

Aqaba-Amman Water Desalination and Conveyance (AAWDC) Project 2025 Environmental and Social Impact Assessment

Chapter 3: Impact Identification and Assessment Methodology

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3 Impact Identification and Assessment Methodology

3.1 Introduction

This Chapter presents a description of the Environmental and Social Impact Assessment (ESIA) process adopted for the Aqaba-Amman Water Desalination and Conveyance (AADWC) Project and the methodology used to assess impact significance.

The key steps to identify and assess the potential impacts of the Project on potential receptors are described in the sections below and include:

- Defining the Project facilities and activities included in the scope of the ESIA
- Undertaking scoping to identify key interactions between the Project and potential receptors
- Defining of the Project Study Area and Area of Influence (AoI) (for social and environmental receptors)
- Characterising environmental and social baseline conditions
- Defining the methodology for the identification and assessment of impacts to environmental or social receptors
- Describing the approach to identifying mitigation and monitoring measures

A detailed description of the Project facilities is presented in Chapter 5: Project Description of this ESIA. The Project comprises both permanent and temporary facilities which have been subject to assessment as summarised below:

- Permanent Facilities
 - Intake and outfall facilities (located on the coastline within the Aqaba Special Economic Zone)
 - Desalination Plant and supporting facilities (located within the Aqaba Industrial Zone)
 - Conveyance System comprising a 438 km underground water pipeline extending from Amman to Aqaba, four pumping stations and three storage tanks (to control system flow and pressure) located along the route
 - Renewable Energy Facilities comprising a solar photovoltaic (PV) power plant and associated electrical substation
- Temporary Facilities
 - Pipeline construction right of way
 - Construction footprints at location of permanent facilities listed above

Other temporary facilities including construction camps, worker accommodation camps, laydown areas, temporary access roads and spoil storage and handling areas are also included within the scope of the assessment along with use of existing infrastructure such as ports and roads.

Associated Facilities include the transmission and electrical facilities required to connect the AAWDC Project facilities to the electrical grid and include overhead transmission lines and substations and potential upgrades to the existing Abu Alanda and Al Muntazah storage reservoir Upgrades: At the time

of writing the design of required upgrades if any, is not finalised. However, it is most probable that, at least, the Al Muntazah storage reservoir will require expansion

Project activities included in the scope comprise construction and operation activities.

3.2 ESIA Scoping Process

Scoping is the preliminary evaluation aimed at identifying potential interactions between project activities and environmental or social receptors. The purpose of scoping is to focus the impact assessment on key impacts and identify and exclude interactions unlikely to cause significant effects.

Scoping was initially undertaken for the 2022 ESIA (Tetra Tech, 2022), with a scoping session presenting the results of a scoping exercise held on 1st March 2021 at the Hyatt Regency Aqaba Ayla Hotel and online. The session included an overview of the technical concept design, the anticipated environmental and social issues and the methodology proposed to assess impacts, including proposed baseline data collection and modelling. The session was attended by representatives from several invited agencies and institutions, who were encouraged to ask questions and provide feedback. All details associated with scoping session including presentations, agendas and letters of invitations are provided within Annex 16 of the 2022 ESIA. The feedback from the session (summarised within Section 7.1 of 2022 ESIA) was subsequently incorporated in the 2022 ESIA Terms of Reference (ToR) and into the 2022 ESIA as it was developed. Scoping was also completed for the 2025 Renewable Energy ESIA, on 20th December 2023, at the Movenpick Hotel in Aqaba, summarised within Section 5.1 of 2025 Renewable Energy ESIA (Tetra Tech, 2025)

Scoping for this 2025 AADWC Project ESIA has been primarily informed by the existing project ESIAs, input from NCPC and EPC contractors on the project design and execution, input received from stakeholders (as detailed in Chapter 8 of this document), additional environmental and social baseline surveys and feedback from the project Lenders. This includes a review of the previous ESIAs against Lender standards and due diligence site visit undertaken by the Lenders and the Lenders Environmental and Social Advisors (LESA) in Q4 2024.

Based on the above, an updated scoping exercise has been completed to identify potential interactions between Project activities and potential receptors for each Project component as well as identify the interactions that may be scoped out of the full assessment process based on limited potential for significant impacts. These form the basis for the impact assessment presented in Chapter 9 of this document.

