

Istanbul North Rail Crossing Project
(INRAIL)
Non-Technical Summary (NTS)

September 2026

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List of Acronyms

Term	Definition
AoI	Area of Influence
AYGM	Directorate-General of Infrastructural Investments / Altyapı Yatırımları Genel Müdürlüğü
BMP	Biodiversity Management Plan
C-ESMP	Contractor's Environmental and Social Management Plan
C-LMP	Contractor's Labor Management Plan
CHA	Critical Habitat Assessment
CLO	Community Liaison Officer
CSC	Construction Supervision Consultant
D+B	Design and Build
E&S	Environmental and Social
ESIA	Environmental & Social Impact Assessment
ESMP	Environmental and Social Management Plan
GIIP	Good International Industry Practice
GHG	Greenhouse Gases
HSE	Health, Safety, and Environment
HGV	Heavy Goods Vehicle
IFC	International Finance Corporation
ILO	International Labour Organization
KBAs	Key Biodiversity Areas
LRP	Livelihood Restoration Plan
MoTI	Ministry of Transport and Infrastructure
NATM	New Austrian Tunnelling Method
NTS	Non-Technical Summary
OHS	Occupational Health and Safety
PBF	Priority Biodiversity Features
PMC	Project Management Consultant
PIOC	Project Implementation Oversight Consultant
RF	Resettlement Framework
RP	Resettlement Plan
SEA/SH	Sexual Exploitation, Abuse and Sexual Harassment
SEP	Stakeholder Engagement Plan
TBM	Tunnel Boring Machine
TCDD	Turkish State Railways
WB	World Bank
YSS	Yavuz Sultan Selim

Objective

The Istanbul North Rail Crossing Project (“INRAIL Project” or the “Project”) is expected to receive co-financing from the World Bank (WB) (lead financier), European Bank for Reconstruction and Development (EBRD), the Asian Infrastructure Investment Bank (AIIB), the Islamic Development Bank (IsDB), the Asian Development Bank (ADB), and the OPEC Fund for International Development, and potentially the European Investment Bank (EIB).

An Environmental and Social Impact Assessment (ESIA) process has been undertaken to identify, assess, and manage potential environmental and social risks and impacts associated with the Project. The ESIA (the “Project-level ESIA”) was prepared by Directorate-General of Infrastructural Investments (AYGM)’s appointed consultant and disclosed in January 2026. The ESIA assessed the anticipated environmental and social impacts of the Project based on the available design and baseline information at the time of preparation and supported the initial lender review process. During 2026, the Project-level E&S documents were further reviewed and updated to incorporate additional studies, lender comments and recommendations, and further environmental and social information developed during Project preparation. Following these revisions, the updated E&S documents were re-disclosed by AYGM in August and September 2026.

As the Project is being implemented under a Design and Build (D+B) model, the Project-level E&S documents provide the basis for the subsequent finalization of lot-specific E&S instruments by the D+B Contractors, taking into account the final design, construction methodology, site-specific conditions, Project Facilities and, where applicable, Associated Facilities.

This Non-Technical Summary (NTS) provides an overview of the Project, the environmental and social baseline conditions, the potential impacts and proposed mitigation measures, stakeholder engagement activities, and the environmental and social management commitments that will be implemented throughout the Project lifecycle. It summarizes the key findings and commitments contained in the updated Project E&S documentation in a concise and accessible format. The NTS is intended to support stakeholder engagement by making Project information available to interested and affected parties in a clear and understandable manner. The figures and technical information presented in this NTS are derived, as relevant, from the updated ESIA and the supporting Project E&S studies and documentation.

Project Overview

Introduction

The INRAIL Project is a major railway investment that aims to improve rail connectivity between the European and Asian sides of Istanbul and strengthen connections within the wider national and international rail network. The Project is intended to address a key cross-Bosphorus rail capacity constraint and strengthen Türkiye’s national and intercontinental freight and passenger corridors.

Currently, the Marmaray Line is the only railway crossing of the Bosphorus. As it is primarily used for passenger services and is heavily utilised on a daily basis, available capacity is limited. Freight operations are particularly constrained and are currently limited to restricted nighttime operating windows. The Project will create an additional cross-Bosphorus rail link, helping to relieve pressure on the existing network while supporting both passenger and freight transportation.

The Project comprises the construction and operation of approximately 127 km of new railway infrastructure extending between Çayırova on the Asian side in Kocaeli and Çatalca on the European side of Istanbul. The railway will cross the Bosphorus via the rail-compatible section of the existing Yavuz Sultan Selim (YSS) Bridge and will provide a high-capacity, fully electrified, double-track, signalled railway connection designed to accommodate both passenger and freight services.

The Project is expected to play a significant role in improving the efficiency, reliability, and sustainability of transportation within the Istanbul Metropolitan Area and Türkiye's wider railway network by providing direct rail connectivity between Istanbul Airport (IST) and Sabiha Gökçen Airport (SAW), while also improving access to the wider national railway network. The Project is also expected to support modal shift from road to rail, contributing to reduced road congestion, greenhouse gas emissions and logistics costs.

The Project is planned to be implemented through a division into four distinct construction lots:

- Lot 1: Construction and Electrification Works for the Çayırova – Sabiha Gökçen Airport – Kurtdoğan Corridor
- Lot 2: Construction and Electrification Works for the Kurtdoğan – Alibahadır Corridor
- Lot 3: Construction and Electrification Works for the Alibahadır – YSS Bridge – Mithatpaşa Corridor
- Lot 4: Construction and Electrification Works for the Mithatpaşa – İstanbul Airport – Çatalca Corridor

The works will be implemented under a Design and Build (D+B) contracting model. The final design, construction methods, sequencing and site-specific arrangements will therefore be further developed by the selected D+B Contractors in accordance with the Project E&S framework.

To minimise environmental and social impacts, the Project has been designed to make extensive use of existing transport corridors and underground sections. The railway will be capable of operating at speeds of up to 160km/h and will include approximately 59 km of tunnels, helping to reduce impacts on surface land uses and nearby settlements **Hata! Yer işareti tanımlanmamış..**

In addition to the permanent railway infrastructure, Project implementation will require supporting facilities such as construction camps, temporary access roads, logistics and laydown areas, material storage areas, batching plants, quarries and borrow areas, spoil disposal areas, precast yards, worker accommodation facilities, emergency shafts and ventilation structures. These will be assessed and managed as Project Facilities and, where applicable, Associated Facilities in accordance with the Project E&S requirements.

An overview of the Project, including the planned construction lots distinguished by different colours, is presented in Figure 2.1.

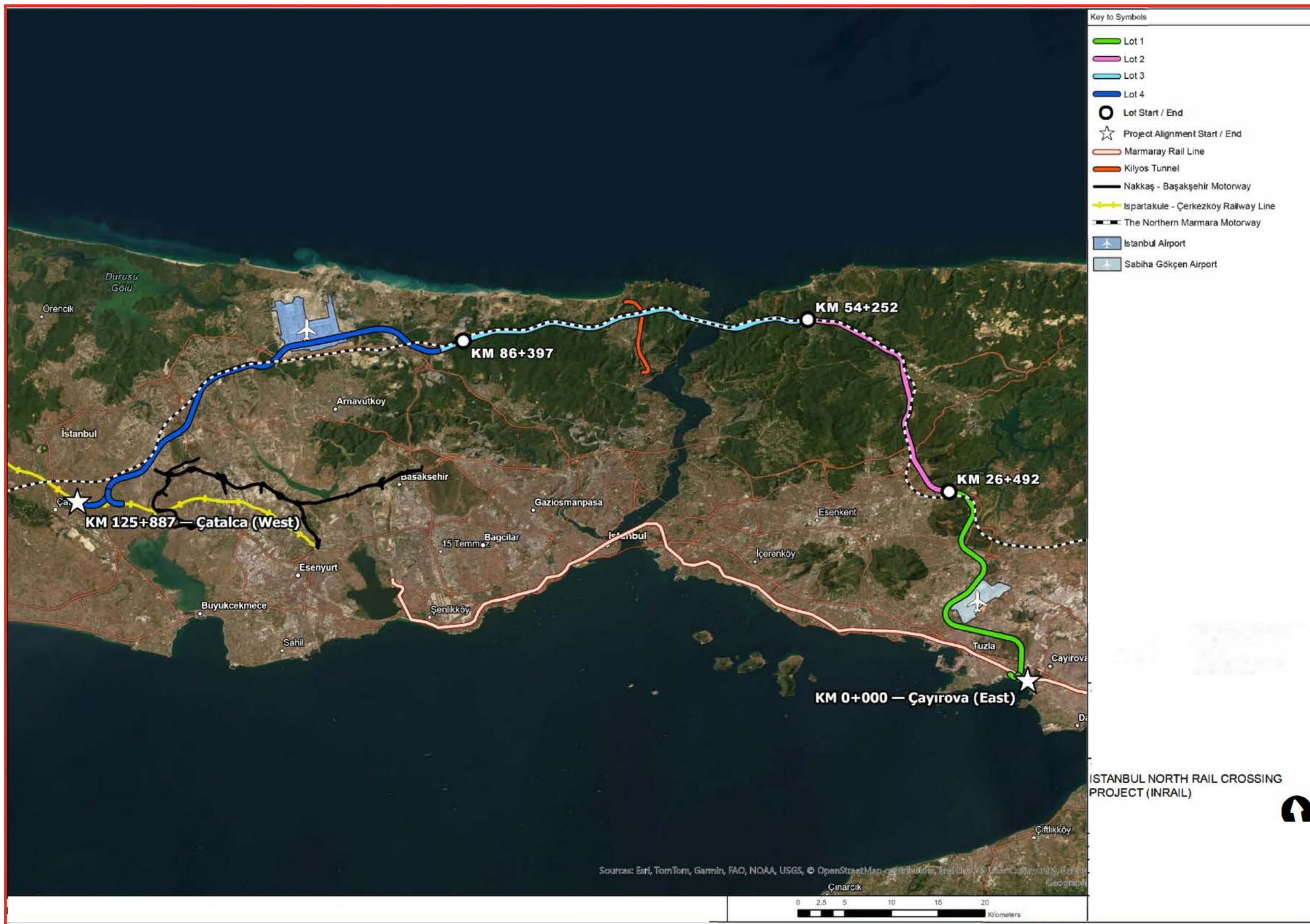


Figure 2.1: Project Overview

Project Objectives

The overall development objective of the Project is to increase the competitiveness and resilience of Türkiye's cross-Bosphorus railway connectivity along its main national and intercontinental corridors. The Project aims to¹:

- Provide an alternative rail crossing of the Bosphorus to complement the existing Marmaray Line, which is currently operating at high capacity and has limited availability for freight and intercity passenger services.
- Increase railway capacity between the Asian and European sides of Istanbul by developing a high-capacity, double-track, electrified railway corridor capable of carrying both passenger and freight traffic.
- Strengthen the integration of Istanbul's metropolitan, national, and international rail networks, linking rail corridors from Anatolia to Europe through a dedicated rail connection across the Bosphorus.
- Improve connectivity to Istanbul's two airports by providing direct railway access to Sabiha Gökçen Airport (SAW) and Istanbul Airport (IST) and facilitating airport-to-airport rail travel.
- Support efficient passenger and freight transport through a mixed-use railway system designed for reliable, high-frequency passenger services and uninterrupted freight operations.
- Relieve congestion on existing transport infrastructure and encourage a modal shift from road transport to rail.
- Support Türkiye's role as a regional and international logistics hub by facilitating national and international freight movements between Asia and Europe.
- Provide a long-term and sustainable solution to Istanbul's growing transportation demand, while maintaining capacity reserves for future passenger and freight growth.
- Minimise environmental and social impacts through route optimization, reduced land acquisition, protection of agricultural and forest areas, and extensive use of tunnels, existing transport corridors, and ecological crossings.

