Aqaba-Amman Water Desalination and Conveyance (AAWDC) Project

2025 Environmental and Social Impact Assessment

Chapter 11: Transboundary Impact Assessment

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11 Transboundary Impact Assessment

11.1 Introduction

Transboundary impacts are those that extend to multiple countries beyond the host country of the project but are not global in nature. This chapter considers the potential for transboundary impacts resulting from the Aqaba-Amman Water Desalination and Conveyance (AAWDC) Project. Where applicable, the chapter draws upon the impact assessment presented in Chapter 9 of this Environmental and Social Impact Assessment (ESIA). Given that climate change and greenhouse gas emissions are global issues rather than transboundary concerns, this chapter does not address this topic; further details are provided in the Climate Vulnerability Risk Assessment presented in Chapter 12.

11.2 Transboundary Impact Assessment

11.2.1 Scoping

IFC Performance Standard (PS) 1 Assessment and Management of Environmental and Social Risks and Impacts 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".*

To generate a transboundary impact, Project activities would need to have the potential to cross national land and sea borders. Those countries whose land territories border Jordan include Saudi Arabia to the south and Palestine to the north-west. These countries also have a maritime border with Jordan within the Red Sea along with Egypt to the west.

The closest Project activities to the international boundaries are those associated with the intake and outfall infrastructure (including the Intake Pumping Station (IPS)), which are located approximately 1.5km from the land and sea border with Saudi Arabia, approximately 7.5km and 11km from the maritime border with Egypt and Palestine, respectively. The Desalination Plant and Booster Pumping Station 1 (BPS1), located within the Aqaba Industrial Zone, are approximately 2km from the Saudi Arabia border, with the remaining Conveyance Pipeline Above Ground Installations (AGIs) and the Conveyance Pipeline itself more than 10 km from the Saudi Arabia border. The Project facilities and associated construction works are located at a significant distance from the north-west land border of Jordan (more than 30km away).

A review of those impacts assessed within Chapter 9 of the ESIA was undertaken to determine which impacts to consider in the context of potential transboundary impacts. The outcome of the review is presented in Table 11-1. Those impacts where there is potential for transboundary impacts are discussed further in the sections below.

Table 11-1: Review of Potential Transboundary Impacts

Activity	Type of impact	Receptor	Potential for transboundary impacts and reasoning
Marine Environment			
Construction: Vessel & equipment operation (underwater sound)	Underwater sound	Marine megafauna, turtles and fish	**Yes** – further consideration required to assess the potential for sound to travel and generate transboundary impacts within the marine environment
Construction: Seabed (benthic) disturbance, including anchoring	Changes to water quality, turbidity and light penetration Benthic habitat loss Smothering of benthic habitats	Water quality Benthic habitats	No – existing controls in place to avoid turbidity during construction– refer to Chapter 9.
Construction: Vessel operation (introduction of invasive species through ballast water)	Plankton changes/loss	Water quality Marine megafauna, turtles and fish	No – existing controls in place around ballast water management to prevent the risk of alien and invasive species introduction – refer to Chapter 9
Construction: Vessel operation (wastes and drainage (including sewage, galley waste and ballast))	Water quality changes	Benthic habitats Water quality Marine megafauna, turtles and fish	No - existing controls in place around containing wastes (including sewage and galley waste) and ship to shore and vessel tank ballast design – refer to Chapter 9
Operations: Abstraction of seawater	Loss of larger marine life due to entrainment	Water quality Marine megafauna, turtles and fish	No – entrainment of large marine life mitigated through intake design – refer to Chapter 9
Operations: Abstraction of seawater	Loss of plankton, coral larvae (planula) and seagrass	Benthic habitats Marine megafauna, turtles and fish	**Yes –** further consideration required to assess the potential for impact on wider habitat function due to abstraction
Operations: Discharge of desalination plant effluent	Water quality changes, benthic habitat damage	Benthic habitats Water quality Marine megafauna, turtles and fish	**Yes** - further consideration required to assess potential for wider impacts to water quality/benthic habitat function due to effluent discharge
Construction & Operations Accidental events[1]	Spill/pollution of the marine environment	Benthic habitats Water quality Marine megafauna, turtles and fish	**Yes** - further consideration required to assess potential for wider impacts to marine environment due to accidental events

