cable (power cable as well as communications cable), what restrictions are there for other objects that might be constructed (off-shore wind farms, etc).

5. The Estonian exclusive economic zone and economic impacts

It is unknown whether the construction of the pipeline assumes a restriction zone in the Estonian EEZ or not – the Developer did not give a clear answer in this respect during the public consultation held in Tallinn. If the Estonian EEZ is used during the construction work, the concert of Estonia is needed.

If the construction of the pipeline takes place in the Estonian EEZ, the activity licence is not given out for the activities the environmental impacts of which have not been assessed. In the Espoo EIA report it has been mentioned that some restriction areas are needed[9]. Here we would like to note that only the competent authorities of Estonia have the right to designate such restriction areas. It is also said in the Espoo EIA report that some actions are planned so that they start before the conclusion of the EIA[10].

The pipeline crosses many important Estonian underwater cables. Estonia has no information whether the owners of the cables are involved in engineering of the crossing-points. There is also no information about the guard ships (data, functions, equipment etc).

The negative effects of the construction and exploitation of the pipeline on the economy and environment of the parties of origin and the affected parties have not been adequately considered in the EIA report. Hence, complementary analysis and research are needed.

6. Impacts on human health

The impacts of the construction of the pipeline on human health and well-being are not assessed adequately. Construction of the pipeline may cause irreversible shifts in the ecological balance of the Baltic Sea, because sediments containing very toxic chemicals are heaved up during the construction. Thereby dioxines, mercury and other chemicals get into the food chain of sea organisms and finally into people's food. The EIA report also includes insufficient assessment of impact on the sea life from the oncological aspect – many chemical substances are carcinogenic.

In case the construction and exploitation of the pipeline causes extensive environmental damage and negative impacts on human life and health the Developer has concrete obligations to take responsibility. However, the EIA report does not contain enough information about that.

There is a need for further research on sediments, which are dug over during the construction of the pipeline. It is also necessary to find out which kind of effects the chemicals from the sediments have on fish and human health.

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sphere of influence were not an option..."

9 The Espoo EIA report page 1571 and 1573.

10 Key issue document, Maritime Safety, paragraph 6, figure 6.1.

7. Impacts on cultural heritage

There is no adequate assessment on how the pipeline affects the cultural heritage. The report has to be amended after finishing the research and every shipwreck of cultural value needs to be analysed in more detail.

In the EIA report the uniqueness of the cultural heritage of the Baltic Sea has been brought out. Still, important research concerning the anchoring corridor has not been carried out. It is also mentioned in the EIA report that the list of wrecks situated further further than 50 m of the pipeline may not be complete, because research concerning the anchoring corridor surrounding the pipeline has not been completed. If new objects were found during the construction of the pipeline, then irreversible damage to the objects might be caused and historical sources destroyed.

In the report there is no assessment on how the potential movement of sediments might impact the locations of shipwrecks. Especially delicate to these processes might be the location of the battleship Russalka, because the wreck lays in the seabed almost vertically. The location of Russalka is a sea grave and in case the distance between the wreck and the pipeline is 50–250 metresthe grave peace is endangered.

8. Impacts occurring during the construction phase

8.1. Increase in turbidity, impact on the water column and marine benthos

Impact occurs due to the clearance of munitions and seabed intervention works (dredging, trenching, rock placement and support structures). In the Gulf of Finland the assessed impact scale is regional and the significance is minor. The gaps and uncertainties of the assessment are not acceptable because:
1) the model (MIKE 3 HD + MIKE PA) used for the impact assessment has not been calibrated and verified by near-bottom flow measurements[11], since the measurements have not been made;
2) remobilization and spreading of fine sediments with destroyed cohesive structure has not been assessed (in this case much smaller near-bottom flows are needed for re-suspension).

These gaps can be removed by making the near-bottom flow measurements, doing the extensive model validation and including the re-suspension of sediments originating from the construction phase works.

