



Chapter 12

Environmental Management and Monitoring

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12 Environmental Management and Monitoring

12.1 Introduction

12.1.1 This Chapter

This chapter describes the management system, implementation procedures and action plans that Nord Stream is developing to ensure that all identified safeguards and mitigation measures are incorporated into the design and execution of the pipeline Project such that Nord Stream is able deliver on its commitment to implement the Project in a safe and environmentally sound manner.

12.1.2 The Bases for Effective Environmental Management

Nord Stream is committed to developing, constructing and operating the proposed pipeline in a safe and environmentally responsible manner. For this reason, Nord Stream has developed a Health, Safety and Environmental Management System (HSE MS) to provide the framework for overall HSE management and to facilitate the development of standards, procedures and plans for implementing effective and reliable HSE management during the planning, construction, pre-commissioning and commissioning, operation and decommissioning phases of the Project.

In addition, the HSE MS will incorporate plans to enable Nord Stream to comply with all provisions stipulated in its permits and to deliver on all commitments made in the various EIAs prepared by the company, including those commitments that are captured in this Espoo report.

The HSE MS has been developed in alignment with the structures of the international standards OHSAS 18001 and ISO 14001.

Nord Stream will also require its contractors engaged in this gas pipeline Project to develop HSE management systems that are similarly aligned with the principles of the aforementioned standards and Nord Stream's HSE MS.

For effective HSE management, in particular management of the identified HSE risks in this Project, there are two main approaches considered for the reduction and control of environmental impacts:

- The application of best international practice throughout the design, construction and operation of the pipeline

- Adoption of site specific mitigation measures identified during the environmental assessment process which will ensure that predicted impacts are mitigated to appropriate levels

This chapter describes the current structure of the HSE MS, setting out how Nord Stream will interact with the contractors carrying out the work and how Nord Stream will ensure that its standards and commitments will be implemented by the various contractors. The provisions of the HSE MS will be cascaded down to all contractors and operations in relation to the Nord Stream Project.

12.2 Nord Stream's HSE MS

12.2.1 HSE MS Overview

The HSE MS clearly sets out Nord Stream's commitment to continual improvement, use of best practice and compliance with national and international legislation.

The Nord Stream HSE MS is structured with three functional levels (as illustrated in **Figure 12.1**):

- The *HSE Policy* (**Box 12.1**) outlines Nord Stream's philosophy and key commitments to the protection of the environment and to ensuring the health and safety of employees, contractors and the public and the commitment to comply with the applicable legislation
- The *Principles and Expectations* define how the HSE policy objectives are to be achieved
- The *HSE procedures* define the minimum HSE Standards required to fulfil the HSE Policy

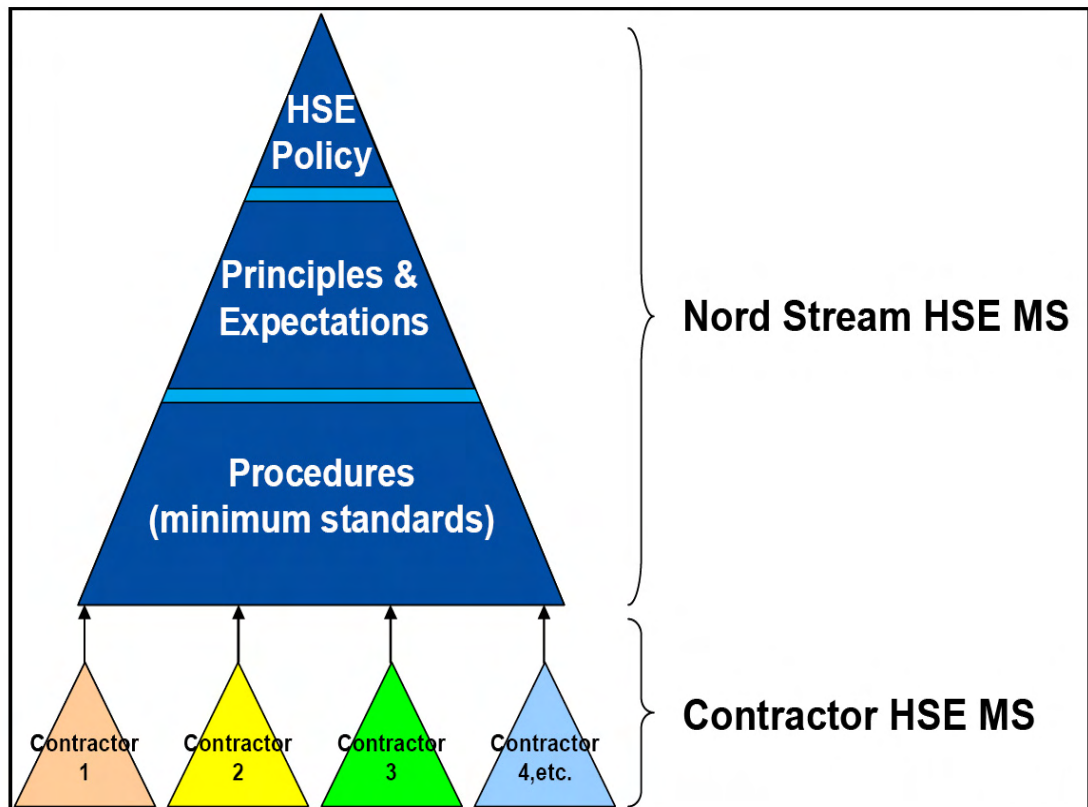


Figure 12.1 Nord Stream's HSE management system structure

Contractors engaged in this Project will play a significant role in HSE management and are contractually obliged to develop specific HSE management systems that support and fulfil the key requirements in the Nord Stream HSE MS.

Box 12.1 Nord Stream's HSE Policy**Health, Safety and Environmental (HSE) Policy**

NORD STREAM AG is a Joint Venture company for the construction and operation of the Nord Stream gas pipeline linking Russia and the European Union via the Baltic Sea.

The company has integrated the management of HSE into its overall Company Management System. The HSE System consists of the following documentation:

- This HSE Policy
- HSE Management System (HSE MS) principles and expectations describing the scope, the intention and the responsibilities.
- Standards and procedures for implementing HSE in the project during the planning, construction, commissioning and operational phases.

The Management of NORD STREAM AG is fully committed to effective HSE management and to continuously improve its performance according to industry best practice and through compliance with all applicable national and international HSE legislation.

Our goal is to provide a safe and healthy work place for employees and contractors and to care for the health and safety of the public. We are also committed to preventing pollution and protecting the environment by minimising the adverse impact of NORD STREAM's business. We set specific HSE objectives and targets, and monitor our performance, in order to realise these goals.

NORD STREAM AG has instituted and maintains the necessary arrangements to ensure that this Policy is implemented through its HSE Management System.

It is the responsibility of each and every person involved NORD STREAM's business to be fully committed to the implementation of the HSE MS and to the realisation of this Policy.


Managing Director


HSE Manager

Zug. 27-08-2007

The HSE MS follows the basic four stage management principles of *Plan, Do, Check, Act* (in line with the structure of ISO 14001 and OHSAS) which is a cyclical process aimed at achieving continuous improvement. This process facilitates the identification of HSE risks in the Project and the systematic control, reduction and management of these risks, in order to achieve the requirements of the HSE Policy. The key elements of the HSE MS are outlined below.