3.2.1 Study Area

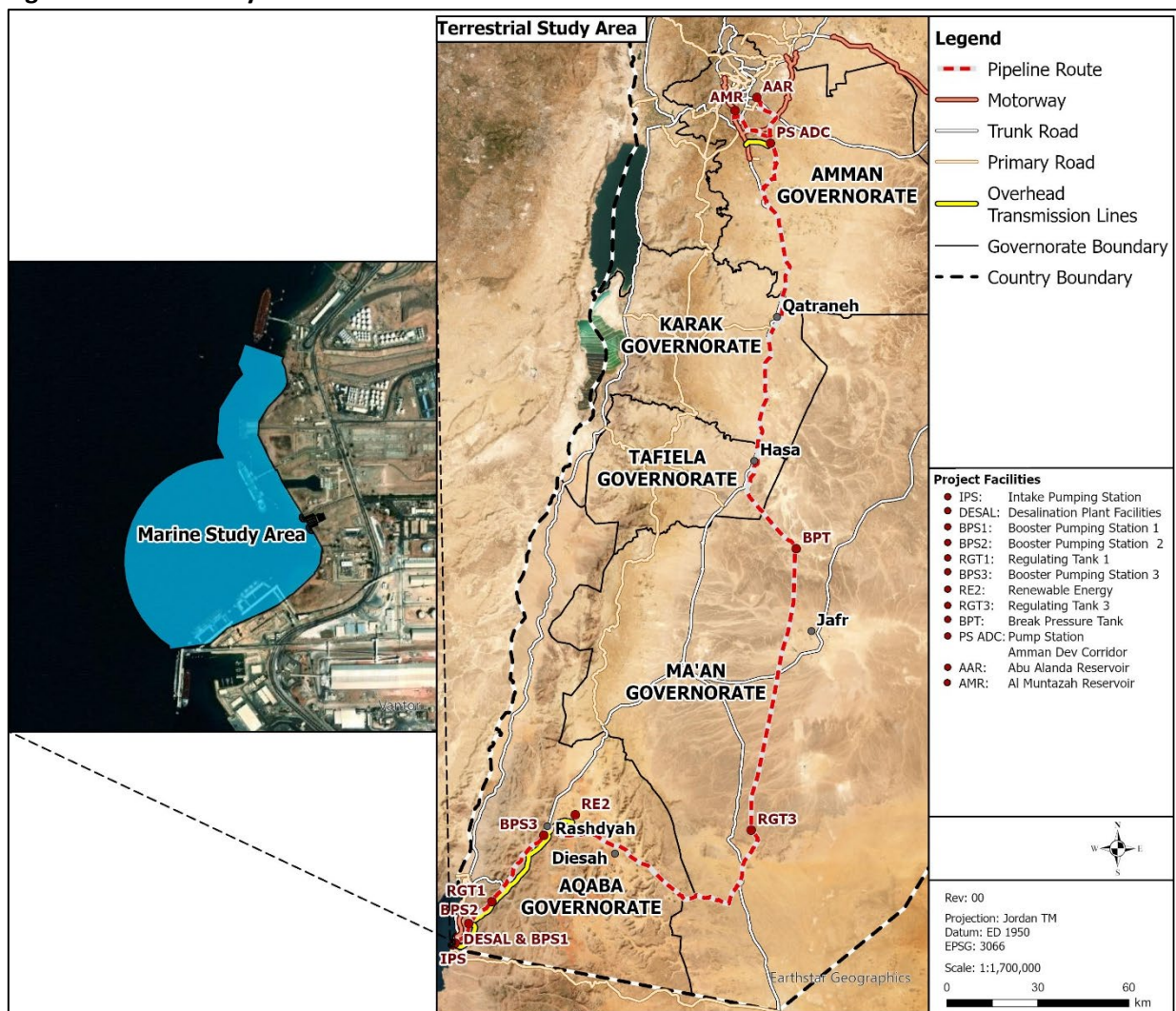
The Study Area defines the geographical boundaries over which baseline conditions are determined to enable the project's impacts to be assessed and to allow the Project's Area of Influence (AoI) to be established. The definition of project AoI in the International Financial Corporation (IFC) Performance Standard (PS)1 (2012) states it *"...includes the primary project site(s) and related facilities that the client (including its contractors) develops or controls; associated facilities... and areas potentially impacted by cumulative impacts from other projects..."*.