Activity	Type of impact	Receptor	Potential for transboundary impacts and reasoning
Terrestrial Environment (Biodiversity and Physical Impacts)			
Construction: Earthworks including topsoil and vegetation removal, sub-surface works, spoil movement and new access roads (all Project components)	Terrestrial biodiversity loss Changes to soils and surface water through erosion and sedimentation Change to groundwater availability, flow and quality	Terrestrial habitats Surface water quality (e.g. wadis) Groundwater and soil quality	No – impact is limited to the footprint of the activities and the immediate surroundings. Potential for transboundary impact via groundwater and soil pathways is negligible
Construction:	Terrestrial biodiversity loss Changes to soils and surface water through erosion and sedimentation Change to groundwater availability, flow and quality	Terrestrial habitats Surface water quality (e.g. wadis) Groundwater and soil quality	No – impact is limited to the footprint of the activities and the immediate surroundings. Camp and yard locations not defined; mitigation to be incorporated into design. No planned yard/camp within close proximity to a national border
Construction and Operation: Permanent presence of IPS, Desalination Plant, Renewable Facility and Conveyance AGIs	Terrestrial biodiversity loss (permanent)	Terrestrial habitats	No – impact limited to the footprint of the Project Facilities. No wider impacts on regional habitat functionality
Construction and Operation: Permanent presence of OHTLs *(Associated Facility)*	Terrestrial biodiversity disturbance	Birds	No – impact limited to Project Area of Influence. Project will include mitigation in the design of the OHTL. No wider impacts on the regional integrity of bird populations
Terrestrial Environment (Infrastructure, Waste and Resource Use)			
Construction: Use of materials, including aggregates, concrete, steel and equipment supply	Decrease in resource availability. Interruption to existing supply chains	Communities Wider supply chain	No – sources of materials and equipment not currently defined. Preference is to source from within Jordan, where feasible, but external sourcing from outside Jordan is anticipated for some equipment and materials. Project to assess demand and develop procurement plans – see Chapter 9. No wider regional impact on

Activity	Type of impact	Receptor	Potential for transboundary impacts and reasoning
			materials and equipment availability anticipated
Construction: Use of national infrastructure and services including water, sewage, power and road network	Decrease in/ interruptions to services and infrastructure	Communities (local, regional and national)	No – project to assess demand and develop appropriate construction management plans to mitigate impacts on national infrastructure. No wider regional impacts anticipated
Construction: Generation of wastes	Decrease in national waste management/ handling capacity	Communities (local, regional and national)	No – Project to develop waste forecasts, undertake due diligence on disposal routes and contractors and implement a waste management plan – see Chapter 9. No wider regional impacts anticipated
Operations: Supply of Potable Water	Change to the national water supply/demand	Communities (local, regional and national)	**Yes** – the Project represents a significant contribution to the national water supply with the potential to reduce existing and future reliance on third-party supply in the region
Operations: Power Supply	Change/interruption to national power supply	Communities (local, regional and national)	No – operational power to be provided from the Project renewable facility supplemented with power from the national Jordanian grid with works to be completed by national electricity companies. No power to be provided from sources outside of Jordan.
Terrestrial Environment (Air Quality, Dust and Noise)			
Construction: Use of Construction Plant and Equipment and Offsite Traffic	Change to air quality	Communities	No – changes in air quality will be temporary, of limited duration and affecting areas within close proximity of the works (within approximately 45m) (refer to Chapter 9). No wider regional impacts anticipated.
	Noise disturbance	Communities	No – temporary disturbance due to construction noise anticipated to extend up to 950m from the works (based on potential sheet piling and no attenuation) (refer to Chapter 9). No wider regional impacts anticipated.
Construction: Earthworks and soil movements	Dust	Communities	No – temporary nuisance due to dust anticipated to be localised to the vicinity of the works and mitigated through controls measures specified within the Construction Pollution Prevention Plan

Activity	Type of impact	Receptor	Potential for transboundary impacts and reasoning
			(refer to Chapter 9). No wider regional impacts anticipated.
Social			
Resettlement, Land, Asset and Livelihoods	Physical displacement Economic displacement and loss of livelihoods	Land/residential owners, businesses including agriculture and tourism, herders, farm workers	No – potential impacts to be mitigated through development and implementation of Resettlement Policy Framework (RPF) in accordance with EBRD PR5 and IFC PS5 and Project Resettlement Action Plan (RAP) focused on potentially affected people. Wider regional impacts not anticipated.
Community Health and Safety During Construction	Health and safety risk	Land/residential owners, businesses including agriculture and tourism, herders, farm workers	No – potential impacts to be mitigated through construction management plans for the duration of the construction works. Wider regional impacts not anticipated.
Local Employment and Local Content	Employment, economic flows	Communities and businesses (local and regional)	No – labour and procurement process to be designed to maximise local content. Wider regional impacts not anticipated.
Labour Management	Labour conditions and worker rights Influx	Workers Communities	No – potential impacts mitigated through Labour and Working Conditions Management Plan, supported by construction management plans and procedures including Code of Conduct and Occupational Health and Safety (OHS) management plan
Gender-Based Violence, Harassment and Sexual Exploitation and Abuse (GBVH/SEAH)	Labour conditions and worker rights	Workers Communities	No – potential impacts mitigated through GBVH/SEAH Code of Conduct and Prevention & Response Action Plans. Wider regional impacts not anticipated.
Cultural Heritage			
Intangible and tangible cultural heritage	Impact or loss of craft, traditions, practices or physical resources	Communities, including Bedouin as well as national resources/assets	No – potential impacts will be local and remain within Jordanian borders and be managed through the Cultural Heritage Management Plan

11.2.2 Underwater Sound (Construction)

Temporary and short-duration underwater sound is anticipated to be generated by activities to install the outfall infrastructure, primarily use of an excavator mounted peckers/hammers for the breaking of rock to enable trenching.

