Chapter 7

Impact Assessment Methodology

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7 Impact Assessment Methodology

7.1 Overview

This EIA has followed a systematic process to identify and evaluate the potential impacts that the proposed Nord Stream Project may have on the physical, biological and social/socioeconomic environments and to develop mitigation measures that will be incorporated by the Project in order to avoid, minimise or reduce these impacts. The aim of this chapter is to provide a description of the methods and concepts employed in this process, the relevant terminology and the specific threshold criteria used in assessing impacts. Accordingly, this chapter focuses on the following:

- *Scoping and Impact Identification*: the scoping and impact identification processes that were followed during the initial phases of the EIA
- *Baseline Description*: the baseline description and the concept of Ecological Sub-Regions and how they were employed in the impact assessment process
- *Impact Assessment Methodology*: the methodology employed to assess the significance of both planned and unplanned events, while taking into consideration forms of mitigation and, for unplanned events, the probability of an event taking place
- *Impact Integration*: the integration of impact mitigation measures, as determined during impact assessment, into the design and execution of the Project
- *Transboundary Impacts*: the assessment of impacts that may extend across country boundaries

The methodology employed complies with the requirements of the Espoo Convention and European Union EIA Directives (85/337/EEC and 97/11/EC); the principles of the IEMA Guidelines for EIA(1) as well as previous experience gained in the assessment of impacts associated with offshore pipelines.

The assessment of impacts is presented in **Chapter 9.** Transboundary impacts are assessed separately in **Chapter 11**.

(1) Institute for Environmental Management and Assessment (IEMA). Guidelines for Environmental Impact Assessment. England. 2004.

7.2 Definition of Scope and Identification of Impacts

7.2.1 Overview

Scoping, in the context of the EIA, is defined as that part of the process that has sought to determine the technical, spatial and temporary scope of the Project for the purpose of impact assessment. Consultation with regulators and stakeholders has been a critical input to scoping, the results of which have contributed to the manner in which the EIA has been conducted.

Following definition of the scope of assessment, the EIA progressed to impact identification, which sought to categorise the potential impacts to the identified environmental and social resources and receptors. As the Project progresses through a number of countries and borders on a number of others, the potential for transboundary impacts is investigated in the EIA.

7.2.2 Establishing the Scope of the Assessment

The Nord Stream Project may give rise to transboundary impacts within both the countries of origin (i.e. the Exclusive Economic Zones (EEZs) of the countries through which the pipeline system passes, which includes Russia, Finland, Sweden, Denmark and Germany) and possible affected countries (i.e. the EEZs of the remaining countries bordering the Baltic Sea, which comprises Estonia, Latvia, Lithuania and Poland). As such, it has been agreed that the Project falls within the auspices of the Espoo Convention and thus the EIA is required to comply with the requirements of the said Convention. This has dictated that the EIA investigates those impacts that are expected along the pipelines' route as well as those impacts that may extend further to a regional or a transboundary level. The Espoo Convention has served to guide the scoping phase of the EIA.

The initial step undertaken in the EIA has been to identify the scope of the assessment, i.e. to identify the range of environmental and social/socioeconomic components to be studied (technical scope), the geographical area to be covered (spatial scope) and the timeframes over which the Project will be carried out (temporal scope).

Technical Scope

The Project definition and design (**Chapter 4**) defined the range of environmental and social/socioeconomic components (**Chapter 8**) that were studied in the context of the EIA. This has been termed the technical scope of the EIA. The technical scope has not been restricted to components that may be affected by the pipeline alone, but has also considered all other pertinent activities associated with the pipeline, such as construction activities, logistical support and ancillary activities as well as pipeline decommissioning. The relevant environmental and social/socioeconomic components on which the Project may impact are summarised in

Table 7.1 and presented in detail as part of the Baseline Description in **Chapter 8**. The impacts upon each component are assessed in **Chapter 9**.

Table 7.1 Environmental and social/socioeconomic components associated with the Nord Stream Project

Environment	Resource or Receptor
Physical environment	Physical processes
	Water column
	Seabed
	Atmosphere
Biological environment	Plankton
	Marine benthos
	Fish
	Sea birds
	Marine mammals
	Nature conservation areas
Social and socioeconomic environment	Fisheries
	Shipping and navigation
	Tourism and recreation
	Cultural heritage
	Offshore industry
	Military operations

The different types of surveys performed for each environmental component are detailed in **Chapter 4**.

Spatial Scope

The spatial scope of the assessment details the geographical area that may be affected by the Project. The pipelines' route is about 1222 km in length. However, the locus of potential impact along the route fluctuates in terms of the environmental conditions (e.g. sediment types, bathymetry, etc), the specific resource or receptor (e.g. water column, marine mammals, etc) as well as the impact of concern (e.g. increase in turbidity, noise and vibration, etc). As such the locus of impact may extend from the pipelines themselves to a number of kilometres on either side of the pipelines. The sensitivity of each potentially affected resource/receptor and the distance over which a related impact may propagate has served as the basis for determining the spatial scope of impact assessment (e.g. the harbour porpoise may be sensitive to noise within 10 km of the construction area while an oil spill may affect a larger area by spreading across country EEZ boundaries). The presence of pathways, such as the atmosphere and the water column, along which impacts may spread causing secondary environmental impacts has also been considered. The spatial scope of each impact on a particular resource/receptor is detailed in **Chapter 9**.

The pipelines' route has been delineated into five Ecological Sub-Regions (ESRs) in order to focus the assessment on specific areas (**Section 7.3.2** and **Chapter 8**). The ESR assessments contribute to an overall impact summary. All impacts are assessed in terms of their effect on the resources/receptors in each ESR. Impacts that migrate across country EEZs are assessed as transboundary impacts (**Chapter 11)**.

