Chapter 21: Transboundary Impact Assessment

Table of Contents

Tables

Figures

21 Transboundary Impact Assessment

21.1 Introduction

Transboundary impacts may be considered as "*impacts that extend to multiple countries, beyond the host country of the project, but are not global in nature. Examples include air pollution extending to multiple countries, use or pollution of international waterways, and transboundary epidemic disease transmission*" (Ref. 21.1).

As the South Stream Offshore Pipeline spans multiple countries and is being constructed across a dynamic marine environment, there is the potential for some Project activities to generate transboundary impacts. Such impacts may arise from Project activities which traverse country boundaries, or impacts that originate within one country, but have the ability to extend across national borders.

This chapter considers the potential for transboundary impacts resulting from the Project. Where applicable, the chapter draws upon the impact assessments conducted in each of the technical discipline sections of this Environmental and Social Impact Assessment (ESIA) Report (Chapters 8 - 18).

Given that greenhouse gas emissions are a global issue as opposed to a transboundary concern, this chapter does not include a Project-related greenhouse gas assessment – details regarding greenhouse gas emissions as associated with Project activities are provided in **Chapter 9 Air Quality**.

21.2 Frameworks for Considering Transboundary Impacts

21.2.1 International Finance Corporation (IFC)

IFC Performance Standard (PS) 1 Assessment and Management of Environmental and Social Risks and Impacts (Ref. 21.2) recognises the need to consider transboundary impacts. PS 1 states that the risks and impacts identification process needs to consider "*potential transboundary effects, such as pollution of air, or use or pollution of international waterways*".

21.2.2 Espoo Convention

As detailed in **Chapter 2 Policy, Regulatory and Administrative Framework**, the Convention on Environmental Impact Assessment (EIA) in a Transboundary Context, 1991 (Espoo Convention) came into force internationally on 10 September 1997 (Ref. 21.3). The Russian Federation signed the Espoo Convention in 1991; however, the Espoo Convention has not been ratified by Russia. The Federal Government is currently planning transposition of the Convention requirements into Russian legislation.

The main objective of the Espoo Convention is to promote environmentally sustainable economic development, as a preventative measure against transboundary environmental degradation. The Espoo Convention stipulates obligations of parties to assess the transboundary environmental impacts of a project in the early planning stages.

The Espoo Convention specifies the obligation of Parties of Origin to notify and consult Affected Parties when a project in their territory is likely to have a significant adverse transboundary impact. Parties of Origin can ask the developer to undertake further public consultation, in addition to normal EIA requirements.

Bulgaria is the only host country of the South Stream Offshore Pipeline to have ratified the Espoo Convention. The Bulgarian government notified Romania during the Bulgarian Scoping Stage of the Project as the only other country signatory to the Espoo convention of all the Black Sea littoral countries potentially affected by the Project; Romania decided not to participate in accordance with the Convention.

21.3 Potential for Transboundary Impacts

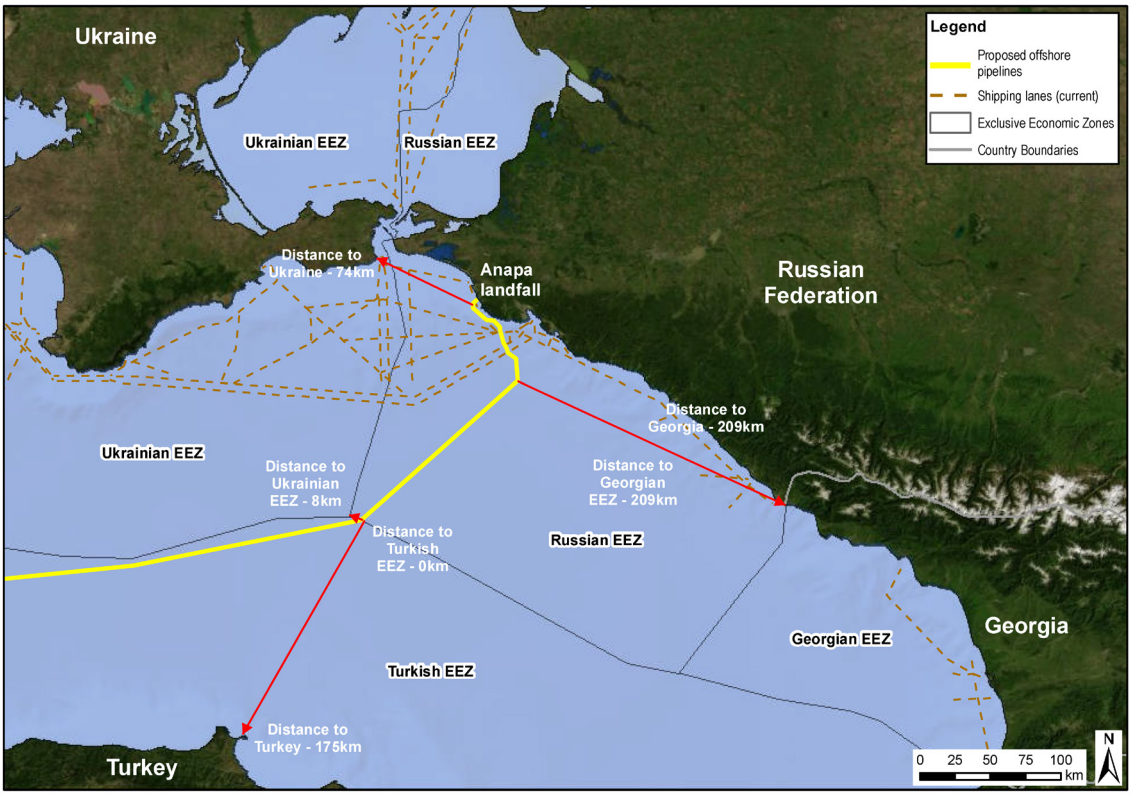
In order to generate a transboundary impact, activities from the Project would need to generate an impact that has the potential to cross national jurisdictions as defined by the Exclusive Economic Zone (EEZ) boundaries and land borders of the Black Sea countries. Figure 21.1 illustrates the closest points of the Project to these boundaries and to land territories of nearby countries.