8.2. Seabed interventions and remobilization of hazardous substances

In the EIA report the information on remobilization of hazardous substances in the process of seabed interventions in course of construction works and munitions clearance is incomplete. The EIA report implies that throughout the Baltic Sea only upper 6 cm of the sediment have been studied for certain metals and organochlorine substances. However, these results have little bearing to the risks of the release of the toxicants in case of seabed interventions, at least

[11] "The validation of the MIKE 3 HD flow model is based on a very small amount of measuring observations, and the seabed currents were validated in the main basin of the Baltic Sea only. Local benthic currents occupy a significant role in calculating the spreading of turbidity caused by aquatic works". Natural gas pipeline through the Baltic Sea. Environmental impact assessment in the exclusive economic zone of Finland. APPENDIX XI: Report on the Water Quality Modelling of the Nord Stream Gas Pipeline. Author: Luode Consulting Ltd, p. 8.

in the Gulf of Finland where the highest concentrations of toxicants are known to occur between 8–30 cm of the sediment. Information on hazardous substances in the sediment column in the Russian EEZ has not been presented, although the HELCOM documents and some previous publications refer to very high concentrations of toxicants in the eastern part of the Gulf of Finland. The scientific information and the public domain information available on the release of dioxins and methyl mercury to 1/3 of the Gulf of Finland from the Kymijoki River indicates high risks of remobilization of the hazardous substances.

To complete the studies on toxicants, it will be necessary to study the sediment column for up to 40–50 cm with the emphasis on all the toxicants in the HELCOM hazardous substance list, including dioxins and furans included in numerous EC regulations and EU directives. Changes in redox conditions of the bottom sediments should be taken into consideration in dealing with the mobile forms of cadmium and mercury (MeHg). The analysis of the transboundary impacts on Estonia is missing.

8.3. Seabed interventions and remobilization of nutrients

According to the modeling results provided in the Espoo report seabed intervention will cause a release of 12,000 t of phosphorus and 53,000 t of nitrogen into the water column. This is 2.5% and 0.75% of the respective annual inputs to the Baltic Sea. The eutrophication segment of the HELCOM Baltic Sea Action Plan adopted and signed by contracting parties in 2007, sets a goal to minimize the additional inputs of nutrients. During the implementation of this plan countries are assigned certain nutrient quotas (maximum allowable amounts of inputs). From the presented report it is not clear how this additional amount of nutrient input will be dealt with in this context. Another aspect of the same problem is that these estimations are made only on the Baltic Proper segment – so there is still a possibility of underestimating the additional inputs on the local scale. As most of the intervention works are planned to be carried out in the Gulf of Finland the amount of additional nutrients released during the construction phase hasto be assigned to contracting parties bordering this sea area (in case of the current project – parties of origin or Russia and Finland).

8.4. Impacts on unpredictable events - disturbance of conventional and toxic munitions

The expected long-distance transboundary impacts of accidents with toxic munitions near Bornholm and elsewhere are mentioned, but not analysed in the statement of the Espoo EIA. The information provided on toxic munitions and the conclusion drawn on the associated minor risks are not in balance, taking into account that the exact locations of dumping places of toxic munitions are not provided. The information about the dumped Hg barrels in the Baltic Proper is insufficient.

The statement that clearance munitions in the Russian EEZ has "minor impact" on Estonia is not supported by any evidence, because information on conventional munitions in the Russian EEZ is missing. The assumption on "minor impact" is made *before* the study of munitions, which according to the official report by Ramboll of October 2007 was planned for the summer and autumn 2009. Also information on the eventual toxic munitions in the Russian EEZ is missing.

Potential accidents with toxic and conventional munitions are related to the highest risks and environmental hazards and therefore, should be included in the EIA report. Without completing and reporting on the above aspects the EIA process is incomplete.

It should be emphasized that within the context of the Espoo Convention and EU EIA directive, planning of any conventional munitions clearance to be carried out by any country should be reported in an appropriate time and thorough evaluation of transboundary impacts.