The pipelines' route, together with the designated ESRs, is depicted in **Figure 7.1.**

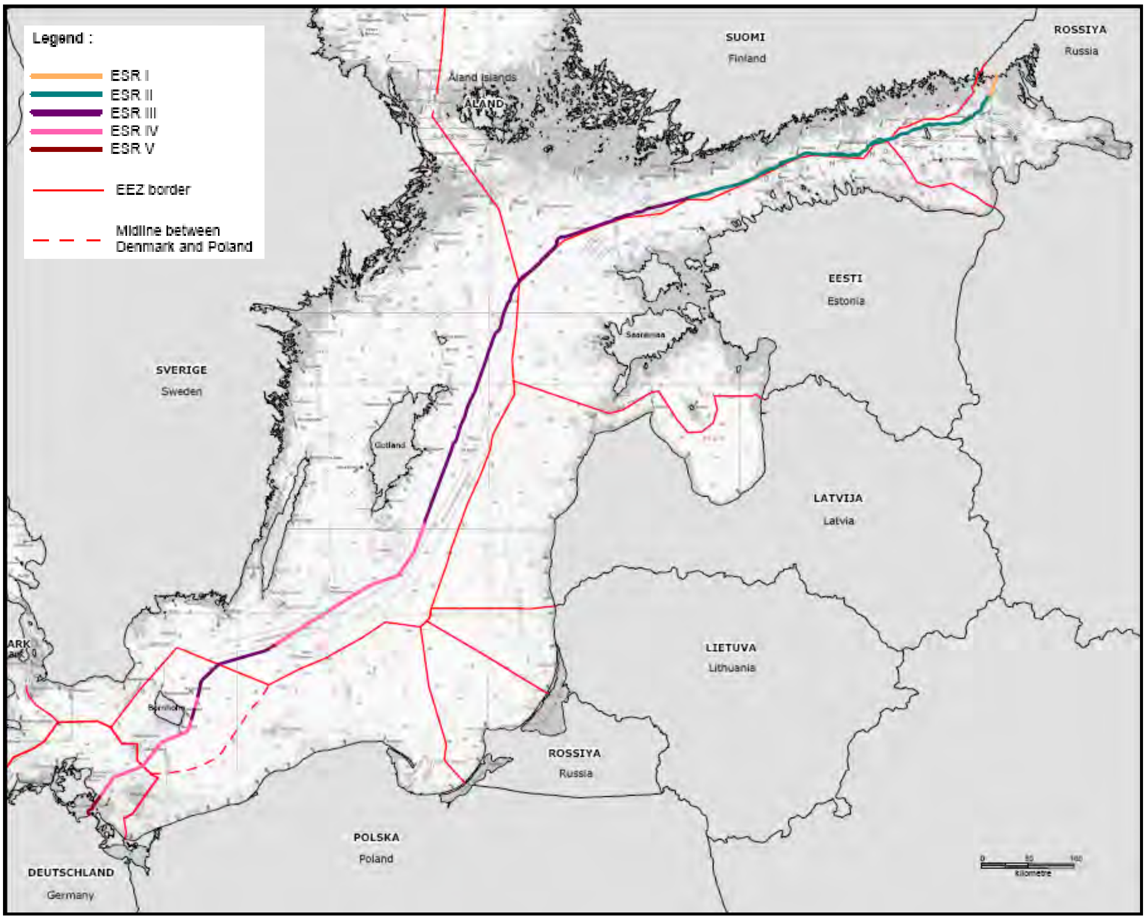

Figure 7.1 **The Nord Stream Project and the designated ESRs together with the Exclusive Economic Zones (EEZ) of the countries surrounding the Baltic Sea**

Temporal Scope

The temporal scope of the assessment has been defined by the four Project phases as follows:

- Construction phase
- Pre-commissioning and commissioning phase
- Operational phase
- Decommissioning phase

The vast majority of the environmental impacts will be experienced during the construction and to a lesser extent, the pre-commissioning and commissioning, and construction phases. The Project schedule is presented in **Section 4.1.2**. The construction and pre-commissioning and commissioning phases for the first pipeline are expected to last a total of 18 months while the second pipeline is scheduled to become operational a year later. The operational life of the pipelines (which is associated with far fewer impacts) is designed to be in the region of 50 years. Timeframes for the decommissioning phase will be guided by the methods employed for Project closure, which will be dependent on the state of affairs at the time (i.e. legislative requirements, available technology, knowledge of the environment and the impact of closure, degree of burial of the pipeline, etc).

It is noteworthy that impacts during the construction and pre-commissioning and commissioning phases will not occur along the full length of the pipelines' route at the same time but will be restricted to specific areas (e.g. the area affected by pipe-laying impacts will move in unison as the lay barge progresses along the pipelines' route).

7.2.3 Consultation

An important facet of an EIA is stakeholder consultation. This has been carried out in accordance with the requirements of the Espoo Convention. The level of stakeholder consultation, together with the process followed and the responses received, is described in **Chapter 3.** As the pipeline crosses various country boundaries, and borders others, a number of authorities have been consulted to provide input on the EIA and other aspects of the Project. In addition, numerous public consultation events have been held.

The response received from stakeholder engagement has provided additional input to scoping of the EIA and has ensured that a transparent and detailed process has been undertaken in the correct context.

7.2.4 Preliminary Impact Identification

Following definition of the scope of assessment, the EIA has progressed to preliminary impact identification.

The preliminary identification of potential impacts has allowed the EIA to identify possible Project alternatives (both route and design alternatives), and for mitigation measures to be incorporated into the design of the Project so as to reduce the significance of specific impacts.

Potential impacts, which include potential transboundary impacts, have been identified by considering the various Project activities and how the Project might interact with its environmental and social/socioeconomic resources and receptors. Completion of this stage has required a detailed understanding of the various Project activities and an understanding of the pertinent baseline environmental and social/socioeconomic conditions including the results from preliminary surveys.