It is acknowledged that some Project activities will be located closer to EEZ boundaries and Black Sea country land borders than indicated in Table 21.1. This includes Project-related vehicle movements from the selected ports, as well as marine supply vessel movements. With regard to marine supply vessels, these are likely to use existing international shipping routes to and from the selected ports (as shown on Figure 21.2).

Table 21.1 Closest Points of the Project to Turkey, Georgia and Ukraine EEZ Boundaries

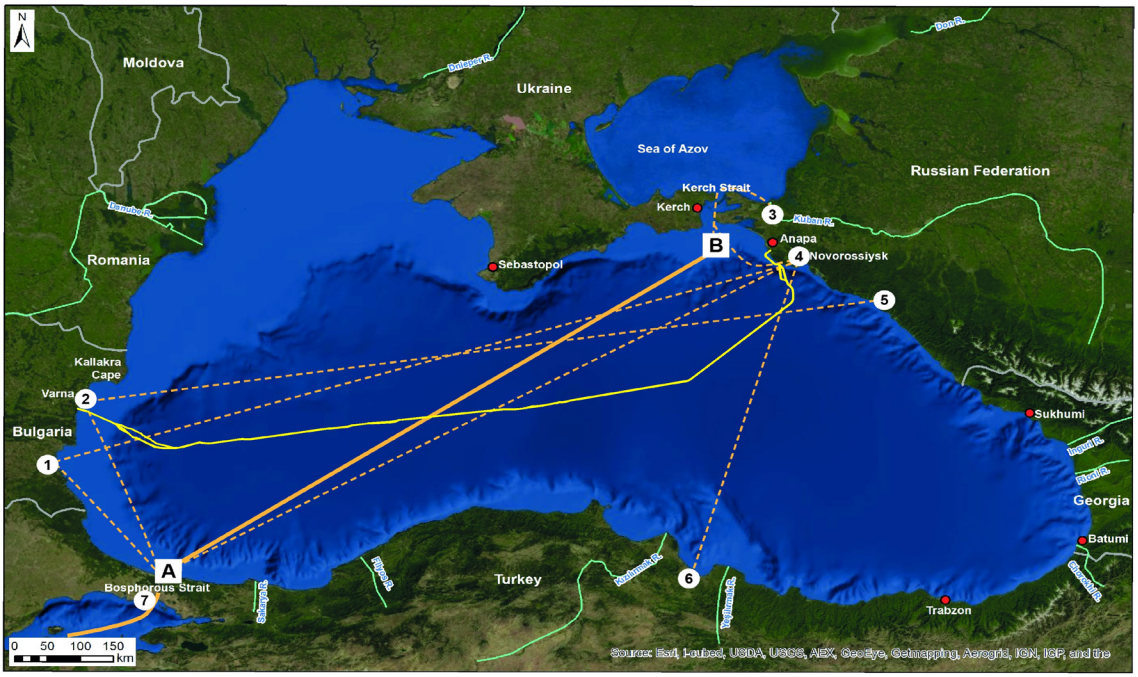
Country	Closest Distance of Project to Land Territory (km)	Closest Distance of Project to EEZ Waters (km)
Turkey	175	Located directly adjacent to the EEZ boundary
Georgia	209	209
Ukraine	74	8

Figure 21.1 Distances from the Project to Turkey, Georgia and Ukraine EEZ Boundaries



All geographic boundaries depicted in maps in this ESIA Report relate to February 2014.