The 2025 AADWC Project ESIA Study Area is defined based on the previous ESIAs Study Areas, with amendments to capture the change in Project scope and Lender requirements. The Study Area adopted for the ESIA (shown in Figure 3-1) includes the footprints of the Project permanent and temporary facilities and the associated facilities i.e. transmission and electrical facilities and the surrounding areas potentially affected by Project activities. The Area is defined to reflect the need to evaluate baseline

conditions both within the anticipated AoI and across wider areas e.g. across governorates, catchment areas, geomorphic regions to provide context and an understanding of regional and district level conditions and trends. The Marine Study Area primarily focuses on the Marine Survey Area (see Section 3.2.2 below) but also extends to the:

- Entire GoA coastline of Jordan for the purposes of understanding permitted coastal fishing and dive sites
- Entire GoA when considering protected, designated and recognised sites and potential critical habitats. Specifically, the extents of Ecologically Appropriate Area of Analysis (EAAAs) within the marine environment as defined within the Marine Critical Habitat Assessment (CHA) (see Appendix 6-2) which comprises the following areas:
 - Entire GoA for elasmobranchs
 - Coastline of the GoA up to various water depths (from 0 to more than 200m) for turtles, marine mammals, giant clam and reef fish and invertebrates depending on their habitat preferences, ecological patterns and migratory paths
 - Coastline of the GoA up to water depths of 150m and up to 70m for coral reef and seagrass habitat respectively

Figure 3-1: ESIA Study Area



The extent of the Terrestrial Study Area adopted is aligned for all environmental topics, extending to the southern and eastern borders of Jordan to consider protected, designated and recognised sites and potential critical habitats within the south of Jordan and hence incorporate the EAAAs identified within the terrestrial environment as defined within the Terrestrial CHA (see Appendix 6-1).

For social aspects, the Study Area over which data was collected comprised the governorates in which Project construction and operational activities will occur except for the area studied in relation to the Bedouin which extended to the northern border of Jordan to capture contextual data relating to the Northern Badia area (more than 40km from any Project activities). Mapping showing the extent of baseline data collection for each topic is provided within Chapters 6 and 7 respectively.

3.2.2 Baseline Characterisation

To identify potential impacts to receptors, an understanding of the existing conditions is essential prior to execution of project activities. As part of the AADWC Project ESIA scoping process and the development of the detailed scope of work, a review of the 2022 data and readily available published reports was undertaken against anticipated data needs to be identify gaps and the additional surveys and studies required for the AADWC Project ESIA.

The scoping process identified the potential for impacts to the biological environment (aquatic and terrestrial), the socio-economic environment (including cultural heritage) and the physical environment (including aspects such as air quality, noise and hydrology). Baseline surveys were undertaken to collect location-specific primary data relating to inform both the ESIA and supporting studies covering terrestrial and marine ecology. These surveys were scoped and executed in collaboration with relevant national experts including representatives from the Jordanian Marine Science Station and Jordan University of Science and Technology.

Both the terrestrial and marine surveys were designed to include an initial survey stage followed by more specific surveys (e.g. focused on specific animals in the terrestrial environment) or an amendment to the survey area, depending on what was encountered in the field. This was to focus data collection on the key receptors and Priority Biodiversity Features (PBF) encountered to support both the ESIA and Critical Habitat Assessments (CHA).

A stakeholder engagement and baseline collection program was carried out in September and October 2025 to ensure that stakeholders are informed about the purpose, nature, and scale of the Project and this ESIA. In addition, the engagement collected the perceptions, expectations, and concerns of all stakeholders, which are understood, noted, and their feedback has been incorporated into the impact assessment analysis, the development of mitigation/management measures, to inform the Project design.

Further details of the environmental and social surveys completed (including survey approach, locations and results) and the secondary data sources consulted are provided within Chapters 6 and 7 respectively. These chapters include commentary on the limitations around the surveys and data collection undertaken including seasonal aspects. Stakeholder engagement and consultation is described within Chapter 8.

3.2.3 Impact Identification and Assessment Process

Table 3-1 presents the AoI and approach for the assessment of impacts which is provided in Chapter 9.