The identification of all the possible impacts of the Project followed a systematic approach, which included consideration of the following:

- *Project Description* **-** an analysis of the Project design, Project phases and activities and the processes involved, which has resulted in a clear understanding of the Project activities that have the potential to give rise to impacts

- *Project Scope of Assessment* – the scope of assessment has highlighted the potential environmental and social/socioeconomic components that may be impacted upon during a certain timeframe and over a certain distance

- *Stakeholder Input* – the input of key stakeholders was considered in identifying the potential impacts that are of concern to those parties that may be impacted by the Project

- *Expert knowledge* – expert knowledge from scientists and regulators familiar with the Baltic Sea as well as prior experience of pipeline engineers and EIA specialists with experience gained from similar marine pipeline projects has contributed to the preliminary identification of impacts

- *Project/Environment Interactions* - A Project activity/environment interaction matrix was developed, which summarised the possible interactions between Project activities and the main resource/receptor types during the phases of the Project. This matrix is presented as **Table 7.2**

- *Potential Impacts* – identification of the interactions between the Project and the receiving environment has allowed the EIA team to identify potential impacts that may result from both planned and unplanned events. Interactions that have been deemed not to result in an impact have been screened out, based upon available knowledge, professional judgment and previous experience. The potential impacts that have been identified for further detailed assessment are summarised and thereafter assessed in detail in **Chapter 9.**

Table 7.2 Preliminary Project activity/environment interaction matrix

	Resources / Receptors Susceptible to Impact															
	Physical Environment				Biological Environment						Social and Socioeconomic Environment					
	Physical processes	*Water column*	*Seabed*	*Atmosphere*	*Plankton*	*Marine Benthos*	*Fish*	*Sea birds*	*Marine mammals*	*Nature conservation areas*	*Fisheries*	*Shipping and navigation*	*Tourism and recreation*	*Cultural heritage*	*Offshore industry*	*Military operations*
CONSTRUCTION PHASE																
SEABED PREPARATION																
Mine clearance		X	X	X	X	X	X	X	X	X	X	X		X		X
Boulder removal		X	X			X	X		X	X	X					
Wreck removal		X	X			X	X		X	X	X		X	X		
SEABED INTERVENTION																
Dredging		X	X		X	X	X	X	X	X	X	X		X		X
Trenching		X	X		X	X	X	X	X	X	X	X		X		X
Rock placement		X	X		X	X	X	X	X	X	X	X		X		X
Sheet piling		X	X		X	X	X	X	X	X	X	X		X		X
Support structures		X	X		X	X	X	X	X	X	X	X		X		X
OFFSHORE PIPE-LAYING																
Pipe-laying		X	X	X	X	X	X	X	X	X	X	X	X	X		X
Anchor handling		X	X		X	X	X	X	X	X	X	X		X		
Pipeline tie-ins		X	X	X	X	X	X	X	X	X	X	X		X		X
Construction & support vessel movement				X			X	X	X	X	X	X	X	X	X	X
PRE-COMMISSIONING & COMMISSIONING PHASE																
Seawater intake		X			X	X	X		X	X						
Flooding, cleaning, gauging and pressure test		X			X	X	X		X	X	X	X	X			
Pressure-test water discharge		X			X	X	X		X	X	X					
Pipeline drying				X												
Pipeline commissioning				X	X	X	X		X	X						
OPERATIONAL PHASE																
Routine inspection and maintenance		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Gas movement in pipeline						X	X		X							
Restriction zones											X	X				X
Pipeline presence on seabed	X	X	X			X	X		X	X	X					
Pipeline temperature		X			X	X	X		X							
DECOMMISSIONING PHASE																
Pipeline abandonment																
UNPLANNED EVENTS																
Fuel/ oil spill		X	x	X	X	X	X	X	X	X	X		X			
Disruption of munitions		X	X	X	X	X	X	X	X	X	X					
Pipeline failure		X	X	X	X	X	X		X	X	X	X	X		X	X

7.3 Baseline Description

7.3.1 Overview

The baseline description for the receiving environment (with a focus on the pipelines' route) is presented in Chapter 8. The relevant environmental and socio-economic components of the baseline that are of most relevance to the assessment of impacts are summarised in Table 7.1. An understanding of the baseline environment has allowed the EIA team to assess the many interactions between the Project activities and the resources/receptors that will be impacted. Baseline data have been sourced as follows:

- Desk study (available literature)
- Authority, organisation, institution and expert input from those countries involved
- Geophysical investigations
- Geotechnical surveys
- Environmental field investigations

7.3.2 The Concept of Ecological Sub-Regions

The Baltic Sea is an area of relatively homogeneous species composition that is clearly distinct from adjacent ecological systems. Accordingly, it is recognised as a global marine ecological region in its entirety. However, in order to reflect the ecological diversity of the Baltic Sea at a more specific level, it has been proposed (specifically for the purposes of this Espoo Report) that the Project considers the environment in terms of the different bio-geographic zones of the area. During various consultations, Nord Stream has committed to adopting this approach for the purposes of the Espoo Report. As such, the proposed route of the pipelines has been categorised into five Ecological Sub-Regions (ESRs) as defined by a region's salinity, oxygen levels and substrate characteristics. These ESRs are as follows:

- ESR I – Portovaya Bay
- ESR II – The Gulf of Finland
- ESR III – Baltic Proper
- ESR IV – The southern sandbanks
- ESR V – Greifswalder Bodden

Figure 7.2 provides an overview as to the location of each ESR in respect to the pipelines' route, while **Table 7.3** provides a summary of pertinent distinctive physical characteristics of each ESR.