Figure 21.2 Shipping and Navigational Routes in the Black Sea which Potentially Interact with the Project Pipelines



Key:

A: Bosporus shipping junction (Istanbul)
B: Kerch Strait shipping junction

river
existing shipping route
main shipping route

1: Burgas
2: Varna
3: Temryuk
4: Novorossiysk
5: Tuapse
6: Samsun
7: Istanbul

21.4 Impact Assessment Methodology

The various technical assessments as presented within this ESIA Report (Chapters 8 - 18) have used defined impact assessment methodologies to quantify Project impacts upon defined sensitive receptors. In undertaking this task, these assessments have considered the potential for identified impacts during the various Project phases (Construction and Pre-Commissioning Phase, Operational (including Commissioning) Phase and Decommissioning Phase) to traverse international borders. This chapter captures the findings of the earlier chapters in so far as they relate to transboundary impacts and considers both planned activities and unplanned events.

In general, potential impacts generated by planned activities during the Construction and Pre-Commissioning Phase of the Project will typically be temporary in nature and localised in extent. Similarly impacts generated from planned activities during the Operational Phase will also be localised. However, during the various Project Phases there is the potential for unplanned events which are those events that are unintended and that may pose risks to human health and/or the environment, including its socio-economic components (**Chapter 19 Unplanned Events**) that may result in wider transboundary impacts. Unplanned events include the

accidental release of hydrocarbons (e.g. spills of fuel from vessels) to the marine environment during the Construction and Pre-Commissioning Phase and the accidental release of natural gas to the atmosphere in the event that the Pipeline is damaged during the Operational Phase. Such events have a low risk of occurrence and strict management measures will be put in place to ensure that risks are minimised and any resultant impacts are also minimised (**Chapter 19 Unplanned Events**).

The sections below consider the potential for transboundary impacts from both planned and unplanned events during the Construction and Pre-Commissioning Phase and Operational Phases of the Project. The activities to be undertaken during the Decommissioning Phase are uncertain, as decommissioning proposals will be developed during the Operational Phase of the Project. Current Good International Industry Practice (GIIP) is to decommission pipelines in place, with few resultant environmental impacts. However, should a decision be made to remove the pipelines and the associated infrastructure, it is expected that the potential transboundary impacts and mitigation measures will be similar in nature to some of those as described herein for the Construction and Pre-Commissioning Phase of the Project. As such, the Decommissioning Phase is not specifically covered in this chapter.

21.5 Potential Terrestrial Transboundary Impacts

21.5.1 Planned Activities

Chapters 8 to 18 have predicted potential impacts on terrestrial sensitive receptors during the various Project Phases. These assessments have identified that due to the distances between planned Project activities and the land territories of Turkey, Georgia and Ukraine (i.e. greater than 74 km), predicted impacts do not have the potential to cross territorial borders and have a transboundary environmental impact. This includes potential transboundary air quality impacts as associated with the transportation of resources to and from the construction sites during the Construction and Pre-Commissioning Phase of the Project. **Chapter 11 Terrestrial Ecology** also considers and concludes that there will not be transboundary impacts upon migratory birds given that the Project will not have significant adverse direct or indirect impacts upon migratory bird species during planned activities.

21.5.2 Unplanned Events

Chapter 19 Unplanned Events considers the various unplanned events that could occur during the different Project Phases and the actions that are to be taken to minimise the occurrence of such events and their associated environmental and socio-economic consequences. A review of these unplanned events indicates that the only potential terrestrial unplanned event that could have a transboundary environmental impact results from the release of non-combusted gas either following pipeline rupture or due to the unplanned need to vent gas from the pipeline (depressurise) to ensure overall system safety. However, **Chapter 9 Air Quality** indicates that such events would not pose a risk to the health of residents at nearby receptors and that any impacts would be localised – it thus follows that such unplanned events would not be able to generate a transboundary air quality impact given the distance from the pipeline to the land territories of Turkey, Georgia and Ukraine.

21.6 Potential Marine Transboundary Impacts

21.6.1 Planned Activities

It is anticipated that some planned Project activities (e.g. operation of plant and equipment) have the potential to result in marine transboundary environmental impacts given that such Project activities will be taking place close to and across EEZ boundaries. A number of marine activities and environmental aspects with the potential to cause adverse transboundary impacts have been identified and are discussed below:

- Impacts on air quality;
- Impacts from waste generation;
- Impacts from underwater noise upon fish and marine mammals;
- Impacts on migratory birds; and
- Impacts on fish migration and fisheries.