Special concerns related to chemical munitions:

1. Not all dumping places of chemical weapons in the Baltic Sea and especially in the Gulf of Finland are known.
2. No data about the Russian zone are available.
3. Chemical weapons lying deep in the mud (deeper than 1 m) could not been discovered.
4. The extent of poisoning by possible chemical weapon accident has not been estimated.

9. Impacts occurring during the operational phase

9.1. Disturbance of traditional fishing patterns

In the Espoo EIA report transboundary impacts on the fishery of Estonia are not correctly assessed.

Constant fishing limitations and prohibited areas are going to be established in the traditional fishing territories of the Baltic Sea. Thus, reimbursement conditions must be set before the construction of the pipeline starts. The EIA report must explicitly specify the essence and location of limitations that are going to be implemented during the constructional and exploiting phases.

As the Russian data is missing, there is a need for additional information about the impact of munitions, chemical weapons and toxicants on the fish resources east side of the Finnish coast.

9.2. Damage to fishing gear

The spawning and feeding distribution as well as the dynamics of fish stocks and fish catches statistics, particularly of the commercially important marine fish species (cod, sprat, flounder and herring), have been assessed inadequately. The fish stocks statistics used in the assessment were based on a too short time period – only the two last decades were considered. It means that the deepest stagnation period in the Baltic Sea during the last 100 years was considered as a normal situation. Actually, during the last 60 years there have been 16 years with high abundances of cod in the Northern Baltic Proper and Gulf of Finland with the maximum annual landings of this species much above 10,000 tons. As the planned exploitation time of the Nord Stream pipeline is is at least 50 years, the findings of the Espoo EIA report that the cod is non-common in the Gulf of Finland and the bottom trawling in this area is marginal, are incorrect.

However, it has occurred that the trawl doors and clamps have touched the bottom. The ower-trawling safety for pelagic trawl in near-bottom position in the free-span pipeline sections has not been estimated, but certainly needs to be addressed. The free-span pipeline sections over-trawling safety for pelagic trawl in near-bottom position (day-time fishing for herring and sprat) is not estimated, but needs to be addressed.

9.3. Impacts of unpredictable events – pipeline accidents

The risk assessment provided in the Espoo EIA report underestimates the frequency of potential pipeline accidents as well as the rates of human and environmental losses in case risk factor lies deep in the unacceptable area of F-N curve.

In the EIA report there are no precise action plans and no information about authorities responsible in risk situations. The affected parties must be informed about the accidents, which may be caused by the construction or the exploitation of the pipeline. The Developer must have a valid Shipboard Oil Pollution Emergency Plan and Pollution Prevention Plan for the period of pipeline construction. We would also like to get copies of the aforementioned documents.

The fact that the Baltic Sea has been designated as a particularly sensitive sea area (PSSA) has not been sufficiently considered in the EIA report. The pipeline route is planned to be located in many ship traffic corridors – this means more danger for ship traffic and for the environment, which is clearly contradicting the principles of the PSSA.

In the report the winter aspect, which may significantly change the results of the analysis has not been taken into account. The pipeline is dangerous because of the glaciation of the Baltic Sea. A minor gas leakage may cause a big explosion when the gas accumulates under the ice. For example, a ship may sink due to the accumulated gas or the accumulated gas may explode and burn afterwards. This kind of risk has not been described in the EIA report.

10. Environmental monitoring

The Espoo EIA Report does not contain a detailed environmental monitoring program, thus its acceptability could not be evaluated. Instead, an outline of the program and the principles of how the program will be finalized are presented. Procedures of the development and implementation of the program are in line with the well known and accepted principles. The main concerns regarding the environmental monitoring program are as follows:

First, in the present form the outline of the program excludes any monitoring activities regarding larger-scale impacts of the pipelines presence during the operational phase. The monitoring of impacts on water column is restricted to an objective "to establish accuracy of impact assessment regarding temperature changes induced by the pipelines and to provide context for the interpretation of benthic ecology"[12]. Marine benthos will be monitored according to the above outline only "immediately around the pipelines and on the slope of the trenched sections". At the same time, the Baltic Sea is defined as a PSSA. Although the experts involved in the EIA process have identified most of the receptors in the report as non-sensitive, we cannot agree that monitoring of impacts of the presence of pipelines on the deep water circulation and consequently, on the ecosystem of the deeper areas of the Baltic Sea is totally excluded from the outline of the monitoring program.