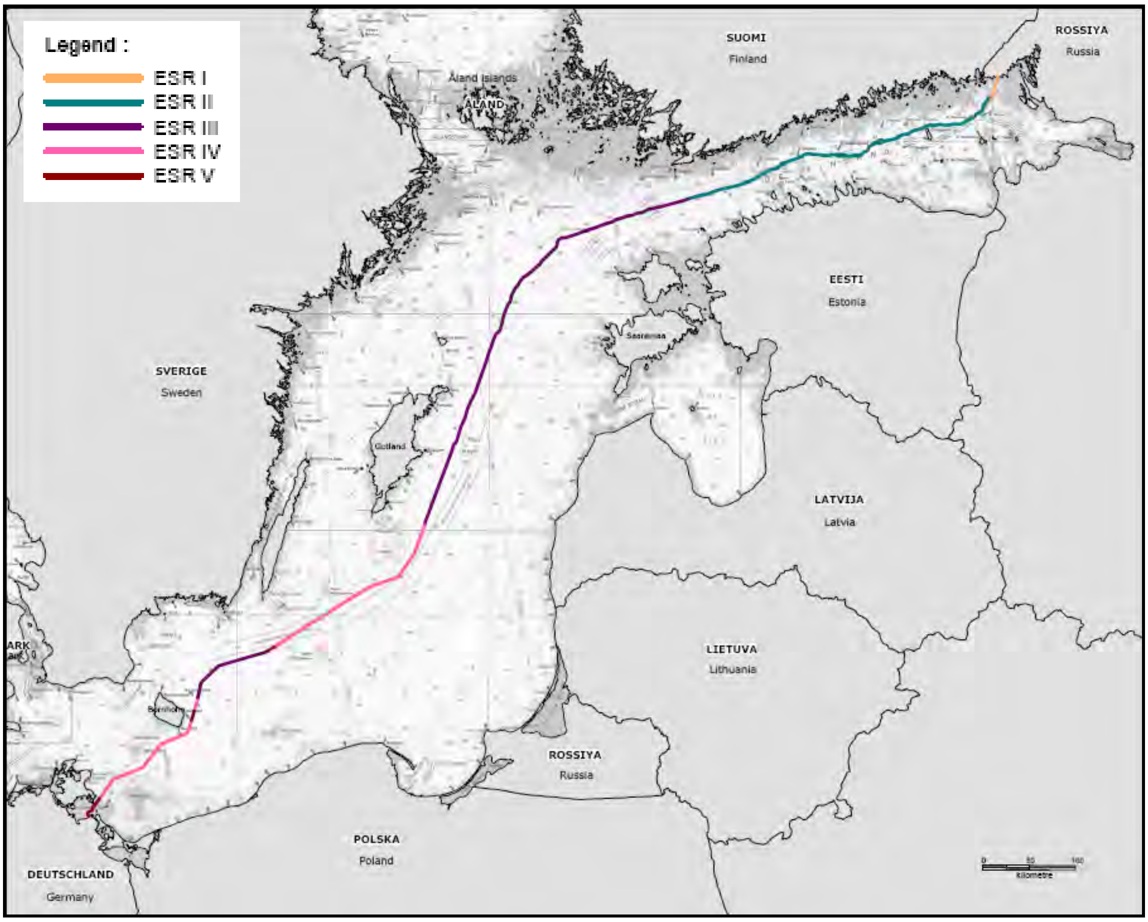

Figure 7.2 **A spatial presentation of the Ecological Sub-Regions used in the EIA**

Table 7.3 A description of the Ecological Sub-Regions used in the EIA

Ecological Sub-Regions	Bottom salinity	Dissolved oxygen	Depth	Substrate
ESR I – Portovaya Bay	0-3 psu	Enough for biological activity	Shallow water	Less exposed beds
ESR II –The Gulf of Finland	3-9 psu	Hypoxia	Shallow and deep water	Mixed beds
ESR III – Baltic Proper	9-16 psu	Predominant anoxia	Deep water	Mud
ESR IV – The southern sandbanks	7-16 psu	Enough for biological activity	Shallow water	Exposed mineral bed
ESR V – Greifswalder Bodden	8-18 psu	Enough for biological activity	Shallow water	Less exposed bed

The delineation of ESRs serves to allow impacts to be assessed and described in a way that relates to specific areas rather than for the entire pipelines' route. This also allows an increased ability to propose alternatives and mitigation measures that are relevant to certain sections of the route. The concept of Ecological Sub-Regions is expanded upon in more detail in the **Chapter 8.**

The social/socioeconomic environment is described on the Baltic Sea level with a focus on specific countries where relevant.

7.4 The Detailed Assessment of Identified Impacts

7.4.1 Introduction

The impact assessment methodology serves to provide a means of characterising those impacts identified and their overall residual significance. Impacts on the physical and biological environment are assessed in each ESR while impacts on the social/socioeconomic environment are assessed on the Baltic Sea level with a focus on specific countries where relevant.

The northwest pipeline will be laid prior to the southeast pipeline, except at each of the two landfalls, where the two pipelines will be laid simultaneously. The assessment considers the construction and pre-commissioning and commissioning based impacts associated with the sequential pipe-laying and seabed intervention works for the two pipelines, taking consideration of their respective construction schedules, as set out in **Chapter 4**. With regard to the operational phase, the assessment considers the overall impacts attributable to the presence of the two almost parallel pipelines on the sea floor for the duration of their operational life.

Residual significance is the significance of an impact upon the receiving environment following the implementation of mitigation measures that have been designed into the intended activity during a particular phase of the Project. Only residual impacts have been assessed in this EIA. Impacts are assessed to be of insignificant, minor, moderate or major significance for planned impacts and of insignificant, low, moderate and high significance for unplanned events. Those impacts that are judged still to be 'major/high' or 'moderate' after the application of mitigation measures are planned to receive ongoing management attention during the various Project phases.

The results of scoping and impact identification has served to guide the design of methodology, the classification and relation of impact variables, the values associated with each variable as well as the techniques used in their assessment.

Two different forms of impact are assessed within the EIA:

- *Planned impacts* – those impacts that result from a planned event. Such impacts are expected to occur during the course of the Project (e.g. an increase in turbidity levels in the water column due to a disruption of seabed sediments)
- *Unplanned impacts* – those impacts that result from an unplanned or non-routine event. Such impacts are not expected during the Project but nevertheless the probability of the impact occurring is assessed (e.g. a fuel/oil spill during construction)

The impact assessment methodology for planned impacts takes into consideration an impact's nature, type and degree of reversibility, its magnitude and nature of the resource/receptor to yield an impact's overall significance. Unplanned impacts are assessed by using an impact's significance which is termed 'consequence' in this respect, and introducing the concept of probability, or the likelihood of an impact occurring. In both cases, impacts are assessed following the implementation of mitigation measures. **Figure 7.3** gives a general overview of the methodologies employed in determining impact significance.