12.2.2 Nord Stream's HSE Principles and Expectations

Underpinning the HSE Policy are the ten HSE principles, which are aligned to the *Plan, Do, Check, Act* framework. These principles, as detailed in **Figure 12.2**, facilitate the development of HSE procedures (thereby forming the minimum HSE standards for the Project).

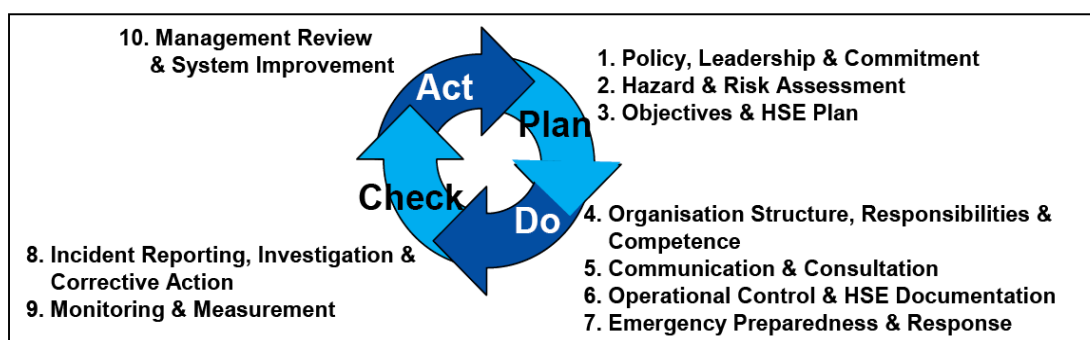


Figure 12.2 HSE management system structure

The ten HSE principles, which are set out below, are based on the structure of ISO 14001 and OHSAS 18001:

1. Policy, Leadership & Commitment
2. Hazard & Risk Assessment
3. Objectives & HSE Plan
4. Organisation Structure, Responsibilities & Competence
5. Communication & Consultation
6. Operational Control & HSE Documentation
7. Emergency Preparedness & Response

-
8. Incident Reporting, Investigation & Corrective Action
 9. Monitoring & Measurement
 10. Management Review & System Improvement

To facilitate effective HSE management, each principle is intrinsically linked to associated expectations, to ensure Nord Stream's goals and objectives are clearly set out and supported by detailed guidance. These expectations have been extracted from Nord Stream's HSE MS documentation and reproduced in **Box 12.2**.

Box12.2 Nord Stream HSE principles & expectations

Principle	Expectation
<p>1. Policy, Leadership & Commitment</p> <p>Senior management must define the general HSE Principles, set the Expectations and provide the resources to develop, implement and maintain the HSE MS. They must demonstrate commitment and leadership through example.</p>	<p>1.1 The HSE Policy defines the general principles to be applied in the Project and in the Nord Stream organisation, these principles include a recognition that harming people or the environment is not an acceptable or sustainable business practice.</p> <p>1.2 The Policy must commit to complying with all applicable legislation, to strive for continual improvement in HSE performance and to set measurable goals (objectives).</p> <p>1.3 The Policy shall be signed by the Managing Director to demonstrate formal commitment to HSE management.</p> <p>1.4 Senior management of the company shall provide leadership and visible commitment in order to drive the process for exemplary HSE performance.</p> <p>1.5 This commitment must be backed up with the necessary resources to develop and implement the HSE MS in order to achieve the objectives of the HSE Policy</p>

Principle	Expectation
<p>2. Hazard & Risk Assessment</p> <p>Operations must be planned so that the Project can be conducted efficiently, where risk is minimised and legal compliance is assured. Planning involves the systematic identification of legal requirements, hazards and impacts, followed by an assessment and control of the risk.</p>	<p>2.1 All activities shall be conducted in a manner which complies with the relevant laws and regulations.</p> <p>2.2 There shall be a systematic and documented identification of hazards and HSE impacts of all planned and continuing activities.</p> <p>2.3 Hazard and impact information shall be used, in conjunction with information on the operational activity, in order to make an assessment of risk in terms of likelihood and consequence of exposure.</p> <p>2.4 Risk assessment information shall be used to determine Safe guards and risk control measures, these shall be selected according to the magnitude of the risk, legal requirements, accepted industry practice and the commercial and business needs of the Project.</p> <p>2.5 Procedures shall be established for updating hazard and risk assessments when there are changes to operational activities (see Principle 6. Operational Control).</p>
<p>3. Objectives & HSE Plan</p> <p>The general purpose of the management system is to prevent our activities from putting people and the environment at risk. Specific objectives need to be set, measured and communicated in order for the system to be efficient and effective.</p>	<p>3.1 For the whole Project Nord Stream shall set HSE objectives following the Management Review of the management system (see Principle 10). This shall occur at least annually.</p> <p>3.2 The objectives shall relate to the significant risks and impacts of the Project and shall be documented in the HSE Plan which describes the actions, responsible persons and timeframe required to reach these objectives.</p> <p>3.3 The objectives shall be measurable and performance during the year shall be monitored by management.</p> <p>3.4 Contractors shall similarly develop a HSE Plan for their own activity in the Project.</p>

Principle	Expectation
<p>4. Organisation Structure, Responsibilities and Competence</p> <p>HSE management is an essential part of the Project. In order for all duties to be performed with due regard to HSE, specific roles and responsibilities need to be defined and communicated. Company and contractor personnel shall be appropriately trained, experienced and competent to work in a way which minimizes HSE risk.</p>	<p>4.1 HSE shall be defined as a line management responsibility and shall be integrated into all functions of the organisation.</p> <p>4.2 HSE roles and responsibilities (duties and accountabilities) must be defined for all safety critical positions, including those performed by contractors.</p> <p>4.3 All personnel shall have basic HSE training and induction, relevant to the risks in their workplace and any legal requirements.</p> <p>4.4 Management shall allocate sufficient resources to training and the provision of specialist HSE support to ensure the correct levels of competence are reached and maintained, relevant to the risk in the workplace.</p>
<p>5. Communication & Consultation</p> <p>Arrangements shall be in place for the communication of relevant HSE information both internally within the Project and externally. Communication shall be in a language and style that is appropriate to those persons receiving the information. Employees shall be consulted on HSE matters and shall be encouraged to participate in improvement initiatives.</p>	<p>5.1 The results of risk assessments and the risk control measures required (including emergency procedures) shall be communicated to relevant staff and contractors.</p> <p>5.2 HSE roles and responsibilities shall be communicated to the relevant persons, including contractors.</p> <p>5.3 There shall be a system for disseminating HSE information throughout the Project in order to promote lateral learning and the sharing of best practice.</p> <p>5.4 There shall be a system for authorising communication of HSE information to relevant external parties. The system shall be governed by the principles of legitimacy and honesty.</p>