During the construction phase suspended solids, sediment spill rate, extent and duration of the sediment plume will be monitored according to the monitoring program outline. It is not clear on the basis of what criteria this element of environmental monitoring would cease. Are these criteria region-specific (shallow areas vs deeper areas, Gulf of Finland vs open Baltic etc.), weather-specific (calm weather vs moderate winds etc.) and/or action-specific (munitions'

[12] The Espoo EIA report page 1653.

clearance, rock dumping etc.). It is not acceptable that such direct impacts will not be monitored in all circumstances. Furthermore, this element of environmental monitoring has to provide answers also to questions about the extent of direct transboundary impacts of sediment intervention works in the Finnish waters to the ecosystem in the Estonian EEZ, since the pipeline route is in some places closer than 200 metres to this zone. Thus, in the monitoring program a special objective and methods of assessment of these impacts based on direct measurements have to be elaborated.

11. Natura 2000

Current assessment of the impacts of the project on Natura 2000 sites is based on the distance from the pipeline route. Based on the distance criteria two existing Natura 2000 areas will be located to reach the „impact corridor" which was calculated based on an expected immediate impact of underwater explosions on marine mammals during the munitions clearance. The conclusion of a minor level of impact was mainly based on the fact that these Natura 2000 areas were designed to protect mostly terrestrial habitats and species. Here are several important aspects that have to be considered in the Natura 2000 evaluation:

1. The Natura areas mentioned have also listed marine habitats to be protected.
2. Mobility of marine mammals and cumulative effects of nutrient and toxic matter release from the sediments are not analysed in this aspect.
3. A number of potential future Natura 2000 areas are located within the 20 km impact corridor. Information on those was made available for the EIA consultant, but is not used in the current EIA report.

12. Decommissioning of the pipeline

It is not discussed in detail how the gas pipeline will be demolished or handled after the end of its active use (50 years time). It is only stated that the decision will be made during the coming 50 years. There should be a clear commitment by Nord Stream that they will take care of the demolition process as well as a clear concept on how this could be achieved, what environmental impacts should be anticipated and how these impacts could be kept to a minimum.

13. Gaps and uncertainties

13.1. Water exchange

According to the EIA report "no impacts to physical processes in the Baltic Sea are anticipated as a result of the physical presence of the pipelines on the seabed"[13]. This conclusion has been made on the basis of an incomplete study conducted to estimate the extent of the potential impact of the presence of the pipelines on the salinity, volume flow and oxygen concentration of new deep water in the Bornholm Basin"[14]. It was stated that the presence of pipelines will have "little or no impact on the existing current patterns." The latter is in contradiction with a very rough estimate if comparing pipeline height and the thickness

[13] The Espoo EIA report page 1416.
[14] The Espoo EIA report page 1072.

of the near-bottom flow. On the basis of published measurement results[15,16] the layer occupied by the bottom currents in the area of interest is only 10–20 meters above the seabed and the layer affected by the pipelines is about 10% of it.

The bottom sediments are a major source of phosphorus in the Gulf of Finland. Release of phosphorus from the sediments occurs under anoxic/hypoxic conditions near the seabed. If the water exchange between deeper areas of the Gulf is restricted then anoxic/hypoxic conditions may appear more frequently (or their duration could increase). In the report no data is provided to prove that the pipelines will not affect the process of release of phosphorus from the bottom sediments. To answer this question, a study has to be carried out assessing whether the seabed intervention works (rock placement) would create more artificial closed deeper areas or not and what is the extent of impacts on the water column and plankton.

In conclusion, the potential impacts of the presence of pipelines on the deep water circulation in the Baltic Sea scale as well as in smaller sub-basin scales in the Gulf of Finland have to be assessed. Measurement data, both available data and specific new data collected by conducting near-bottom current measurements, have to be taken into account.