This section details the following:

- Nature, type and degree of reversibility of the impact
- Impact magnitude
- Nature of resource or receptor (value/sensitivity)
- Impact significance
- Mitigation measures
- Degree of uncertainty

- Unplanned impacts

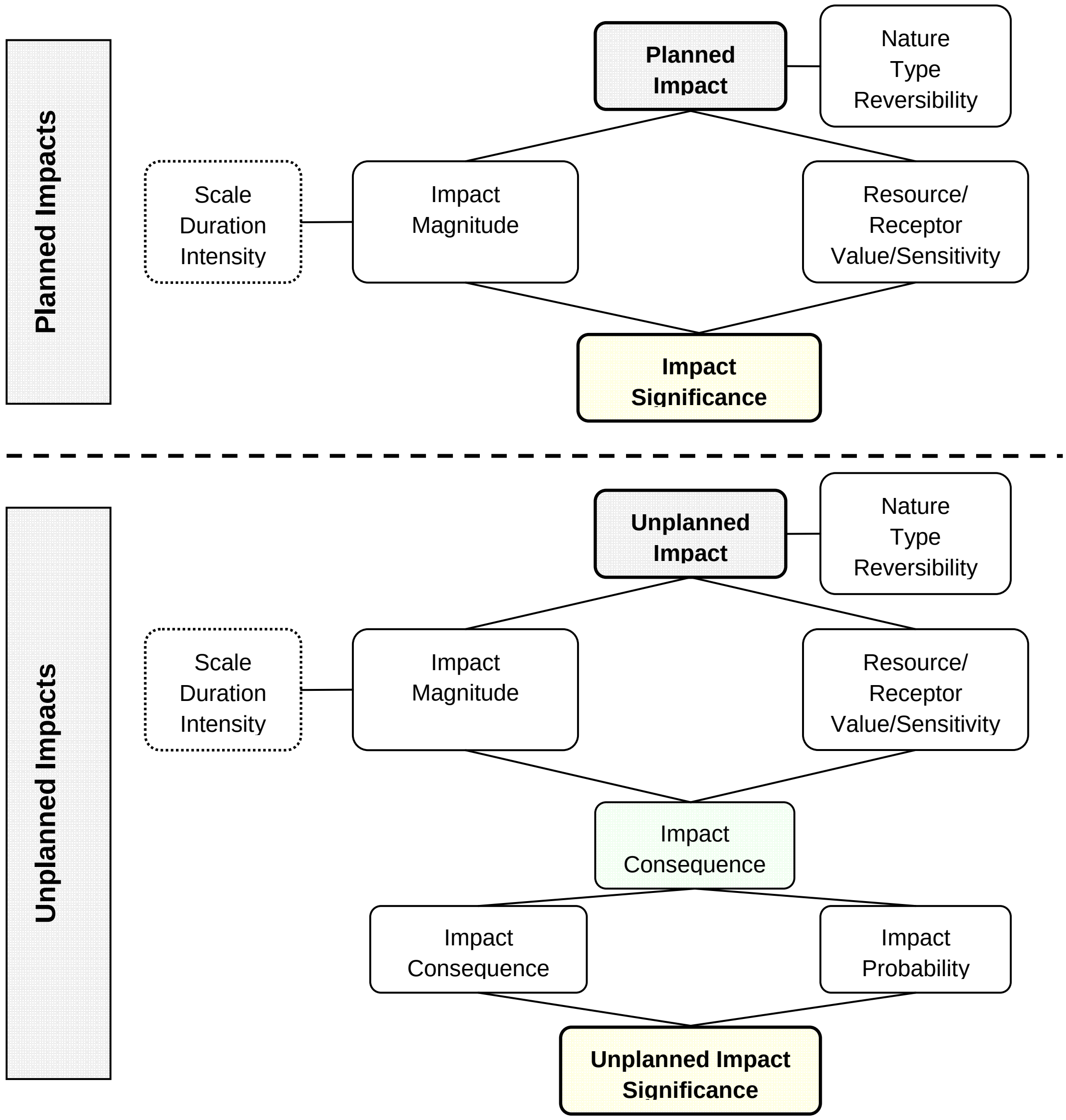

Figure 7.3 Environmental Impact Assessment methodologies for planned impacts and unplanned impacts

7.4.2 Nature, Type and Reversibility of Impact

Impacts are initially classified according to their nature, either negative or positive, their type and their degree of reversibility. Type refers to whether an impact is direct, indirect, secondary or cumulative. The degree of reversibility refers to the capacity of returning an impacted resource/receptor to its pre-impact state. Ideally, all impacts associated with the Project are reversible. Nature, type and reversibility are elaborated upon in **Box 7.1**.

Box 7.1 Nature, type and reversibility of impact

Nature of Impact

Negative – an impact that is considered to represent an adverse change from the baseline, or to introduce a new undesirable factor.

Positive – an impact that is considered to represent an improvement to the baseline or to introduce a new desirable factor*.

Type of Impact

Direct - impacts that result from a direct interaction between a planned Project activity and the receiving environment (e.g. the loss of a habitat during pipeline installation).

Indirect – impacts that result from other activities that are encouraged to happen as a consequence of the Project (e.g. an increase in fisheries activity along the pipeline route due to the creation of an artificial habitat favourable to certain target species).

Secondary - impacts that follow on from direct or indirect impacts as a result of subsequent interactions within the environment (e.g. secondary direct - an impact upon marine fauna due to a loss of a habitat; secondary indirect – by-catch of non-target species).

Cumulative – impacts that act together with other impacts (including those from concurrent or planned future third party activities) to affect the same resources and/or receptors as the Project (e.g. the combined effect of other similar projects in the general area – Baltic Sea).

Degree of Reversibility

Reversible - impacts on resources/receptors that cease to be evident, either immediately or following an acceptable period of time, after termination of a Project activity (e.g. turbidity levels in the water column will decrease to normal levels following construction).

Irreversible - impacts on resources/receptors that are evident following termination of a Project activity and which remain for an extended period of time. Impacts cannot be reversed by implementation of mitigation measures (e.g. the creation of an obstruction on the sea bed affecting water inflow).

*In certain circumstances, it can be argued that an impact can be classified as negative and/or positive. Whether the impact is one or the other depends largely on expert opinion. In such cases, both classifications are argued.

7.4.3 Impact Magnitude

Predicted impacts are defined and assessed in terms of a number of variables. This would comprise an assessment into the scale, duration and intensity of an impact. These variables collectively determine an impact's magnitude. Awarding values is, for the most part objective, due to the limits in place. However, awarding a value to variables, such as intensity, requires professional judgement in that the extent of change is difficult to define. Expert judgement and prior experience of the EIA team has ensured a reasonable degree of consensus on the value placed on an impact variable.