Principle	Expectation
<p>6. Operational Control & HSE Documentation</p> <p>All company and contractor operations shall be conducted according to the HSE standards that have been set to minimise risk. The adverse HSE consequences of temporary and permanent changes in the Project shall be assessed, managed and authorised. It is essential that information on hazards and risks are properly documented and that written procedures define how activities shall be conducted in order to minimise risk.</p>	<p>6.1 Written procedures shall be developed and implemented to ensure that the risks associated with planning, construction, commissioning, operating and maintaining the Nord Stream pipeline are adequately controlled.</p> <p>6.2 All written HSE procedures shall be easily understandable, with practical requirements, and shall define the persons responsible for carrying them out.</p> <p>6.3 Procedures shall be in place to ensure that HSE documentation is periodically reviewed, revised by authorised persons and made available so that only current versions are in use.</p> <p>6.4 It shall be ensured that operational documentation such as drawings, work procedures, maintenance programs, monitoring records, etc. shall be accessible to the relevant staff and contractors and that there is cross referencing to relevant HSE documentation.</p> <p>6.5 All equipment shall be used within its safe operating limits and in compliance with the relevant regulatory requirements.</p> <p>6.6 Protective and safety systems shall be periodically tested and subject to a preventative maintenance program.</p> <p>6.7 Systems are in place for re-assessing risk, approving (by an appropriate authority) and applying appropriate risk controls when operational parameters change (management of change).</p> <p>6.8 Operations undertaken by contractors shall be subject to the minimum HSE requirements defined by Nord Stream. Contractors shall apply those minimum standards to subcontractors.</p>

Principle	Expectation
<p>7. Emergency Preparedness & Response</p> <p>Plans and procedures shall be in place to respond to foreseeable emergencies and to minimise the HSE effects. Plans and procedures shall be periodically tested and improvements made.</p>	<p>7.1 The Project shall have an emergency notification plan to ensure proper and fast reaction to emergencies.</p> <p>7.2 The Project shall establish an emergency response procedure to manage emergencies in a manner appropriate to the risk.</p> <p>7.3 All work locations shall have plans and procedures for responding to fire and evacuation. Other types of emergencies shall be addressed dependant on the level of risk and legal requirements.</p> <p>7.4 Emergency plans shall be documented, accessible and easily understood.</p> <p>7.5 The effectiveness of plans and procedures shall be regularly reviewed and improved, as required.</p> <p>7.6 Plans and procedures shall be supported by training and, where appropriate, exercises.</p> <p>7.7 Equipment for detecting and responding to emergencies shall be subject to a preventative maintenance program, testing and calibration, according to the relevant standards.</p>
<p>8. Incident Reporting, Investigation & Corrective Action</p> <p>Procedures shall be in place to immediately respond to incidents to minimise the consequence. All incidents shall be reported to the appropriate level of management. Serious incidents shall be investigated in order to determine root causes and to prevent recurrence.</p>	<p>8.1 Procedures shall be in place for immediately responding to incidents (see Principle 7).</p> <p>8.2 Procedures shall be in place for reporting incidents (actual and potential accidents) to the appropriate level of management and, where applicable, to external authorities.</p> <p>8.3 The resources devoted to incident investigation and corrective action shall reflect the potential consequence and not just the actual consequence of the incident.</p> <p>8.4 Investigations shall be conducted objectively in order to determine root causes and to identify corrective actions that will be effective.</p> <p>8.5 Preventative actions and lessons learned from incidents shall be communicated appropriately in the Project.</p>

Principle	Expectation
<p>9. Monitoring & Measurement</p> <p>The monitoring and measurement of HSE performance is required in order to correct deficiencies in the system and to provide a quantifiable measure of improvement over time.</p>	<p>9.1 The performance criteria selected by the operation in order to measure its HSE objectives (see Principle 3) shall be reported to Management on a quarterly basis.</p> <p>9.2 The scope and frequency of inspections and audits shall reflect the level of risk.</p> <p>9.3 Monitoring and measuring equipment shall be installed at locations where a failure to detect a release of hazardous material or energy would result in a serious incident or breach of legal requirements.</p>
<p>10. Management Review & System Improvement</p> <p>Management shall formally review the effectiveness of HSE Management System implementation. Actual performance shall be compared with the requirements of the Policy and Principles and opportunities for improvement shall be identified.</p>	<p>10.1 Management of the Project shall undertake a review, at least on an annual basis.</p> <p>10.2 HSE performance shall be reviewed in terms of incidents, audit findings and how well the objectives of the HSE Plan have been met.</p> <p>10.3 The effectiveness of the HSE Management System to deliver the requirements of the HSE Policy shall also be reviewed, taking into account likely changes in legislation and operational activities.</p> <p>10.4 Opportunities for improvement in HSE performance shall be identified and shall form the basis of the HSE Plan for achieving the objectives for the next year.</p>

12.2.3 Nord Stream's HSE Procedures

Supporting the ten HSE Principles and Expectations are Nord Stream's minimum standards. The HSE Procedures define how the minimum standards are to be implemented at all stages of the Project. Therefore, all contractors working on this Project will have to commit to achieving or exceeding Nord Stream's minimum standards in line with the HSE MS hierarchy illustrated in **Figure 12.2**.

12.3 Implementation

12.3.1 Roles and Responsibilities

The roles and responsibilities of Nord Stream employees are clearly outlined in the HSE MS procedure *HSE Organisation and Responsibilities*. A separate document outlining the health, safety and environmental requirements for contractors has also been developed and is described in **12.3.2**. The relationship and responsibilities is illustrated overleaf in **Figure 12.3**.

In addition to this general description of organisation and responsibilities for HSE, each procedure describes detailed responsibilities relating to the subject of the procedure. The general principle that HSE is a line management responsibility and that sufficient professional HSE support and advice must be provided to Nord Stream management, is applied throughout.