21.6.1.1 Air Quality

It may be necessary to source materials (such as rock material) and fuel from outside Russia for Project use within Russia and Russian waters (**Chapter 5 Project Description**). The sources for these materials have not yet been confirmed.

Chapter 9 Air Quality indicates that air emissions from marine vessels have the ability to affect air quality due to the emission of carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter (PM), and sulphur dioxide (SO_2), although such vessel emissions will not result in an environmental impact offshore where there are no relevant sensitive receptors. Marine vessel usage in the vicinity of EEZ borders is thus not able to exert an air quality related transboundary impact given the absence of sensitive receptors. In addition, low intensity vessel usage for material delivery and fuel transportation via other countries is not anticipated to result in any significant air quality impacts upon any transboundary sensitive receptors. Similarly, transnational marine vessel use during the Operational Phase of the Project as associated with material supply and maintenance activities are not anticipated to result in any transboundary air quality impacts given the low volume of marine vessels involved in such activities.

21.6.1.2 Waste Generation

Waste material will be generated on board the pipe-laying and other vessels throughout the Construction and Pre-Commissioning Phase and to a lesser extent during the Operational Phase (**Chapter 18 Waste Management**). Materials will be transported to the pipe-laying vessel by supply vessels, which will also be responsible for the removal of any waste material and its subsequent transportation to the shore (e.g. using existing port waste reception facilities at selected ports).

Supply vessels may originate from several countries and not just from Russia and in some circumstances waste may be temporarily stored on board pipe-lay vessels, prior to subsequent transportation for disposal via a port outside of Russia. It is normal practice in the shipping

industry for port waste reception facilities to receive waste from vessels using that port, where the waste has been generated during the ship's voyage including transit outside of the waters of the receiving country. The amount of waste that will be generated within Russian waters and transported to ports in other countries is uncertain and is dependent upon which ports are selected by the Project.

Irrespective of the location and quantity of waste generated, the Project will comply with the International Convention for the Prevention of Pollution from Ships (MARPOL) Annexes 1, IV and V (Ref. 21.4 and Ref. 21.5), each of which includes specific waste management provisions, as well as the national requirements of the recipient country. All hazardous waste will be disposed of at licenced facilities. Waste mitigation measures to be applied are detailed in **Chapter 18 Waste Management**.

Adherence to MARPOL will enable significant adverse transboundary impacts associated with Project waste to be avoided.

21.6.1.3 Underwater Noise Impacts upon Fish and Marine Mammals

An increase in maritime traffic and other Project activities such as micro-tunnelling, rock placement and pipe-laying, will result in an increase in underwater noise levels during the Project Construction and Pre-Commissioning Phase which may impact upon ecological receptors (e.g. fish and marine mammals).

The acoustically sensitive receptors in the Black Sea are the fish species categorised as 'hearing specialists' and marine mammals. None of the sensitive fish species are protected, but all marine mammal species such as the bottlenose dolphin, common dolphin and harbour porpoise that are found in the Black Sea are of conservation concern (**Chapter 12 Marine Ecology**). The potential for Project construction activities in Russian waters to impact upon acoustically sensitive ecological receptors located across EEZ boundaries (principally in Turkish waters) thus needs to be considered. As reported in **Chapter 12 Marine Ecology**, some Project activities such as pipe-laying and trenching will increase underwater noise levels. The noise levels associated with such activities are most likely to cause mild avoidance or harassment reactions rather than strong behavioural reactions and injury. Project activities that generate underwater noise resulting in mild avoidance or harassment reactions means that the fish or marine mammals may be aware of the sound, but does not imply that they will move or be impacted. **Chapter 12 Marine Ecology** indicates that no impacts are predicted to hearing generalist species. Hearing specialist fish are generally more sensitive to underwater noise and behavioural effects may be apparent in some species such as sprat or kilka in some situations (though not shad or anchovy). The maximum predicted range for behavioural effects in hearing specialist fish is 260 m. **Chapter 12 Marine Ecology** also reports that underwater noise arising from several vessels simultaneously were insufficient to give rise to mortality in marine mammals. The injury footprint of proposed construction operations is estimated to be very limited. Porpoise in close proximity to pipe-laying (20 – 60 m) may experience permanent

threshold shift (PTS)[1] although in reality it is unlikely that cetaceans will approach loud sound sources. Based on audiogram weighted criteria, mild behavioural effect ranges for individual vessel operations are only estimated to be significant for dolphins and porpoises, to a maximum range of 0.72 km for dolphins and 1.5 km for porpoise at any modelled location.

