HSR Blue & Red Lines - Environmental and Social Impact Assessment Report

Non-Technical Summary

PREPARED FOR

Egyptian National Authority for Tunnels (NAT)

DATE

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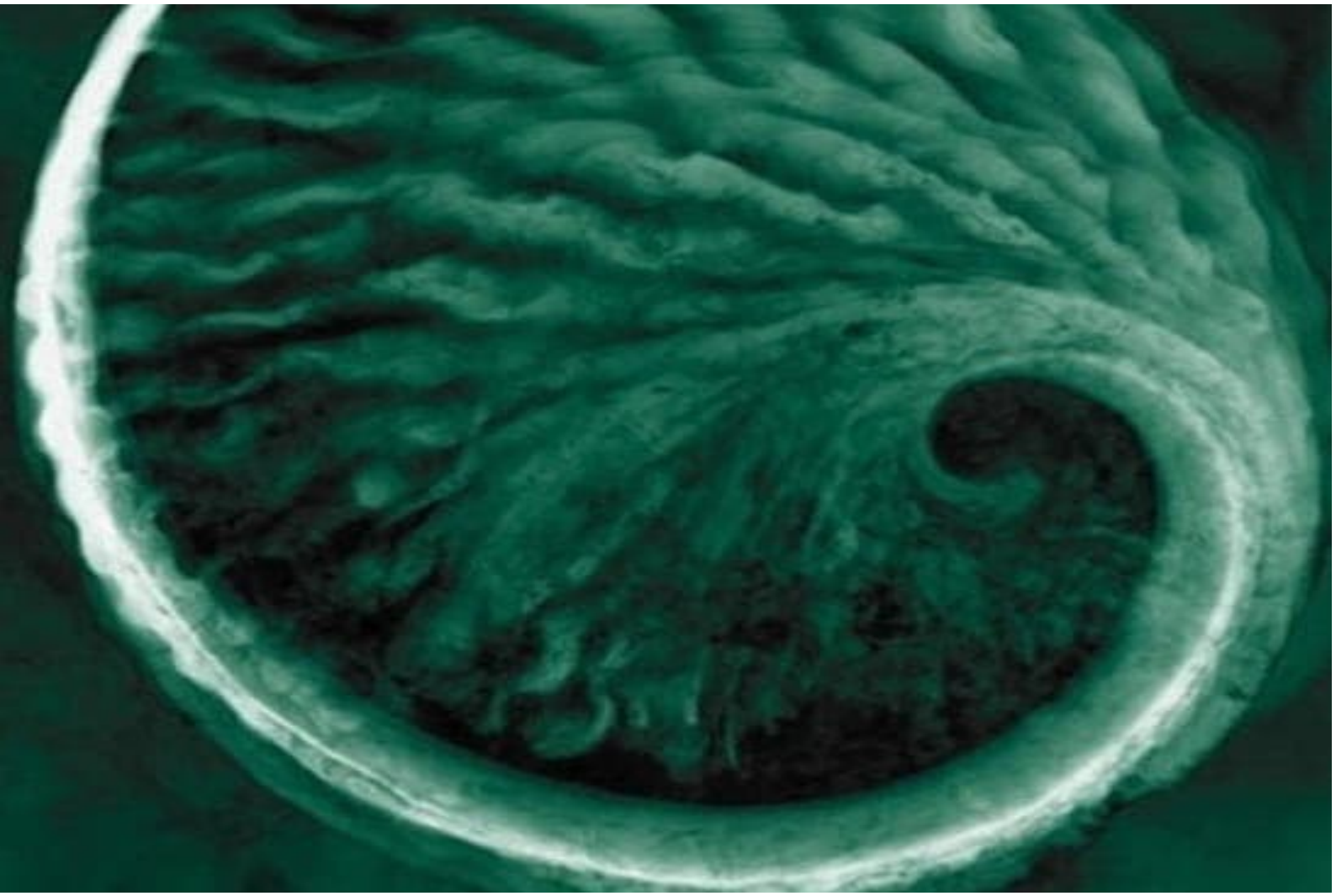

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SIGNATURE PAGE

HSR Blue and Red Lines - Environmental and Social Impact Assessment Report

Non-Technical Summary

0667980

Cristina Ortuno

Partner

Ignacio Marticorena

Consulting Director

ERM GmbH
Siemensstr. 9
Neu-Isenburg
Germany
63263

T +49 6102 206 0

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ACRONYMS AND ABBREVIATIONS

Name	Description
CEMP	Community Engagement Management Plan
CHMP	Cultural Heritage Management Plan
CLO	Community Liaison Officers
DMP	Dust Management Plan
E&S	Environmental and Social
EEAA	Egyptian Environmental Affairs Agency
EHS	Environmental Health and Safety

Name	Description
EIA	Environmental Impact Assessment
EN	European Standards
ENR	Egyptian National Railways
ERM	Environmental Resources Management
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
FGD	Focus Group Discussions
GHG	Greenhouse Gases
GM	Grievance Mechanism
GRM	Grievance Redress Mechanism
H&S	Health & Safety
HSR	High-Speed Rail
IAQM	Air Quality Management
IFC	International Finance Corporation
LRP	Livelihood Restoration Plans
MoT	Ministry of Transport
NAT	National Authority of Tunnels
NGO	Non-Governmental Organisations
NTS	Non-Technical Summary
OCC	Operational Control Centre
OHS	Occupational Health and Safety

Name	Description
PAP	Project Affected Persons
RAP	Resettlement Action Plan
RoW	Right of Way
SEP	Stakeholder Engagement Plan
UNESCO	United Nations Educational, Scientific and Cultural Organization
WB	World Bank

1. INTRODUCTION

The development of the Public Transportation Sector in Egypt and development of railway networks within the country are two economic development priorities in the "*Sustainable Development Strategy: Egypt 2030 Vision"*[1]. Given that the current Egyptian National Railways (ENR) railway system is unable to meet the increased passenger demands and continuous economic development, the Egyptian Government is currently working on multiple development projects focused on modernizing the railway systems in Egypt and enhancing their capacity. The transport sector's development in Egypt is guided under the strategic direction of Egyptian President Abdel Fattah el-Sisi.

One of the executive decisions of the President was to implement as part of the Egypt 2030 Vision the country's first modern, electrified high-speed rail (HSR) network. In total, three HSR lines are foreseen extending for approximately 1,900 km in total: the Green Line (already approved by EEAA[2]) a Blue Line (subject to this ESIA) running from October Gardens Station (near Cairo) via Fayoum/Beni Suef to Abu Simbel and a Red Line (subject to this ESIA) running from Safaga to Qena.

The HSR project is considered a "*Project of National Importance*" and is being promoted strongly on behalf of the President by the Minister of Transport, Kamel al-Wazir.

1.1 WHAT IS THIS DOCUMENT?

The Egypt High Speed Rail Project (HSR) consists in the design, construction, commissioning and operation of the country's first high-speed train system. The network of three lines (referred to as the Green, Blue and Red Lines) will extend for a distance of approximately 2,000 km, connecting Cairo, Upper Egypt, the Red Sea and the Mediterranean (see Figure 2-1):

- Green Line: Marsa Matruh to Ain El Soukhna; approximately 606.2 km length.
- Green Line (extension): Cairo to Fayoum/Beni Suef; approximately 85 km length.
- Blue Line: Fayoum/Beni Suef to Abu Simbel; approximately 1,148.6 km length.
- Red Line: Qena to Safaga; approximately 162.3 km length.

The Green Line is currently under construction, whereas the Blue and Red lines are currently under design phase.

The main legal instrument dealing with environmental issues in Egypt is Law No. 4/1994, amended by Law No. 9/2009 and Law No. 105/2015 and its Executive Regulation (ER) 338/19995 amended by Decrees No. 1741/2005, 1095/2011, 710/2012, 964/2015, 618/2017, 1963/2017 and most recently Decree No. 202/ 2020 commonly known as the Law on Protection of the Environment. The law deals mostly with the protection of the environment against pollution. Prime Ministerial Decree No. 631/1982 established the EEAA as the

[1] Egypt Vision 2030 strategy represents the plan for the Country and Egypt's general objectives for 2030
[2] Note: the ESIA for the HSR Green Line also included the so-called "Fayoum Extension" portion of the Blue Line extending about 85 km from October Gardens Station south to Fayoum/Beni Suef Station, as this Fayoum Extension is included in the construction contract for the Green Line. Nevertheless, the Fayoum Extension segment is included as part of the planned operations for the Blue Line from October Gardens to Abu Simbel.

competent body for environmental matters in Egypt. Law No. 4/1994 also stipulates the role of the EEAA as the main regulatory agency for environmental matters.

According to Articles 19, 20, 23, and 73-75 of Law No. 4/1994, the legal entity responsible for a given project is required to carry out an assessment of the potential environmental and social impacts of the project on the natural and socio-cultural environment before implementing that project. The findings of the assessment are submitted to the EEAA for review and approval before other relevant governmental authorities can issue their permits for implementing the Project.

In addition to the Egyptian legislative requirements, the funding for realization of the Blue and Red lines, will be partially obtained from international banks, which have requested investigation of potential impacts of the Project[3] on the environment and on the people (social impacts). As a major long-term infrastructure, the HSR Project is considered "*High Risk*" as it has the potential to cause significant environmental and social (E&S) impacts associated with the construction and operation of the proposed railway system. Consequently, the international consultancy ERM was mandated to perform the Environmental and Social Impact Assessment (ESIA), which included extensive studies undertaken in collaboration with local experts (EcoConserv) for a period spanning over two years. This resulted in many 100s of pages complied in the ESIA Report and other related documents.

This document is a Non-Technical Summary (NTS) of the main findings of the ESIA studies conducted for the HSR Blue and Red Lines Project.

The NTS is intended to be an easy-to-understand summary of the information that is provided in the full ESIA study. The purpose of the NTS is to facilitate the public and the Project stakeholders understand:

- The Project need and background;
- Project description and main components;
- The ESIA process, including stakeholder engagement and grievance mechanism;
- The potential adverse and positive environmental and social effects of the Project; and
- The mitigation measures that will be implemented to avoid or reduce adverse effects and enhance the benefits.

The Ministry of Transport (MoT) is the owner of the HSR Project through the National Authority of Tunnels (NAT). NAT is being supported for the management and implementation of this Project by the international transport consultant, Systra.

The Construction Phase of the Project is divided into two main Work Packages which are coordinated by both NAT and Systra:

1. Work Package 1: includes major civil works such as: line alignment, earthworks, construction of stations, bridges, etc. and which will be executed by Egyptian contractors; and

[3] Note. The term "Project" in this document refers to the HSR Blue and Red Lines

2. Work Package 2: includes the rails, electrification and controls, provision of rolling stock by the international partnership of Siemens and its Partners (also known as Siemens/CJV-Consortium[4]).

1.2 WHERE TO GET MORE INFORMATION?

The intention of NAT is to make it easy for the public to become informed about the Project, and to invite the public to provide their views and comments (whether positive or negative) about the Project.

For any comments, suggestions, questions or complaints about the ESIA process or the HSR Project in general, or to receive further information, please contact NAT through the contact details stated below: Mobile: +202 20545335/36/37

Website: http://www.nat.gov.eg/Default.aspx

[4] The term “Siemens/CJV-Consortium” refers to one or more open consortium/consortia to be established by and amongst Siemens Mobility Egypt LLC, Siemens Mobility GmbH and the Construction Joint Venture, which consists of Orascom Construction S.A.E. and The Arab Contractors (Osman Ahmed Osman & Co)

2. PROJECT DESCRIPTION

2.1 GENERAL OVERVIEW – WHY IS THIS PROJECT NEEDED?

Currently, Egypt is served by a rail network extending some 9,500 km, which has far exceeded its maximum capacity owing to steep population increases over the past century.