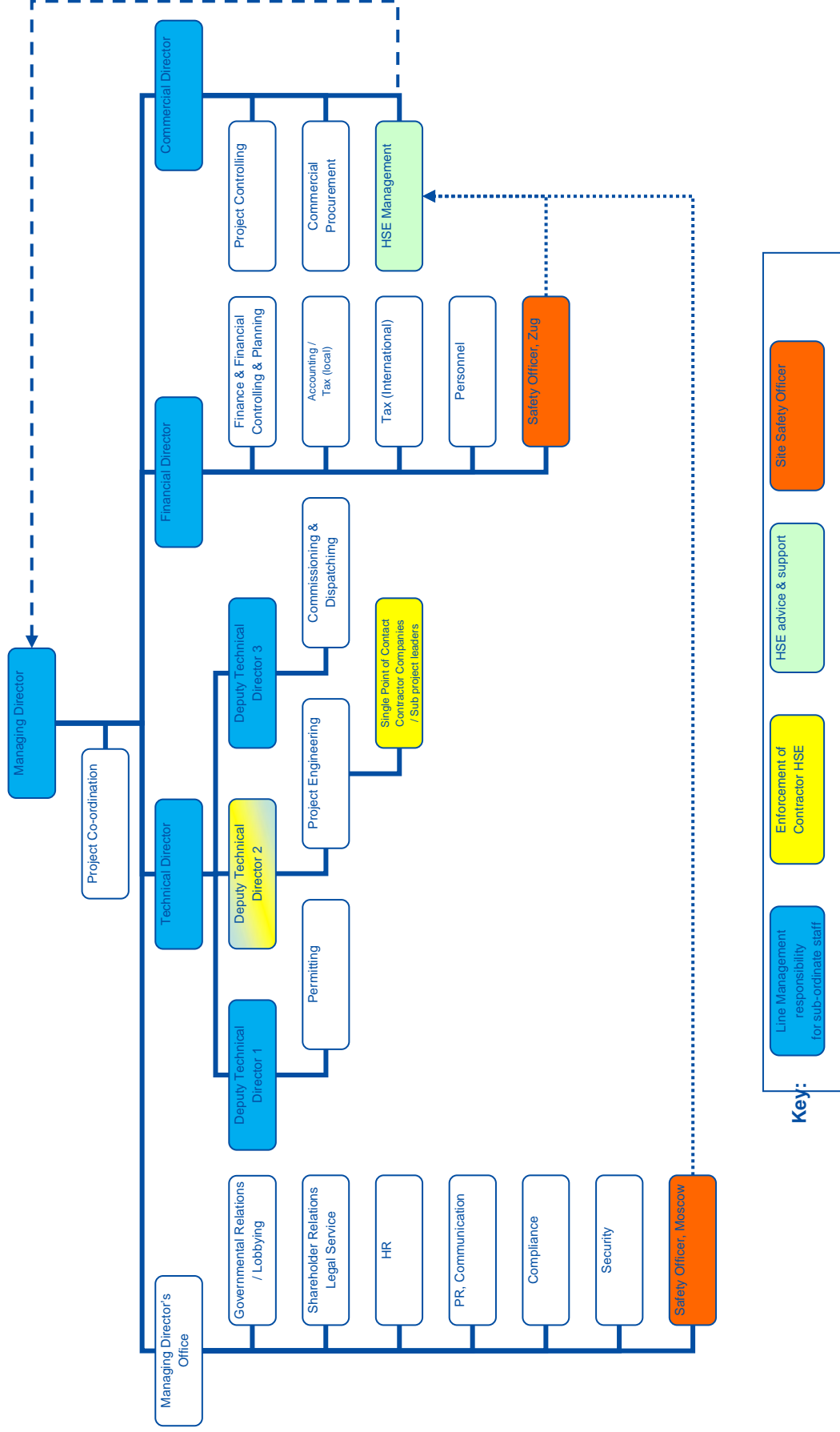


Figure 12.3 Nord Stream HSE responsibilities and contractor links

The Company Representative (Nord Stream's Single Point of Contact, responsible for each contract), in conjunction with the HSEQ Manager, is responsible for communicating with the contractor in relation to:

- Ensuring the HSE plans are suitable and sufficient and are subjected to prior approval
- Specifying the appropriate technical HSE standards for the work
- Monitoring the implementation of the HSE plans
- Ensuring compliance with specific HSE procedures (both Nord Stream's and the contractor's own)

12.3.2 Contractor Management During Construction

Construction of the pipelines will be carried out by contractors on behalf of Nord Stream under the direction of the Nord Stream Project team. Nord Stream is aware of the need to provide the contractors with a set of minimum HSE standards to be implemented during construction. Contractors will be required to implement a HSE Management System in line with the principles of OHSAS 18001 and ISO 14001 and meet or exceed the standards set by the Nord Stream HSE MS. This requirement will be incorporated into all contracts.

This strategy will ensure consistency in approach towards environmental and social performance, and implementation of the Project wide commitments, standards and requirements across all aspects of the Project and by all contractors.

The management of the significant environmental and social risks and impacts will be part of the objectives of the HSE Plan. These will be defined in a specific Environmental and Social Management Plan (ESMP) in advance of each major phase of the Project, i.e. construction, pre-commissioning and commissioning, operation and decommissioning. Each ESMP will capture all of Nord Stream's commitments from the EIAs and its obligations from the permits for each of the phases to be implemented. The ESMPs will be supported via subsidiary plans that will address specific issues of concern to that phase (such as management of vessel movements during construction, for example). Where appropriate, these subsidiary plans will be implemented by contractors under Nord Stream's direction, but Nord Stream will retain accountability for their effective implementation.

A brief overview of typical support plans is presented in **Section 12.4**. A comprehensive register of all Project commitments is currently under development. This register will capture all material Nord Stream commitments contained in the five national EIAs and the Espoo Report.

As discussed above Nord Stream will appoint a Company Representative for each major contract (such as pipe-laying, for example). The Company Representative will be responsible for reviewing the HSE performance of the assigned contractor and ensuring that the contractor incorporates all EIA commitments and permit conditions into the contractor's method statement and field execution.

12.4 Supporting Environmental Management Plans

The following plans have been (or are in the process of being) developed based on industry experience of implementing international marine pipeline Projects of a similar scale.

- Pipe lay reinstatement plan
- Pollution prevention plan
- Chemical management plan
- Waste management plan
- Emergency notification and response plan
- Vessel management plan
- Pre-commissioning plan

12.4.1 Pipe lay Reinstatement Plan

A large proportion of potential Nord Stream pipelines' impacts are associated with the various pipe lay activities and the significance of the realised impacts will be directly reliant on the rigorous implementation by the pipe lay contractor of the various mitigation and management measures that have been incorporated into the Project. In this regard, a specific Pipe lay Reinstatement Plan (RP) will be developed prior to commencing construction of the pipelines to ensure that the pipe lay contractor (and subcontractors) implement the Project in the way that is intended. The plan will reflect Nord Streams commitments arising out of the environmental assessment process as well as the requirements stated in permits. The Nord Stream ESMP will monitor the effectiveness of the reinstatement plan and the results of the monitoring will be used to identify where the RP needs to be modified.

The RP will be applicable to both sub-sea and terrestrial elements of the pipelines construction.

12.4.2 Pollution Prevention Plan

A Pollution Prevention Plan (PPP) is to be developed which will outline the Project wide approach to removing or reducing the risk of pollution occurring during the course of the Project. The PPP will be a high level document outlining the overall approach to pollution prevention and will address such topics as:

- Risk identification and reduction
- Site inspection practices
- General principals on emissions to air, water and soil

12.4.3 Chemical Management Plan (CMP)

During the construction phase of the Project there are likely to be a wide range of chemicals needed and used both on land and at sea. The prevention of fuels spills is a particularly important aspect. Contractors will be required to submit Chemical Management Plans for approval by Nord Stream prior to the commencement of construction. Nord Stream has developed a Chemical Management Policy defining the standards for ensuring chemicals are managed so that the risk to individuals and the environment is minimized. It also specifies the content of Chemical Management Plans and includes:

- Specifying persons responsible for plan implementation
- The maintenance of chemical inventories
- The maintenance of MSDS records
- Documented risk assessments relating to the use of the chemicals
- Documented procedures for storage, labeling and use
- Prevention of incidents and emergencies
- Emergency response procedures
- Arrangements for training

The CMP will feed into and will be aligned to the PPP, waste management plan, emergency response plan, as well as the more general health and safety requirements defined in HSE MS procedures. The CMP will make specific reference to the storage, transportation and transfer of

oil both on land and at sea. Specific requirements in relation to facilities to be provided and maintenance of such facilities are to be outlined, and include requirements for:

- Overflow prevention systems
- Spill containment systems
- Sumps and drainage systems
- Alarm systems including high level alarms
- Fire and explosion prevention systems
- Inspection and maintenance programmes for equipment and instrumentation
- Asset integrity programmes
- Spill prevention and emergency response training for its personnel

12.4.4 Waste Management Plan

Nord Stream has developed a Waste Management Policy. Specific waste management plans will be developed for each phase of the Project to ensure that the commitments in the policy in relation to minimisation, monitoring, reporting and compliance with legal requirements are maintained.

The waste management plans will address waste produced during the construction and operational phases of the Project and at facilities on land and at sea.