Whilst Project construction activities have the potential to generate underwater noise, and thus impact upon fish and marine mammal behaviour, the limited spatial extent of strong avoidance reactions is such that significant transboundary impacts would be avoided. For example, given that construction activities would be located at least 8 km from the Ukrainian EEZ boundary (see Table 21.1), Project construction activities are not anticipated to be able to impact upon fish or marine mammals in Ukrainian waters. Similarly, there would be no impacts upon fish or marine mammals in Georgian waters. Construction activities close to the Turkish EEZ boundary would be able to generate avoidance reactions (fish and marine mammals) as per the limited distances as detailed above, noting that such impacts would be less than those as associated with project construction activities that will be undertaken within Turkish waters.

During the Operational Phase, given that underwater noise levels will be lower than those experienced during the Construction Phase, significant transboundary ecological impacts are not anticipated.

21.6.1.4 Birds

The Black Sea coastline is a major migratory route for birds (**Chapter 12 Marine Ecology**). There are two periods for migration in the north-eastern Black Sea region; one during the spring (mid-February to early-June) and one in the autumn (early-August to end-November). The pipeline construction corridor in the offshore sections is approximately 2 to 3 km wide, and will cross only a small part of the migratory route (as migratory routes run in a north to south direction). In addition, the Construction and Pre-Commissioning Phase is temporary in nature and the scale of the construction corridor is very small. This means that the Project will not result in the formation of any barriers that could result in a change to bird migration patterns (**Chapter 12 Marine Ecology**). As a result, Construction and Pre-Commissioning Phase activities will not cause long term levels of disturbance to migratory birds or the ecological features upon which they depend. Similarly, Operational Phase activities are not anticipated to impact upon bird migration. Overall, no significant adverse impacts to the transboundary activities of migratory birds are expected as a result of planned Project activities.

21.6.1.5 Fisheries

The fish stock in the Black Sea has been drastically reduced as a consequence of eutrophication, overfishing and plankton reduction (**Chapter 14 Socio-Economics**). Nevertheless, fishing is still a substantial source of revenue for Black Sea countries.

[1] Defined as the onset of permanent threshold shift (PTS) which is the point at which hearing may become impaired and from which the animal cannot recover

The majority of Project activities will take place in areas where only pelagic fishing can take place, because of the absence of any species at depths in excess of approximately 150 m, below which the Black Sea is anoxic. Pelagic fishing involves commercial species such as the European anchovy (*Engraulis encrasicolus*), sprat (*Sprattus sprattus*), and Black Sea horse mackerel (*Trachurus mediterraneus ponticus*). Given this distribution, it is the activities in the shallower parts of the offshore section and in the nearshore section of the Project that are more likely to interact with both fish populations and commercial fishing in Russian waters.

Any impacts upon migratory fish species, such as anchovy, would have the potential to influence fisheries in other Black Sea countries. Potential impacts could occur as a result of construction activities such as pipe-laying, dredging and post lay trenching which result in underwater noise, generation of suspended sediments and the loss of habitat. Anchoring, pipe-laying, dredging and post lay trenching will generate sediment plumes, which will be of limited duration and dimension. These plumes will not occupy a significant proportion of the local water column and it is anticipated that fish will avoid them. The loss of habitat from pipe-laying is considered insignificant in the context of the wider Black Sea environment and is thus not expected to result in an impact on either migratory or non-migratory fish.

Given the limited area the offshore and nearshore sections of the Project will occupy, and the temporary nature of the Construction and Commissioning Phase, no significant transboundary impacts to fish stocks and fisheries are expected.

21.6.2 Unplanned Events

Unplanned events are considered separately from planned activities as they would only arise as a result of a technical failure, human error or as a result of natural phenomena such as a seismic event (**Chapter 19 Unplanned Events**). Unplanned events that are considered to have the potential to generate a transboundary marine impact include (with each being discussed in the sections below):

- Disruption or damage to non-Project subsea infrastructure (principally during the Construction Phase);
- Increase on maritime traffic causing accidents;
- Hydrocarbon spillages (as a result of maritime accident/collision) (principally during the Construction and Pre-Commissioning Phase);
- Vessel operations have the potential to inadvertently introduce invasive alien species, either in ballast water, on the biofilm inside ballast tanks or carried as fouling organisms on the hull; and
- Large scale release of gas (during the Operational Phase).