The role of modern and efficient transportation is important to improve the infrastructure, the economy and communal safety of the Egyptian population. Over the years, numerous transportation projects, particularly in the major cities of Cairo and Alexandria have been introduced.

The proposed 2,000-kilometer HSR network has been introduced to respond to the above-listed challenges by offering a fast, efficient and safe mode of transportation for both passengers (speeds up to 230 km/hr) and freight (up to 120 km/hr) and providing new connection possibilities between Egyptian ports, industrial zones, new development zones and the new administrative capital.

The Egypt HSR (also known in Egypt as the *Electric Express Train*) is in alignment with Egypt's Vision 2030, aiming to enhance Egypt's transportation infrastructure, by widening its current transportation network, and better serving communities in new urban districts where access to sustainable transportation modes is currently unavailable. In addition, the three lines will allow for the transport of local materials to industrial zones across the country, thus promoting industrial growth across the nation, as well as urban, tourism and commerce development.

The Project aligns with the Objective 1 of Egypt Vision 2030 "*to improve the quality of life of life and standard of living of the Egyptian citizens*" as well as Objective 3 "to promote competitive and diversified economy" through which job opportunities can be created.

2.2 ROUTE OF THE HSR BLUE AND RED LINES

The Blue and Red Lines rail alignment will pass through a total of 11 Governorates[5] of Egypt from Beni Suef in the north to Aswan in the south and the Red Sea Governorate in the east (see Figure 1 and Figure 2below).

Note: The first 85 km segment of the Blue Line alignment, from October Gardens to Fayoum/Beni Suef Station were covered in the ESIA Study for the Green Line prepared by the ESIA Consultant in 2022[6], and therefore is not included in the current study.

[5] Only 10 described in this Project as 2 of them belong to the Fayoum Extension described in the GL ESIA.
[6] Egypt HSR Green Line ESIA Report, ERM, 2022.

FIGURE 1 HSR BLUE & RED LINES ROUTE

Source: ERM, 2025.

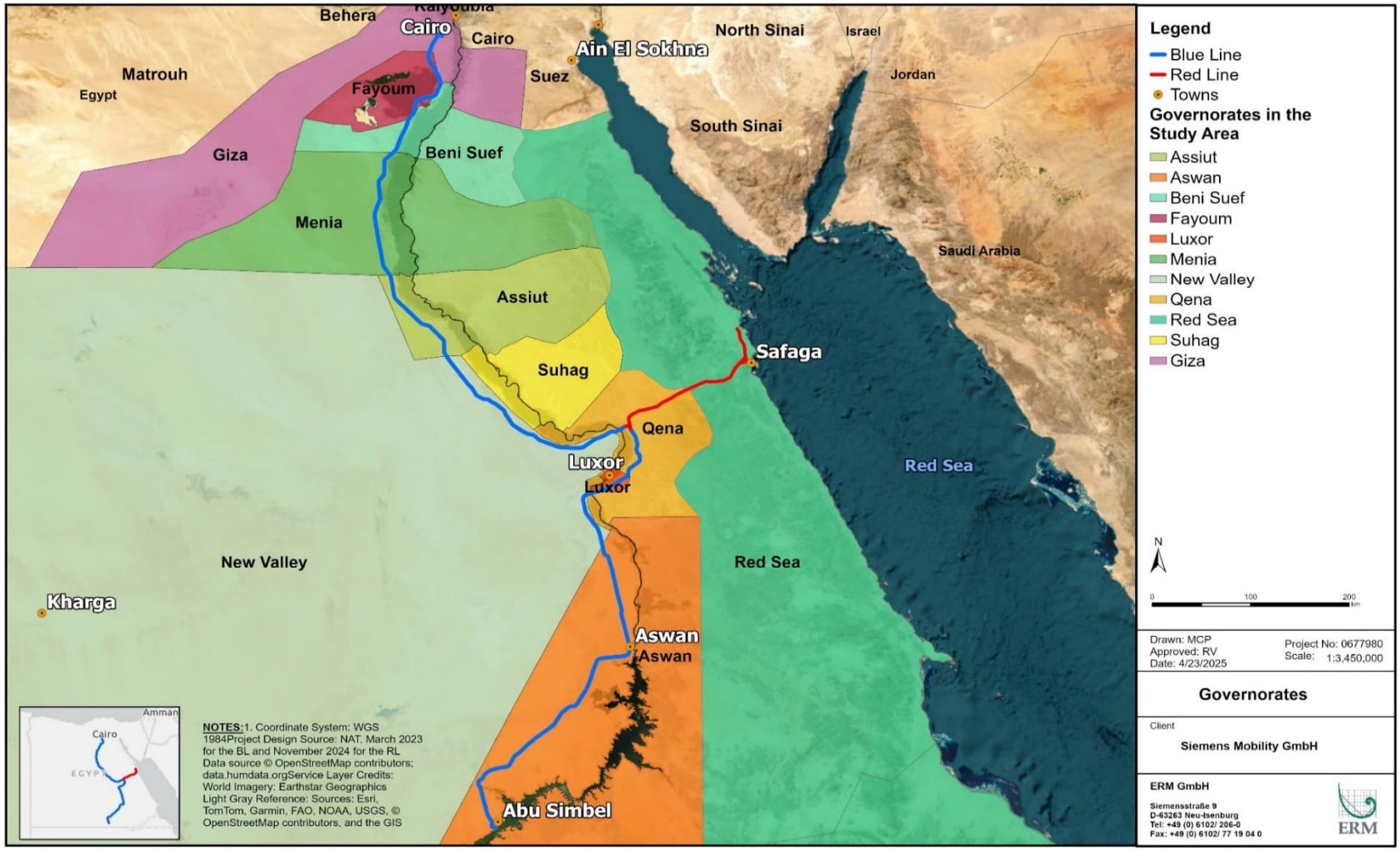

FIGURE 2 GOVERNORATES CROSSED BY THE BLUE AND RED LINES

Source: ERM, 2025.

The Blue and Red Lines are designed to be both passenger lines incorporated with inter-city function, alongside freight transportation capabilities. The HSR system will be implemented as a separate network without connection to the existing ENR rail network, and no utilisation of any existing ENR stations or depots is foreseen. Several maintenance depots are planned, whereby the overall main depot and operational centre for the entire HSR network in Egypt (Green, Blue and Red Lines), will be near the October Garden Station and is being built as part of the HSR Blue and Red lines. The Blue and Red Line will enable the following basic operation services:

- Regional passenger service: stopping at each station and with a maximum train speed of 200 km/h;
- Express passenger service: stopping only at major selected stations and with a maximum train speed of 250 km/h; and
- Freight train service: no stopping at any of the stations and with a maximum train speed of 150 km/h.

Express train based on the Velaro platform | Regional train based on the Desiro platform | Freight locomotive Vectron Platform

FIGURE 3 TYPES OF ROLLING STOCK

Source: Siemens, 2021

Note: This ESIA represents a collaborative effort involving two distinct lines that have experienced various alignment modifications and design updates since ERM's engagement in November 2022. At the Project's inception, the Blue Line was at a more developed design phase, and during the ESIA study, several minor adjustments to the alignment were evaluated and incorporated into this report. ERM submitted an initial draft of the ESIA to the Client in May 2023. As the Project evolved, ERM was tasked with revising the ESIA study specifically for the Red Line, following the introduction of a new Red Line alignment in October 2024 and a new data package for the Blue Line in April 2025. Consequently, this report includes:

For the Blue Line:

- Scoping site visit based on the alignment provided in November 2022.
- ESIA baseline studies based on the alignment provided in January 2023[7].

[7] Several baseline studies gathered during this period for the Red Line were also utilized in the 2025 revision, owing to the alignment's closeness to receptors, particularly in the coastal region.

- Impact Assessment for the Blue Line based on the alignment provided in March 2023[8].
- Project Description update based on the additional data package provided in April 2025.

For the Red Line:

- ESIA baseline studies and Impact Assessment for the Red Line based on the alignment provided in October 2024. Additionally, a new alignment was provided in February 2025 which did not include any substantial changes but rather removed the optional route on Safaga station.

This ESIA Report is based on the information provided by Systra, Consortium (Siemens, Orascom and Arab Contractors) and NAT/Systra as of April 2025 (for the Blue Line) and as of February 2025 (for the Red Line). When data was not available or not adequate, reasonable assumptions were made based on ERM's past experience and professional judgement. Also, where data and design specifications are unavailable at the time of writing, the design elements of the previous phase (Green Line) were utilized.

2.3 KEY FEATURES OF THE BLUE AND RED LINE

The most important civil engineering components of the HSR Blue and Red Lines are presented in the table below:

TABLE 1 PROJECT'S KEY ELEMENTS

Feature	Description
Length	1,311 km of newly built electrified double-track system
Design Speeds	Regional: 200 km/h Max. Speed, 160 km/h operational speed. Express: 250 km/h Max. Speed, 230 km/h operational speed. Freight: 150 km/h Max. Speed, 120 km/h operational speed.
Passenger Capacity	Regional: 600 seats per train Express: 500 seats per train
Freight Train Capacity	1,200 tons
Rolling Stock fleet	■ 60 Siemens Desiro HC 4-car train sets used for regional services. ■ 26 Velaro High speed trains for express service.

[8] The modifications between the January 2023 and March 2023 alignments to the Blue Line were examined, and it was determined that these changes do not compromise the quality of the baseline data collected, nor do they influence the impact assessment. Additionally, it was confirmed that the Blue Line data package received in April 2025 did not introduce changes in the March 2023 alignment.

Feature	Description
	■ 26 Siemens Electric Locomotives (Vectron) of the latest generation for freight transport.
Safe Train Control System	A safe train control system, based on a computer interlocking system (i.e. Siemens Westrace, a European Rail Traffic Management System (ERTMS) of Level 2[9]).
Telecommunication Systems	Telecommunication systems, assuring passenger comfort and security, as well as system safety and security.
Other Systems/Equipment	Depot Workshop Equipment (DWE) and an Automatic Fare Collection (AFC) system.

The following photos illustrate some of the key elements of the Project. For instance, Figure 4 presents an example of pedestrian crossing (here built to enable people crossing a large road). The same type of structure will be used along the HSR.

FIGURE 4 EXAMPLE OF PEDESTRIAN CROSSINGS

Some sections of the HSR Blue and Red Lines will be built “at grade” (meaning at the ground level) and provided with fences and barrier to avoid people and animals entering the railway area. At some places (crossing of roads, rivers/canals, other linear infrastructures and in urban areas or close to most of the stations) the railway will be instead built using bridges and overpasses.

According to the latest design information, there are two primary water crossings over the Nile River, one of which is close to Qena, and the other close to Aswan.

With reference to the bridges crossing the River Nile, the following picture presents a view of the Imbaba Bridge crossing the Nile (about 495 m) as an example of what the project’s bridges could resemble. This bridge is currently the only railway bridge across the Nile in Cairo.

[9] Level 2 involves continuous supervision of train movement with constant communication via GSM-R between the train and trackside.