Project Parties

The Project is being developed by the Republic of Türkiye Ministry of Transport and Infrastructure (MoTI), through its Directorate-General of Infrastructure Investments ("AYGM" or the "Project Administration").

AYGM is responsible for the planning, procurement, environmental and social management, and overall implementation and construction oversight of the Project. Following completion and commissioning, the railway infrastructure will be transferred to the Turkish State Railways (TCDD), which will assume responsibility for the operation, maintenance, and management of the railway assets.

During the construction phase, AYGM will engage separate Design and Build (D+B) Contractors for each of the four Project lots. These contractors will be responsible for the detailed/final design and construction of their respective sections of the railway. As part of the design development process, the D+B Contractors will identify and assess technical, environmental, social, and operational factors. In addition, each D+B Contractor will finalize and update the relevant lot-specific E&S instruments, including the ESIA, ESMP and SEP, based on the final design and site-specific conditions, and will prepare the Contractor's Environmental and Social Management Plan (C-ESMP) and applicable sub-management plans prior to construction.

¹ Technical Evaluation Report of INRAIL Project, prepared by AYGM on February 2026.

AYGM will also be supported by a Construction Supervision Consultant (CSC/Engineer), which will supervise and enforce the D+B Contractors' compliance with the contractual E&S requirements; a Project Management Consultant (PMC), which will support AYGM in Project coordination, review and reporting; and a Project Implementation Oversight Consultant (PIOC), which will provide independent monitoring, audit and assurance of Project implementation.

Project Lenders

The Project is expected to be co-financed by the World Bank (WB) (lead financier), the European Bank for Reconstruction and Development (EBRD), the Asian Infrastructure Investment Bank (AIIB), the Islamic Development Bank (IsDB), the Asian Development Bank (ADB), and the OPEC Fund for International Development with potential participation from the European Investment Bank (EIB), (the "Lenders").

Project Timeline

The Project is expected to be implemented over a period of approximately six to seven years. Construction is planned to commence following the completion of detailed design, permitting, land acquisition, applicable environmental and social approvals and clearances, including required World Bank No-Objections, and other preparatory activities required prior to mobilization. Construction works will be undertaken in a phased manner, taking into account engineering requirements, environmental and social considerations, and logistical constraints along the different sections of the alignment. Based on the current implementation schedule, the railway is anticipated to become operational by mid-2032, subject to construction progress, regulatory approvals, stakeholder coordination, and the timely completion of key project activities. The implementation schedule will be further refined as the Project progresses and additional information becomes available during the detailed design and construction planning stages.

Alternative Analysis

As part of the Project development process, AYGM evaluated alternative route options to identify a railway alignment that meets the Project objectives while minimizing environmental, social, and technical constraints. Two principal route alternatives were considered at the planning stage.

Alternative 1 commenced at Çayirova, connecting with the existing Ankara–Istanbul railway corridor, and extended westward via SAW, the YSS Bridge, and IST, before continuing towards Halkalı. This option would provide connectivity to major transport hubs; however, it involved a longer alignment, greater construction requirements, increased land acquisition and expropriation needs, and offered limited suitability for efficient freight operations.

Alternative 2, which forms the basis of the proposed Project, also starts at Çayirova and passes through SAW. However, after SAW, it follows a more northerly alignment, crosses the Bosphorus via the Yavuz Sultan Selim Bridge, serves IST, and subsequently connects to the Halkalı–Kapıkule railway corridor at Çatalca.

Alternative 2 is found to make greater use of existing transportation corridors, particularly the North Marmara Motorway corridor and the rail reservation already incorporated into the YSS Bridge, thereby reducing land take, expropriation requirements, and potential environmental and social impacts. In addition, Alternative 2 provides a more suitable strategic corridor for both passenger and freight services and better supports the Project's objective of creating an additional high-capacity rail crossing of the Bosphorus.

In parallel with the route selection process, the Project-level ESIA assessed the No-Project (Zero Option), under which the INRAIL Project would not be implemented. Under this scenario, future passenger and freight demand would continue to rely primarily on the existing Marmaray corridor

and road transport network. Given the current and anticipated capacity constraints on Marmaray, particularly for freight and intercity rail services, the No-Project Option would not achieve the objectives of improving cross-Bosphorus rail capacity.

The Project-level ESIA also examined alternatives for the location of the stations (SAW and IST). The assessment considered engineering feasibility, operational efficiency, passenger accessibility, integration with existing and planned transport infrastructure, environmental and social constraints, and future passenger demand. Based on these considerations, the selected station locations at SAW and IST were determined to provide the most effective integration with the airport facilities and wider transportation networks while supporting the overall objectives of the Project. As a result, these locations were identified as the preferred station options.

Following the evaluation of route, station, and No-Project alternatives, AYGM concluded that Alternative 2, together with the selected station locations at SAW and IST, represents the preferred option from technical, operational, environmental, and social perspectives and provides the most effective means of achieving the Project's strategic transportation objectives.

Land Acquisition

The Project requires the acquisition of land for the railway alignment, stations, associated facilities and construction activities. Based on the current design, approximately 371 land parcels covering around 3.95 million m² may be affected by the Project. The affected lands include private lands (244 parcels), public lands (102 parcels) and parcels with mixed ownership arrangements (25 parcels). These estimates are preliminary and indicative and may change following completion of the detailed design and field verification. These parcels are distributed across the Project corridor extending through 53 settlements located within the districts of Çayirova and Gebze in Kocaeli Province, and Tuzla, Pendik, Sultanbeyli, Sancaktepe, Çekmeköy, Beykoz, Sarıyer, Eyüpsultan, Arnavutköy and Çatalca in Istanbul Province.

The Project design seeks to minimise the need for land acquisition wherever possible by optimising the alignment and using existing transport corridors where feasible. However, some impacts on landowners, land users and livelihoods may still occur deriving from the Project's land acquisition activities. These may include the permanent or temporary loss of land, restrictions on land use, and, in some cases, physical or economic displacement. The Project may also affect a limited number of residential, commercial and agricultural structures located within or close to the Project footprint.

Consideration will be given to vulnerable households and informal land users who may be more susceptible to Project-related impacts. The Project E&S documentation, including the RF, identifies measures to avoid, minimise and manage these impacts and provides for assistance to eligible affected persons, including vulnerable groups and informal users, in accordance with ESS5.

Any land acquisition required for the Project will be undertaken in accordance with applicable national requirements and World Bank ESS5. A Resettlement Framework (RF) has been prepared and disclosed to guide the management of land acquisition, compensation and livelihood restoration measures where required in line with World Bank ESS5. Following finalization of the detailed engineering design by the D+B Contractors, AYGM will prepare the relevant Resettlement Plans (RPs), including Livelihood Restoration Plans (LRPs), where required. The RF specifically assigns preparation, implementation and internal monitoring of the RPs/LRPs to AYGM.

No civil works will commence on any section affected by land acquisition or resettlement until the applicable RP has been prepared, consulted upon, approved, disclosed and implemented as required. Sectional RP Completion Reports will be prepared by the CSC, reviewed and cleared

by AYGM, independently reviewed by the PIOC and submitted to the World Bank for No-Objection. Following receipt of the World Bank's No-Objection, AYGM will issue formal land access clearance for the relevant section, and the Contractor will not access the land or commence construction before such clearance is issued.

Further information on the Project's potential social impacts related to land acquisition, displacement, compensation and livelihood restoration is provided below.

Environmental Impacts of the Project

Air Quality

The Project is expected to affect air quality, especially during the construction phase. During the construction phase, earthworks dust, tunnelling activities, construction machinery emissions, spoil transport, and stockpile dust were defined as the main sources of air pollution.

The Project-level ESIA used AERMOD dispersion modelling to assess emissions from surface earthworks and stated that predicted particulate matter (PM₁₀ and PM_{2.5}) concentrations² remained within applicable limits. However, an exception was identified at Uskumruköy, where cumulative daily PM_{2.5} concentrations reached 32.9µg/m³, exceeding the 25µg/m³ limit. The ESIA notes that localized exceedances may occur, particularly in Çayırova and Uskumruköy, and therefore requires enhanced dust suppression and air quality control measures in these areas.

As part of the environmental and social assessment process, additional attention was given to the air pollution sources of NATM tunnel portal emissions, TBM ventilation exhausts, spoil transport dust, and construction vehicle fleet emissions. As the final design, construction methodology, equipment fleet and detailed work sequencing will be developed by the D+B Contractors, further lot-specific air quality assessment will be required before the relevant works. This will include additional PM₁₀/PM_{2.5} baseline monitoring, dispersion modelling covering relevant construction emission sources, and assessment of tunnel portal emissions. The findings will be incorporated into the finalized lot-specific ESIA/ESMP, the C-ESMP and relevant sub-management plans, as applicable.

Sensitive receptors and monitoring locations are presented in Figure 3.1.

² PM_{2.5} and PM₁₀ are airborne particulate matter pollutants, where PM_{2.5} consists of fine particles with diameters of 2.5 micrometres or less that can penetrate deep into the lungs and bloodstream, while PM₁₀ includes larger particles up to 10 micrometres in diameter that primarily affect the respiratory system.