The waste management plans will identify the type, source, quantity and disposal route for each waste stream in a “cradle to grave” approach. Approved disposal options or contractors will be identified and details of reporting, monitoring and auditing of third party contractors will be specified.

12.4.5 Emergency Notification and Response Plan

This plan is currently in place. The purpose of the plan is to provide contractors and Nord Stream employees with the clearly defined procedure to follow in emergency situations. The plan focuses on the procedure for notifying Nord Stream management in the event of an HSE emergency and outlines the responses to be taken by senior management. This plan is subject to regular review and will be developed further to address both construction and operational phases in advance of their implementation.

12.4.6 Vessel Management Plan

Considering the number of vessels to be used in the construction of the pipeline, including the pipe laying vessel and support vessels, it is important to develop a specific vessel management plan. This plan will reflect commitment to such practices as the use of accepted and standard shipping lanes, operation in sensitive areas and reporting of ice breakage, monitoring for mammals, interfacing with the CMP and Waste Management Plan as well as referencing the minimum legal international HSE requirements.

12.4.7 Pre-commissioning Plan

A specific plan will be developed for the management of environmental issues around the testing and commissioning of the pipeline. Potential impacts and associated mitigation measures identified in the EIA will form the basis for this plan. The plan will specifically address:

- Abstraction of water for pre-commissioning
- Treatment of water to be used in pre-commissioning
- Treatment and discharge requirements of pre-commissioning waters

The plan will also outline the monitoring required to ensure discharges meet the limits set out in the relevant permits, which will be incorporated into the overall environmental monitoring programme, along with the reporting requirements to Nord Stream and the relevant national authorities.

12.5 Supporting Management Requirements

12.5.1 HSE Training and Awareness

An HSE Induction is given to all employees when they join the company. The induction includes the following topics:

- Site orientation and emergency procedures
- General HSE rules, regulations and access to HSE documentation
- Information on the HSE Management System

Training needs in relation to job function are assessed each year during the personal appraisal with the individual's line manager. HSE training, either internally or from an external training

provider, is decided at this time. There is also provision to provide training in addition to that identified during the appraisal, subject to line management approval.

HSE training and competence of contractor and sub-contractor personnel is a key requirement of contractual agreements and is closely monitored by Nord Stream during the execution of the work.

12.5.2 Ensuring Effective Implementation of the HSE-MS

As part of the “Check” phase of the *Plan, Do, Check, Act*, management process see **Figure 12.2** Nord Stream has developed a HSE Audit and Inspection Procedure.

Assessment of the effectiveness of contractor and supplier management systems will be carried out through planned audits and unannounced inspection of sites. The HSE Audit and Inspection Procedure outlines the overall framework of how audits and inspections are scheduled and carried out and includes detailed requirements relating to demonstrating the implementation of contractor HSE Plans. The procedure is designed to allow the scheduling of audits and inspections to be directed towards those areas of high risk, but can be altered in response to any incidents and weaknesses detected in the contractor’s system.

The Nord Stream HSE Manager has overall responsibility for scheduling, review of reports and tracking of non-conformances.

As stated, audits are directed towards areas of high risk and are carried out to assess compliance with the standards defined in the HSE MS, such as:

- Minimum HSE Standards for Contractor Worksites
- The Contractor’s HSE Plan
- HSE Incident Reporting and Investigation Procedure
- Internal and External Communication Procedure
- Pollution Prevention Plan
- Chemical Management Plan
- Waste Management Plan
- Vessel Management Plan

12.5.3 Change Management

General considerations

Gaps and uncertainties in information regarding the Project and the EIA process inevitably remain at the time of completing the environmental assessment process, prior to the start of construction. The HSE MS, and more specifically the HSE Plan, requires formal “management of change” procedures to be implemented so that changing circumstances and / or re-evaluation of initial assumptions made can be fully considered and the implication for the EIA can be resolved.

Timing and the EIA process

The Nord Stream EIA process was initiated in 2005 alongside early Project feasibility studies and has been completed alongside more detailed design. It has therefore had the opportunity to influence Project development as the environmental aspects and impacts were identified in parallel to the design engineering. It has also allowed stakeholder consultation to take place and to influence the pipeline design. As a result, there is good alignment between the scope of the EIA and the detail on how the Project will be executed. Consequently, major changes to the Project that may influence the findings of this EIA are not expected to occur.

Dealing with uncertainty and future changes

However, it is important to realise that uncertainty is an inherent feature of EIA. In the case of the Nord Stream pipelines, the main areas of uncertainty are the understanding of the baseline environment (ecosystem, habitats etc.) and in the assumptions made during the impact assessment.

At this stage of the Nord Stream Project development, the Project design is well developed, certainly sufficiently to enable all of the potentially significant impacts to be identified and assessed. Identifying any key remaining uncertainties, i.e. those that could materially have some influence on the assessment of impacts presented in earlier sections, is intended to allow plans to be put in place to acquire the outstanding information and continue to take account of it as part of the overall Project ESMP.

Where uncertainty is present, it needs to be dealt with in a structured and transparent way. The system implemented by Nord Stream for dealing with post-EIA submission design changes will also serve to manage current uncertainty. The EIA Change Management System for dealing with design changes and uncertainty recognises three orders of change/uncertainty:

- A first order, where the change or uncertainty is largely immaterial to the EIA findings. The only necessary action is to amend the ‘Commitments Register’ and Project ESMP to (if necessary) reflect how this change or uncertainty is ultimately resolved.

- A second order, where the change or uncertainty is material to the EIA findings, but is within the boundaries of the defined Project base-case covered by this EIA. The required action is to define the change, assess impacts and mitigation. Frequently this will impact one or more of the management plans and if significant, additional notification and consultation with other stakeholders
- A third order, where a future design change or uncertainty leads to a departure from the base-case, or a key aspect of it. An addendum to the EIA and formal submission and approval process are likely to be required

The way in which these changes or uncertainties will be dealt with in the period following completion of this ESPOO Report is shown in **Figure 12.4**.

In order to ensure a robust management of change process is applied during the Project, the Nord Stream HSE MS will include a requirement for the Contractor to classify any changes in design or process and to assess these changes to establish whether or not it affects the significance of environmental impacts and related mitigations. The Nord Stream will follow the Management of Change process where any significant environmental impact should be highlighted.