FIGURE 5 EXAMPLE OF BRIDGE FOR THE PROJECT (IMBABA BRIDGE – ENR BRIDGE CROSSING THE NILE RIVER)

Source: By Hossam el-Hamalawy (CC BY SA 2.0)

Achieving a safer mode of transportation is one of the main objectives of the Project, this is why the HSR overall (including the Blue and Red Line), will be designed, constructed and operated in accordance with the highest international specifications and best practices. All equipment and products will be provided by the highest quality international suppliers and meet the requirements for similar high-speed rail operations in European countries. Also, to provide the best comfort and less disturbance possible to the local communities, noise and vibration levels from the operation of the HSR will be minimized in accordance with European Standards (EN) and Egyptian Environmental Protection Standards.

2.4 CONSTRUCTION WORKS

Typical machinery and equipment for such large infrastructure project will be found on site such as: bulldozers, cranes, excavators, bobcats, graders, lorries, loaders and other equipment.

Employment on the different sections of the HSR Blue and Red Lines will vary depending on the stage of construction, the schedule of works for each contractor and their respective scope of work. The Project will include employment for different purposes ranging from engineers to labourers. Most of the workforce is expected to be (85%) local Egyptians, usually residing near the area where they will be employed. The remaining 15% are expected to be expat workers.

Most workers will be sourced from localities surrounding the Project area to minimize the need for any accommodation camps onsite, and adequate on-site sanitation services will be included. Instead, during communication with NAT on 14 of April 2025, it was confirmed that there will be resting sites nearby the alignment to be used by workers for breaks (i.e. lunch, water pause, or to provide shade).

2.5 OPERATIONAL PHASE

Service operations are planned to start by 2026 in the Greenline where it is estimated that around 100 passenger trains will be servicing normal operations throughout the year. During a certain number of days per year, traffic will be reduced slightly to enable the operating company to carry out routine maintenance activities on the line.

It is important to note that the overall HSR network (Green, Blue and Red Lines) will be operated and maintained by the same entities and will operate as a single overall railway system.

Peak travel times are expected to be between 07:00 to 09:30 in the morning and between 17:00 to 19:30 in the evening. The operating service provider will also take in consideration increased passenger demands during special occasions (Ramadan period and other civic, sports or religious events) and provide additional service trains. The HSR Blue and Red Lines will provide service for circa 500 seated passengers per train and a maximum of 600 passengers per train (including tip-up seats and standing passengers)[10].

The Project is designed for a lifespan of approximately 15 years. After this period, the HSR system's physical and electrical components will be upgraded to match more advanced technologies and better standards in place.

[10] Same operation as the Green Line has been assumed.

3. HOW WAS THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT CONDUCTED?

3.1 INITIAL DESK STUDY

The first ESIA step included a review of relevant literature related to the HSR Project and project areas. Much of the background information on the project was collected from NAT and Systra – which included the project design, plans, project coverage as well as other assessments. In addition, relevant district and regional profiles were used as sources of data and information that describe baseline conditions.

3.2 STAKEHOLDER CONSULTATION

Stakeholder engagement – meaning discussions with institutional stakeholders (Governorate Authorities), nearby residents, affected persons and other interested parties - was done within the ESIA process to gather information, to disclose the project to affected people and to gather their perceived Project-related concerns.

A Stakeholder Engagement Plan (SEP) was prepared to coordinate stakeholder engagement and project disclosure. The SEP was also used as a tool to enable NAT to align with international best practice for engaging stakeholders and to ensure that this has been done in line with a culturally appropriate approach. The SEP includes a Stakeholder Identification, a Stakeholder Analysis, Engagement Planning, and the Development of a Communication Strategy. Further information on the Stakeholder Engagement is given in chapter 4 of this NTS.

3.3 GENERAL ESIA PROCESS

The impact assessment process predicts and describes environmental and social (E&S) impacts that are expected to occur for different phases of the HSR Project; based on this assessment the appropriate set of actions is defined to help avoid or minimize the impacts (all this is described in the full ESIA report). Subsequently, a monitoring and evaluation programme is implemented to assess how effective the proposed mitigation measures are (described in the Environmental and Social Management Plan – ESMP).

The ESIA for the HSR Project was carried out using different scientific methodologies to comply with the EIA Regulatory Framework of Egypt as well as good international practice and standards as defined by the WorldBank/IFC and Equator Principles. The main ESIA steps are described below.

3.4 DATA COLLECTION AND OBSERVATIONS

Interviews and documentation methods were supplemented by physical observations to identify features within the specific route (Right-of-Way) of the HSR Blue and Red Lines. Environmental and social specialists conducted several fieldwork trips in the Project areas.

The fieldwork involved physical surveys, social-economic surveys, verification of secondary information, and consultation in order to gather information on physical,

biological, cultural and social-economic aspects of the HSR Blue and Red Lines through sampling, site walkovers and engagement with local stakeholders.

3.5 IMPACT ASSESSMENT

The impact assessment evaluates how the proposed Project activities will have an effect onto the baseline environmental and socio-economic conditions of the Project site. The result is an identification of potential environmental and social impacts of the proposed HSR Blue and Red Lines. Many impacts are minor and can easily be remedied; other impacts are more significant and will require specific measures to fix them.

At this stage, a key benefit of the ESIA process is that initial results of the impact assessment can be passed on to the Project designers so that they can improve the Project design to avoid subsequent negative impacts - and to enhance the positive impacts.

A key guiding assumption in the ESIA Report is that the HSR Project will be designed, constructed, operated and maintained with due care for safety and environmental matters using current and practical engineering designs and methods that also meets good international practice for such projects.

3.6 IDENTIFICATION OF MITIGATION MEASURES

The Environmental and Social Management Plan (ESMP) for the HSR Project details environmental and social actions – the so-called mitigation measures - to minimize the potential impacts identified in the ESIA. This also includes the requirement for both NAT and Systra to establish and implement an Environmental and Social Management System (ESMS) for the Project to ensure that sufficient staff, resources and processes are in place to successfully implement the ESMP. Further information regarding the management and monitoring of project impacts is given in chapter 6 and 7 of this NTS.

The Mitigation Hierarchy:

In accordance with good international practice, Mitigation Measures are selected according to the so-called “Mitigation Hierarchy”. This means that the first preference is to find design or process methods to avoid/prevent an impact in the first place (e.g., using non-toxic chemicals); the next preference is to employ measures to minimize the risk of impact (e.g., proper chemical containers and worker training to avoid spills/leaks), followed by protective equipment to minimise the effects of an impact (e.g., spill trays and clean-up kits, proper gloves for workers). For more information, please refer to Figure 3-1 below.

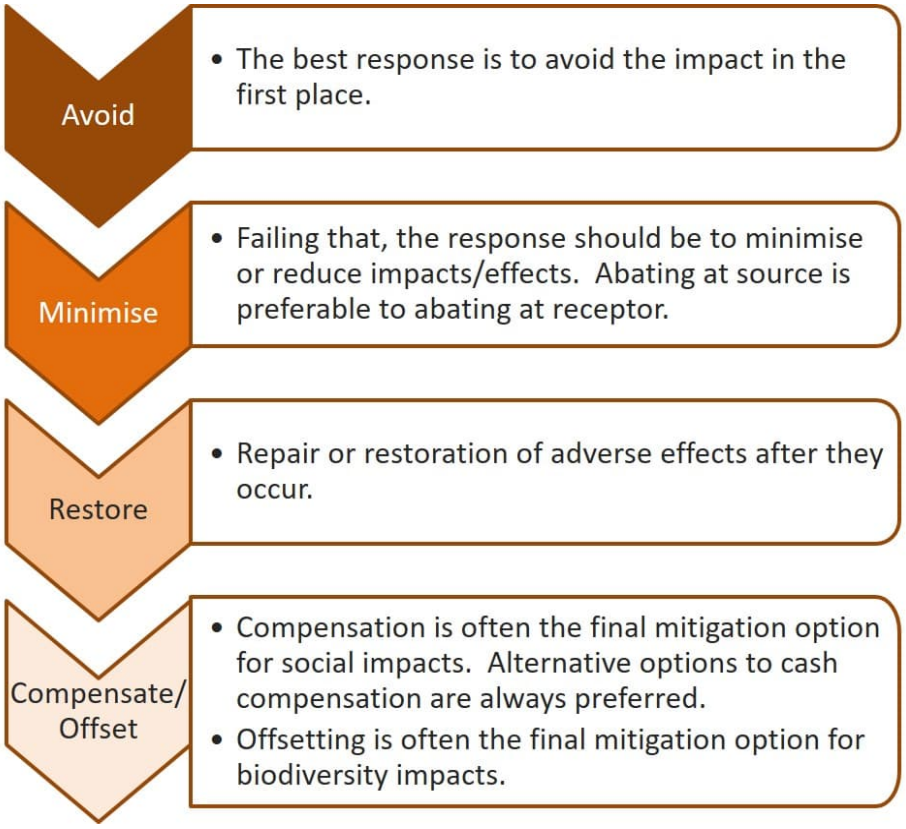

FIGURE 6 MITIGATION HIERARCHY

4. WHAT STAKEHOLDER ENGAGEMENT HAS TAKEN PLACE?

4.1 GENERAL APPROACH

The term “stakeholders” refers to local residents, public institutions, private organisations and other persons who may be (positively or negatively) affected by the Project or are otherwise interested in the Project.

Stakeholder engagement, as a part of the ESIA process, is all about how MoT/ NAT provide Project information to the stakeholders – and asks them about their views of the Project, including any comments, suggestions, questions or complaints. This two-way process of stakeholder engagement is a very important part of the overall HSR Project, beginning prior to start of construction and continuing through the operations.

The principal entities identified for this ESIA Study included government ministries, departments or agencies at national, district and local levels, private companies, non-government/civil-society organisations (NGOs), community- based organizations, user groups and people directly affected by the Project, such as goods and services providers.

4.2 STAKEHOLDER ENGAGEMENT PLAN (SEP)

The SEP is a separate document describing the mechanisms by which involved people, communities and other stakeholders are informed about the Project and given opportunities to provide comments and input to the Project development. The SEP describes the engagement already undertaken in the past as well as meetings and other events planned for the future. In line with current international best practice, the SEP aims to ensure that engagement with stakeholders is free of interference and intimidation; engagement should also be relevant, understandable and provide accessible information in a culturally appropriate way. The SEP thus allows affected people to give their opinions and concerns and allow that these concerns influence Project decisions.

The SEP activities extend throughout the Project construction and operation phases as well as disclosure of the Project ESIA Package.

This SEP is a *'living document'* and will be regularly updated as the Project progresses and, for example:

- new stakeholders are identified for the Project;
- more details become available on preferred means of engagement by stakeholders;
- more resources are needed for implementing the SEP;
- responsibilities for implementation change or are delegated.

A key part of the SEP is the so-called "Grievance Mechanism", which provides an easy way for every person affected by the HSR Project to submit their comments, questions or complaints (so called "grievances") to the responsible project managers of the project developer. A Grievance form is included in Appendix A of this NTS.

4.3 STAKEHOLDER ENGAGEMENT ACTIVITIES

The following section presents the stakeholder engagement conducted to date and the ones planned for the future, as presented in the SEP.

4.3.1.1 PRE-SCOPING CONSULTATIONS

Pre-Scoping consultations took place in March and April 2021 between the ESIA consultant (on behalf of NAT) and selected stakeholders and covered the Green, Blue and Red lines.