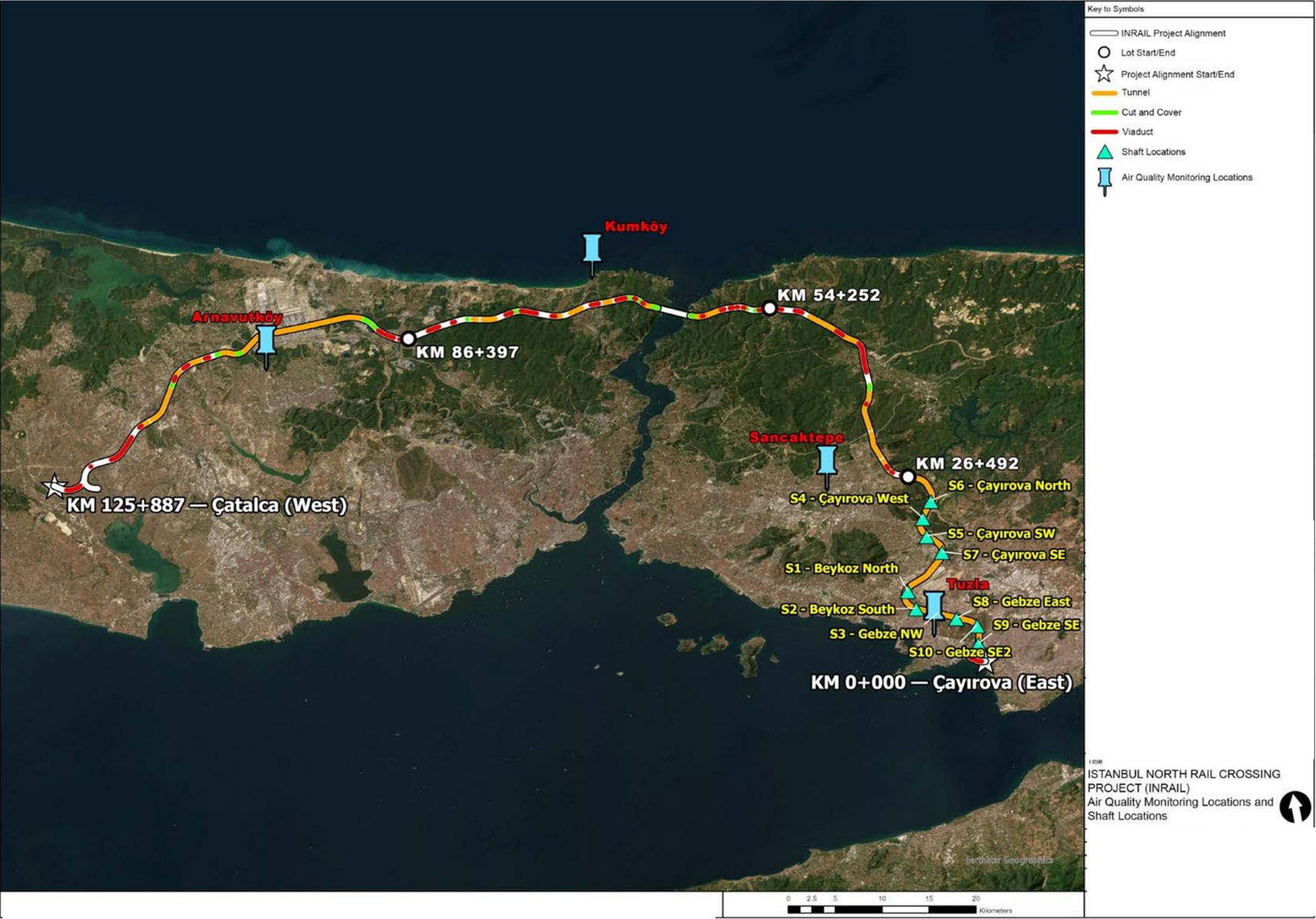


Figure 3.1: Emission Sources, Sensitive Receptors and Air Quality Monitoring Locations

Other construction-related impacts, including TBM ventilation exhaust, machinery emissions, and spoil transport dust, were assessed as moderate before mitigation and generally minor to moderate after mitigation. To address these risks, the following mitigation measures are included in the ESMP, including:

- Preparing Lot-specific dust suppression plans,
- Receptor-specific controls at high-sensitivity locations such as Uskumruköy,
- TBM portal air quality assessment and monitoring at portal exhaust points and nearby sensitive receptors,
- Applying construction equipment emission standards,
- Continuous PM10 and PM2.5 monitoring at vulnerable and sensitive receptor locations,
- Applying spoil transport management procedures,
- Preparing blasting management plan (if blasting is applicable),
- NATM/TBM portal-specific air quality controls and monitoring, as determined through the Lot-specific assessment and C-ESMP.

Following implementation of these mitigation measures, air quality impacts are expected to reduce to minor or negligible residual impacts. However, localized air quality risks may remain at highly sensitive receptors and will require receptor-specific monitoring and adaptive mitigation during construction.

During the operational phase, air quality impacts are anticipated to be minor or negligible, as the electrified railway will not generate direct traction emissions. The Project is also expected to provide a long-term regional air quality benefit through the transfer of freight movements from road to rail, reducing HGV-related emissions of NO_x and particulate matter. Operational air quality impacts associated with maintenance vehicles, depot activities and other ancillary facilities will be managed through applicable operational mitigation and monitoring measures.

Before construction begins, each D+B Contractor will undertake baseline air quality monitoring, receptor mapping, detailed dispersion modelling, NATM and TBM portal assessments, haul-route analysis through Lot-specific ESIA studies and updates to the ESMP to confirm and refine the Project's air quality management approach. The results will be incorporated into the finalized Lot-specific ESIA/ESMP and C-ESMP and associated dust-control procedures.

Noise and Vibration

Building on the findings of the Project-level ESIA, construction and operational noise and vibration modelling were undertaken to assess the potential impacts of the Project on surrounding sensitive receptors. The assessment identified the construction phase as the primary source of potential noise and vibration impacts and divided construction activities into three stages:

- Site preparation and earthworks,
- Bridge and viaduct construction,
- Railway track installation and associated infrastructure works.

As site preparation and earthworks and bridge and viaduct construction were expected to generate the highest noise and vibration levels, they were assessed as the worst-case construction scenarios.

Construction noise modelling was carried out at 24 receptors (22 are residential properties and two are commercial properties, the distance from the source ranges from 14 to 597m, with an average separation distance of approximately 237m) locations and assessed against applicable daytime and night-time noise limits. The results identified the site preparation and earthworks activities as the most significant noise-generating stage, reflecting the conservative assumption that all construction equipment would operate simultaneously at full capacity. During this stage, 21 of the 24 receptors were assessed as experiencing major impacts, while one receptor was assessed as moderate. Noise impacts

were lower during the bridge and viaduct construction, although 13 receptors still experienced major impacts and four experienced moderate impacts. The highest predicted noise level was recorded at a receptor located approximately 5m from the works, where noise levels reached 87.9dBA, exceeding the applicable limit by up to 27.9dBA. The most significant impacts were concentrated at receptors located within approximately 5-33m of active construction areas, confirming that construction noise represents a significant but temporary impact.

To reduce construction noise impacts, a range of mitigation measures were recommended through the assessment and have been incorporated into the ESMP. These include restricting the noisiest activities to daytime hours, installing temporary acoustic barriers and site hoarding between construction areas and nearby receptors, using low-noise equipment and appropriate acoustic enclosures and implementing construction sequencing to avoid the simultaneous operation of multiple high-noise activities in the same area. Noise monitoring and proactive community engagement are anticipated throughout the construction period. Collectively, these measures are expected to achieve a reduction of approximately 11-15dBA at the most affected receptors.

Construction vibration was assessed at the same 24 receptor locations. The main vibration sources were identified as bulldozers during the site preparation and earthworks activities and pile-driving activities during the bridge and viaduct construction. The assessment found that vibration effects are generally localised and decrease rapidly with distance from the source. For example, TBM-induced vibration is predicted to decrease from approximately 10mm/s at 2.5m from the machine to around 1mm/s at 20m and 0.3mm/s at about 45-46m. The highest vibration impacts were associated with piling and ground-improvement works, where seven receptors were classified as experiencing major impacts and one receptor experienced a moderate impact. To minimise these effects, the ESMP recommends the use of low-vibration construction methods where practicable, including rotary bored or Continuous Flight Auger (CFA) piling, adjustable hydraulic hammers, vibration monitoring at sensitive receptors, careful construction sequencing, daytime scheduling of high-vibration activities, and ongoing stakeholder communication.

Operational impacts are expected to be substantially lower than those during construction. Operational noise was assessed at 24 receptor locations, with three receptors predicted to experience moderate impacts and no receptors predicted to experience major impacts according to Project standards. To address these impacts, several mitigation options were evaluated, including noise barriers, noise berms, and vegetation planting. The preferred solution comprises the installation of noise barriers at the affected locations. Following implementation of these barriers, the receptors previously classified as experiencing moderate impacts are reduced to negligible impact, resulting in a residual assessment of 23 receptors with negligible impact and one receptor with a minor impact.

Operational vibration from passenger and freight train movements was also assessed and found to remain below the applicable vibration criteria at all receptor locations. Consequently, all receptors were classified as no impact, and no operational vibration mitigation is currently required. Nevertheless, further vibration assessment will be undertaken during the detailed design stage using site-specific information on track design, rolling stock characteristics, operating speeds, and ground conditions to confirm the final vibration performance of the railway.

Before construction, each D+B Contractor will undertake Lot-specific noise and vibration baseline surveys and modelling using the final design and construction information. This will include 48-hour Type-1 noise measurements, tri-axial vibration measurements at representative and sensitive receptors, construction and operational modelling, and receptor-specific vibration trigger/action levels. The results will be incorporated into the finalized Lot-specific ESIA/ESMP and C-ESMP.

Soil

Building on the Project-level ESIA evaluated construction and operational soil impacts. The most significant construction-phase impacts were found to be associated with permanent topsoil loss,

temporary topsoil loss, soil compaction, erosion, and potential soil contamination from construction activities. Permanent topsoil loss beneath stations, viaducts, and other permanent structures was assessed as a major adverse impact, particularly where sensitive forest soils are affected. Soil compaction and erosion were also identified as important risks, especially within the North Marmara Forest area and on steep slopes where soil characteristics make the ground highly susceptible to degradation. Additional risks include fuel and oil spills, concrete and cement contamination, hazardous waste storage, legacy contamination in urban and industrial areas, and impacts associated with spoil disposal sites.