Table 3-1: Area of Influence and Approach to Assessment

Topic	Area of Influence	Approach to Assessment
Terrestrial environment including biodiversity (flora, fauna and habitats)	Terrestrial area to be occupied by and adjacent to temporary and permanent Project facilities and structures	Quantitative and qualitative assessment (based on characteristics of activity) and expert judgement, supported by baseline and secondary data presented in the environmental description.
Marine environment including biodiversity (benthic and water column receptors, PBFs and habitat), including sediment and water quality	Marine area to be occupied by and adjacent to temporary and permanent Project facilities and structures Marine zone within the vicinity of marine works potentially affected by dispersion from intake, desalination plant discharge and sediment transport Marine zone extending into the Gulf of Aqaba potentially affected by underwater noise and potential accidental marine events	Quantitative assessment (based on characteristics of activity), expert judgement/benchmarking and discharge/underwater noise modelling. Supported by baseline and secondary data presented in the environmental description.
Air quality and dust	Area in the vicinity of the Project construction activities including road and access routes and immediate vicinity of permanent Project facilities	Air quality, dust, noise and vibration: Quantitative assessment based on screening-level modelling. Supported by secondary data presented in the environmental description.
Noise and vibration environment (terrestrial)		
Surface and groundwater resources (quality)	Wadis and drainage ditches adjacent to and crossed by temporary and permanent Project facilities and structures. Local groundwater in areas to be occupied by and adjacent to temporary and permanent Project facilities and structures	Qualitative assessment using a risk-based approach and secondary data sources
Ecosystem services	Terrestrial area to be occupied by and adjacent to temporary and permanent Project facilities and structures. Marine area to be occupied by and adjacent to temporary and permanent Project facilities and structures.	Qualitative assessment (based on characteristics of activity) and expert judgement, supported by baseline and secondary data presented in the environmental and social description.

Topic	Area of Influence	Approach to Assessment
GHG and climate change risk	Project facilities and structures	Qualitative assessment supported by Climate Risk Vulnerability Assessment (CRVA)
	Global and national	Quantitative based on operational and construction emission estimates – excluding estimated emissions from imported power from the grid and the embedded carbon estimate associated with major equipment and pipe.
Resettlement, Land, Asset and Livelihoods	Area to be occupied by temporary and permanent Project facilities and structures	Qualitative assessment (based on characteristics of activity) based on sensitivity mapping, social survey, stakeholder engagement and secondary data sources. Supported by the Resettlement Policy Framework.
Community Health and Safety	Communities and public in the vicinity of the Project construction activities	Qualitative assessment, identification of potential hazards and risks and protection and prevention measures.
Local Employment and Local Content	People employed by the Project and supply chains for Project goods and services	Expert judgement based on local context and identification of risk, and identification of protection and prevention measures and stakeholder engagement
Labour Management	People employed by the Project	
Landscape and visual	Area surrounding the Project from which temporary and permanent Project facilities and structures are visible – focused on Wadi Rum WRPA	Quantitative and qualitative assessment using the Landscape and Visual Impact Assessment (LVIA)
Cultural heritage and archaeology	Area to be occupied by temporary and permanent Project facilities and structures and immediate surroundings including the WRPA buffer zone	Quantitative and qualitative assessment (based on characteristics of activity), expert judgement and engagement WRPA assessed in accordance with applicable UNESCO guidance, supported by Heritage Impact Assessment (HIA)

3.2.3.1 Identification of Impacts

The assessment of impacts involves identification and characterisation, determination of significance, identification of mitigation measures and evaluation of residual impact. Impacts may be direct or indirect, adverse (negative) or positive, or cumulative (see Table 3-2).

Table 3-2: Definition of Types of Impacts

Type of Impact	Definition
Direct Impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (e.g. the loss of vegetation and habitat because of site clearing, or between an effluent discharge and receiving water quality)
Indirect Impact	Direct impacts on one environmental component may lead to indirect impacts on other components. Typically, these impacts are assessed through a source-receptor-pathway approach and are cross-linked across topics e.g. an impact to a physical receptor, affecting a biological receptor, potentially impacting a social receptor e.g. through a livelihood effect.
Cumulative Impact	The combined effects of other existing or planned future developments or natural processes on the same resources and/or receptors; these effects are additive or interactive in nature.
Residual Impact	The residual impact is the impact that is expected to persist assuming that the avoidance, reduction, and mitigation measures have been implemented effectively.

Significance of impacts are ranked based on a combination of the magnitude of effect and sensitivity of receptors as set out below. As described within Section 3.2 above, the impact assessment is intended to focus on those interactions with the greatest potential to cause significant impacts. Where interactions between Project activities and receptors are expected to result in insignificant impacts these may be excluded from the scoring process (or "scoped out") based on several methods, including quantitative and semi-quantitative analysis, and expert scientific judgment. This judgement includes consideration of relevant mitigation included within the Project design. Scoping out does not imply that there is no interaction or impact but that the impact can be reasonably predicted to be insignificant on the basis of scoping level analysis.