- Ministry of Antiquities (date: 04/04/2021)
- SUMED Corporation (date: 05/05/2021)
- GASCO Corporation (date: 05/05/2021)
- The Egyptian National Railways (ENR) (date: 31/03/2021)

- Sixth of October City Authority (date: 28/03/2021); Wadi al-Natrun City Authority (date: 06/04/2021); Department of Urban planning in Alexandria Governorate (date: 07/04/2021)

4.3.1.2 SCOPING CONSULTATIONS

During the preparation of the Scoping Report for the Project, a total of 14 meetings were held with Governorate and city authorities, and other community leaders in eight (08) Governorates out of the 10 Governorates crossed by the Blue & Red Line in November and December 2022 (all Governorates except for New Valley and Fayoum), to verify and analyse data collected through desktop study and collect initial views of the key stakeholders.

Approximately 82 people attended the meetings (of which 19 women). The aim of these consultation activities was to give a presentation on the Project and its potential impacts during the construction and operation phases, to receive feedback as well as concerns, requirements, and recommendations. Table 2 presents the meetings organized as part of the Scoping Phase. Concerns related to the Project impacts were also raised during the meetings.

The New Valley Government has not been addressed by a specific consultation as the Project does not impact any inhabited area. Please refer to the SEP document (ERM, 2022) for the presentation of the main issues raised during the Scoping consultation activities.

TABLE 2 SCOPING CONSULTATIONS

Line	Governorate	Stakeholders met	Date
Blue Line	Beni Suef	1. General Secretary of Beni Suef Governorate 2. Director of the Technical Office of the Governorate General Secretary Office 3. Head of the Geographic Information Systems Unit of Beni Suef Governorate Headquarters 4. Information and Decision Support Center of Beni Suef Governorate Headquarters 5. Urban Planning Department of Beni Suef Governorate Headquarters 6. Engineering Department of Beni Suef Governorate Headquarters 7. Head of the New Malawi and Fashn Cities Development Authority 8. Director of the Engineering Projects Department at the New Fashn City Authority	November 20th, 2022

Line	Governorate	Stakeholders met	Date
	Mynia	9. General Secretary of Mynia Governorate 10. Deputy Governor of Mynia Governorate 11. The Geological Advisor for the Mynia Governorate 12. Director of the Urban Planning Department 13. Director of Property Department 14. Director of the Engineering Inspection Department 15. Spatial information infrastructure management Officials 16. Antiquities Directorate Official	December 13th, 2022
	Assiut	17. General Secretary of Assiut Governorate 18. Director of the Office of the General Secretary of the Governorate 19. Director of the Urban Planning Department 20. Property Department Official 21. Antiquities Directorate Official	November 22nd, 2022
	Sohag	22. General Secretary of Governorate 23. General Secretary Assistant 24. Director of the Urban Planning Department 25. Property Department Official	November 22nd, 2022
	Qena	26. General Secretary of Qena Governorate 27. Director of the Urban Planning Department 28. Urban Planning Department Official 29. Investment Department Official 30. Egyptian Antiquities area in Qena Official 31. Directorate of Roads and Bridges Official 32. General Authority for Agriculture 33. Reclamation in Qena 34. Irrigation Directorate Official	November 23rd, 2022
	Luxor	35. General Secretary of Luxor Governorate 36. Urban Planning Department Official 37. Property Department Official 38. Director of the Upper Egypt Antiquities Area in Luxor	November 25th, 2022
	Aswan	39. General Secretary of Aswan Governorate, 40. Head of the Urban Planning Department of the Aswan Governorate Headquarters 41. Head of the Environment Department of the Aswan Governorate Headquarters 42. General Authority for Roads and Bridges in Aswan 43. Director of the Egyptian antiquities area in Aswan 44. Head of the New Urban Communities Authority in Aswan	December 4th, 5th and 6th 2022

Line	Governorate	Stakeholders met	Date
		45. Vice President of the Union & Responsible for the "*Voice of Nuba*" newspaper in Aswan 46. Member of the Union of Nubian NGOs and President of *"Amir Cap NGO"* 47. Member of the Union and President of *"El Qoba NGO"* in West Aswan 48. Treasurer of the Union of Nubian NGOs 49. Coordinator of West Aswan villages 50. Head of the Abu Simbel City Council 51. Director of the Engineering Department of the Abu Simbel City Council 52. Director of the Environment Department of the Abu Simbel City Council 53. Nursery Director in Abu Simbel City 54. Rural Leader in Abu Simbel City 55. "El Salam" Community Development Association 56. "Abu Simbel" Community Development Association 57. Health Leader in the Abu Simbel Community 58. School Administration Manager 59. Mosque Imam 60. Inspector at the Health Directorate in Abu Simbel 61. Merchant 62. Teacher 63. Official from the "Agricultural Development Bank" 64. Director of the "Abu Simbel Tourist Cultural Palace" 65. El Salam Community Development Association	
Red Line	Red Sea	66. General Secretary of Red Sea Governorate Headquarters 67. Head of the Urban Planning Department of Red Sea Governorate Headquarters 68. Head of the Utilities Networks Information Center in the Red Sea Governorate 69. Head of the Safaga City Council 70. Director of the Urban Planning Department of the Safaga City Authority 71. Director of the Engineering Department	November 27th and 28th, 2022 December 18th, 2024

Source: ERM and EcoConServ, 2023 (Blue Line), 2024 (updated Red Line)

4.3.1.3 ESIA BASELINE SURVEYS AND PROJECT DISCLOSURE

Stakeholder engagement during the ESIA phase consisted of (i) briefing Project stakeholders on the details of the Project and the ESIA process, the associated timeline; (ii) consulting stakeholders of the Project on the potential impacts of the Project on their living conditions and their activities to collect their opinions, fears, and suggestions; and (iii) collect primary socio-economic data to inform the ESIA.

As presented in Table 2 Focus Group Discussions (FGDs), Key Informants Interviews (KIIs), ground truthing and field observations have been organized between the 31st January to the 28th February 2023 (for the Blue and old Red Line) and the 17th to the 28th December 2024 (for the updated Red Line alignment). A total of 133 Focus Groups Discussions (FGD) and 45 Key Informants Interviews (KII) have been conducted between 2023 and 2024. For details on the social field work conducted, please refer to Annex 15 of the main ESIA report.

5.5.1.1 ENGAGEMENT DURING ESIA DISCLOSURE PROCESS

The last stage of the ESIA process is “Disclosure”, which consists of publicly disclosing a draft version of the complete impact assessment, i.e., the Final Draft ESIA Report. The Final Draft ESIA report and supplementing documents (“ESIA package”), including the Non-Technical Summary, ESMP and SEP, will be made widely available to the public for comment via the Project website and hard copies available (at least the summaries in case of large documents) for inspection at a number of specified locations.

The Public Disclosure for the Blue Line took place in 2023 at the following locations:

- Helnan Auberge Hotel in Fayoum City (19th July 2023),
- Horus Hotel in Minya City (24th July 2023),
- Azur Hotel in Sohag City (25th July 2023),
- Stegenburger Nile Palace Hotel in Luxor City (26th July 2023),
- Tulip Hotel in Aswan City (1st August 2023).

The public disclosure for the Red Line – old alignment - took place on the 3rd of August 2023, at the Movenpick Hotel Soma Bay in Hurghada City (Red Sea Governorate).

A brief Consultation Report was prepared summarizing the key comments received during disclosure and explaining how these comments are reflected in the Project and the final ESIA Report.

All comments, questions and other input from the public were logged and then considered by NAT and the ESIA team. Where feasible and relevant, changes will be made in the Project planning/design/ implementation to address concerns raised. These changes will be reflected in revisions to the Project as appropriate.

5.5.1.2 POST ESIA STAKEHOLDER ENGAGEMENT

Engagement is an ongoing process of sharing information, understanding stakeholder issues, and responding to questions and concerns. After the ESIA/EIA Phase, NAT will be in charge of stakeholder engagement through the construction, operation and closure phases of the Project. Following disclosure of the ESIA, stakeholder engagement will continue to be carried out by NAT for the Blue and Red Line Project in line with the SEP, which will be updated at least biannually (every 6 months) through construction and annually during operations, or more frequently, as required, based on stakeholder feedback and changes to Project planning. The community relations team will carry out updates to the SEP, with the following intent:

- To make sure stakeholder lists and mapping remains accurate;
- To review and amend, if necessary, information dissemination and engagement practices in order to continue to meet the needs of stakeholders; and
- To review and assess stakeholder participation in order to revise, if necessary, the frequency, means and format of engagement to meet accessibility and participation requirements of all stakeholders.

5.5.1.3 GRIEVANCE MECHANISM

Grievances are complaints or comments (or questions/suggestions) related to the way a project is being carried out. A mechanism for resolving these grievances constitutes a permanently open official channel, through which stakeholders can exchange with the promoter and its service providers, while the follow-up of grievances warns of the existence of conflicts or disputes in progress. The establishment of such a mechanism is required under the Equator Principles (EP) IV and IFC PS.

NAT has an existing Grievances Mechanism in place which is a participatory tool for the internal and external stakeholders, while it is a mandatory process for NAT.

The Grievance Mechanism is presented in detail in the Stakeholder Engagement Plan (SEP). The procedure is extended to communities, all workers onsite, including permanent workers, casual workers, service providers, consultants, suppliers, subcontractors and external stakeholders and at no cost and without retribution.

Although there are grievance mechanisms for workers at the construction site (that will be monitored by SYSTRA, the consultant assigned by the NAT to monitor and follow up the work of the contractors working on the project), NAT's complaints channels are available to all parties concerned with the project.

5. THE MAIN FINDINGS OF THE ESIA

5.1 SUMMARY OF THE STUDY AND KEY FINDINGS

The ESIA has identified potential impacts (both positive and negative) to the physical, natural and socio-economic environments. In order to avoid, minimise and reduce negative impacts, and to ensure opportunities for the enhancement of positive impacts are realised, an overall Environmental and Social Management Plan (ESMP), other detailed Management Plans, and associated Procedures have already been developed for the Construction phase and will be developed for the Operation phase, prior to operation of the HSR Blue and Red Lines.

More in detail the ESIA presents an assessment of baseline conditions and the related impacts for the following components:

- Physical Environment: describing the atmosphere (the air we breathe and the climate), noise and vibrations (the sound landscape or “soundscape” that surrounds us and that we can hear and feel through vibrations), the earth in terms of landforms and geology (soils, rocks, mountains, deserts), the water (the Nile River, other streams and canals, wadis, the groundwater used for irrigation and drinking), the landscape (described in terms of what we can see along the Blue and Red Lines and how the railway will be once constructed).
- Biological Environment: describing the natural areas, the animals, the plants found along the HSR Blue and Red Lines and its vicinity;
- Social Environment: describing the population, status of current infrastructure (schools, public utilities, health institutions, etc.) as well as the economic conditions of the communities along the Project;
- Cultural Heritage: describing cultural heritage resources (objects of archaeological value and interest, sites under or tentative to the UNESCO World Heritage list) and classifying them according to their value and sensitivity to potential impacts (high, medium and low)

A summary of key impacts is shown below in Table 3. Details on the impacts with highest significance and how these negative impacts will be minimized, are provided in the other sections below.