Various methods are employed in determining the value of the variables that make up the magnitude of an impact. These include:

- The use of modelling techniques to determine the extent of interaction between a Project activity and the receiving environment
- The use of Geographical Information Systems (GIS) to plot resources/receptors in relation to the pipelines' route and the sphere of influence of an impact (determined by modelling, previous studies and available literature)
- Statistical evaluation
- The results of desk studies and field surveys into resource/receptor presence and sensitivity
- Prior experience of the EIA Team

An explanation of the variables and values employed in the EIA are presented in **Box 7.2**.

Box 7.2 Impact magnitude definition and criteria

Scale of Impact

Local: impacts that affect locally important resources/receptors in close vicinity to the pipelines (~<500 m from pipelines' route) or are restricted to a single resource/receptor (e.g. the disruption of sediment during seabed intervention works)*.

Regional: impacts that affect regionally (500 m – 10 km from pipelines' route) important environmental resources/receptors or are experienced at a regional scale as determined by Ecological Sub-Regions (ESR), Exclusive Economic Zones (EEZ), habitats or ecosystems (e.g. the generation of noise and its impact upon marine mammals).

National: impacts that affect nationally (~>10km from pipelines' route) important environmental resources/receptors, affect an area that is nationally important/protected or have macro-economic consequences (e.g. disruption of a marine faunal breeding area).

Transboundary: impacts that are experienced within one EEZ as a result of activities in another (e.g. the spreading of re-suspended sediment in the water column).

Duration of Impact

Temporary: impacts are predicted to be of short duration and intermittent/occasional in nature (e.g. sporadic rock dumping along the pipelines' route).

Short-term: impacts that are predicted to last only for a limited period but will cease on completion of the activity, or as a result of mitigation/reinstatement measures and natural recovery (e.g. settling of suspended sediment during construction).

Long-term: impacts that will continue over an extended period (operational phase – 50 years), but cease when the Project stops operating (e.g. noise generation from gas movement in the pipelines). These will include impacts that may be intermittent or repeated rather than continuous if they occur over an extended time period (e.g. repeated seasonal disturbance of species as a result of maintenance/inspection activities).

Permanent: impacts that occur during the development of the Project and cause a permanent change in the affected resource/receptor or that endure substantially beyond the Project lifetime (e.g. the destruction of a coral outcrop).

Intensity of Impact

Low: impacts may be forecast but are frequently at the detection limit and do not lead to any permanent change in the structures and functions of the resource/receptor concerned.

Medium: the structures and functions of the resource/receptor concerned are affected but their basic structure/function is retained.

High: the structures and functions of the resource/receptor concerned are affected completely. Structure/function loss is apparent.

*Note: The definition of 'local' scale (<500 m) is not necessarily consistent with that of the National EIAs. For the Espoo Report, more conservative criteria have been adopted for classifying the scale of an impact in order to facilitate a rigorous approach to the identification of transboundary impacts. The approach for the assessment of transboundary impacts is detailed in **Section 7.6**

Determining magnitude is typically a combination of quantifying scale, duration and intensity, where relevant, and applying professional judgment/past experience. As the criteria that determine the magnitude of an impact differ per resource/receptor, various definitions are used for the physical, biological and social/socioeconomic environments. Impact magnitude on a scale of low, medium and high and combining assessments of scale, duration and intensity, is presented in **Table 7.4**, **Table 7.5** and **Table 7.6**.

Table 7.4 Impact magnitude - physical environment

Impact Magnitude	Definition
Low	A temporary or short-term impact on a physical resource/receptor that is localised and detectable above natural variations but not regarded as imparting an order of magnitude change. The environment will revert back to pre-impact status once the impact ceases.
Medium	A temporary or short-term impact on a physical resource/receptor that may extend beyond the local scale and may bring about an order of magnitude change in the quality or functionality of a resource/receptor. It does not, however, threaten the long-term integrity of the resource/receptor or any receptor/process dependent on it. A medium magnitude impact multiplied over a larger area would be regarded as a high magnitude impact.
High	An impact on a physical resource/receptor that results in an order of magnitude change on the local or larger scale that is irreversible and above any applicable limits. The change may alter the long-term character of the resource/receptor or another receptor/process dependent on it. An impact that persists after the activity ceases is a high magnitude impact.

Table 7.5 Impact magnitude – biological environment

Impact Magnitude	Definition
Low	An impact on a species that affects a specific group of localized individuals within a population over a short time period (one generation or less), but does not affect other trophic levels or the population itself.
Medium	An impact on a species that affects a portion of a population and may bring about a change in abundance and/or a reduction in the distribution over one or more generations, but does not threaten the long-term integrity of that population or any population dependent on it. The size and cumulative character of the consequence is also important. A medium magnitude impact multiplied over a wide area would be regarded as a high magnitude impact.
High	An impact on a species that affects an entire population or species in sufficient magnitude to cause a decline in abundance and/or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) would not return that population or species, or any population or species dependent upon it, to its former level within several generations, or when there is no possibility of recovery.

Table 7.6 Impact magnitude – social/socioeconomic environnent

Impact Magnitude	Definition
Low	Impact on specific groups/communities within society or on socio-economic assets (cultural, tourism, livelihoods etc) within a short period of time but this does not lead to widespread and long-lasting damage to people or resources.
Medium	Impact on specific groups/communities within society or on socio-economic assets that may bring about change in status for an extended duration but does not threaten the overall stability of groups, communities or socio-economic assets. A Medium Magnitude Impact over a wide area would be regarded as a High Magnitude Impact.
High	Impact on specific groups, communities or one or more socio-economic assets of sufficient magnitude to bring about a long-term or permanent (intergenerational) change in status.

7.4.4 The Nature of a Resource or Receptor

It is imperative to place some form of value (low, medium and high) on a resource or receptor that could potentially be affected by Project activities; expert judgement and stakeholder consultation ensures a reasonable degree of consensus on the intrinsic value of a resource or receptor. The allocation of a value to a resource/receptor allows for the assessment of resource's/receptor's sensitivity to change (impact). Various criteria are used to determine value/sensitivity including, amongst others, resistance to change, adaptability, rarity, diversity, value to other resources/receptors, naturalness, fragility and whether a resource/receptor is actually present during a Project activity. These determining criteria are elaborated upon in **Table 7.7**, **Table 7.8** and **Table 7.9**.