3.2.3.2 Magnitude of Effect

For those impacts scoped into the full assessment magnitude of effect is determined based on the following parameters:

- Duration of the impact - ranging from long term (e.g. years) to short term (e.g. hours)
- Spatial extent of the impact – for instance, within the site, boundary to regional, national, and international
- Reversibility - ranging from permanent requiring significant intervention to return to baseline to no discernible change

Impact magnitude is categorised as major, moderate, minor or negligible (adverse or beneficial) using these criteria, with justification provided for the ranking assigned.

3.2.3.3 Receptor Sensitivity

The sensitivity of a receptor is determined based on review of the available data and consideration of the following parameters, including:

- Vulnerability – extent to which a receptor is vulnerable to change and seasonal variability
- Value – extent to which a receptor is valued or protected with higher value receptors having a higher sensitivity

- Resilience - the extent to which a receptor can recover from an impact

Receptor sensitivity is categorised as high, medium, low or negligible using these criteria, with justification provided for the ranking assigned.

3.2.3.4 Assessment of Impact Significance

Impact significance, as a function of magnitude of effect and receptor sensitivity, is subsequently ranked as “Negligible”, “Minor”, “Moderate” or “Major” as shown in Table 3-3 below, where Major impacts are further classified as “Significant” and all other impacts classified as “Not Significant”. Ranking is undertaken prior to mitigation and residual impacts ranked post mitigation.

In assessing significance, controls to ensure compliance with applicable legislation and standards are assumed to be adopted.

Table 3-3: Significance Ranking Matrix

		Sensitivity			
		Negligible	Low	Medium	High
Magnitude	Negligible	Negligible	Negligible	Negligible	Negligible
	Minor	Negligible	Minor	Minor	Medium
	Moderate	Negligible	Minor	Medium	Major
	Major	Minor	Medium	Major	Major

In the event an impact is ranked as “Significant” it is necessary to identify appropriate measures to avoid, minimise and mitigate the impact, consistent with the mitigation hierarchy. The mitigation hierarchy includes measures taken to avoid creating environmental or social impacts from the outset of development activities, and where this is not possible, to implement additional measures that would minimise, mitigate, and, as a last resort, offset and/or compensate any potential residual adverse impacts.

3.2.4 Cumulative and Transboundary Impacts

3.2.4.1 Cumulative Impact Assessment

Cumulative impacts are those that act collectively with other impacts, from different projects, to influence the same environmental or social resource or receptor. The potential for cumulative impacts with other planned projects and activities is based on a review of available information, taking into account the geographical and temporal scope of the individual project impacts and hence the potential to result in cumulative impacts with the Project. Where there is potential for impact interaction, and the project is sufficiently defined and sufficient data is available, a quantitative assessment of cumulative impacts will be undertaken.

This is further assessed within Chapter 10 Cumulative Environmental and Social Impact Assessment, Mitigation and Monitoring.

3.2.4.2 Transboundary Impact Assessment

Transboundary impacts are defined 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” (IFC, 2012).

Typically, transboundary impacts are considered with the context of the UNECE Convention on Environmental Impact Assessment in a Transboundary Context, 1991 (Espoo Convention) which establishes the framework for conducting transboundary environmental impact assessments for projects that may have significant adverse effects across national borders including requirements around notification and consultation between parties where significant impacts may be anticipated. While Jordan and its neighbouring states are not party to the Espoo Convention, Egypt, Saudi Arabia and Jordan along with Sudan, Djibouti, Yemen, and Somalia are all party to the Jeddah Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment (Jeddah Convention (1982)) which was established in 1982 to address the conservation of marine and coastal environments in the region. It was initiated in collaboration with the Arab League Educational, Cultural and Scientific Organization (ALECSO) and the United Nations Environment Programme (UNEP) as part of the Program for the Environment of the Red Sea and Gulf of Aden (PERSGA). The convention emphasizes the need for regional cooperation to combat threats such as marine pollution, overfishing, and resource depletion, which are of transboundary nature.

The assessment of potential transboundary impacts is presented within Chapter 11 Transboundary Impact Assessment, Mitigation and Monitoring of this ESIA.

References

Tetra Tech International Development, “AAWDC Project – Final Environmental and Social Impact Assessment Report” 5th April 2022

Tetra Tech International Development, “Preliminary Risks Assessment and ESIA for the AAWDC Project (Jordan) – Renewable Energy Component Comprehensive Environmental and Social Impact Assessment” 1st June 2025

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