TABLE 3 SUMMARY OF IMPACTS

Identified Impact	Construction Phase		Operation Phase	
	Pre-mitigation significance	Post-mitigation significance	Pre-mitigation significance	Post-mitigation significance
Physical Environment				
GHG Emissions	Major	Major[11]	Major[12]	N/A
Soil Loss and degradation	Major	Moderate to Major	Negligible	N/A
Changes to the geomorphological setting, stability risks and soil erosion	Negligible to Major	Negligible to Major[13]	Moderate to Major	Minor
Surface and Groundwater Availability	Major	Major[14]	N/A	N/A
Degradation of surface and groundwaters resources and quality	Minor to Major[15]	Minor	Moderate	Negligible
Landscape	Minor to Major[16]	Minor to Major	Moderate and Major	Moderate and Major
Construction Noise	Major[17]	Minor to Moderate	N/A	N/A

[11] Measures to significantly reduce emissions during construction are limited. For example, it is unrealistic that diesel-powered vehicles will be replaced by electric or other non-fossil fuel powered engines during the construction period, as such vehicles – and the required infrastructure – are not yet readily available. The amount of earthworks needed, or the fuel consumed, will be reduced where feasible to save costs. Thus, only marginal reductions in fuel/energy use are expected.

[12] The Egyptian government has set renewable energy targets of 20% of the electricity mix by 2022 and 42% by 2035. This is an indication that the operational GHG emissions of the Project will likely decrease by 36% by 2035 and then only have a Moderate impact.

[13] Depending on soil type and activities (e.g blasting activities in the R.2 Section will still have major impacts).

[14] For the purpose of this impact assessment Luxor Governorate was used as a case-study. Best water saving practices will be maintained by construction activities, and local municipalities will be involved where possible, however, it is unlikely that even through best practices the scale of the impact will change.

[15] Minor impact along most of the alignment where small canal, wadis and irrigation channels are crossed. Moderate to Major impact significance is assigned to the crossing of the Nile River. Therefore, specific mitigation measures for the Nile River water quality protection are recommended as described below.

[16] For the R.2 Section in case of blasting activities which will be permanent and irreversible.

[17] The assessment is focused only on sections along the Project where receptors are in the proximity of the Project. For sections of the Project located at large distances from the receptors, only Negligible impacts are anticipated.

Identified Impact	Construction Phase		Operation Phase	
	Pre-mitigation significance	Post-mitigation significance	Pre-mitigation significance	Post-mitigation significance
Construction Vibration	Major	Minor to Moderate	N/A	N/A
Construction blasting (R.2 section)	Negligible	Negligible	N/A	N/A
Railway Noise	N/A	N/A	Moderate to Major	Moderate to Major[18]
Ground-Borne Vibration Railway	N/A	N/A	Moderate	Moderate[19]
Construction Dust	Major	Negligible to Minor	N/A	N/A
Construction traffic - Air quality	Minor	Negligible to Minor	Minor	Minor

[18] Depending on the type of receptor and route section. The implementation of a noise barrier would decrease the length of impact zones, thus decreasing significantly the number of potentially impacted receptors. However, the assessment still results in a Moderate impact to residential receptors (type II) located within 100 meters from the alignment centreline in the Route Qena – Luxor and into a Major impact to sensitive receptors (type I - schools, hospitals, libraries, public gardens, resorts, and rural areas) located within the same distance in the same area.
[19] The implementation of the speed limit of 70 km/hr will not change the impact significance, however, it will significantly decrease the predicted impact zones, and the equivalent number of potential impacted receptors..

Identified Impact	Construction Phase		Operation Phase	
	Pre-mitigation significance	Post-mitigation significance	Pre-mitigation significance	Post-mitigation significance
Biological Environment				
Terrestrial Habitats/Flora	Minor to Moderate	Negligible to Minor	Minor to Moderate	Negligible to Minor
Aquatic Habitats, Flora and Fauna	Moderate to Major[20]	Minor to Moderate	Minor to Moderate	Negligible
Terrestrial Fauna	Minor to Major[21]	Negligible to Moderate	Minor to Major[22]	Negligible to Moderate
Sensitive Areas	Moderate to Major[23]	Minor to Moderate	Minor to Moderate	N/A
Social Environment				
Loss of residential structures	Major	Minor to Moderate	N/A	N/A
Loss of (or access to) commercial, business, and non-residential structures	Major	Minor to Moderate	N/A	N/A
Natural resources related to loss of agricultural and grazing land	Major	Minor to Moderate	N/A	N/A
Loss of livelihoods and household income due to permanent land restrictions (safety zones) and resettlement	N/A	N/A	Major	Minor to Moderate

[20] The main water body crossed by the alignment is the Nile River, where the construction of two bridges is envisaged. The construction of bridges (estimated 500 m length each) is planned near the city of Qena city and the Al Gharirah settlement. In addition to the Nile area, wetlands south of the Blue Line, which are connected to Lake Nasser, play an important role for aquatic biodiversity. Also, the alignment crosses many ephemeral streams such as wadis, with impacts on the wadi system expected to be significant.
[21] HSR Blue and Red Line passes through areas that may be considered natural habitats for fauna with medium or high sensitivity (the section of the Red Line that runs through the mountain deserts, the area of the Western Desert that runs along the Blue Line south of the city of Fayoum, and the area west of Lake Nasser).
[22] Habitat loss from a linear infrastructure such as the HSR may further contribute to existing habitat fragmentation in these areas; with highly mobile terrestrial (non-bird) fauna being most affected by movement restrictions due to the barrier effect.
[23] HSR Blue and Red Line passes through several protected/designated areas that are considered to contain a significant number of natural habitats.

Identified Impact	Construction Phase		Operation Phase	
	Pre-mitigation significance	Post-mitigation significance	Pre-mitigation significance	Post-mitigation significance
Changes in land values post construction in peri-urban and rural areas due to building restrictions	N/A	N/A	Moderate	Minor
Permanent loss of livelihoods and household income due to permanent land restrictions	N/A	N/A	N/A	Minor to Moderate
Direct and Indirect Employment Opportunities	Positive	N/A	Positive	N/A
Temporary Economic Impacts from Taxes and Fees, Procurement and Worker Spending	Positive	N/A	N/A	N/A
Long-term benefits of capacity enhancement of local labour	Positive	N/A	N/A	N/A
Increase of Road Safety risks	Moderate	Minor	Negligible	N/A
Site Trespassing and Injury	Major	Minor	Negligible	N/A
Environmental Health	Major	Minor	Major	Minor
Increased Transmission of Communicable Diseases	Moderate	Minor	N/A	N/A
Increased Transmission of Sexually Transmitted Diseases	Moderate	Minor	N/A	N/A
Community disturbance and Increase in risk of Gender-based Violence and Harassment	Moderate	Minor	Major	Minor
Increased Pressure on Health Care	Moderate	Minor	N/A	N/A
Use of Security Personnel	Minor	Negligible	N/A	N/A
Disruption to infrastructure and utilities	Major	Minor	N/A	N/A
Disruption to water pipeline during construction	Moderate	Minor	N/A	N/A

Identified Impact	Construction Phase		Operation Phase	
	Pre-mitigation significance	Post-mitigation significance	Pre-mitigation significance	Post-mitigation significance
Resources, infrastructures and community Severance	Major	Minor to Moderate	Major	Minor to Moderate
Unmet Expectations of Benefits	Moderate	Minor	Moderate	N/A
Business infrastructure	N/A	N/A	Positive	N/A
Loss of (or access to) communal resources as well as infrastructure and social services	N/A	N/A	Moderate	Minor
Cultural Heritage				
Physical ground disturbance through earthworks activities on High sensitivity Cultural Heritage Resources	Moderate[24]	N/A[25]	N/A[26]	
Physical ground disturbance through earthworks activities on Medium sensitivity Cultural Heritage Resources	Minor to Major[27]			

[24] Blue Line: This is for Hawara and a land under the authority of the Ministry of Tourism and Antiquities that contains archaeological evidence of historical cemeteries and pottery remains in Fayoum.
Red Line: This is for Wadi Qena Tentative World Heritage Site.
[25] The only mitigation measure that would be effective in reducing the significance of direct physical impact would be avoidance via rerouting. If this were to be applied, the resulting post-mitigation significance would be negligible. However, for the purposes of this Impact Assessment, it is assumed rerouting the alignment to avoid impact is not possible as a mitigation measure.
[26] No direct impacts to Cultural Heritage resources have been identified at the operation phase of the Project, as direct impacts to cultural heritage resources will happen at construction phase during earthwork activities, either partially or wholly removing the resource.
[27] Blue Line: Major Impact for Ezbet Shaqlouf Cemetery.
Red Line: Minor Impact for Potential historic military site.

Identified Impact	Construction Phase		Operation Phase	
	Pre-mitigation significance	Post-mitigation significance	Pre-mitigation significance	Post-mitigation significance
Physical ground disturbance through earthworks activities on Low sensitivity Cultural Heritage Resources	Negligible to Minor[28]			
Visual and auditory on High sensitivity Cultural Heritage Resources	Moderate[29]	N/A	Negligible	N/A
Visual and auditory on Medium sensitivity Cultural Heritage Resources	Negligible to Minor[30]	N/A	Negligible	N/A
Visual and auditory on Low sensitivity Cultural Heritage Resources	Negligible[31]	N/A	Negligible	N/A

Appropriate mitigation measures are described in the complete ESIA study and supporting documents to remedy the potential negative impacts shown in the above table to an acceptable level.

[28] Blue Line: Negligible Impact for a Historic Enclosure and potential Structures in Qena. Negligible Impact for an area of high archaeological potential in Aswan. Minor Impact for the l-Hajj Abu Al-Majd Tawfiq Abdul-Karim Mosque (place of worship).
Red Line: Negligible for Historic Enclosure and potential Structures, military, mounds .Minor Impact for Historic Enclosure and potential Structures, mound and Historic military.
[29] This is for Pyramid of Amenemhat III.
[30] Blue Line: Minor Impact for Archangel Michael Church and services buildings connected to the Monastery of Angel Gabriel.
Red Line: Negligible Impact on cemetery.
[31] Blue Line: Negligible Impact for places of worship.
Red Line: Negligible Impact for Area of high archaeological potential, mounds and potential burial, British checkpoint, Historic Enclosure and potential Structures.

In general, the associated negative impacts can be minimized largely through good engineering design and envisaged construction practices and through implementing construction and operations-phase environmental and social management systems. Specific mitigation measures have been suggested in the study to avoid and minimize the inherent adverse impacts.

The ESIA concludes that the implementation of the proposed Blue and Red Line HSR will entail overall acceptable level of impacts, provided that the recommended mitigation measures are adequately put in place in a timely manner.

MoT/NAT and its contractors are committed in implementing all the recommendations given in the ESIA and to further carrying out the environmental auditing and monitoring schedules, and a budget to implement such has been, and will be, made available for their implementation.

5.2 WHAT ARE THE MAIN NEGATIVE ENVIRONMENTAL IMPACTS?

5.2.1 GREENHOUSE GASES RELATED IMPACTS

The High-Speed Red and Blue Line Project, considered as a Category A project, is expected to have significant Red and Blue Greenhouse Gas (GHG) emissions during both its construction and operation phases.

During construction the overall significance of impacts is “Major” considering that the project wide (Blue and Red Line) GHG emissions are about 700,000. t CO_2e per year and the scale of its impacts is classified, according to IFC standards, as Large (100,000 – 1,000,000 t CO_2e threshold). Construction activity impacts will be occurring on a continuous basis during the construction period, along the several work fronts. Mitigation measures intended to manage the impact connected to GHG emissions are described below.

- Transport logistics (locations/routes) will be optimized to ensure efficient carriage of raw materials and promote fuel efficiency.
- Vehicle idling times will be reduced through focus on scheduling of construction operations.
- The use of fuel-efficient transportation vehicles will be prioritised and regular maintenance of vehicles ensured.
- Energy efficiency usage among workers will be promoted.