13.2. Missing information on near-bottom flows that control spreading of sediments and released substances

Many of the pipeline-related activities (munitions clearance, seabed intervention works, dredging, pipe laying) affect the environment (water column, plankton, marine benthos, fish, nature conservation areas) through dislocation of sediments, increase of turbidity and release of hazardous substances. The extent of spreading and released concentrations was assessed based on the modeling method. In general terms the used model is acceptable, but requires calibration and validation by observational data in each individual case. For the Nord Stream pipeline, model performance to simulate near-bottom currents is a critical factor in qualifying the results of calculations into impact assessment scale categories as local, regional and national scale impact and intensity categories. The model validation is especially important in the Gulf of Finland and Northern Baltic Proper where bottom relief is very rough compared to the other Baltic Sea regions[17]. We consider the use of best available technology for the assessment of sediment spreading imperative. Observations of near-bottom current must be carried out in the amount that allows firm calibration and validation of the model in the specific conditions of the EIA.

In the list of survey activities, investigation of near-bottom currents that control spreading of dislocated sediments and substances, accumulated formerly in sediments, is missing.

The summary statement "Information on current velocities and water levels is acquired from readily available hydrodynamic models that have been calibrated over decades and take into account the corresponding meteorological changes"[18] is in contradiction with the more detailed report on the used modeling techniques in the Gulf of Finland "The validation of the

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[15] Sellschopp J. et al., 2006. Direct observations of a medium intensity inflow into the Baltic Sea, Cont. Shelf Res., 26, 2393-2414.

[16] Meier M. et al., 2006. Ventilation of the Baltic Sea deep water: A brief review of present knowledge from observations and models. Oceanologia, 48S, 133-164, and references therein.

[17] Nord Stream Espoo Report: Key Issue Paper. Seabed Intervention: Works and Anchor Handling, Figure 2.3, p.11.

[18] Nord Stream Espoo Report: Key Issue Paper. Seabed Intervention: Works and Anchor Handling, p.38

MIKE 3 HD flow model is based on a very small amount of measuring observations, and the seabed currents were validated in the main basin of the Baltic Sea only. Local benthic currents play a significant role in calculating the spreading of turbidity caused by aquatic works."[19]

13.3. Missing information on the impact of the field of internal waves on the pipeline and the surrounding sediment

The potential impact of the vertical stratification of water masses to the dynamics of water motions has been recognized a long time ago. It is well known that in the case of stratification the velocities near the underlying surface may be strongly intensified compared to the homogeneous case[20] and it is customary to study the related effects in the planning phase of underwater pipelines[21].

One of the basic agents of hydrodynamic activity in stratified seas are internal waves. Their impact on sea bottom and on the pipeline is dynamically similar to that of the surface waves. The most intense internal waves are usually found to exist at depths where the largest changes of water density occur. A major feature of the hydrography of the Gulf of Finland is the quasi-permanent halocline (at times evolving to a system of different jump layers) separating the upper, relatively well-mixed, warmer and fresher water from the near-bottom, more saline and usually colder water[22]. The presence of this feature gives rise to a multi-layer structure of the water masses during a large part of the year. In the eastern part of the Gulf of Finland the permanent halocline may be missing, but the thermocline still gives rise to a two-layer structure.

The typical depth of the halocline (60–80 m) in the western Gulf of Finland roughly coincides with the depth of planned pipeline and thus, it may frequently be impacted by internal waves excited in the Baltic Proper. Owing to large variations of the halocline position and potential events of almost total exporting of the more saline water out of the Gulf of Finland[23], virtually the entire section of the pipeline in the Gulf of Finland may be subject to direct impact of the halocline-bound or thermocline-bound internal wave activity. The analysis of the potential consequences to the pipeline (scour, inhomogeneous sinking, remobilization of bottom sediments and nutrients due to accompanying local intensification of hydrodynamic processes etc.) is completely missing.