A key finding of the assessment is the sensitivity of the North Marmara Forest soils, which are considered the highest-value soil resource along the railway corridor. The dominant soil types have relatively low bulk density, making them highly vulnerable to compaction from heavy construction machinery. The assessment also identified strongly calcareous Rendzina soils, which require specific restoration and revegetation approaches.

To address these risks, the following mitigation measures were introduced in the ESMP:

- Applying topsoil management plan during construction,
- Completing baseline soil contamination survey for all brownfield, urban, and industrial sections of the alignment, particularly the Kocaeli industrial corridor (Çayırova, Gebze) and urban İstanbul sections,
- Applying contaminated land management protocol,
- Preparing erosion and sediment control plan,
- Applying soil compaction prevention,
- Applying hazardous substance management,
- Spoil characterisation and classification,
- Protection measures for drinking water catchments,
- Applying post-construction soil rehabilitation.

Especially, restricting vehicle movements in sensitive soil areas, preserving and reinstating topsoil, controlling erosion, and ensuring the use of suitable native plant species during restoration were highlighted as mitigation measures in the Project's ESIA.

Following implementation of the proposed mitigation measures, soil-related impacts are expected to reduce to minor or negligible residual impacts. However, permanent topsoil loss remains a moderate residual impact because it is irreversible beneath permanent infrastructure, while soil compaction in sensitive forest and Rendzina soils also remains a moderate residual impact, although affected areas are expected to recover gradually following appropriate rehabilitation and revegetation measures.

Operational-phase impacts are generally assessed as minor to negligible, reflecting the low contamination risk associated with an electrified railway and the limited extent of direct soil interaction along the largely tunnelled and viaduct-supported alignment.

The main outstanding requirement was identified as the completion of baseline soil contamination surveys in industrial and urban sections of the route and the incorporation of the resulting soil protection, contamination management, erosion control, monitoring and rehabilitation measures into the finalized Lot-specific ESIA/ESMP, C-ESMP and applicable ER-required sub-management plans before the relevant works commence.

Water

The water quality assessment identified surface water and groundwater resources as important environmental receptors along the railway corridor. Key receptors include the Ömerli, Büyükçekmece, Sazlıdere and Alibey reservoirs, the Black Sea and Marmara Sea, and several ponds and wastewater treatment facilities as seen in Figure 3.2. The Project route crosses the reservoir areas of Ömerli and

B y k ekmece Dams and passes through their protection zones, while it does not intersect the Sazlıdere and Alibey reservoirs but remains within their long-distance protection zones

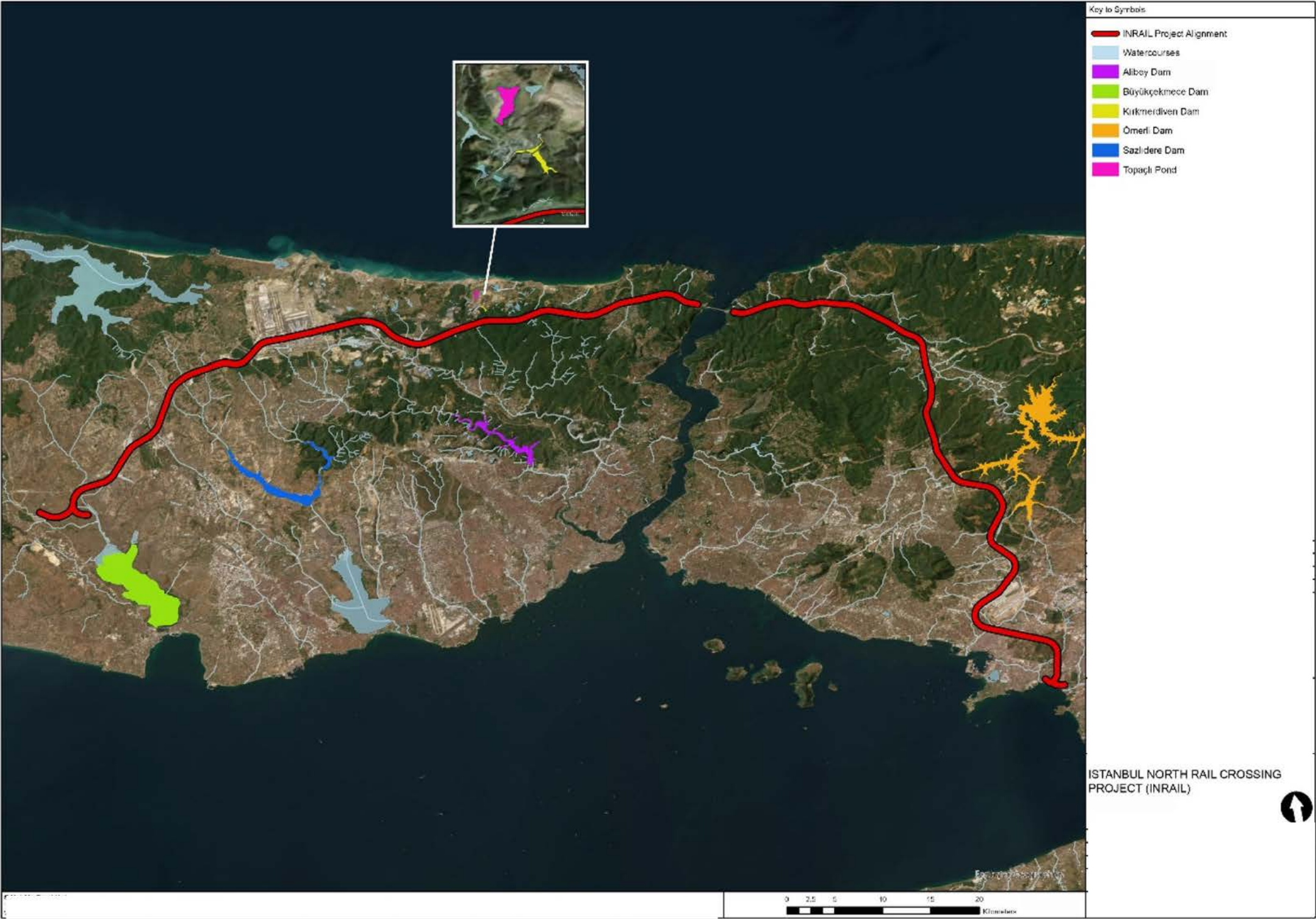


Figure 3.2: Watercourses in the Project Area

The ESIA assessment identified several potential water quality impact pathways during construction, including sediment runoff from earthworks, tunnel dewatering, TBM slurry management, fuel and chemical spills, concrete washwater, worker camp wastewater, construction run-off within reservoir protection zones, and spoil disposal site leachate. Two impacts were assessed as potentially major pre-mitigation:

- Increased sediment and turbidity affecting drinking water reservoirs,
- Groundwater drawdown associated with tunnel dewatering in fractured aquifers.

Additional impacts, such as contaminated dewatering discharge, wastewater from worker camps, and hydrocarbon contamination, were assessed as moderate or minor.

Operational-phase water quality impacts of the Project were expected to be considerably lower and mainly relate to track drainage and maintenance facility discharges.

To manage these risks Lot-specific water quality management measures will be further defined and incorporated into the finalized Lot-specific ESIA/ESMP, C-ESMP and applicable ER-required sub-management plans, including erosion and sediment controls, drinking water protection zone measures, tunnel dewatering management, closed-loop TBM slurry systems, spill prevention measures, wastewater treatment, groundwater and surface water monitoring, and spoil site drainage controls.

With implementation of these measures, most impacts are expected to reduce to minor or negligible residual significance. However, two residual moderate impacts remain:

- Potential sediment impacts on drinking water reservoirs,
- Groundwater drawdown from tunnelling.

The reason is that additional baseline monitoring and Lot-specific assessments will be completed using the final design and construction information. These studies will confirm groundwater and surface-water baseline conditions and refine the mitigation and monitoring measures applicable to each Lot before the relevant works commence.

During the Lot-specific ESIA studies, D+B contractors will be required to undertake baseline groundwater and surface water monitoring to establish existing conditions and identify any potential project-related impacts. Attention will be given to groundwater abstraction wells, reservoir catchments, aquifer systems, and sensitive marine environments. The findings will be incorporated into the finalized Lot-specific ESIA/ESMP, C-ESMP and applicable ER-required sub-management plans.

Geology & Hydrogeology

The geological and hydrogeological assessments identified several sensitive receptors, including communities and infrastructure located near tunnelling and excavation works, drinking water reservoir catchments, fractured aquifers, alluvial groundwater systems, and areas of geological importance.

The Project is located within a highly seismic area close to the North Anatolian Fault, making earthquake risk one of the key geological considerations. Eight potential impact pathways were identified, with the most significant pre-mitigation impacts being seismic loading on the Project structures and ground settlement caused by tunnelling and excavation activities, both of which were assessed as major impacts due to the potential consequences if engineering controls were not implemented.

Additional geological and hydrogeological risks include groundwater drawdown from tunnel dewatering, mobilisation of naturally occurring contaminants from excavated materials, slope instability in weak ground conditions, karst-related ground collapse or water ingress, management

of large spoil volumes. These impacts are generally associated with the varied geological conditions along the route, including weak shale, bentonitic clays, alluvial deposits, fractured aquifers, and limestone formations. Although these risks are considered significant before mitigation, they are well understood and can be managed through standard geotechnical and tunnelling practices.

Mitigation measures include:

- Site-specific seismic design,
- Pre-construction building condition surveys,
- Settlement-controlled tunnelling,
- Groundwater monitoring and dewatering management,
- Geotechnical investigations,
- Spoil characterisation,
- Slope stability controls,
- Karst probing ahead of tunnel excavation.

The Project will be designed to meet Turkish seismic design standards and other relevant standards. Site-specific seismic studies will be undertaken during detailed design, and earthquake early warning systems will be incorporated into railway operational safety arrangements.

Following implementation of these measures, most impacts are expected to reduce to minor or negligible residual significance. The only residual moderate impact relates to potential groundwater drawdown and associated settlement effects, as this cannot be fully assessed until detailed groundwater monitoring and hydrogeological investigations are completed before construction.