After the implementation of mitigation measures the impact still results in a Major Impact significance, as recommended mitigation measures at this stage would not significantly change the overall magnitude.

Measures to significantly reduce emissions during construction are limited. For example, it is unrealistic that diesel-powered vehicles will be replaced by electric or other non-fossil fuel powered engines during the construction period. The amount of earthworks needed, or the fuel consumed, will be reduced where feasible to save costs. Thus, only marginal reductions in fuel/energy use are expected.

In accordance with the international requirements, NAT will compile annual data on GHG emissions during construction and report these to the appropriate Egyptian authorities (i.e., EEAA) and to the lenders. As part of the reporting, NAT will assess if any further mitigation measures may be feasible to help reduce GHG emissions.

Furthermore, the assessment done by the ESIA consultant indicates that emissions from the trains running on the Blue and Red Lines amount to roughly 100,000 t CO_2e per year[32]. Based on the IFC standard, this would imply a Major Impact during the operation. The electricity use for powering the trains depends on their weight, climatic conditions, the number of passengers and volume/weight of the freight. Approximately 40% of CO_2 emissions in Egypt originate from the electricity generation sector, which is predominately dependent on oil and gas (90%), followed by renewables[33].The portion of renewables in Egypt's electrical capacity is planned to increase significantly in the coming years, with renewable energy targets of 20% of the electricity mix by 2022 and 42% by 2035[34] . As the national grid factor improves each year (i.e., the carbon factor declines), the Project-related operational GHG emissions will decrease. As a rough estimate, if the 2021 grid factor is based on a renewables portion of 10%, resulting in operational emissions of 118,000 t CO_2e per year, then by 2035 the targeted renewables portion of 42% would result in operational emissions of about 64,000 t CO_2e per year[35], a decrease of 36%. As such, the above-mentioned annual emissions of 100,000 t CO_2e per year can be seen as a conservative estimate that will in any case be steadily reduced year on year in the coming decades.

5.2.2 IMPACTS ON QUALITY OF WATER RESOURCES

During construction, interactions with the surface and groundwater system will be caused due to clearance activities, followed by earthworks, levelling and compaction. Groundwater will be likely affected where deep foundation drilling/excavation will be required especially near the Nile River and through agricultural areas where the groundwater table is found near the surface.

The key construction activity potentially affecting surface water quality is the construction of the two 700 m long bridge across the Nile River at Qena and Armant. Six large irrigation channels will be also crossed by the HSR, but the smaller bridges needed here will enable overpass with no direct interactions/supports to the underlying water system.

Waste from construction activities and wastewater generation from construction accommodations may impact the surface/groundwater water quality. All wastewater from these compounds poses a risk to the water environment if not treated before discharge (either by on-site treatment or removal for disposal via the local sewage network, if available).

Mitigation measures intended to manage the impacts on surface waters include (*among others*):

For surface and groundwaters a specific Water and Groundwater Management Plan (WMP) will be defined with the overall objective of:

- to ensure an adequate management of water resources
- minimize the risks associated with water resource selection and consumption for the project activities.

[32] Siemens Mobility (2021)
[33] Abdallah & El-Shennawy (2020) Evaluation of CO_2 emission from Egypt's future power plants. Available at: Evaluation of CO2 emission from Egypt's future power plants | SpringerLink
[34] IRENA (2018), Renewable Energy Outlook: Egypt, International Renewable Energy Agency, Abu Dhabi. Available at: Renewable energy outlook: Egypt (irena.org)
[35] If current grid factor generates 0,000627 tons of CO_2 e per kWh at 10% renewable energy share, then at 42% renewable energy share this grid factor becomes 0,0004 tons of CO_2 e per kWh.

- Ensure water will be used and disposed of in a manner consistent with Egyptian legislation and where appropriate, international good practices.

Special measures related to Water and Groundwater and with a focus on the Nile River are:

- Water permits will be obtained in case groundwater or surface water usage is required by the Project activities.
- Machinery used to work in the Nile River (boats, barges, pontoons and related cranes and excavators) will be maintained in good condition ensuring that oily water (bilge) and oily water drains are treated before discharge,
- Fuelling of machineries used in the river shall be carried out in delimited and appropriate areas.

To ensure pollution prevention at surface and groundwater:

- Wastewater from all construction compounds and the associated building will be either discharged into the local/municipal sewage network or treated before discharge to the suitable receiving environment or collected on site and transported by tanker for disposal at the local sewage treatment works.
- All wastewater discharges must comply with relevant Egyptian legal requirements (Law 63/1962) and Project Standards before disposal, and relevant permits shall be in place.
- There will be no direct discharge of contaminated run-off from worksites to any watercourse along the alignment.
- Construction equipment will be cleaned away from surface waters.
- All facilities and structures will be regularly inspected and maintained to ensure proper and efficient operation at all times, and especially after heavy rainfall.
- The size and duration of exposure of areas of the open ground will be kept to a minimum.
- Protection measures to prevent soil erosion after the finalisation of the earthwork will be implemented where required such as:
  - use of erosion-control blankets or mats;
  - renaturation as soon as feasible.

5.2.3 IMPACTS RELATED TO NOISE

The assessment of the potential noise and vibration impacts analysed both potential impacts arising from the construction and operation of the Blue and Red Line. Baseline surveys have been carried out and extensive mapping analysis has been used to enable noise levels from the railway alignment to be assessed.

The construction of the Project will progress along the route and will result in a noise and vibration impact on a short-term basis as the construction approaches and moves past each section. Impacts from structures and borrow pits would affect receptors over a relatively small area, but for a longer period during the temporary construction phase. The efficacy of potential mitigation in the form of noise barriers in typical situations has been tested via modelling; based on these results, the way in which noise mitigation will be prioritised in the final railway design.

Noise impacts can be caused by noise emissions from construction equipment (earthmovers, etc.), and construction vehicles carrying materials and spoil to and from the locations where work is taking place along the railway. Construction materials will be delivered from borrow pits where concrete batching facilities will be located. The assessment considered different construction activities (Cuttings, Demolitions, Embankment, Viaducts, Over/under bridge, Culvert, Borrow pit, Ballast, Train Station) defining noise levels. Large magnitude construction noise impacts are anticipated in where the alignment will be very close to receptors (within large magnitude impact zones) in many areas. For this reasons a number of mitigation measures have been defined in order to properly mitigate impacts. The key measures are (*among several*):

- stationary noisy equipment will be sited as far away as possible from receptors, and orientated away from the receptors
- alternatives to audible reversing alarms

Where practicable:

- hydraulic or electric-controlled units
- acoustically treated enclosures
- Throttle settings will be reduced
- Equipment will be regularly inspected
- Use of mufflers or silencers
- Storage of excavated material between the construction site and the sensitive use building to form a noise barrier (with cover to avoid dust erosion) or installation of other (temporary) noise barriers.
- Taking advantage of the natural topography for noise shielding.
- Implementation of speed limits
- Reducing Project traffic
- Limiting hours of operation for specific equipment or operations (*e.g.* trucks or machines operating in or passing through community areas).

The assessment of impacts - subsequent to implementation of mitigation measures - resulted in a minor to moderate significance. However, compliance monitoring to undertaken on a regular basis with direct measurement at critical receptor locations will be implemented.

Rail noise during operations depends on the types of trains, track-type driving, driving speed. The assessment made use of Egyptian standards and guidelines and those issued by the IFC/ WB EHS Guidelines to determine if noise from operations may be significant. The potential significance of impacts was assessed based on the assumption that noise barrier of 3-meter height will be used at receptors along the route where Moderate to Major impacts are predicted without such barriers. The implementation of a noise barrier would decrease the length of impact zones, thus decreasing significantly the number of potentially impacted receptors. However, the assessment still results in a Moderate impact to residential receptors (type II) located within 100 meters from the alignment centreline in the Route Qena – Luxor and into a Major impact to sensitive receptors (type I - schools, hospitals, libraries, public gardens, resorts, and rural areas) located within the same distance in the same area.

It is also noted that the assessment is based on the available data. This included a number of conservative assumptions including simplified ground height data and the use of a maximum likely constant speed for the trains.

As the Project design is refined, it would be possible to show a more specific assessment of the need for mitigation, which is likely to reduce the noise levels and therefore the areas that are affected. Further mitigation measures will also be considered during detailed design.

5.2.4 IMPACTS ON AIR QUALITY

The Project has the potential to adversely impact local air quality due to generation of construction dust and pollutant emissions from construction traffic and operational traffic. Construction dust is likely to have the largest magnitude of risk due to the arid desert environment of much of the route; however, noting that through most of the route there are no sensitive receptors. Construction and Operational traffic are likely to have negligible to small impacts as based on modelling the traffic numbers are unlikely to reach a high enough number to cause a significant effect.

With mitigation there are opportunities to avoid the impacts relating to the above arising, including dust dampening procedures and effective management of track out, demolition, earthworks and construction. For traffic measures, these can include optimisation of access routes, tie-ing into existing public transport, and optimisation of stations location, design and layout to minimise traffic impacts. However, this will depend on the effectiveness of the mitigation implementation in reality. If mitigation is not applied correctly or thoroughly there is the potential for moderate to severe impacts for construction dust.

The following mitigation measures for construction dust are recommended in accordance with Institute of Air Quality Management (IAQM) guidance for high-risk sites[36] and IFC best practice[37]. A Dust Management Plan (DMP) should be developed and implemented as a basic-embedded measure (as part of the CEMP). The mitigation set out below is deemed sufficient to render residual impacts acceptable:

- Communications: community engagement before work commences on site and a mechanism to record and respond to complaints (part of the Stakeholder Engagement Plan (SEP) and Grievance Mechanism (GM));
- Site Management: record all dust and air quality complaints in the GM, identify cause(s), take appropriate measures to reduce emission; record any exceptional incidents that cause dust and/or air emissions;
- Monitoring: undertake daily on-site and off-site inspection, carry out regular site inspections to monitor compliance with the DMP, increase the frequency of site inspections when activities with a high potential to produce dust, monitoring in line with the local environmental authority (the EEAA, Egyptian Environmental Affairs Agency) requirements;
- Preparing and Maintaining the Site in Sensitive Construction Locations: such as machinery and dust causing activities are located away from receptors, erect solid screens or barriers

[36] IAQM 2014. Guidance on the assessment of dust from demolition and construction. Version 1.1. https://iaqm.co.uk/text/guidance/construction-dust-2014.pdf
[37] IFC 2007. General EHS Guideline: Construction and Decommissioning https://www.ifc.org/wps/wcm/connect/7d708218-2a9e-4fcc-879d-9d5051746e7d/4%2BConstruction%2Band%2BDecommissioning.pdf?MOD=AJPERES&CVID=ls62NKq

around dusty activities, control site runoff of water or mud, remove materials that have a potential to produce dust from site as soon as possible, cover or fence stockpiles to prevent wind whipping;

- Operating vehicle/machinery: impose and signpost a maximum-speed-limit of 25 km/h on surfaced and 15 km/h on unsurfaced haul roads and work areas; only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction; and
- Measures specific to construction activities (excavations, access roads, etc): amongst several measures such as vegetate exposed areas/soil stockpiles to stabilise surfaces, where it is not possible use mulches or surface sealants, store dusty materials in bunded/fenced area, fine powder materials delivered in enclosed tankers, bags are sealed after use, paved surfaces clean and free of dust and debris, binding agent-assisted dust sweeper(s) on the access and local roads, vehicles (trucks) entering and leaving sites covered to prevent escape of materials during transport.