13.4. Anisotropic transport patterns in the Gulf of Finland

The classical overall circulation scheme of the Baltic Sea is that the water masses perform a slow cyclonic motion in the Baltic Proper and in the largest sub basins. Eddy-resolving simulations of the Gulf of Finland circulation revealed an intuitively obvious fact that the

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[19] Natural gas pipeline through the Baltic Sea. Environmental impact assessment in the exclusive economic zone of Finland. APPENDIX XI: Report on the Water Quality Modelling of the Nord Stream Gas Pipeline. Author: Luode Consulting Ltd, p. 8.

[20] Baines, P. 1995. Topograpic effects in stratified flows. Cambridge University Press

[21] Berntsen, J., Furnes, G. 2002. Small scale topographic effects on the near sea bed flow at Ormen Lange. Report No 171. Department of Mathematics, University of Bergen, 34 pp.

[22] Alenius P., Myrberg K. & Nekrasov A. 1998. Physical oceanography of the Gulf of Finland: a review. *Boreal Env. Res.* 3: 97–125

[23] Elken J., Raudsepp U., Lips U., 2003, *On the estuarine transport reversal in deep layers of the Gulf of Finland*, J. Sea Res., 49, 267–274. Elken J., Mälkki P., Alenius P., Stipa T., 2006, *Large halocline variations in the Northern Baltic Proper and associated meso-and basin-scale processes*, Oceanologia, 48(S), 91–117.

generally discernible cyclonic circulation overlaps with numerous quasi-permanent mesoscale features (eddies, fronts and local jets) and possesses a nontrivial vertical structure. On top of that, there exists a specific structure of the circulation patterns of the Gulf of Finland that becomes evident in the form of strongly anisotropic pollution transport patterns in this area[24]. The experience with two relatively large-scale pollution events in 2006 and current simulations of the transport of pollution released in different areas of the Gulf of Finland[25] suggest that pollution released into this Gulf has a high chance to hit the Estonian coast.

This feature is of large concern for Estonia, because its presence may substantially increase the probability that pollution, toxic materials, chemical waste, etc., that will be re-suspended during the construction works and will be transported close to the southern coast of the Gulf of Finland and may heavily hit the protected and Natura 2000 areas located in the vicinity of Estonian coasts. Moreover, the described specific feature of transport patterns drastically increases the probability of the Estonian coast being hit by water masses with high concentrations of rinsing chemicals – that will be released into the territorial waters of Russia according to the actual work plan as made public in an expert meeting in May 2008 in Moscow. These aspects are completely overlooked in the documentation presented by the Developer.

13.5. Geology, tectonics and seismicity

The compilers of the report have failed to communicate how the key questions related to geological structure, tectonics, fault systems and related aspects of endemicity, and sub-sea land slides relate to the risks in construction of the sub-sea installations. Information on bedrock geology does not meet the standards of current knowledge and has missed the extensive geological and geophysical research on submarine geology since 1980s up to the present days. Information on seismicity is missing in the Espoo EIA. The Danish and Swedish EIAs provide data on old earthquakes in Scandinavia from a textbook issued in 1994, referring to an assumption that the probability of an earthquake of magnitude 5 is once in 500 years. However, after the Osmussaar earthquake in 1976 (magnitude 4.7) and the Kaliningrad earthquake in 2004 (magnitude over 5) recorded among the most significant earthquakes in 2004-2006 in the Council of Europe's major hazards network, the earthquake risks have been re-evaluated as significantly higher. However, the mechanism, hypocenter depth, and relation to the tectonic structure of Fennoscandian Shield have not been taken into account. The fact that the earthquake destruction ability does not depend only on magnitude, but is a function of magnitude and the hypocenter depth, is omitted. In Fennoscandian Shield the seismic events are mainly of tectonic origin and therefore with relatively high destruction ability in respect to the magnitude. The extensive instrumental seismic monitoring data collected within the last 50 years in Sweden, Finland and Estonia has determined the relatively higher seismic activity zone at the junction of the Gulf of Finland and Baltic Sea, and this fact must not be ignored. It is also obvious that only the instrumental datasets collected within the last 50 years are authentic for precise seismic hazard estimations, not the macro seismic data on historical events.