As the detailed design is developed, the D+B Contractors will undertake the additional studies, surveys and assessments required to confirm site-specific geological and hydrogeological conditions and to refine the applicable mitigation and monitoring measures. The results will be integrated into the finalized Project E&S instruments and C-ESMP, as applicable.

Landscape

The landscape and visual assessment identified potential impacts associated with vegetation clearance, permanent infrastructure, temporary construction activities, lighting, and spoil transport. The most significant pre-mitigation impacts were assessed as:

- Permanent loss of vegetation and changes to landscape character, particularly within the North Marmara Forest and woodland areas,
- Visual intrusion from permanent above-ground structures, including viaducts and bridges, which together extend for approximately 22.1 km, tunnel portals, shafts, substations, and retaining structures.

Temporary construction activities, such as construction compounds, spoil stockpiles, earthworks, and haul routes, were assessed as having moderate visual impacts, while construction lighting in rural and forested areas was also identified as a moderate concern due to potential light spill and glare.

To minimise these effects, several mitigation measures are integrated within the ESMP, including:

- Limiting vegetation clearance to the minimum necessary footprint,
- Careful siting and screening of temporary construction facilities,

- Management of spoil stockpiles,
- Control of night-time lighting,
- Progressive reinstatement and revegetation of disturbed areas,
- The visual integration of permanent structures through appropriate design, materials, colours, planting, and landscape treatments,
- Maintaining construction sites in an orderly condition,
- Managing visual impacts along haul routes,
- Implementing a monitoring and grievance mechanism to address community concerns regarding visual impacts.

Following implementation of these measures, most impacts are expected to reduce to minor or negligible residual significance. Temporary visual impacts associated with construction activities, lighting, spoil haulage, and cumulative effects with the existing O-7 Motorway are all reduced to negligible levels.

The main remaining impact is the permanent loss of vegetation and landscape character at high-sensitivity forest receptors, particularly within the North Marmara Forest area, which remains a moderate residual impact because vegetation loss at permanent infrastructure locations is irreversible. Further design optimisation will therefore be required at high-sensitivity forest receptors, particularly within the North Marmara Forest area.

During the Lot-specific ESIA stage, more detailed landscape and visual assessments will be undertaken to refine receptor mapping, identify representative viewpoints, optimise the design of permanent structures, and further minimise impacts on sensitive landscapes and visual receptors.

Waste

The waste management assessment identified excavated spoil, hazardous waste, construction and demolition waste, and spoil transport activities as the main waste-related issues during construction.

The most significant challenge is the management of an estimated approximately 27 million m³ of potentially surplus excavated material generated by tunnelling, earthworks, and other construction activities. This estimated volume of surplus excavated material will be updated during the detailed design and Lot-specific cut-and-fill optimisation studies. Five candidate disposal sites in Istanbul provide a combined capacity of approximately 47.7 million m³, which is considered sufficient to accommodate the Project's disposal needs. However, spoil disposal and the potential for soil and groundwater contamination from leachate and runoff were assessed as the two most significant pre-mitigation impacts. Additional impacts include hazardous waste management, community impacts associated with spoil haulage, and the management of routine construction and demolition wastes.

To manage these risks, a comprehensive set of waste management measures are proposed and incorporated in the ESMP, based on the waste hierarchy, prioritising avoidance, reuse, recycling, recovery, and disposal as a last resort. Key measures include maximising on-site and off-site beneficial reuse of excavated material, spoil characterisation and contamination screening, segregation of waste streams, controlled management of temporary storage areas, hazardous waste controls, use of licensed transporters and disposal facilities, dust and spill prevention measures, material tracking systems, and worker training programmes. Two particularly important measures are:

- Spoil characterisation before transport and disposal, ensuring contaminated material is identified and managed appropriately,

- Formal verification of environmental permits and remaining capacity at each disposal site before spoil haulage begins.

Following implementation of the proposed mitigation measures, all waste-related impacts are expected to reduce to minor or negligible residual significance. Risks associated with spoil disposal, contamination from disposal sites, hazardous waste management, and construction waste handling are significantly reduced through characterisation, monitoring, licensed disposal, and environmental controls.

A positive opportunity has been identified during the assessments through the beneficial reuse of excavated material, with approximately 10% of spoil currently expected to be reused within the Project. The beneficial impact associated with reuse of excavated material remains moderate and positive after the mitigation measures, with opportunities to increase reuse through Lot-specific cut-and-fill optimisation studies.

Before construction begins, D+B Contractors will be required to undertake the required spoil management studies, including identification of storage and disposal sites, preparation of the construction spoil generation schedule, and preparation of a spoil and excavated material management plan identifying the final destination of surplus spoil. Other waste streams will be managed in accordance with the waste hierarchy, applicable legislation, GIIP, and the relevant requirements of the C-ESMP.

Traffic

The construction phase has been identified as the period with the greatest potential transport-related impacts, primarily due to the movement of large volumes of excavated material by heavy goods vehicles (HGVs).

The most significant pre-mitigation impacts relate to road safety, particularly in communities located along haul routes and on the secondary road network in Beykoz. The assessment estimates that up to 973 HGV movements per day could occur on some Beykoz roads that were originally designed for local traffic rather than heavy articulated vehicles.

Additional construction impacts include community severance, dust generation, pavement deterioration, temporary restrictions to emergency vehicle access, and traffic-related nuisance such as noise and visual intrusion. In contrast, impacts on the wider classified road network were assessed as relatively low, with traffic increases on major roads remaining below 20%.

To address these impacts, mitigation measures have been included in the ESMP and the D+B Contractors will prepare and implement Lot-specific Traffic and Transportation Management Plan. These measures include pavement condition surveys, vehicle registration and axle-load controls, dust and mud management, strict haulage scheduling, restrictions on night-time movements, emergency access protocols, road safety programmes, incident reporting procedures, and monitoring of traffic volumes. The Plans will also address safe routing of construction traffic, vehicle monitoring, signage, barriers and speed controls.

Particular attention will be given to traffic and road safety risks on sensitive secondary roads and within communities along construction traffic routes, including the Beykoz area. Additional traffic and road safety assessments will be undertaken where required during design finalization and before the relevant construction activities.

Following implementation of the Plan measures, most traffic impacts are expected to reduce to minor or negligible significance. Traffic congestion, emergency access restrictions, and community amenity impacts become negligible, while dust and pavement deterioration reduce to minor impacts. However, two moderate residual impacts remain: road safety risks within general haul-route settlements and on Beykoz secondary roads. These residual impacts remain

significant because pedestrians, cyclists, school children, and other vulnerable road users are considered highly sensitive receptors. Therefore, it is concluded that continuous monitoring, incident reporting, and traffic management reviews will be required throughout construction phase.

During operation, the Project is expected to provide a long-term beneficial traffic impact by transferring a portion of freight movements from road to rail. This modal shift is anticipated to reduce HGV traffic on major corridors, including the O-7 motorway.

Before construction begins, several key studies must be completed, including traffic and road safety assessments required for the relevant construction activities and the preparation and approval of the applicable Lot-specific Traffic and Transportation Management Plan by the D+B Contractors. Required permits and approvals for construction traffic arrangements will also be obtained in accordance with the Contract and applicable legislation.

Climate & GHG

The Project is expected to contribute to lower-carbon transport through the development of an electrified railway and the anticipated modal shift of freight and passenger movements from higher-emission transport modes, particularly road transport, to rail. While construction will generate GHG emissions associated with materials, earthworks, tunnelling, transport and other construction activities, long-term operational benefits are expected from the shift towards electrified rail.

The climate assessment also considered Istanbul's existing climate conditions and future climate projections. These projections indicate increasing temperatures, more frequent hot days, longer dry periods, reduced summer rainfall, and increased risks of drought, wildfire, flooding and landslides. These climate-related hazards may affect both construction activities and the long-term operation of the railway infrastructure if they are not adequately managed.

During the construction phase, key climate-related risks include heat stress affecting workers and construction equipment, increased dust generation during dry periods, flooding and waterlogging of construction areas during intense rainfall, slope instability, and wildfire risks in forested areas. These risks may affect construction safety, site access, programme continuity, equipment performance, and the stability of temporary and permanent works.

During the operational phase, climate change may affect railway infrastructure through track deformation or buckling under extreme heat, overheating of electrical and signalling systems, impacts on overhead line equipment, ballast washout, flooding of railway assets, embankment instability, wildfire damage, and rainfall-induced landslides.

To address these risks, the following mitigation and adaptation measures have been incorporated within the Project documentation and ESMP including:

- Climate-resilient design standards and thermal tolerances for railway infrastructure,
- Enhanced drainage and flood management systems,
- Slope stability, erosion control and geotechnical monitoring,
- Vegetation management and wildfire prevention measures,
- Emergency preparedness and response planning,
- Monitoring of critical assets, including drainage, slopes, electrical systems and track condition,
- Adaptive management and periodic review of climate risk assumptions as the design develops.

Following implementation of these measures, most construction and operation phase climate risks are expected to be reduced to low or medium levels. However, additional climate change

adaptation and climate resilience studies will be undertaken where required during design finalization to refine site-specific risks and confirm appropriate design, mitigation and monitoring measures.

During operation, the railway will be fully electrified, and operational GHG emissions will primarily relate to electricity consumption associated with railway operations.

Overall, although the Project will generate construction-related GHG emissions, these are expected to be outweighed over time by the operational GHG savings associated with electrified rail and modal shift. The Project is therefore expected to contribute to lower-carbon transport, support a shift away from higher-emission transport modes, and contribute to Türkiye's long-term sustainable transport and decarbonisation objectives. Climate resilience considerations will be further refined during design finalization and incorporated into the relevant Project E&S instruments and design requirements, as applicable.

Biodiversity

The Project ESIA included biodiversity baseline studies and assessments covering habitats, flora, terrestrial fauna, mammals, bats, reptiles, amphibians and birds within the Project Area and its wider Aol. These studies combined desktop review, field surveys and habitat- and species-specific assessments to identify sensitive biodiversity receptors, assess potential Project-related impacts and support the application of the mitigation hierarchy in accordance with ESS6. The ESIA also included a Critical Habitat Assessment (CHA).

In addition to the biodiversity studies undertaken as part of the ESIA, supplementary biodiversity studies were undertaken during 2025 and 2026 to update and strengthen the existing biodiversity baseline. These studies included additional seasonal field surveys covering habitats, flora, fauna, birds and geophytes. The supplementary findings were consolidated with the existing ESIA biodiversity information to provide an updated and strengthened evidence base for the Project biodiversity assessment.