5.2.5 IMPACTS ON AQUATIC HABITATS, FLORA AND FAUNA

In the locations near Qena and Armant where the construction of the two viaducts across the Nile are planned, there are small patches of wetlands. During the Project implementation, these areas may be disturbed, however, the area of impact is expected to be small, since the main areas of wetlands are located away from the future construction sites. In addition to the Nile area, wetlands south of the Blue Line, which are connected to Lake Nasser, play an important role for aquatic biodiversity; the Blue Line traverses close to this area along the southern end of the alignment (Abu Simbel), though the Project is not expected to have a direct impact on these wetlands.

The alignment crosses many ephemeral streams such as wadis, with impacts on the wadi system expected to be significant. Specific construction practices are to be employed at different areas where train tracks are to be built on viaducts; whereas earthworks and structures erected within wadis (though most of the year may in fact be considered terrestrial habitats) may alter natural drainage patterns. Water will be drained in the fill sections of the HSR at the directions of natural wadis, which is among the design criteria so that the water is not allowed to be stored or stagnant. Dikes are to be used to divert the water from minor wadis in cut sections on the outer boundaries of the embankment.

Mitigation measures proposed are:

- Pre-construction surveys to identify location of areas where permanent/ephemeral aquatic biodiversity may be dense along the Project footprint. It is understood that these areas are mainly located in the Nile River crossing, areas near Lake Nasser, and in wadis (if with water). Surveys should focus on confirming/discarding the presence of key species such as those critical habitat triggers, threatened/endemic species and aggregations of avifauna. As per the Green Line, these studies can also be conducted as part of the Pre-Land Access Surveys.
- Correct implementation of an overall Biodiversity Management Plan (BMP) for Project biodiversity features.
- Provide good water crossing design that aims to minimise erosion and degradation of water channels.

- Use of chemical substances in the construction area, in waterbed and/or adjacent to aquatic ecosystems, will be prevented.
- Excavation materials will not be dumped onto riverbed/wadi areas.
- Minimize destruction of wadi system as possible; limiting earthworks strictly to the site plan; avoid removal of natural rocks from wadis outside the project borders.
- Any contamination of water resources will be avoided through pollution control measures and pollution response measures including training in use of and deployment of spill kits.
- During the construction and operation phases, no water shall be used from natural water resources within the project site without the corresponding technical water studies and permit from relevant authority.
- Use of sediment/silt traps to reduce sedimentation yields in order to minimize the effects to downstream aquatic flora/fauna.
- Avoid formation of waste dumps or any other temporary accumulation of construction material within a buffer zone (50m) along the banks of the Nile River, adjacent wetlands areas or channels.

These mitigation measures during construction are considered sufficient for impacts to be handled effectively. Monitoring is suggested at the onset of start of operations.

5.2.6 IMPACTS ON TERRESTRIAL FAUNA

Among the studied areas of the HSR, the Qena-Hurghada sector showed the greatest biodiversity value; corresponding to a mountainous desert with a backbone of large mountains, bisected with numerous and complex drainage system of wadis with alluvial sand and gravels and scant vegetation cover along with rare, scattered trees. Such areas contain a large number of threatened, rare and sensitive species, as well unique assemblages of fauna and flora, when compared with other surveyed sectors along the HSR and are thus likely to be the most sensitive to impacts from the Project activities.

The main impact expected on terrestrial fauna is that of loss of habitat and severance. This effect would be most significant in identified natural habitat areas, where species presence is considered relatively higher (e.g., the section of the Red Line that runs through the mountain deserts, the area of the Western Desert that runs along the Blue Line south of the city of Fayoum, and the area west of Lake Nasser). Habitat loss from a linear infrastructure such as the HSR may further contribute to existing habitat fragmentation in these areas; with highly mobile terrestrial (non-bird) fauna being most affected by movement restrictions due to the barrier effect.

Beyond activities that are expected to significantly modify habitats along the Project's direct footprint, the presence of the work front machinery and workforce, together with associated atmospheric, noise, liquid and light emissions, may further degrade adjacent habitats, and cause disturbance to surrounding fauna.

In both cases, habitat loss and disturbance may lead to direct loss of species, especially in the case of those of limited mobility/burrowing species, which may not be able to escape from activities occurring along the direct footprint. Mobile fauna may be subject to vehicle strikes, or fauna may be directly killed for being considered a nuisance/threat to workers (e.g. snakes).

To minimize these negative effects, the following measures are proposed:

- There are sensitive fauna species (e.g. *Uromastyx aegyptia* and *Uromastyx ocellata*) which would require pre- construction surveys to locate their key used areas (e.g. burrows). These pre-construction surveys can be implemented as part of the Pre-Land Access Surveys, as implemented already by the Green Line. The BMP will detail the survey methodology and subsequent actions if key areas are identified and will follow a similar structure and approach applied for the Green Line.
- Correct implementation of an overall Biodiversity Management Plan (BMP) for Project biodiversity features; and a Biodiversity Action Plan (BAP) for specific biodiversity features identified in the Critical Habitat Assessment.
- Implement controls to minimise lighting and noise.
- Fence off those areas to which fauna may be attracted (e.g. construction/accommodation camps domestic waste accumulation sites).
- Maintain connectivity around or across construction areas, through use of animal crossings to allow highly mobile fauna (e.g. foxes, hare, jerboa, snakes) to be able to traverse the alignment.
- Protocols for capture or herding of fauna found in construction areas where these unable to exit by themselves.
- Based on the pre-construction surveys data, the BMP will need to assess if a significant loss of habitat for sensitive fauna species would occur as a consequence of the project's construction. If this is the case, then the BMP should explore opportunities to replace lost habitat (e.g. Uromastyx burrows). The BMP will follow the same structure and approach that was implemented for the Green Line.
- To mitigate barrier effect (associated to railroad fencing), a crossing strategy must be implemented to identify existing likely movement areas within the AoI and establish suitable types of crossings (e.g. wider culverts below the tracks). This will be particularly important in mountainous areas along the Red Line and close to protected areas (i.e. Wadi Qena, Kor Kor and Dongol, Shaieb El-Banat).
- Special animal crossings should be integrated into Project design and provided for areas throughout undisturbed desert territories in the area of the Western Desert (Blue Line south of the city of Fayoum, area west of Lake Nasser and where the Red Line runs along the Red Sea (traversing between mountain areas and desert plateau).
- Regarding migratory birds and their potential collision with the HSR, conduct vantage point surveys during the winter season near the Armant viaduct in the Upper Nile IBA/KBA (the area with the highest likelihood of interactions with the Project) to establish a baseline pre-construction particularly for the Ferruginous Duck and other low-flight waterbird species, for adaptive management. This would include species abundance, flight height and flight behaviours.

5.3 WHAT ARE THE MAIN NEGATIVE SOCIAL IMPACTS?

5.3.1 IMPACTS ON OCCUPATIONAL HEALTH AND SAFETY

The climate data results show that present day extreme heat conditions could have a material impact on the Project. Future projections suggest a moderate increase for both RCP38s until 2030 and a significant increase of average maximum temperature between 2°C – 3°C for 2050. Increased temperatures could lead to the following potential risks:

- Overheating of equipment and reduced efficiency of vehicles and machinery;
- Heat impacting workers, resulting in health issues and restricted working hours;
- Risks of thermal expansion of the material causing e.g. track buckling;
- High temperatures may cause power cable failure;
- HVAC unit in the trains may fail due to overheating, resulting in heat stress to passengers;
- It is not known if Project personnel will be required to work outside for extended periods of time, or what kind of specific equipment is used for the Project.

The potential impacts of extreme heat on construction workers and laborer could include heat stress, heat exhaustion, and heat stroke, which may result in decreased productivity, increased absenteeism, and higher risk of heat-related illnesses. These impacts could lead to increased medical costs, potential project delays, and increased human resource management efforts to address heat-related health issues.

The following mitigation measures have been included as part of the Project commitments in the Environmental and Social Management Plan (ESMP):

- Provide sufficient drinking water dispensaries spread over the site, ensure that these are always filled, especially during drought/extreme heat conditions.
- The EPC contractor will advise workers that appropriate clothing (light-coloured, lightweight, loose-fitting cotton clothing) should be worn. Maintain regular checks/ verification of the clothing of employees entering the construction sites.
- Employees will be encouraged to take breaks and hydrate any time they feel necessary.
- A space in a shaded area or an air-conditioned building will be provided for taking breaks.
- Work changes will be considered to lower the risk of heat stress.

5.3.2 LAND RELATED IMPACT

The Blue and Red Line cross both inhabited and desert areas and densely populated and constructed area. The Egyptian government, through NAT, will acquire the land that is required for the construction of the HSR Project. Land will be acquired on a permanent and temporary basis depending on the specific project needs. The Project components requiring permanent land take and expropriation include the HSR Footprint and RoW (i.e. the

[38]Representative Concentration Pathways (RCPs) from the IPCC AR5 fifth assessment report.

rail track itself, stations, deposit and stabling area, crossings, associated facilities and drainages). Additional areas for access roads, borrow pits and the site construction camps will be required temporarily during construction. Permanent land acquisition has the potential to result in displacement of households, community assets, infrastructures, land and of business activities displacement. Moreover, construction of the HSR will require additional acquisition of land for camps, laydown areas and other construction related activities, although these will be temporary and limited to the construction phase.

To avoid, minimize and reduce environmental and social impacts and specifically avoid as much as possible residential structures, NAT has analyzed several routing options. Wherever possible, NAT will make sure that existing utilities remain in place or are incorporated into the new works. In locations where this is not possible, the utilities shall be diverted.

Land use will vary within the RoW, but for most of the Project alignment these will be within the 30m RoW, including the space for the maintenance/access road and fixed installations. In populated areas where an access road is not required, the RoW can be as narrow as 18 m. In addition to the stations and depots, the HSR Project will require also the construction of overpasses, underpasses, bridges, viaducts and culverts. A number of lengthy bridges have been included in the Project design to reduce as much as possible interactions with the local urban and agricultural areas and reduce land take and its impacts.

The following restrictions will apply to the 30m RoW:

Construction Restrictions	Operation Restrictions
■ Permanent removal of all houses and structures. ■ Land clearance and removal of all crops and vegetation. No new trees or crops. ■ No pedestrian access during construction and operation.	■ No pedestrian access. ■ No houses/structures, or crops and permanent plantations (except the landscaping work within Project scope).

According to available information (NAT, 2025), a total of 92 plots will be acquired for the Blue Line project (as defined by Decree No. 175 of 2024, Decree No. 951 of 2023, Decree No. 1773 of 2023, and Decree No. 760 of 2024 (October – Abu Simbel)). Information on land ownership and use is currently not available. No information is available with regard to the Red Line.

A Project specific Resettlement Action Plan (RAP) will be prepared by NAT detailing land acquisition, number, status and eligibility of Project Affected Persons (PAP) and compensations, in compliance with the Resettlement Framework adopted in 2021 and Egyptian legislation. Special attention is given in the RAPs for vulnerable persons (e.g. illiterate, poor, disabled). Also, a Grievance Redress Mechanism (GRM) will be made available to all PAP, it will be part of the RAP.

During the future operational phase of the Project, no additional land acquisition and displacement activities will be required.