Inadequate information on any aspect of the risks used as input for risk analysis would lead to the failure of the overall risk analysis. Unfortunately, a great deal of the inadequate information in the EIA report stems from the poor presentation of geology and tectonics of

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[24] Soomere, T., Quak, E. 2007. On the potential of reducing coastal pollution by a proper choice of the fairway, *Journal of Coastal Research*, Special Issue 50, 678–682.

[25] Döös, K. Meteorological Institute, University of Stockholm, unpublished calculations.

the Baltic Sea area.

13.6. Gaps in evaluating secondary impacts

The report has not recognized the impacts of the remobilisation of dioxins and other organic and inorganic substances, their transport with underwater currents, accumulation in the food web and toxic effects to insectivorous birds, marine mammals and human health. Also, the extensive remobilisation of nutrients and its influence to the Baltic Sea ecosystem has not been discussed.

13.7. Gaps in cumulative impact assessments

The Developer has identified the gaps of "the cumulative impacts of the pipelines with developments such as wind farms, new cables for telecommunications and the extraction of minerals in the Baltic Sea." However, the cumulative impact of the potential highest risk – the potential crossing of the Nord Stream with the Baltic connector gas pipe in the Gulf of Finland that is evident from the introductory chapters, has not been emphasized. The Baltic connector gas pipe between Paldiski, Estonia and Inkoo, Finland, is promoted by the companies sharing the shareholders with Nord Stream: Finnish Gasum OY (Gazprom 25%, E.ON 20%) and Latvijas Gaze (E.ON 47.15%, Gazprom 25%). Consequently, Gazprom and E.ON are involved in planning two gas pipelines in the Gulf of Finland that will cross each other. Nevertheless, this key issue has been left out of the focus of attention and the cumulative risks of two crossing gas pipelines have not been evaluated.

To complete the environmental impact assessment the Developer has to:

1. **complete the study on impacts of the presence of pipelines on deep water circulation and water exchange (near-bottom flow measurements have to be conducted) as well as on the sensitivity of the Baltic Sea ecosystem, on the changes in water exchange and consequent release of phosphorus from the bottom sediments;**
2. **make the near-bottom flow measurements, conduct the extensive model validation and include the re-suspension of sediments originating from the construction phase works;**
3. **study the sediment column for up to 40–50 cm, with the emphasis to all the toxicants on the HELCOM hazardous substance list, including dioxins and furans included in numerous EC regulations and EU directives;**
4. **use adequate information and reassess the risks in regard of seismic activities;**
5. **fill gaps in assessing secondary and cumulative impacts;**
6. **elaborate a detailed monitoring program in order to assess direct transboundary impacts;**
7. **provide the data on toxic munitions and munitions clearance to be able to properly assess the possible impact of these actions on remobilisation and spread of nutrients and toxic substances from the disturbed sediment;**
8. **assess the risks of pipeline failure by taking into account realistic crossing statistics (coincidence of ship routes and pipeline route);**
9. **estimate impacts on fishery taking into account the impact on pelagic trawling as well;**
10. **reassess the impact on fisheries by taking into account the statistics on fish stocks and catches from a longer time period (at least 50 years).**

The Ministry of the Environment of Estonia would appreciate your feedback on our concerns. In case the EIA report will be amended after the publication of the documentation, we would kindly ask you to send us the final version.

Estonia is interested in additional consultations with the parties of origin under Article 5 of the Espoo convention to continue to give input and receive feedback in order to ensure that all the aspects of permitting processes of the Parties of Origin were in compliance with the EU legislation and all relevant international instruments and conventions.

Please, let us know of the suitable times for further meetings.

Yours sincerely,

Harry Liiv
Deputy Secretary General
Point of Contact of the Espoo Convention in Estonia

Enclosures: Received statements (12)
The analysis of the Nord Stream EIA report by the expert group

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