The modelling undertaken to determine the potential impacts to the megafauna known to be present in the marine environment in the region (including fish, cetaceans and turtles) is presented in Chapter 9. The modelling predicted no potential for mortality or injury at distances greater than 76m, but potential for disturbance and behavioural changes in fish up to 684m and in cetaceans within 500m.

Mitigation to reduce impacts include incorporating specific measures relating to underwater sound management into the Marine Construction Works Management Plan including adoption of measures aligned with the JNCC guidance and the IMCA ES005 “Guidance on Mitigation of Underwater Noise” (2025) and “World Bank Environmental, Health, and Safety Guidelines Ports, Harbors, and Terminals February 2, 2017 and integration of a marine mammal observation program including use of soft start and stop work protocols. On this basis, it was determined that no more than a moderate adverse impact on fish, turtles and cetaceans was anticipated.

In a transboundary context, the extent of the underwater sound impacts from the Project activities are not predicted to reach Jordan's marine borders and no transboundary impacts from underwater sound associated with construction are anticipated.

11.2.3 Spills From Vessels (Construction)

Vessels associated with Project construction and supply chain activities are expected to use existing international shipping routes to and from their destinations in Jordanian waters. Those vessels associated with the construction and installation of the intake and outfall infrastructure will operate in the vicinity of the works for the duration of the activities. This area is subject to significant commercial and industrial marine traffic due to the presence of numerous industrial facilities and loading and unloading terminals distributed along the coastline extending from the Aqaba Port adjacent to the Saudi Arabia border to the oil terminal approximately 1km north of the Project Intake Pumping Station (IPS) site (refer to Chapter 6 Figure 6.51).

The facilities in this area fall under the jurisdiction of the Aqaba Special Economic Zone Authority (ASEZA), which is responsible for coastal zone management, and the Aqaba Development Corporation (ADC), which is responsible for the development, management, and operation of the facilities, along with private owners and operators. Co-ordination of marine traffic movements is undertaken by the Port of Aqaba authorities, with security, safety, and operational support from customs and immigration, the harbour master, pilots, and the Jordan Navy Coastguard.

Third-party vessels present in areas adjacent to the Project marine works will vary in type and function but will likely hold significant quantities of materials, including fuel and chemicals, as part of their routine inventory, on a scale much larger than any of the vessels anticipated for the Project works. These vessels will be required to comply with relevant maritime regulations, including requirements for identifying spill risks and procedures for spill mitigation and response, including coordination with responsible authorities and third parties.

To mitigate potential impacts in the event of a spill relating to Project activities in the marine environment, mitigation measures have been identified as described in Chapter 9. These include compliance with applicable international and Jordanian maritime regulations and the development of

emergency and spill response plans for Project marine activities, aligned with the requirements and capacity of the competent authority. In addition, the Project will complete a spill risk assessment, supported by engagement with third-party asset owners/operators and competent authorities, to identify hazards and risks and document relevant safeguards. The development of these plans, in combination with the existing plans and procedures held by third parties, is considered to adequately mitigate the potential for transboundary impacts from accidental spills associated with the Project.

11.2.4 Routine and Non-Routine Desalination Plant Discharges (Operations)

Operational discharges from the desalination plant will comprise routine discharge of effluent comprising primarily brine from the reverse osmosis process and non-routine discharges, which include treated and neutralised Cleaning-In-Place (CIP) effluent that will be co-mingled with the desalination effluent discharge before discharge. The assessment of the discharges, which included modelling, is presented in Chapter 9 and was based on the application of a 100m mixing zone and criteria to be met at its edge. This included a conservative requirement for the discharge to meet a salinity criterion of no more than 2% increase above ambient concentrations at the edge of the mixing zone and industry standard criteria of no more 5% increase for other components present in the discharge.