21.6.2.1 Disruption to Subsea Infrastructure

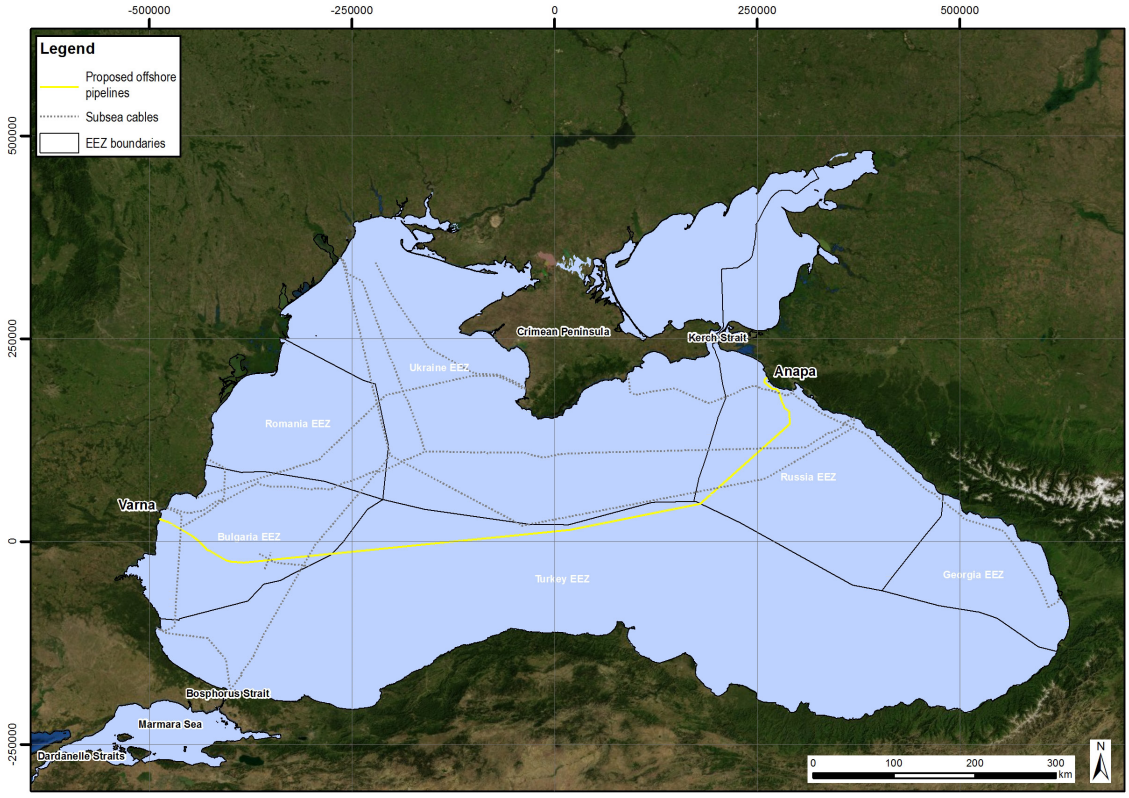
As shown in Figure 21.3, existing subsea infrastructure cables cross the Black Sea (including three subsea infrastructure cables which pass through the Russian EEZ). Consequently, there is a risk that during the Construction Phase pipe-laying activities that a cable could be damaged

which would have a potential adverse transboundary impacts upon other Black Sea countries due to service interruption.

To mitigate the potential damage to subsea infrastructure cables, it will be necessary to install structures above the existing cables to ensure their protection. Such protective structures could include concrete or rock mattresses. South Stream Transport will contact known cable owners prior to pipe-laying and agree technical and commercial aspects of any such cable crossings.

With the implementation of the defined mitigation approach, the risks of damaging subsea infrastructure cables and associated transboundary impacts (i.e. disruption to communication networks) will be minimised.

Figure 21.3 Location of Subsea Cables



21.6.2.2 Increase in Marine Traffic

Project related maritime traffic and navigation restrictions have the potential to increase the risk of marine vessel collisions or obstruct other vessels traversing the Black Sea (originating from or en route to ports outside of Russian Federation territory). However, the pipe-laying spreads (pipe-laying and supporting vessels (**Chapter 5 Project Description**)) will move at very low speeds (i.e. around two nautical miles a day), which means that they can effectively be considered to be stationary objects rather than moving vessels. Consequently non-Project vessels can be notified of the spread's daily position to minimise the risk of vessel collisions. In

addition, the Project will comply with all international mandatory requirements (e.g. MARPOL - Ref. 21.4 and Ref. 21.5), including the following measures:

- Prior to and during construction, liaise with the appropriate maritime authorities and ports to ensure suitable navigational warnings are issued; and
- Radio communications and other safety devices (such as navigational lights and maritime warnings) to communicate the location and extent of the exclusion zone around the Project construction activities.

With the implementation of such measures, the risk of third party vessel collisions is minimal and the Project's activities are not expected to result in a significant impact on transboundary marine vessel movements. In avoiding the pipeline spread, non-Project vessels may be required to deviate from their preferred course, however, such deviations would not significantly disrupt vessels undertaking long range transnational journeys.