Table 7.7 Value/sensitivity criteria - physical environment

Value/Sensitivity	Description
Low	A resource/receptor that is not important to the wider ecosystem functions/services, or one that is important but resistant to change (in the context of Project activities) and will naturally and rapidly revert back to pre-impact status once activities cease.
Medium	A resource/receptor that is important for wider ecosystem functions/services. It may not be resistant to change, but can be actively restored to pre-impact status, or will revert naturally over time.
High	A resource/receptor that is critical to ecosystem functions/services, not resistant to change and cannot be restored to pre-impact status.

Table 7.8 Value/sensitivity criteria – biological environment

Value/Sensitivity	Description
Low	A species (or habitat) that is not protected or listed. It is common or abundant; is not critical to other ecosystem functions (e.g. as prey to other species or as predator to potential pest species); and does not provide key ecosystem services (e.g. coastal stabilisation).
Medium	A species (or habitat) that is not protected or listed; is globally common but rare in the Baltic Sea; is important to ecosystem functions/services; and is under threat or the population is in decline.
High	A species (or habitat) that is specifically protected under EU/Baltic States legislation and/or international convention (e.g. CITES); is listed as rare, threatened or endangered by IUCN; and is critical to ecosystem functions/services

The criteria for the biological environment are applied with a degree of caution in that seasonal variation and species lifecycle stages are considered. Bird species for example may be deemed more vulnerable during the breeding season, but also for some species during passage and migration, particularly moulting birds at sea. The assessment of a habitat's value/sensitivity is a combination of the variables applicable to both the physical and biological environment.

Table 7.9 Value/sensitivity criteria – social/socioeconomic environment

Value/Sensitivity	Description
Low	The socio-economic assets affected are not considered to be significant in terms of their resource, economic, cultural or social value.
Medium	The socio-economic assets affected are not significant in the overall context of the Project Area but are of local significance to the asset base, livelihoods etc.
High	The socio-economic assets affected are specifically protected by national or international policies or legislation and are of significance to the asset base or livelihoods of the Project Area at regional or national scale.

Value/sensitivity is awarded to each resource and receptor within the environmental baseline chapter (**Chapter 8**).

7.4.5 Impact Significance

Virtually all human activity imposes some disturbance to components of the environment because of physical impacts on natural systems or due to interactions with other human activities and human systems. Often such impacts are slight or transitory and have an effect that may be regarded as insignificant.

There is no statutory definition of significance and the determination of significance is therefore necessarily subjective. For the purposes of the EIA, the following definition of significance has been adopted:

> *An impact, either in isolation or in combination with other impacts, assessed to be significant by the EIA specialists on the Nord Stream Project, should be taken into account in the decision-making process together with the necessary mitigation measures (by the Project) and consenting conditions (from Regulators and Stakeholders).*

Criteria for the assessment of the significance of impacts stems from the following key elements:

- The magnitude of the impact: The magnitude (in terms of the scale, duration and intensity of the impact) of the change to the physical, biological and social/socioeconomic environment is expressed, wherever practicable, in quantitative terms. For social/socioeconomic impacts, the magnitude is viewed from the perspective of those affected, by taking into account the likely perceived importance of the impact and the ability of people to manage and adapt to the change

- The nature of the resource or receptor: The value/sensitivity of a resource/receptor is determined to allow for the assessment of resource/receptor's sensitivity to change (impact). Various criteria are used to determine value/sensitivity including, amongst others, rarity, diversity, naturalness, fragility and whether a resource or receptor is actually present during a Project activity

In determining significance, the status of compliance of each impact is also considered in terms of its conformity to the relevant government legislation, standards and limits, its degree of alignment with the applicable policies and plans and whether any guidelines, environmental standards and company/industry policies are pertinent to the potential impact.

For this assessment, impacts have been defined as either insignificant, or of minor, moderate or major significance. The later three levels are elaborated upon in **Table 7.10**. The matrix details the relationship between magnitude and value/sensitivity to yield significance.

Unplanned impacts are subject to a further criterion in determining impact significance. This criterion is termed probability and aims to consider the likelihood of an impact occurring based upon previous experience, Project design and evidence that such an unplanned event has occurred in the past. Unplanned impacts, and the associated methodology employed, are detailed in **Section 7.4.8**.

Table 7.10 Overall significance criteria for the EIA

	Low Magnitude Impact	Medium Magnitude Impact	High Magnitude Impact
Low value/sensitivity	**Minor**	**Minor**	**Moderate**
Medium value/sensitivity	**Minor**	**Moderate**	**Major**
High value/sensitivity	**Moderate**	**Moderate**(1)	**Major**
Impact Significance			
No impact or insignificant	Impacts are indistinguishable from the background/natural level of environmental and social/socioeconomic change.		
Minor Significance	Impacts of low magnitude, within standards, and/or associated with low or medium value/sensitivity resources/receptors, or impacts of medium magnitude affecting low value/sensitivity resources/receptors.		
Moderate Significance	Broad category within standards, but impact of a low magnitude affecting high value/sensitive resources/receptors, or medium magnitude affecting medium value/sensitivity resources/receptors, or of high magnitude affecting medium sensitivity resources/receptors.		
Major Significance	Exceeds acceptable limits and standards, is of high magnitude affecting high or medium value/sensitivity resources/receptors or of medium magnitude affecting high value/sensitivity resources/receptors.		

7.4.6 Mitigation Measures

A key objective of the EIA is to identify means of reducing the impact of the Project on the receiving environment. To achieve this, mitigation measures have been developed and integrated into the Project design in response to impacts that are anticipated to be of significance. These mitigation measures have been established through legal, best practice industry standards or specialist environmental input from the EIA team.

In this EIA, the significance of an impact upon the receiving environment is assessed following the implementation of mitigation measures that have been designed into the intended activity during a particular phase of the Project. These are termed residual impacts. Impacts deemed to be “major” or “moderate” after the application of the intended mitigation measures will receive

(1) The impact may, however, be major where the spatial or temporal scale of the impact is significant.

ongoing management and monitoring during the various Project phases. Additional mitigation measures are suggested where applicable.