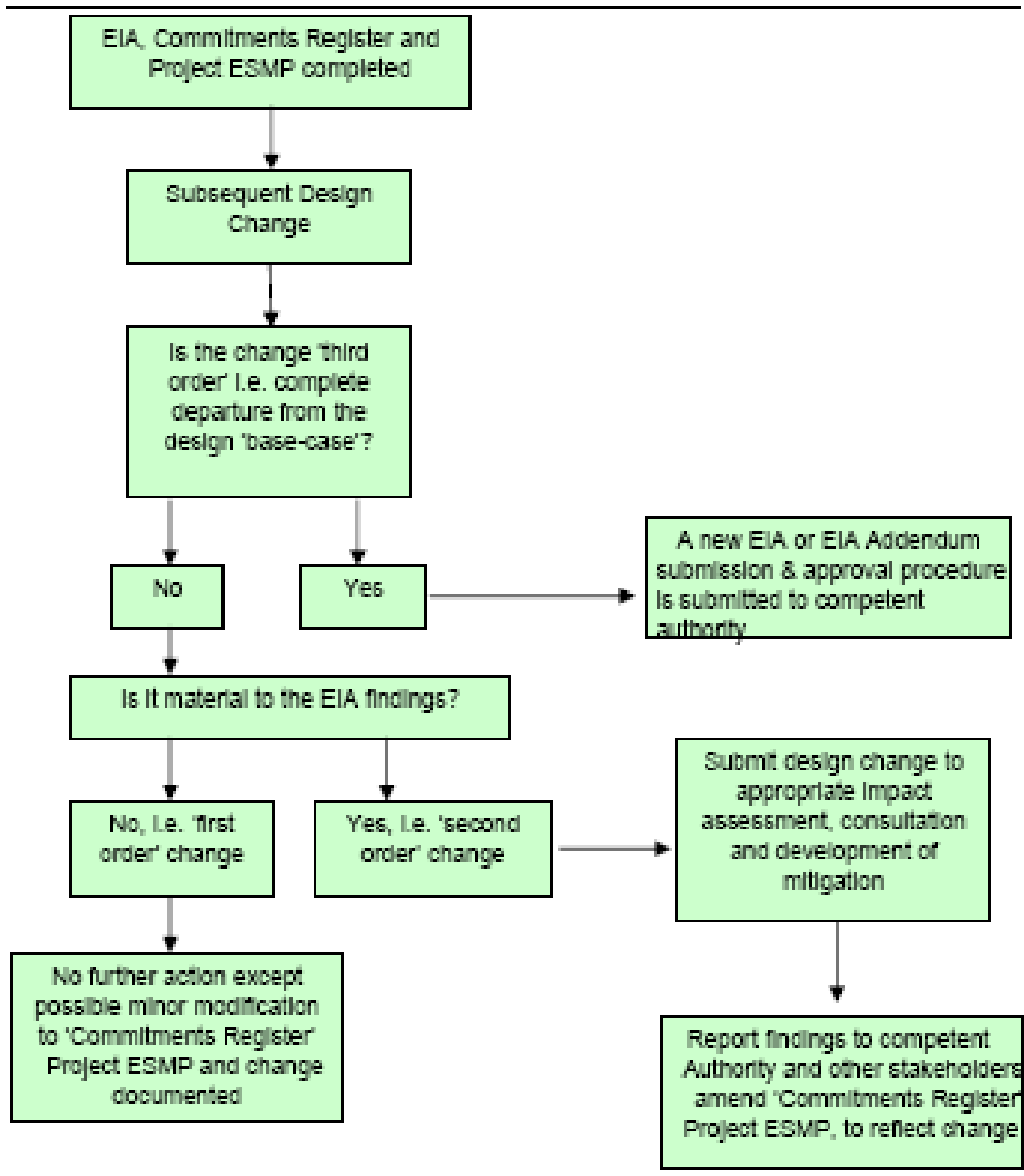


Figure 12.4 The EIA process for dealing with uncertainty and post-submission design change

12.5.4 Third Party Communications Procedure

Nord Stream will develop a structured procedure for dealing with all communications from third parties, such as members of the public, NGOs, workers employed by Nord Stream's contractors and the other Stakeholders. The objective of the Third Party Communications Procedures will be

to capture all incoming communications, whether oral or written and whether of complaint, grievance, communicative or any other nature. The procedure will provide for the communication to be logged and directed to an appropriate party for a considered response to be provided to the initiator of the communication. All outcomes will be recorded.

12.5.5 Reporting

The HSE MS procedure defines the requirements for a programme of internal and external reporting through all stages of the Project. Contractors will be required to fully comply with the reporting programme, in terms of timely submissions and detail of reporting.

The reporting programme is anticipated to include the following components:

- Audit and inspection reporting
- Reporting of incidents, causing environmental pollution, injuries or delays or potential delays or implications for the work
- Compliance reports demonstrating compliance with all relevant requirements of the EIA, permits, etc as they relate to the contractors scope of works and highlighting any areas of non-compliance and remedial actions
- Revised schedules detailing progress of specific tasks

Specific communication channels will also be developed to facilitate the provision of external communications and reporting from Nord Stream to the relevant National Authorities and Espoo.

12.6 Management During Operation

Prior to the start-up and operation of the pipeline, Nord Stream will establish a dedicated Operations Department, responsible for the pipeline operation under all conditions. Key personnel within this department will be fully trained to operate the pipeline utilising specific protocols and procedures. Within the Operations Department, all emergency procedures, reporting lines, and responsibilities will be clearly defined and documented and all necessary personnel will be fully trained in these procedures. To ensure timely planning and implementation of all of these measures, Nord Stream has already appointed its Director of Operations.

Prior to start-up, during pipeline commissioning, a full systems check will be carried out on all communication lines and protocols, automation systems, pressure safety systems and all mechanical systems. Alarms and set points will also be adjusted and tested. Once this systems

check has been completed successfully, the integrity of the pipeline will be tested using a leak test to the appropriate engineering standards and national regulations.

Following successful completion of all testing procedures on the system, the pipeline will become operational, under the control of the Operations Department.

12.7 Environmental Monitoring Programme

12.7.1 Nord Stream's Approach to Environmental Monitoring

Consistent with its obligations as a prudent and responsible operator, Nord Stream is committed to the goal of preventing pollution and minimising the impact on the environment from its operations. In this respect, Nord Stream has ensured that a high level of mitigation has been incorporated into the Project from an early stage in Project design and has identified commitments as part of the EIA process towards achieving this goal.

One of the key means of demonstrating that Nord Stream is achieving its goal is through monitoring. Nord Stream is committed to the implementation of a focussed, fit-for-purpose Environmental Monitoring Programme with the following objectives:

- To meet the requirements of the national permits
- To verify the broad findings of the modelling used to predict the impacts
- To ensure that the construction and operation of the pipeline is not causing impacts not previously identified in the EIA
- To ensure that the construction and operation of the pipeline is not causing known impacts to a greater significance than predicted
- To verify the effectiveness of mitigation measures
- To identify at an early stage unforeseen adverse effects, and to take remedial action
- To monitor the rehabilitation of the environment post construction

12.7.2 Development of an Environmental Monitoring Programme

The EIA process through scoping, literature studies, expert involvement and detailed surveys and analyses of the physical, biological and social/socio-economic environment allows the Project baseline to be understood in terms of its values and sensitivities. The EIA process goes

on to identify Project impacts (planned and unplanned), predicts their magnitude (e.g. through modelling approaches) and assesses impact significance based on the magnitude of impact experienced versus the value or sensitivity of the resource or receptor impacted.

This EIA approach implies that environmental monitoring will be directed at those areas of environmental sensitivity that are predicted to experience significant (moderate significance or more) impacts from the Project. It is equally important to direct monitoring effort where there is significant uncertainty as to the accuracy of the impact assessment, and where the outcome of monitoring has the potential to influence an intervention from the Project that will reduce the significance of the impact. In the context of this Project, the opportunities to apply lessons learned from monitoring are threefold: at or near to the monitoring site, in subsequent sections of the pipeline route and for the second pipeline.