Supplementary field surveys undertaken during 2025 and 2026 included additional seasonal flora, fauna, bird and geophyte surveys. Dedicated bird surveys were also undertaken during spring 2026 from fixed observation points to further assess bird presence, seasonal movements and use of the wider Project area. These supplementary findings complement, rather than replace, the baseline and biodiversity assessment already established through the ESIA.

The Project Aol is located within a region of high biodiversity value and overlaps with, or is situated close to, several nationally and internationally recognised protected and important biodiversity areas. The Project also overlaps with or is located near a number of Important Bird Areas (IBAs), Important Plant Areas (IPAs), Important Nature Areas (INAs) and Key Biodiversity Areas (KBAs). In particular, the Project overlaps with the Bosphorus Key Biodiversity Area (KBA), Pendik Valley KBA and Büyükdere Lake KBA. (See Figure 3.3)

The combined biodiversity assessment, drawing on the ESIA baseline and assessment together with the supplementary biodiversity studies. The assessment identified 10 Critical Habitat triggers, comprising 6 bird species and 4 Key Biodiversity Areas (KBAs). These findings were primarily associated with migratory bird species and populations recorded within the wider Project area. The assessment also identified 61 Priority Biodiversity Features (PBFs), including five KBAs, nine habitat types, six flora species, 17 bird species, 5 terrestrial mammal species, 15 bat species, 3 reptile species and 1 invertebrate species.

The assessment also identified important ecological connectivity corridors for bats and terrestrial fauna within the Project Area and its wider Aol. Based on habitat characteristics, landscape connectivity, 40 potential wildlife crossing locations were identified to support the continued movement of fauna across the Project corridor (See Figure 3.4). Particular attention was given to

sections where the railway alignment runs parallel to the North Marmara Motorway (KMO), as well as areas associated with wetlands, natural habitats and established wildlife movement routes. Information provided by the General Directorate of Nature Conservation and National Parks, together with findings from previous regional studies, was used to identify areas of higher ecological sensitivity and inform the proposed connectivity measures.

Potential biodiversity impacts were assessed for the design, construction and operation phases of the Project. During the detailed design stage, localised impacts on habitats and species may arise as a result of micro-realignments and design refinements. During construction, the main risks include habitat loss and degradation, disturbance to wildlife, the accidental introduction and spread of invasive species, and pollution affecting land, water and air quality. Construction activities are also expected to generate noise, vibration, lighting and increased human presence, which can disturb wildlife and reduce the ecological value of nearby habitats.

During operation, the railway may affect wildlife movement and habitat connectivity, particularly in areas where fencing, embankments, cuttings and train movements create barriers for animals. Small animals may be at risk of becoming trapped within parts of the railway infrastructure. In addition, birds and bats may be exposed to collision and electrocution risks associated with railway infrastructure and operations.

A range of measures has been incorporated into the Project design and planning to avoid, minimise and manage biodiversity impacts. These include reducing habitat disturbance where possible, preventing pollution, controlling invasive species, restoring affected areas, providing wildlife-friendly crossing opportunities, and implementing measures to reduce disturbance as well as collision and electrocution risks for birds and bats. Biodiversity monitoring will be undertaken throughout construction and operation to assess the effectiveness of mitigation measures and support adaptive management where required. The D+B Contractors will prepare and implement a Biodiversity Management Plan and, where required, a Biodiversity Action Plan as part of the applicable C-ESMP framework.

The assessment indicates that most biodiversity impacts can be reduced to low levels through the implementation of the proposed mitigation measures. However, potential impacts on bird species remain one of the key biodiversity considerations for the Project and will require continued monitoring and management throughout the Project lifecycle.

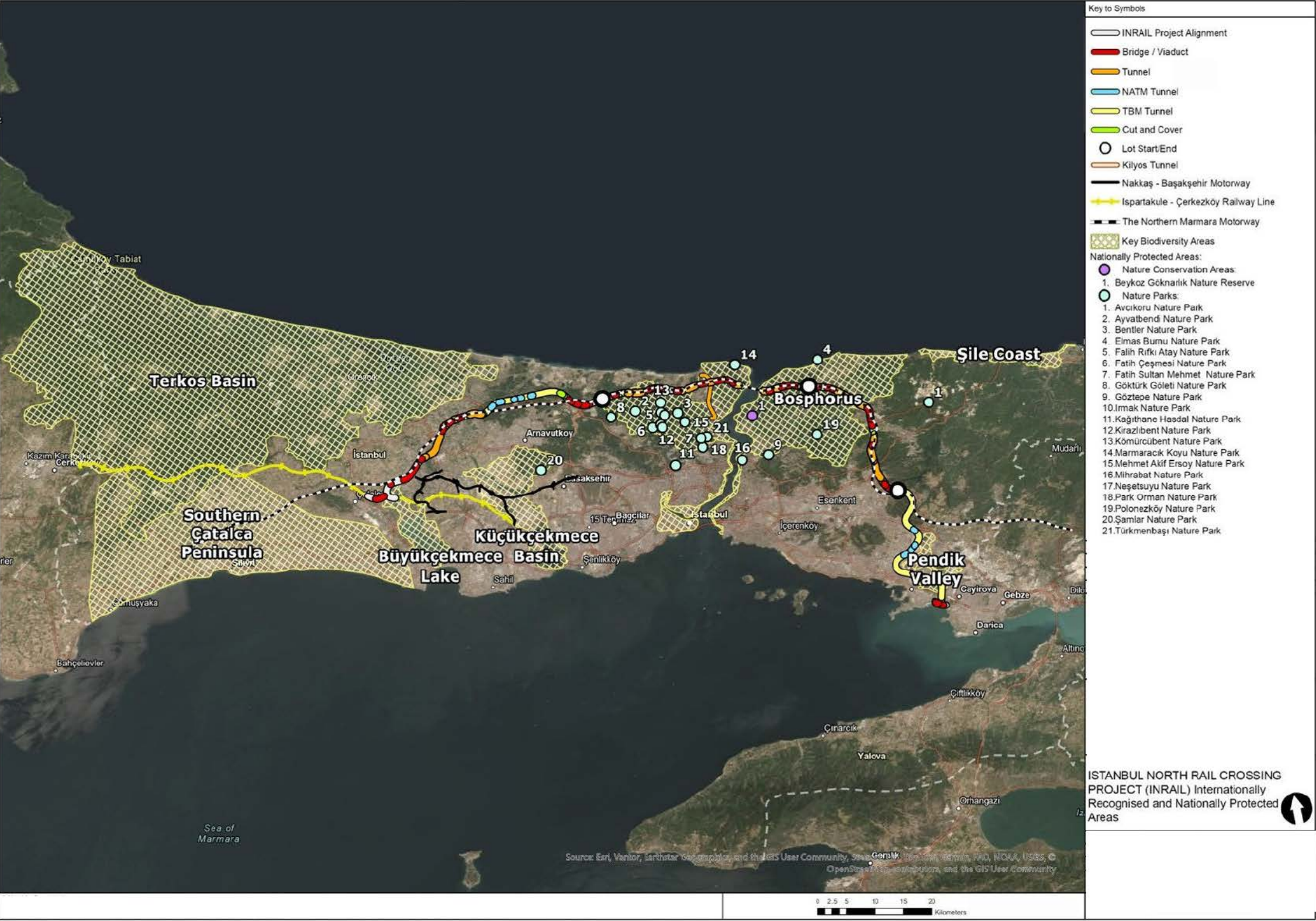


Figure 3.3: The project, internationally recognised and protected areas, and other nearby projects

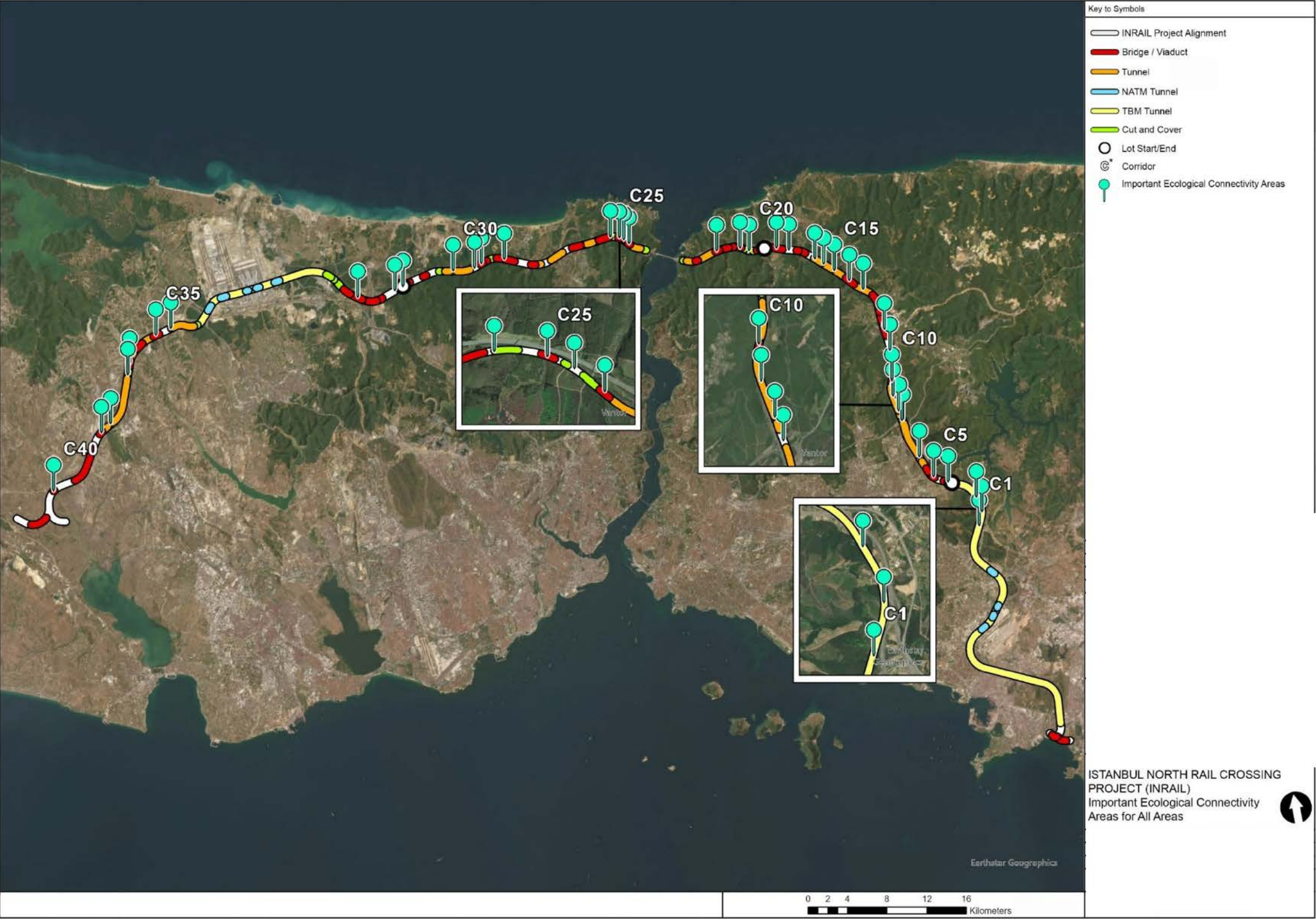


Figure 3.4: Important ecological connectivity areas

Social Impacts of the Project

Socioeconomic Conditions

The Project is expected to generate a range of socioeconomic benefits at local, regional and national levels. By modernising and enhancing railway infrastructure, the Project aims to improve transport efficiency, strengthen regional connectivity and support long-term economic development within the areas served by the railway corridor.