21.6.2.3 Maritime Accidents Leading to Oil Spills

Chapter 19 Unplanned Events considers the risks of Project vessel accidents and collisions and the potential environmental impacts from any resultant hydrocarbon spillages. The assessment was supported by a maritime risk assessment and hydrodynamic modelling of various oil spill scenarios. The maritime risk assessment indicates that the probability of vessel collisions (and vessel grounding in nearshore areas) occurring is considered to be very low. The probability that such incidents would result in an oil spill is even lower, as a high-energy collision would be required to damage a vessel to such an extent that marine diesel was spilled into the sea.

Hydrodynamic modelling has been undertaken for various oil spillage scenarios (Ref. 21.6), some of which can be used to illustrate the potential for transboundary impacts. Oil spillage modelling has been undertaken for an oil spillage along the Pipeline route very close to the Russian and Turkish EEZ border (spillage of 2,000 m^3 of Marine Diesel Oil (MDO)).

Whilst the oil spillage release location for the modelling scenario as detailed above was located just outside the Russian EEZ border (see Figure 19.2), it is considered that the modelling results can be used to illustrate the potential for spillages within the Russian EEZ to generate potential transboundary impacts. Hydrodynamic modelling results illustrate the following (**Chapter 19 Unplanned Events**):

- **2,000 m^3 MDO spillage on the Turkish / Russian EEZ border:** Hydrodynamic modelling predicts a moderate area of the Black Sea would be affected with a surface slick of thicknesses > 1 µm visible for up to 96 km from the release location. Thus an oil spillage along the Pipeline route close to the Russian EEZ border would have the potential to impact upon the marine waters of the Ukraine and Turkey within in a matter of hours. Dissolved water column concentrations of greater than 50 ppb are predicted a maximum of 68 km away from the release site, with concentrations taking up to 1.5 days to fall below this threshold in localised areas (oil is not expected to have acute toxic effects at water column concentrations less than 50 ppb). The risk of the oil spill reaching any shorelines is predicted to be low (up to 13%) due to the central location of the oil release and limited shoreward transport by prevailing currents. The minimum coastal arrival time for dissolved

oil is predicted to be around three days with a total mass onshore of approximately 85 tonnes - this quantity would be spread across a large coastal area such that concentrations would be likely to be very low - the majority of oil would arrive as fine droplets which are not expected to be visible. Russian and Ukrainian coastal locations would have the greatest exposure, although there may be very small quantities reaching Turkey and perhaps Georgia depending on tidal and weather conditions. Beaching after three days across a wide area of coastline suggests that any dissolved oil arriving onshore at the countries specified above would arrive in a weathered and dispersed state, only being noticeable in isolated areas. This modelling does not take into consideration oil spill response procedures being in place during the spill.

Chapter 19 Unplanned Events illustrates that the severity of the consequences of an oil spill depends on several factors including (a) type of oil spilled, (b) the amount of oil spilled and, perhaps most importantly, (c) the proximity of the oil spill to oil-sensitive resources. Whilst the probability of oil spillages is inherently low, the hydrodynamic modelling results as presented above indicates that such spillages in Russian waters have the potential to generate transboundary environmental impacts in other Black Sea countries (principally the marine waters of the Ukraine, Turkey and Georgia), with the significance of the impact being dependent upon the spillage volume and sensitivity of the release location.

Given that such hydrocarbon spillages have the potential to generate a transboundary marine environmental impact, the Project will implement a range of measures that aim to reduce the probability of such events occurring, as well as definition of actions to be taken following spillages to reduce potential environmental impacts (applicable to all Project phases). The oil spill prevention and mitigation strategy has been defined taking into account the findings of the hydrodynamic modelling (refer to **Chapter 19 Unplanned Events**) and includes:

- Marine diesel will be transported by supply Project vessels and vessels deployed in the Project Area will, where practical, use Marine Gas Oil (MGO) or MDO, commonly referred to as 'marine diesel' and conforming to ISO-8217:2010 Marine Distillate Fuel Grades DMA, DMB or DMZ. Therefore, any accidental spillages of fuel would have less adverse consequences than a spill that involved heavier fuels;
- Contractors working on behalf of South Stream Transport will be required to develop and implement an Oil Spill Prevention and Response Plan. South Stream Transport will ensure that contractor Oil Spill Prevention and Response Plans are appropriately aligned with the Black Sea Contingency Plan (Ref. 21.7);
- Contractors and operators of vessels working on behalf of South Stream Transport will operate in compliance with MARPOL regulations on oil spill prevention and response and are required to prepare Shipboard Oil Pollution Emergency Plans (SOPEP) and Shipboard Marine Pollution Emergency Plans (SMPEP) as applicable for each vessel (Ref. 21.8; Ref. 21.9). The SOPEPs will specify the control and response measures that have to be available on board every vessel in order to respond to a spill that does not require external intervention; and
- All marine vessel crews will have the appropriate training, qualification and certification to undertake the tasks required during the construction of the pipelines.