The modelling results indicated the maximum excess salinity at 100m from the outfall (equipped with a diffuser) would be close to the 2% criterion with all other inorganic components within the effluent discharge under routine and non-routine discharge conditions, aside from iron, predicted to below the +5% criteria within 17m from the point of discharge (which is where the discharge plume is predicted to reach the seabed). The extent of seabed habitat affected by the increase in salinity was estimated as 9076m^2 with the area affected represents 1.2% of the coral habitat within the Study Area

Concentrations of other chemical components within the discharge plume were assessed and found to be result in insignificant impacts based on anticipated operating scenarios, safeguards and monitoring in place, the behaviour and break down of the chemicals in the environment and their insignificant effects e.g. in terms of low potential to contribute to eutrophication and oxygen depletion.

Concentrations of iron in the discharge (from the addition of ferric chloride as a coagulant) were predicted above the 5% threshold due to insufficient dilution in the plume within the mixing zone. While corals are known to be tolerant to heavy metals in environments where they are not acclimatised there is potential for effects. Literature suggests non-acclimatised corals have been shown to be affected at iron concentrations above 0.005mg/l. The predicted iron concentration at the edge of the 100m is highest (during non-routine discharge) at 0.014 mg/l. Considering the conservative assumptions made within the modelling, spatial impacts were anticipated to be limited to within the defined mixing zones (except for iron where mitigation is included to confirm anticipated concentrations and identify opportunities for process controls or treatment to reduce the discharge concentration).

It was concluded that impacts from the routine and non-routine effluent discharges were predicted to be moderate and not significant. While a limited range was predicted for changes in water quality i.e. no significant changes beyond 100m of the discharge, receptor sensitivity was classified as high given presence of Critical Habitat and Priority Biodiversity Feature triggering species of fish, turtles and cetaceans and seagrass and coral habitat. Receptors were considered to be of moderate vulnerability and resilience of the receptors (specifically the seagrass and coral habitats which cannot move away from the plume as opposed to mobile marine species such as fish, turtles and cetaceans) and, with mitigation in place, impacts of no more than moderate adverse significance were predicted. Given the distance to the Jordanian maritime borders from the Project outfall (at more than 1.5km away) and the relatively localised effects predicted, the potential for transboundary impacts resulting from the desalination plant discharges is considered insignificant.

11.2.5 Abstraction of Seawater (Operations)

The Project design is based on a seawater intake flow rate of 21.8 m3/s via the new Project intake channel. This abstraction will occur continuously throughout the operational phase of the Project.

The potential for effects on receptors in the water column as presented in Chapter 9 focused on coral larvae, seagrass that pollinate through the water column (which includes most species in the Gulf of Aqaba), and bivalves (specifically the giant clam) that trigger critical habitat. Entrainment control measures included in the design to prevent the entrainment of larger marine life include bubble curtains and a fish recovery and return system.

With respect to seagrass, the intake suction area where current speeds were predicted to exceed normal currents, no seagrass or seagrass habitat has been recorded within surveys. On this basis and, considering use of the bubble curtain, the potential effect to seagrass reproduction through pollen or seed entrainment was deemed low.

With regard to coral larvae and other species with planktonic larval life forms, including giant clam gametes, it was estimated that the bubble curtain is likely to reduce potential entrainment by around 40-50% with coral larvae that may be entrained expected to not be viable evidenced through the lack of existing coral habitat in the shore/beach area. The footprint of the area affected by the increased current velocity due to the intake covers an area of approximately 3,500m^2 of intertidal habitat which has the lowest coral cover at 2% across the Study Area. Conservatively it was estimated that 4.2% of the coral area within the Study Area affected by the increase in current velocity due to abstraction and where coral larvae and clam gametes recruitment is estimated to be viable may be affected. Effects would be limited to the Study Area and would be further minimised through the implementation of mitigation measures including optimisation of the intake entrainment avoidance design measures and implementation of the Project Biodiversity Management Plan which will include measures to achieve not net loss or net gain for all critical habitat species and habitats.

The effect of the abstraction beyond the Jordanian maritime border is expected to be insignificant, given the distance from the abstraction location, the localised impacts predicted and the mitigation proposed. No transboundary impacts of significance are anticipated.

11.2.6 Supply of Potable Water (Operations)

The most significant long-term positive impact of the Project is its expected contribution to addressing the substantial shortfall between water supply and demand in Jordan. As detailed in Chapter 4 of this ESIA, the water supplied by the Project will not only deliver freshwater into the Jordanian network but also help restore the overexploited and degraded groundwater sources. Additionally, it will reduce reliance on purchasing water from international sources and diminish dependence on transboundary agreements. These agreements cover both surface water and groundwater resources shared with neighbouring countries, which many nations have rights to extract from. This includes the Jordan River, now degraded due to overdevelopment and pollution; the Yarmouk River on the Jordan-Syria border, impacted by dams and overexploitation; and the Disi aquifer beneath Jordan and Saudi Arabia, utilised by both countries. The realisation of the AADWC Project will thus enhance Jordan's water security, provide a dependable supply, and help reduce dependency on natural transboundary resources, potentially contributing to their recovery.

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