The Project corridor extends across Kocaeli Province and both the Asian and European sides of Istanbul, passing through 53 settlements located within the Project's Area of Influence (Aoi). The railway is expected to strengthen connectivity between industrial areas, logistics centres, ports and major transport hubs including Sabiha Gökçen Airport and Istanbul Airport, thereby supporting regional economic activity and freight transportation efficiency.

One of the most significant positive impacts of the Project will be the creation of employment opportunities during the construction phase. Construction activities are expected to require a substantial workforce, creating opportunities for direct employment as well as indirect employment through contractors, suppliers and service providers. Local businesses may also benefit from increased demand for accommodation, transportation, catering, maintenance and other support services.

Consultation activities undertaken during the Project-level ESIA process indicated that many stakeholders anticipate positive economic effects associated with employment opportunities, improved mobility and broader economic benefits associated with the Project. Local employment was identified by a number of stakeholders as an important expected benefit.

The Project is also expected to contribute to skills development through on-the-job training and workforce capacity building during construction and operation. These opportunities may provide lasting benefits for workers and local communities by enhancing employability and supporting the development of technical and professional skills. Equal access to employment and skills-development opportunities, including for women and disadvantaged groups, will also be an important consideration under the Project's social and labour management framework.

The anticipated socioeconomic benefits of the Project include:

- Creation of direct and indirect employment opportunities,
- Increased demand for local goods and services during construction,
- Opportunities for local businesses and suppliers,
- Skills development and workforce training,
- Improved railway infrastructure and transport efficiency,
- Improved regional connectivity and accessibility and
- Support for long-term economic growth and development.

The improvement of railway infrastructure is expected to enhance the efficiency, reliability and safety of rail transport within the Project area. Improved connectivity may facilitate the movement of passengers and goods, support commercial activities and contribute to regional integration. Over the long term, these improvements are expected to provide economic and social benefits for communities, businesses and transport users.

At the same time, some temporary and permanent socioeconomic impacts may occur during the construction phase. These may include temporary disruptions associated with construction traffic, noise, dust, vibration, restrictions on access and other construction-related activities. Temporary and permanent impacts on land use, livelihoods and community activities may also occur in certain locations.

Key socioeconomic impacts include:

- Temporary disturbance associated with construction activities,
- Increased construction traffic and related inconvenience,
- Temporary or permanent restrictions on access to land, properties or businesses,
- Potential impacts on livelihoods and economic activities, and
- Temporary or permanent impacts on community amenity and quality of life.

The Project seeks to avoid or minimise these impacts through careful planning, route optimisation and the development of environmental and social management measures. Where impacts cannot be avoided, and acquisition, compensation, livelihood restoration and other applicable mitigation measures will be implemented in accordance with national legislation, ESS5 and the Project's approved RF and subsequent RP/LRP, as applicable.

Overall, the Project is estimated to deliver substantial long-term socioeconomic benefits through improved railway infrastructure, enhanced connectivity, employment creation and support for regional economic development. While temporary adverse impacts may occur during construction, these impacts are expected to be managed through the measures incorporated in the ESMP and the applicable social instruments, including the SEP, LMP and RF/RP/LRP framework.

Labour and Working Conditions

The Project is anticipated to create significant employment opportunities during both construction and operation. During construction, a large workforce consisting of direct employees, contractors and subcontractors is expected to be engaged across multiple work sites and associated facilities.

The workforce will include a range of technical, operational, administrative and support personnel. The Project is expected to provide opportunities for local employment, skills development and economic benefits for nearby communities and businesses.

Stakeholders consulted during the Project-level ESIA process highlighted local employment opportunities as one of the key expected benefits of the Project and expressed interest in fair and transparent recruitment processes during construction.

Based on the current Project planning, the construction workforce is expected to peak at approximately 1,500 to 2,000 workers across the four construction lots. Given the scale of the Project and its geographically dispersed work sites, workforce management, contractor oversight and worker accommodation have been identified as important aspects of Project implementation. The final workforce numbers will depend on the construction methodology, sequencing and subcontracting arrangements adopted by the D+B Contractors.

As a large proportion of the workforce may be recruited from outside the Project area, the potential for labour influx and worker-community interactions are important social considerations. Appropriate workforce management measures, worker Codes of Conduct, awareness training and community engagement activities will be implemented to minimise potential tensions, inappropriate behaviour and risks related to gender-based violence and harassment (GBVH), and communicable diseases in line with the Project standards.

Key assessed labour-related risks and opportunities are associated with:

- Recruitment and employment practices,
- Terms and conditions of employment,
- Occupational health and safety,
- Contractor and subcontractor management,
- Worker accommodation and welfare,
- Worker grievance mechanisms,

- Prevention of child labour and forced labour,
- Non-discrimination and equal opportunity, and
- Prevention of workplace harassment and GBVH.

Given the scale of the Project and the involvement of multiple contractors and subcontractors, effective labour management is considered a key aspect of Project performance. The Project will require all contractors and subcontractors to comply with Project requirements relating to labour and working conditions and to implement appropriate management systems for their workforce. Each D+B Contractor will prepare, submit and implement a Contractor's Labor Management Plan (C-LMP) in accordance with ESS2, applicable national labour legislation and the ESCP. The C-LMP will also address labour influx management and workers' camp management.

The health and safety of workers represent a particular priority in the scope of the Project. Construction activities may involve excavation works, operation of heavy machinery, work at height, movement of vehicles and other potentially hazardous activities. Without proper controls, such activities could create risks to workers and surrounding communities.

Therefore, the Project will implement occupational health and safety procedures aligned with national requirements, WB ESS2 and international good practice. These measures will include workforce training, risk assessments, safe systems of work, emergency preparedness arrangements and regular inspections of work sites and facilities.

Where worker accommodation is provided, accommodation facilities will be managed in accordance with Workers' Accommodation: Processes and Standards Guidance developed jointly by EBRD and IFC. Appropriate standards relating to accommodation quality, sanitation, drinking water, healthcare access, welfare facilities and security arrangements will be applied. Regular inspections of workers' accommodation will also be undertaken.

Contractors and subcontractors will be required to comply with Project labour requirements including those related to worker welfare, grievance management, occupational health and safety and prevention of discrimination, child labour, forced labour, GBVH and workplace harassment.

Given the Project's reliance on multiple contractors, subcontractors and suppliers, labour management arrangements will extend throughout the supply chain and contractor hierarchy. The Project will require contractors and subcontractors and relevant suppliers and labour service providers to comply with the applicable Project labour requirements. These requirements will be cascaded through relevant subcontracts, labour service agreements and supplier arrangements, as applicable.

The Project recognises the importance of providing workers with accessible channels to raise workplace concerns. A dedicated Worker Grievance Mechanism will be maintained throughout the Project lifecycle and will be available to all direct employees, contractors and subcontractor personnel. The mechanism will allow workers to raise concerns related to working conditions, occupational health and safety, accommodation, discrimination, harassment or any other employment-related matter. Grievances may be submitted confidentially and without fear of retaliation, and all concerns will be reviewed and addressed through a transparent process.

The Project also recognises that certain categories of workers may face increased vulnerability within the workforce including women, migrant workers, workers employed through subcontractors, lower-skilled workers, workers with disabilities and other potentially disadvantaged groups. Measures will be implemented to promote equal access to employment opportunities, fair treatment, non-discrimination and inclusive working conditions throughout the Project lifecycle.

The Project will also implement measures to prevent workplace harassment, discrimination and GBVH risks. Workforce awareness and training programmes will support respectful behaviour and positive interactions within the workforce and between workers and local communities.

Through these measures, the Project seeks to promote safe, fair and inclusive working conditions while maximising the positive employment benefits associated with Project implementation.

Community Health and Safety

The construction and operation of the Project may affect the health, safety and wellbeing of nearby communities in a number of ways. The Project-level ESIA assessed potential community health and safety risks associated with construction activities, labour influx, increased traffic movements, temporary access restrictions, land acquisition processes and operation of the railway. Appropriate mitigation and management measures have been identified to avoid, minimise and manage these risks throughout the Project lifecycle. The D+B Contractors will further assess community health and safety risks during finalization of the Lot-specific ESIA/ESMP and will reflect the required measures in the C-ESMP and applicable sub-management plans.

The Project corridor extends through 53 settlements located across Kocaeli Province and the Asian and European sides of Istanbul. Social baseline studies and stakeholder engagement activities undertaken during the Project-level ESIA process identified traffic safety, construction-related nuisance, access restrictions, housing damage concerns, community wellbeing and disruption to daily activities as some of the key issues raised by local residents, mukhtars and other stakeholders.

Construction activities will take place along an approximately 127 km railway corridor and will include tunnelling works, viaduct construction, earthworks, transportation of materials and management of excavated material. Consequently, the nature and significance of impacts may vary between locations depending on proximity to construction sites, haulage routes and sensitive receptors such as residential areas, schools, healthcare facilities and community infrastructure. The Project-level ESIA identified 115 sensitive receptors along the Project corridor, including residential buildings, schools, mosques, healthcare facilities and cemeteries. Of these, 82 receptors are located within 500 m of the railway alignment and will require particular consideration during construction planning and implementation.