The Nord Stream Environmental Monitoring Programme will therefore provide the basic information to enable management decisions for any necessary corrective measures to be taken during the construction and operational phases. It will provide the basis for evaluating the effectiveness of mitigation measures and identify at an early stage unforeseen adverse effects, and to take remedial action accordingly. Future monitoring activity will focus on two principal aims:

- *Impact monitoring*: This category of monitoring will be ongoing throughout the Project construction and must be implemented to ensure that critical environmental impacts are within the predicted levels and that specified environmental performance targets are being achieved.
- *Compliance monitoring*: This type of monitoring will be implemented to ensure that the prescribed mitigation measures are having the predicted and desired effect. This monitoring will be conducted periodically, the timing of which will vary according to the parameters. It will be undertaken where appropriate (and where mandated by the competent authority) to check that the levels of specific environmental parameters are corresponding to acceptable levels, compliant with laws, regulations, standards or guidelines, as applicable. The programme will need to make provision for remedial measures to be implemented in the event of noncompliance, i.e. when mitigation measures are demonstrated to be inadequate or when impacts have been underestimated in the EIA.

12.7.3 Key Considerations in Developing the Final Monitoring Programme

The Nord Stream Environmental Monitoring Programme will address four discrete phases of monitoring activity:

- Pre-construction

- During construction
- Immediately post-construction
- Operation

There will be certain distinctions between the monitoring rationale and focus for the four designated monitoring phases. In addition, the monitoring programme is a direct response to the environmental impacts and issues that have been addressed in the EIA, specifically those requiring mitigating measures and monitoring. It is therefore important to note that the requirement for monitoring of particular parameters or the degree (spatial and temporal frequency) of monitoring will vary considerably from place to place, for example as determined by the different characteristics of the Ecological Sub-Regions and also to address particular reporting requirements at the national levels. For the clear identification of the effectiveness of mitigation measures and potential actual Project-related impact the receptors/indicators identified for the environmental monitoring program have to be of low natural variability, ESR-specific broad applicability, indigenous, measurable and with a sound historic data series. In addition their selection needs to be appropriate to the scale of disturbance, to the impact mechanism and to temporal and spatial dynamics.

Further key considerations in the environmental monitoring programme are as follows:

- *Consistency*: It will be desirable to the extent practicable to have a harmonised approach in terms of sampling and analysis protocols along the length of the route. For some parameters there may be prescriptive requirements at the national level but where this is not the case a harmonised approach will deliver data that are more readily comparable and will allow for improved environmental management and performance. A harmonised approach will be facilitated by already existing agreements on scientific monitoring embraced under HELCOM.
- *Synergy*: The Project will undertake engineering and maintenance led investigations and surveys. These will include seabed investigations to understand substrate and presence of obstacles, and the condition of pipelines and their support structures. These surveys, using ROVs, can be readily combined with surveys of seabed condition, cultural heritage, etc. The principle to be adopted will be to have integrated survey protocols that maximise synergy between these different objectives.
- *Reporting and Data Sharing*: It will be important for the Project to have access to ongoing data acquisition programmes by third parties and government institutions to be able to most fully interpret the data it collects. This may potentially extend to using common stations for control monitoring as part of a Before-After-Control-Impact (BACI) approach (see also below). By the same token, subject to any constraints on disclosure placed by a national authority, the Project is committed to share its data with interested parties and make

arrangements to facilitate this process. At a Project-wide level, Nord Stream is committed to report publically on its monitoring programme on a regular basis. At a national level, results will be shared with national authorities on a frequency to be negotiated with each national authority.

- *Seasonal and Inter-annual Variability and BACI:* It is important to consider the inherent natural variability that is typical of many of the parameters used in marine monitoring programmes. For instance, seasonal and inter-annual variability in recruitment success of mussels can easily mask changes brought about by the Project or lead to incorrect conclusions about its presumed impacts. Similarly, it is pertinent that adequate controls and reference sites are used to account for the spatial variability that may occur in the marine environment. This is where a BACI approach is of particular value, whereby data are acquired from within the impact area (as predefined in the EIA) and at reference areas located sufficiently far away to ensure that they will be unaffected by the Project and where natural environmental conditions will be preserved. It may be advisable to adopt the co-use of 3rd party (HELCOM etc) monitoring stations. The distances at which the control stations are located from the Project area will vary according to the different types of impact as predicted in the EIA. For the monitoring programme to be effective, testable hypotheses will be drawn up about the impact of the Project vis-à-vis the natural variability. It follows that the methods and parameters chosen and number of samples taken will ensure a statistically rigorous approach that is capable of detecting significant changes.
- *Review and Close Out:* Monitoring is not an open-ended process. It is important to regularly review monitoring results, not just from the perspective of impacts but also to establish whether there is any need for a particular element of the monitoring programme to continue, or to continue in its current form. Once a designated purpose has been served some elements of monitoring will cease. Others may be enhanced or become more frequent in response to new learnings. Overall it is important that the programme remains fit-for-purpose and delivers the main monitoring objectives throughout the Project lifetime. Expert review will therefore be conducted on a regular basis to ensure these objectives still hold true.

12.7.4 Outline of Nord Stream's Monitoring Programme

Pre-construction Phase Monitoring

The pre-construction phase, where it should be noted that much data have already been collected and reported as part of national application documents and the Espoo Report baseline **Chapter 8**, applies to any data collection in advance of construction (whether it is a few months or a few days) that adds to the pre-Project baseline.

Priority for monitoring in the pre-construction phase has been given to filling gaps or updating baseline data for topics and parameters that will be important in subsequent phases of monitoring and in the context of BACI: Before-After- Control-Impact. In this regard, an extensive marine survey programme has already been undertaken to establish the baseline conditions along the pipelines alignment. If any national environmental monitoring programme should require pre-construction phase monitoring additional to the work already conducted then this will be aligned with the earlier surveys so as to secure continuity within the Environmental Monitoring Programme.

Monitoring During Construction

This addresses impacts during the construction phase, i.e. while there is work physically ongoing, to collect data on actual construction impacts.

Priority for monitoring of the construction phase has been given to:

- Impacts that have a cause-effect relationship with the construction activities
- Effects that can and should be mitigated
- Effects that can be measured
- Effects that have some uncertainty attached
- Effects that are important based on the findings of the impact assessment process

Box 12.3 Monitoring During Construction

<i>MONITORING DURING CONSTRUCTION</i>
<p>Physical Environment - Water Column (oxygen, nutrients and chemical compounds that could be harmful to the environment, such as heavy metals and organic compounds):</p> <ul style="list-style-type: none"> • <i>Objective</i> - to verify the assessed impacts related to the construction works (seabed intervention works, pipe-laying and anchor handling) • <i>Approach</i> - HELCOM or national standards
<p>Physical Environment - Water Column (e.g. suspended solids, sediment spill rate, extent and duration of the sediment plume, natural sediment):</p> <ul style="list-style-type: none"> • <i>Objective</i> - to describe and evaluate sediment spreading and sedimentation based on in situ measurements, including the spreading of contaminants. If the measurements of sediment spill rates should deviate significantly from the assumed spill rates adequate action will be taken. Results from the monitoring programme will be used to validate input data used for the mathematical modelling in the EIA and to verify the modelling results. If the monitoring verifies the results of the modelling then this element of environmental monitoring will cease on the basis that impacts are as predicted. • <i>Approach</i> – the precise approach to the monitoring programme, including the number and location of monitoring stations, methodology used and number and timing of surveys, will be established in consultation with the relevant country authorities.
<p>Biological Environment - Marine Mammals and Sea Birds:</p> <ul style="list-style-type: none"> • <i>Objective</i> - to ensure that no critical interaction occurs during the pipe-laying activities offshore e.g. avoiding considerable disturbance of marine mammals or birds • <i>Approach</i> - watching brief on-board construction vessel by a suitable expert. Methodology to be determined with the authorities
<p>Social and Socio-economic Environment - Cultural Heritage:</p> <ul style="list-style-type: none"> • <i>Objective</i> - pre-installation surveys are aimed at allowing the Project to avoid any areas or objects of cultural value, however, there is a residual risk of artefacts being present and only becoming revealed during seabed intervention works also referred to as chance finds. The main purpose will be to record and add to knowledge. • <i>Approach</i> - methods will be adopted to suit the construction activities but these will include adding protocols to seabed inspection during construction to cover cultural heritage and also to evaluate any materials that is uncovered.