21.6.2.4 Invasive Species

Some of the vessels used by the Project will originate from locations outside of the Black Sea. Depending on the previous location of marine vessels (including the pipe-lay, support and supply vessels), there is a possibility that some vessels could introduce invasive species to the Black Sea via ballast water or fouling organisms on the vessel hulls. To mitigate against this risk, the following measures will be put in place where possible and practicable (also refer to **Chapter 19 Unplanned Events**):

- Where relevant and practical these measures will be based on those identified in the IPIECA (Global Oil and Gas Industry Association for Environmental and Social Issues) document Alien Invasive Species and the Oil and Gas Industry, Guidance for Prevention and Management and the International Maritime Organization (IMO) Ballast Water Management Convention and Guidelines. They will be applied to all marine plant and equipment that is used on the Project and which has the potential to be a vector of live organisms, spores, larvae and young and will include ballast water management, use of antifouling coatings, cleaning of equipment prior to deployment and the change of cooling water;
- Where practicable use anti-fouling coatings (non-TBT) or sealing coatings to minimise inadvertent transport of organisms;
- Where practicable, careful cleaning of hulls and tanks before use and prior to entering the Black Sea; and
- Vessels entering the Black Sea using ballast water exchange will, whenever possible, conduct ballast water exchange as far from the nearest land as possible, and in all cases at least 50 nautical miles (nm) from the nearest land and in water at least 200 m in depth.

With the implementation of such measures, no significant adverse impacts associated with transboundary invasive species are expected as a result of Project activities (applicable to all Project Phases).

21.6.2.5 Release of Gas

The only possible sources of large scale releases of gas into the atmosphere would be the result of a pipeline rupture or an unplanned need to vent gas from the pipeline (depressurise) to ensure overall system safety during the Operational Phase. Statistically a pipeline rupture is a very rare event and the probability of such an extreme situation is very low. Such events have been too infrequent for a meaningful analysis of frequency as based on historic industry data. As detailed in **Chapter 19 Unplanned Events**, the Project pipelines will be designed in compliance with national and internationally recognised standards, whilst the Project has developed specific design criteria taking into account Russian Federation design standards and international pipeline industry standards that aim to minimise the risks of pipeline failures which could result in large scale gas releases.

In the unlikely event of rupture of one of the pipelines during their operation, a shutdown sequence would be initiated via the emergency shutdown (ESD) valves at the landfall facilities or via from the central control room (CCR) in Amsterdam as soon as practicable (**Chapter 5 Project Description**). This would lead to closing of ESD valves at the Russian and Bulgarian landfall facilities. The shutdown sequence is part of the detailed process design of the pipeline

system and is currently under development. After shut down, the pipeline may require depressurisation and gas may be vented at landfall facilities in Russia or Bulgaria to allow repairs to take place (see Section 21.5.2).

Gas will be trapped within the isolated pipeline with the exception of the point of rupture from which gas could escape. Any gas escaping the pipeline will partially dissolve in the water column and mainly flow to the surface, expanding during the ascent towards the surface of the sea. On contact with the water surface, gas will vent to the atmosphere. Depending on the volume of gas escaping the Pipeline, adverse effects to fish and marine life in general could occur. All impacts would, however, be localised within the area of rupture of the Pipeline because of the vertical route that any escaping gas would take after being released from the pipeline.

Given the above, unplanned releases of gas are not anticipated to have a transboundary environmental impact given that such events would only have localised impacts. However, pipeline shut down would result in the interruption to gas supplies in countries as serviced by the South Stream Offshore Pipeline.

Chapter 19 Unplanned Events details the design controls that have been included to reduce the likelihood of pipeline gas leakages.

21.7 Conclusions

21.7.1 Terrestrial Transboundary Impacts

Due to the distances between the Project and the land territories of Turkey, Georgia and Ukraine, planned activities and unplanned events do not have the potential to result in impacts that cross territorial borders and thus significant transboundary environmental impacts are not anticipated.

21.7.2 Marine Transboundary Impacts

Some planned Project activities have the potential to result in adverse marine transboundary environmental impacts given that Project activities will be taking place close to EEZ boundaries. However, defined mitigation strategies will mean that significant impacts on transboundary marine vessel movements, air quality, waste generation, invasive species, acoustically sensitive marine species, migratory birds, fish and fisheries would be avoided.

Some unplanned events involving the disruption or damage to subsea infrastructure , invasive species and hydrocarbon spillages (as a result of maritime accidents or collisions) have the potential to result in adverse marine transboundary environmental and socio-economic (e.g. disruption to telecommunications and gas supply) impacts. As such, the Project will implement a range of measures that aim to reduce the probability of such events occurring in the first instance, and define actions to be taken to reduce potential environmental and socio-economic impacts in the unlikely event of an unplanned marine incident.

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