The HSR Project will lead to a possible separation/severance of communities in the Project areas. Some people may also find it difficult to access local infrastructure, social facilities (e.g. schools, mosques) and agricultural areas. Wildlife and livestock will also not be able to move

freely in search of pasture, water and breeding ground in these areas. There may also be informal tracks or pathways used by community members to access infrastructure or for moving livestock to water or grazing, which also may become affected.

However, the potential HSR impacts on access have been reduced by appropriate mitigation measures, including for example:

- Provision of overpasses and bridges for use by people and animals for crossing the railway line;
- Railway fencing to avoid illegal overpasses;
- Regular stakeholder engagement to identify additional access needs and availability of the Grievance Mechanism.

5.3.3 COMMUNITY HEALTH AND SAFETY RELATED IMPACT

The railway will pass through some highly populated areas. This could affect the health, safety and security of the communities both during the construction and operation phases. During construction, impacts on community health and safety are expected to result mainly from air emissions from construction vehicles and dust and increased background noise levels, in addition to:

- Safety risks to the public at or near the construction sites.
- Increased incidence of communicable diseases (e.g. COVID 19) due to the presence of workers
- Personal safety and well-being impacts associated with increased traffic and road accidents, worker influx (the latter in particular for women), risk of site trespass.

The impacts on the community health, safety and security will be localized and can have significant effects. Appropriate measures of management have been identified through the ESIA and are implemented within the ESMP. These include, for example:

- Preparation and implementation of a Community, Health, Safety and Security Plan for construction works; a Traffic and Access Management Plan, Emergency Preparedness and Response Plans for construction and for operations, Workers Management Plan and Code of Conduct to mitigate workers' influx risks;
- A Community Safety Operation Management Plan (including Emergency Preparedness and Response Plan) will be developed to support the Environmental and Social Operation Management Plan and address additional mitigation measures required during the operation of the railway to protect people and animals from accidents and measures to reduce risks to women passengers.

5.3.4 DISRUPTION TO INFRASTRUCTURE AND UTILITIES

Construction activities will induce impacts on utilities and infrastructure, mainly due to site clearance works, excavation and movement of soil, embankment construction, and construction of the various elements of the railway (except along desert/ not inhabited areas). This is likely to generate pressure on existing local utility supplies (which already have temporary disruption), disturbance to traffic and transportation due to road crossings, and short-term planned and unplanned disruption to electricity, telecommunication, sewage, storm

water lines, natural gas and water supply for irrigation, domestic, drinking and industrial purposes.

A Public Utilities Enhancement Plan will be developed by NAT before the beginning of the construction phase, to include a set of specific impact prevention and mitigation measures. A detailed pre-construction survey will be signed off by landowners and conducted to identify infrastructure at risk. Infrastructure relocated by the Project (electricity, telecommunication, sewage, natural gas distribution, storm water lines and water supply, etc.) will be developed in a way that allows neighbouring communities to benefit from them after construction is over. Special attention will be paid to the settlements with poor access to infrastructure and services and in the RoW of the HSR. The Public Utilities Enhancement Plan will be developed in close coordination with local utilities companies, authorities at the regional and local level and communities to ensure the appropriateness of the relocation and improvements. Community Liaison Officers (CLOs) will be present at work fronts to ensure that impacts from planned disruptions are minimised and that unplanned disruptions are properly managed.

5.4 WHAT ARE THE MAIN NEGATIVE IMPACTS ON CULTURAL HERITAGE?

The baseline identified a total of 174 cultural heritage resources, comprising One Designated Resource and 173 Non-Designated Resources within the Blue and Red Line HSR Project area.

For the Blue Line:

A total of 150 cultural heritage resources were identified within the Blue Line out of which One Designated cultural heritage resource (UNESCO World Heritage Site) situated within the Aswan Governorate and was inscribed onto the World Heritage List in 1979 and contains the Temples of Ramses II at Abu Simbel , which was saved from the rising waters of the Nile, led by the International Campaign launched by UNESCO between 1960 and 1980.[39]

For the Red Line:

No designated cultural heritage resources were identified within the Project area but a total of 24 non-designated cultural heritage resources. However, One Tentative UNESCO World Heritage site was identified (Wadi Qena).

Five potential impacts are considered during the construction phase:

- Physical ground disturbance through earthworks: a direct impact, ground disturbance and earthworks associated with the construction phase have the potential to partially or wholly remove Cultural Heritage resources, such as:
  - Buried archaeology, including undiscovered archaeological sites and pyramids;
  - Built heritage including historic buildings, places of worship, shrines or tombs;
  - Historic agricultural, irrigation, settlements or enclosures; and
  - Industrial heritage including historic railways, rail and road bridges.
- Restriction of access: restriction zones associated with the construction phase have the potential to temporarily or permanently restrict the access for traditional users or researchers to existing Cultural Heritage resources;

[39] https://whc.unesco.org/en/decisions/5732

- Visual: The construction of temporary or permanent structures (bridges, fly-over, embankments etc.) has the potential indirectly impact built and living Cultural Heritage through the introduction of intrusive visual elements to the physical environment or 'setting' where the resource draws value from its surroundings.
- Auditorial: The construction phase has the potential to introduce intrusive auditorial (noise) elements through associated construction works to the physical environment or 'setting' of Cultural Heritage resources; and
- Dust: The construction phase has the potential to introduce intrusive dust elements through associated works to the physical environment or 'setting' of Cultural Heritage resources

Three types of indirect impacts are considered during the operation phase:

- Restriction of access: the potential to permanently restrict access for traditional users or researchers to existing Cultural Heritage resources;
- Visual: the potential to introduce mobile intermittent intrusive visual elements to the physical environment or 'setting' of Cultural Heritage resources; and
- Auditorial: the potential to introduce intermittent intrusive auditorial elements to the physical environment or 'setting' of Cultural Heritage resources;

No direct impacts to Cultural Heritage resources have been identified at the operation phase of the Project, as direct impacts to cultural heritage resources will happen at construction phase during earthwork activities, either partially or wholly removing the resource.

A comprehensive Cultural Heritage Management Plan (CHMP) should be developed for the Project to ensure all Cultural Heritage resources are addressed and managed adequately. The plan should be developed and agreed pre-construction, to allow appropriate mitigation measures to be applied before any impact occurs. Items to be covered in the CHMP include (but not limited to):

- Specific design measures, such as screening bunds or noise reduction measures, to address indirect impacts;
- Regulator engagement with the Ministry of Antiquities to agree site-specific mitigation measures;
- Further field survey and assessment for potentially impacted resources. In the absence of more detailed information on Cultural Heritage resources identified in the baseline, additional field survey may be required under the CHMP to determine the full extents and significance of Project impacts to be undertaken by an appropriately qualified Cultural Heritage specialist. The CHMP should be updated to reflect the findings of this additional survey.
- Access management (Memorandum of Understanding with local communities regarding access and activities). Access arrangements should be made to the satisfaction of identified stakeholders through a Memorandum of Understanding agreed to by authorities and identified stakeholders, which will allow unrestricted access to Cultural Heritage resources. This memorandum should be in place before construction begins.
- Cultural Heritage input into the Community Grievance Mechanism;

- Grave Relocation Plan. This should be designed and implemented with the agreement of the local communities (for the cemetery identified in the AOI, if affected).
- Chance Finds Procedure. A Chance Finds Procedure should be designed and implemented to manage any unexpected discovery of archaeological material in-line with international requirements and guidelines IFC PS8.
- Detailed site-specific Archaeological mitigation, such as pre-construction investigations, archaeological excavations, etc.
- Built heritage recording; and
- Monitoring of mitigation measures and Mitigation Control.

6. HOW WILL THE IDENTIFIED RISKS BE MANAGED?

The Environmental and Social Management Framework (ESMF) and more detailed topic-specific management plans describe the environmental and social mitigation and monitoring measures, the criteria for their successful implementation and the organizational measures to be implemented during the (pre-) construction and operation of the Project. The ESMF is included in the ESIA package of documents, which is made publicly available. As the Project progresses, the ESMF will be regularly reviewed and updated to reflect any changes in the implementation and organization as well as in regulatory requirements.

The ESMF for the HSR Project details environmental and social actions to minimize the potential impacts and includes the requirements of an Environmental and Social Management System (ESMS) and an Environmental and Social Monitoring Plan (ESMP). The ESMS in turn includes other management plans that are key to an adequate implementation of the HSR Project, such as a Waste Management Plan, Health & Safety (H&S) Plans for construction works, an Emergency Preparedness and Response Plan, a Traffic Management Plan, a Chemical Accident and Spills Management Program and others.

In addition to these management plans, other key components of the HSR Project's ESMS include training, audits and inspections and reporting.

It must be emphasized that NAT has a compliant Green Line ESMS under implementation which will be used as basis to build the Blue and Red Line ESMS.

NAT has also the opportunity to maintain the continuity of Green Line HSE personnel towards the Blue and Red Lines, while also facilitating capacity building for new staff to enhance the effective implementation of ESMS on the ground.

7. HOW WILL THE IMPLEMENTATION BE MONITORED?

The Project's Environmental and Social Monitoring Plan (ESMP) provides the mechanism to monitor the environmental and social impacts of the Project implementation to reduce their negative effects and to introduce standards of good practice to be adopted for all further Project works. The Monitoring Plan is thus very important to ensure that the numerous mitigation measures foreseen for the Project are indeed implemented as planned – and achieve the desired beneficial results.

How can the stakeholders be sure that all these actions will be undertaken in the future as promised in the ESIA and the ESMP?

The Project activities will be monitored and checked frequently by numerous parties:

- The Egyptian regulatory inspectors and regional/local officials will conduct their obligatory, statutory inspections per Egyptian permits and regulations applicable to the Project;
- Systra will monitor its own activities during construction – and those of its subcontractors – per the obligations and commitments in the ESIA/ESMP, and they must submit periodic reports to NAT;
- NAT/Systra will need to report periodically to the Project Lenders on progress in implementation of commitments to ensure they are abiding by their contractual obligations, including conformance with permits and ESIA/ESMP commitments; and
- Finally, the international Project Lenders for the HSR Project will conduct periodic monitoring visits of the Project to ensure that NAT, Systra, Siemens and all other parties are in compliance with their obligations under the loan agreement. Typically, the Lenders conduct visits on a quarterly or semi-annual basis during construction, and then annually during operations.

As such, for the HSR Project there are multiple-layers of monitoring and reporting obligations to help ensure that the ESIA/ESMP obligations are ultimately implemented for the Project in a satisfactory manner.

APPENDIX A GRIEVANCE FORM

GRIEVANCE FORM

Reference No. *(To be assigned by Project office personnel):*

Preferred language for communication	☐ Arabic ☐ English ☐ Other, please specify: _____

Please enter your contact information and grievance. This information will be dealt with confidentially.

Please note: If you wish to remain anonymous, please enter your comment/grievance in the box below without indicating any contact information – your comments will still be considered by

Full Name	
Anonymous submission	☐ I wish to raise my grievance anonymously ☐ I request not to disclose my identity without my consent
Please mark how you wish to be contacted (mail, telephone, e-mail).	☐ By telephone (please provide telephone number): _____ ☐ By e-mail (please provide e-mail address): _____

Description of incident or grievance:	What happened? Where did it happen? Who did it happen to? What is the result of the problem?

Date of incident/grievance: _____	☐ One time incident/grievance (date _____) ☐ Happened more than once (how many times? _____) ☐ On-going (currently experiencing problem)

What would you like to see happen to resolve the problem?

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ERM GmbH
Siemensstr. 9
Neu-Isenburg
Germany
63263
T +49 6102 206 0
www.erm.com