Post-construction Monitoring

Monitoring immediately *post-construction* is aimed at establishing recovery from the changes induced by construction activity.

Priority for monitoring in the *post-construction phase* has been given to:

- Effects that have a cause-effect relationship with the after-effects of construction
- Effects that can and should be further mitigated
- Effects that could allow continuous improvement later in the Project
- Effects that are important based on the findings of the impact assessment process

Box 12.4 Post-Construction Monitoring

<i>POST-CONSTRUCTION MONITORING</i>
<p>Physical Environment - Water Column (oxygen saturation, salinity, temperature in bottom waters):</p> <ul style="list-style-type: none"> • <i>Objective</i> - to provide context for observations of benthos • <i>Approach</i> - precise approach to monitoring programme to be established in consultation with the relevant country authorities
<p>Physical Environment –Seabed (bathymetry and sediment characteristics):</p> <ul style="list-style-type: none"> • <i>Objective</i> - monitoring of seabed and substrate characteristics to understand restoration/recovery in the first years after pipeline construction • <i>Approach</i> - use of bathymetric measurements, Side Scan Sonar and grain size distribution tests. Additional checks to see if reworking is required due to local erosion.
<p>Biological Environment - Marine Benthos:</p> <ul style="list-style-type: none"> • <i>Objective where the pipeline has been trenched:</i> To provide a record of baseline conditions against which to verify EIA predictions, monitor changes and regeneration of benthic fauna communities • <i>Objective where the pipeline has been laid:</i> To describe the epifauna and infauna communities on and in close vicinity to the pipeline and compare these communities with the fauna structures in/on the undisturbed seabed • <i>Approach</i> - HELCOM or national standards. Precise approach to monitoring programme to be established in consultation with the relevant country authorities, but assumed to replicate baseline surveys in terms of methodologies and station locations.
<p>Biological Environment - Fish:</p> <ul style="list-style-type: none"> • <i>Objective</i> - to monitor changes in the fish community after construction of the pipelines and during operation • <i>Approach</i> - precise approach to monitoring programme to be established in consultation with the relevant country authorities (e.g. HELCOM or national). The methodology and interpretation of results will need to be such that inter-annual and seasonal variations can be understood and the impacts of the fishing industry on fish populations can be isolated.
<p>Social and Socio-economic Environment - Cultural Heritage:</p> <ul style="list-style-type: none"> • <i>Objective</i> - to verify the successful application of mitigation measures applied during construction that were related to cultural heritage and to check for other obstacles on the pipeline route e.g. dropped objects, outcrops of rock and unidentified bottom features • <i>Approach</i> – subject to the results of monitoring during construction and therefore necessity for further monitoring, this will utilise an ROV (Remote Operated Vehicle) which will navigate along the pipeline and perform a visual survey, identifying any obstacles on the route, In the event that there is poor visibility, the ROV will utilise other on-hand equipment such as sonars.

Monitoring in the Operational Phase

During the *operational phase*, monitoring is aimed at establishing the effects of the long-term presence/operation of the pipeline, and will also provide a baseline for the future decommissioning phase.

Priority for monitoring in the *operational phase* has been given to:

- Effects that have a cause-effect relationship with the physical presence of the pipeline and associated features (such as support structures) on the seabed
- Effects that can and should be further mitigated
- Effects that are important based on the findings of the impact assessment process

Box 12.5 Monitoring in the Operational Phase

<i>MONITORING IN THE OPERATIONAL PHASE</i>
<p>Physical Environment - Water Column (oxygen saturation, salinity, bottom-water temperature):</p> <ul style="list-style-type: none"> • <i>Objective</i> - to establish accuracy of impact assessment regarding temperature changes induced by the pipelines and to provide context for the interpretation of benthic ecology • <i>Approach</i> - precise approach to monitoring programme to be established in consultation with the relevant country authorities but presumed to be a one-off exercise at one location
<p>Physical Environment –Seabed (bathymetry):</p> <ul style="list-style-type: none"> • <i>Objective</i> - to monitor changes in seabed characteristics against equivalent monitoring exercise in pre- and post- construction stage, to ensure structural integrity of the pipelines and to monitor unforeseen changes such as local erosion, in the seabed conditions • <i>Approach</i> - use of bathymetric measurements, Side Scan Sonar, grain size distribution tests and visual inspection via ROV survey
<p>Biological Environment – Marine Benthos:</p> <ul style="list-style-type: none"> • <i>Objective</i> - to understand the recolonisation of affected areas and new substrate by benthos and macrophytes (in shallower areas) and changes in benthic community structure immediately around the pipelines and on the slope of the trenched sections • <i>Approach</i> - HELCOM or national standards (and application of BACI). Precise approach to monitoring programme to be established in consultation with the relevant country authorities. Need for ongoing monitoring to be reviewed once there is community stability
<p>Biological Environment – Fish:</p> <ul style="list-style-type: none"> • <i>Objective</i> - a programme to monitor changes in the fish community after construction of the planned pipelines (compare with monitoring information from the pre-construction baseline) • <i>Approach</i> - precise approach to monitoring programme to be established in consultation with the relevant country authorities (e.g. HELCOM or national). The methodology and interpretation of results will need to be such that inter-annual and seasonal variations can be understood and the impacts of the fishing industry on fish populations can be isolated (application of BACI)
<p>Unplanned Events - Disturbance of Munitions:</p> <ul style="list-style-type: none"> • <i>Objective</i> - to ensure no munitions have encroached onto the pipelines' corridor • <i>Approach</i> - ROV inspections

12.7.5 Finalising the Nord Stream Environmental Monitoring Programme

Section 12.7.4 sets out Nord Stream's outline monitoring programme. This proposed programme will form the basis of negotiations with authorities in each of the five Party of Origin countries.

Nord Stream is currently in the process of submitting its national applications in the five Party of origin countries. Negotiating monitoring requirements will form a key component of the negotiations with each competent authority (for each stretch of the pipeline along its entire route). Once detailed monitoring requirements are delineated for each of the five countries Nord Stream will compile an integrated Environmental Monitoring Programme for the Project, taking cognisance of the requirements of the various authorities, seeking to incorporate synergies and maximise the informative value of the monitored data along the entire lengths of the pipelines.

12.7.6 Delivering Monitoring Commitments

The Environmental Monitoring Programme requirements will be passed down to Contractors, Sub-contractors or other parties. This will involve appropriate requirements to maintain records and report on monitoring activities as part of the application of overall environmental management systems and procedures.