In general major negative impacts are considered to be unacceptable and are required to be further mitigated to a lesser level of significance (e.g. avoided, minimised, reduced or compensated for). In some instances, a major negative impact may be offset by a positive impact of similar magnitude. In such situations, however, the relative importance of the impacts must be considered in assessing their level of acceptability. For moderate negative impacts, the focus of specific mitigation measures is to reduce these to an acceptable level by best practical means. Minor impacts are generally controlled through the adoption of best practice management measures. This can apply to moderate impacts as well. In developing mitigation measures, the first focus is on measures that will prevent or minimise impacts through the design and management of the Project rather than on reinstatement and compensation measures.

Mitigation measures, where relevant, are presented in response to each impact within **Chapter 9**. Impact management and monitoring of the impacts during the Project phases is discussed in **Chapter 12**.

7.4.7 Dealing with Uncertainty

Even with a final Project design and a constant environment, impacts are difficult to predict with certainty. Predictions can be made using varying means ranging from qualitative assessment and expert judgement through to quantitative techniques. Use of these latter techniques allows a reasonable degree of accuracy in predicting changes to the existing environmental conditions and making comparisons with relevant environmental quality standards. Where assumptions have been made, the nature of any uncertainties that stem from the 'prediction' process are presented.

Uncertainty can also arise as a result of the stage reached in the design process at the time of preparation of an EIA report. Where a Project design is still in the process of being finalised, some level of uncertainty in assessing the resultant impacts is inevitable. Where this uncertainty is material to the findings of the EIA, it is clearly stated. The general approach then is to take a conservative view of the likely residual impacts and propose various mitigation measures accordingly.

The monitoring of impacts during the Project phases will determine whether impacts have been predicted and assessed in an accurate manner (**Chapter 12**).

7.4.8 Unplanned Impacts

In addition to the predicted impacts, those impacts that could result in the event of an accident or unplanned event within the Project (e.g. fuel/oil spill or pipeline failure), or in the external environment affecting the Project, are taken into account. These impacts are termed unplanned impacts and are defined as being a combination of event or incident frequency (probability) and the environmental consequences of the event or incident. Unplanned impacts are considered in much the same way as predicted impacts save for the inclusion of the probability factor. Probability and consequence are elaborated upon in **Box 7.3**

Box 7.3 Probability and consequence in the assessment of unplanned impacts

Probability

Probability describes the likelihood of an event or incident actually occurring and is considered at two levels. Firstly, the likelihood of an incident or event taking place is considered (e.g. likelihood of an oil spill from construction vessels occurring). Secondly, the likelihood of a receptor and/or resource being present during the event or incident is considered (e.g. the probability of marine mammals being present in the impact area during an unplanned event or incident). Probability is considered in terms of the following variables:

Low: the event or incident has occurred in other marine environments but not in the Baltic Sea within the last 50 years or the event or incident has not occurred in a specific industry.

Medium: the event or incident has occurred in other marine environments and in the Baltic Sea during the last 50 years or the event incident has occurred in a specific industry but is not common.

High: the event or incident occurs regularly (every year) in the Baltic Sea or the event or incident occurs on a regular basis in a specific industry.

Consequence

The potential consequence of an impact occurring is a culmination of those factors that determine significance for predicted impacts, namely; the magnitude of the unplanned impact (in terms of the nature, type, scale, duration and intensity of the impact), the nature of the resource/receptor (sensitivity) and compliance to the relevant legislation, polices and guidelines. Consequence is classified as follows and mirrors those definitions for impact significance presented in **Section 7.4.5**:

Minor consequence: impacts of low magnitude, within standards, and/or associated with low or medium value/sensitivity resources/receptors or impacts of medium magnitude affecting low value/sensitivity resources/receptors.

Moderate consequence: broad category within standards, but impacts of a low magnitude affecting high value/sensitive resources/receptors, or medium magnitude affecting medium value/sensitivity resources/receptors, or of a high magnitude affecting medium sensitivity resources/receptors.

Major consequence: exceeds acceptable limits and standards, is of high magnitude affecting high or medium value/sensitivity resources/receptors or of medium magnitude affecting high value/sensitivity resources/receptors.

Unplanned impact significance, in terms of the relationship between probability and consequence, is presented in **Table 7.11**.

Table 7.11 Overall unplanned impact significance

Potential Consequence (Significance)	Frequency of Event/Incident Occurrence (Probability)		
	Low	**Medium**	**High**
Minor	**Low**	**Low**	**Moderate**
Moderate	**Low**	**Moderate**	**High**
Major	**Moderate**	**High**	**High**
Low	Continuous Improvement Zone		
Moderate	ALARP Zone – demonstrate that the likelihood of the environmental impacts has been reduced to As Low As Reasonable Practicable and that contingency measures are in place to minimise the consequences.		
High	Intolerable Zone: Unacceptable to the countries of origin, affected countries and Nord Stream.		

7.5 Impact Integration

Once potential impacts have been identified and assessed and the necessary mitigation measures associated with an impact have been agreed with the Nord Stream Project team and approved in the regulatory process, the integration of the latter into the Project is required. In order for this to be successful, a plan detailing responsibility, timing and reporting requirements associated with each measure or set of measures is compiled. Various forms of monitoring are developed to ensure that the functionality and success of each mitigation measure is assessed to ensure that impacts are at an acceptable level by best practical means throughout the Project duration and to highlight possible areas that require improvement. The above information is most effectively captured within an Environmental Management Plan (EMP). An EMP seeks to manage all interactions between the various Project activities and the receiving environment during the Project lifecycle. Information on the Project's approach to environmental management and monitoring is presented in **Chapter 12** of this document.

7.6 The Assessment of Transboundary Impacts

The key objective of an EIA in a transboundary context is the rigorous assessment and succinct communication of anticipated transboundary impacts. The Espoo Convention defines a transboundary impact as:

"…any impact, not exclusively of a global nature, within an area under the jurisdiction of a Party caused by a proposed activity the physical origin of which is situated wholly or in part within the area under the jurisdiction of another Party."

The assessment of transboundary impacts relies on the prior identification of all potential impacts associated with the Project along the full length of the pipelines and for these to have been assessed rigorously and consistently in accordance with the methodology set out in **Section 7.4.**

The methodology for the identification and screening of impacts in terms of their potential to have a transboundary effect is described in **Chapter 11**, together will a full analysis of the assessment findings.

7.7 Reference List

Institute for Environmental Management and Assessment (IEMA). 2004. Guidelines for Environmental Impact Assessment.