One of the most significant community health and safety considerations relates to construction traffic. Construction activities are expected to generate substantial movements of heavy vehicles associated with the transportation of excavated material and construction supplies. The assessments identified potential increases in traffic volumes, road safety risks and temporary disruptions to local mobility, particularly in areas where road capacity is limited. Community health and safety risks may vary across the four construction lots due to differences in settlement patterns, traffic conditions and road capacity. Traffic-related risks are expected to be more pronounced in Lots 1 and 2, where construction activities will take place in densely populated and industrialised areas with existing traffic pressures. In Lot 4, risks are expected to be associated primarily with the use of lower-capacity local roads, access to agricultural areas and the movement of construction vehicles through rural settlements. In addition, sections of the alignment in Beykoz were identified as requiring specific management measures due to road geometry constraints and anticipated heavy vehicle movements associated with excavated material transport.

The key community health and safety risks identified during the ESIA studies include:

- Increased traffic and road safety risks associated with construction vehicles and haulage activities,
- Temporary noise, dust and vibration affecting nearby communities,
- Temporary restrictions on access to properties, businesses, agricultural land and community services,
- Construction-related safety risks associated with excavation works, tunnelling activities, heavy machinery and active work sites,
- Potential interaction-related impacts between Project workers and local communities,
- Risks affecting vulnerable groups including children, elderly people, persons with disabilities and other individuals with reduced mobility,
- Risks associated with unauthorised entry into active construction areas, and
- Potential impacts on emergency access and emergency response times during periods of intensive construction activity.

The assessments also identified potential community risks associated with potential labour influx. During peak construction, approximately 1,500-2,000 workers are expected to be engaged across the Project. While workforce mobilisation may provide economic opportunities for local businesses and service providers, it may also place temporary pressure on local infrastructure and services and create risks related to community relations, communicable disease transmission and GBVH if not appropriately managed. Therefore, contractors will be required to implement workforce management measures, Codes of Conduct, awareness programmes and grievance mechanisms designed to promote respectful interactions between workers and local communities. Labour influx and worker-community interaction risks will also be addressed through the C-LMP and Community Health and Safety Management Plan, as applicable.

Stakeholders consulted during the Project-level ESIA process also expressed concerns regarding vibration, noise and the potential for damage to buildings and other structures located close to construction activities, particularly in areas where tunnelling and major civil works will be undertaken. These concerns have been considered in the design of monitoring programmes and mitigation measures that will be implemented during construction and are incorporated in the disclosed ESMP.

To minimise risks to local communities, the Project will implement a range of mitigation measures including Traffic and Transportation Management Plans, designated haulage routes, vehicle speed controls, road safety audits, driver training, community awareness activities, safety signage, controlled access arrangements and stakeholder communication programmes. Dust, noise and vibration impacts will be managed through construction planning, monitoring programmes and implementation of appropriate environmental controls. Particular attention will be given to locations where construction works are situated close to schools, residential areas, healthcare facilities and other sensitive community receptors. The D+B Contractors will also prepare and implement Community Health and Safety Management Plans.

Emergency preparedness and response arrangements will be established in coordination with emergency services, local authorities and affected communities. Measures will be implemented to maintain emergency access routes and minimise disruption to emergency response services throughout the construction period. The D+B Contractors will prepare and implement Emergency Preparedness and Response Plans. The Project will also maintain communication and grievance mechanisms to ensure that community concerns related to safety, nuisance impacts, access restrictions and construction activities can be raised and addressed in a timely manner.

During operation, the Project is expected to provide long-term community benefits through improved transport efficiency, enhanced railway safety and increased freight rail capacity across the Bosphorus. Design measures such as fencing, controlled crossings, modern signalling systems, operational safety procedures and emergency response arrangements will contribute to maintaining public safety and reducing risks to communities located near the railway corridor. Over the longer term, the Project is also expected to support a gradual shift of freight transport from road to rail, reducing pressure on regional road networks and contributing to improved transport safety and efficiency.

Land Acquisition

The Project requires land acquisition for the railway alignment, associated infrastructure and supporting facilities. Although efforts have been made to minimise land requirements through route selection, tunnelling sections and design optimisation, some impacts on landowners, land users and livelihoods cannot be completely avoided.

The ESIA studies have assessed potential impacts associated with land acquisition, restrictions on land use, physical displacement and economic displacement. The assessment considered both temporary and permanent impacts and evaluated how these impacts could affect households, businesses, farmers and other land users along the Project corridor.

Based on the current preliminary design and land acquisition information, approximately 371 land parcels may be affected by the Project. Potential land acquisition impacts are distributed across the

four construction lots and include privately owned land (244 parcels), publicly owned land (102 parcels) and parcels with mixed ownership arrangements (25 parcels). The current estimated expropriation corridor covers approximately 3.95 million m². These figures are preliminary and indicative and may change as the detailed design is finalized and the site-specific RPs are prepared.

While a significant proportion of the alignment follows existing transport corridors and tunnel sections, land acquisition requirements remain for sections of the railway alignment, stations, ancillary facilities, construction compounds, access roads and other temporary or permanent Project facilities.

The nature and significance of land acquisition impacts vary along the Project corridor. In the more urbanised sections of the alignment, impacts may be associated with residential, commercial and industrial land uses, while in rural sections, impacts may relate primarily to agricultural land, grazing areas and other land-based livelihood activities. As a result, land acquisition planning and mitigation measures will be tailored to local land use conditions and the characteristics of affected people.

Potential land-related impacts include:

- Permanent loss of privately or publicly owned land,
- Temporary occupation of land during construction,
- Restrictions on access to land, pasture areas or natural resources,
- Limited physical displacement of households or businesses in certain locations,
- Economic displacement resulting from loss of income or livelihood activities,
- Impacts on agricultural production and land-based livelihoods,
- Impacts on informal land users and users of common resources, and
- Impacts on vulnerable households and individuals.

For many affected people, the most significant impact may be related to agricultural land and livelihood activities. The Project corridor passes through areas where land is used for crop production, livestock grazing and other economic activities. Temporary or permanent loss of access to land may affect agricultural production, household income and livelihood security if not appropriately managed.

The Project-level ESIA identified landowners, co-owners, formal land users, informal land users and users of common resources such as grazing areas among the groups that may potentially be affected by land acquisition activities. Particular attention will be given to agricultural land users, livelihood-dependent households and individuals who may not possess formal land tenure documentation but rely on affected land or resources for their livelihoods.

The assessments also identified the potential for economic displacement. Economic displacement may occur where Project activities result in reduced access to land, loss of agricultural production, disruption to business activities or loss of income-generating opportunities. These impacts may affect farmers, agricultural workers, businesses, employees and other individuals who depend on land or local economic activities for their livelihoods.

In some locations, Project activities may affect residential, commercial, agricultural or ancillary structures. Where such impacts occur, appropriate compensation, relocation assistance and livelihood restoration measures will be implemented in accordance with Project commitments and applicable requirements. The Project seeks to avoid physical displacement wherever feasible through design optimisation and careful planning of construction activities.

Potential for both physical (limited) and economic displacement in certain locations has been identified. While detailed impacts will continue to be refined during detailed design and preparation of the applicable RPs/LRPs, particular attention will be given to households, businesses, agricultural land users, informal users and other affected persons whose assets, income sources or access to land may be affected by Project activities.

Consideration has been given to vulnerable households and informal land users. These groups may face greater challenges in adapting to Project-related changes and restoring their livelihoods following

Project impacts. The stakeholder engagement process undertaken as part of the Project-level ESIA identified potentially vulnerable groups including women-headed households, elderly persons, persons with disabilities, economically vulnerable households and other individuals with limited capacity to cope with livelihood disruption. Additional support measures will be considered where required.

The Project has adopted a mitigation hierarchy that prioritises avoiding and minimising displacement wherever feasible. Design decisions have sought to significantly reduce impacts on people, assets and livelihoods through route optimisation, use of tunnels and utilisation of existing transport corridors where possible. Where impacts cannot be avoided, affected people will be informed, consulted and provided with opportunities to participate in decisions affecting them.

Compensation and assistance measures will be implemented in accordance with applicable national legislation and WB ESS5 requirements. The objective is to ensure that affected persons are treated fairly and that livelihoods are restored, and where feasible improved, following Project-related impacts.

A Resettlement Framework (RF) has been prepared and disclosed to guide the management of land acquisition, physical displacement and livelihood restoration activities in line with WB ESS5 and international good practice. The RF establishes the principles, eligibility criteria and procedures applicable throughout Project implementation and defines the approach for consultation, compensation, livelihood restoration and grievance management.

Following finalization of the detailed design, AYGM will prepare and implement the applicable Resettlement Plans and Livelihood Restoration Plans (RP/LRPs), as required, in accordance with the RF and ESS5. Detailed census, socioeconomic and asset surveys will be undertaken as part of the applicable resettlement planning process. No civil works may commence on any section until the applicable RP has been prepared, consulted upon, approved, disclosed and implemented to the extent necessary to provide lawful and unencumbered access to the relevant site.

For each relevant section or sub-section, the CSC/Engineer will prepare a Sectional RP Completion Report; AYGM will review and clear the report; the PIOC will independently review it and provide its recommendation to the World Bank; and the World Bank will issue its No-Objection. Only after receipt of the World Bank's No-Objection will AYGM issue formal land-access clearance. The D+B Contractor may not access the land or commence construction before such clearance is issued.

Cultural Heritage

The Project area contains a number of cultural heritage resources including archaeological remains, historic assets and locations that may hold cultural significance for local communities. Desktop studies and a walkover survey undertaken between 22 and 25 May 2025 identified 51 registered and unregistered cultural heritage sites/assets within the Project route and its 400 m impact corridor. These include archaeological and historical assets requiring consideration during detailed design and construction planning. Particular attention has been given to potential impacts associated with excavation works, tunnelling activities, earthworks and vibration-generating construction activities.

The ESIA studies assessed potential impacts on both designated and non-designated cultural heritage resources located within or near the Project corridor. The Cultural Heritage Management Plan (CHMP) further defines the applicable management, mitigation, monitoring, training and Chance Find requirements for Project activities that may affect cultural heritage. Cultural heritage contributes to the identity, history and cultural values of local communities. Therefore, protecting these resources is an important component of the Project planning and implementation.

Potential impacts on cultural heritage may include:

- Disturbance of known archaeological resources during construction activities,
- Accidental damage to cultural heritage assets resulting from excavation works,
- Vibration-related impacts on nearby heritage structures,
- Temporary restrictions on access to culturally significant locations,

- Changes to the setting or visual character of heritage assets, and
- Discovery of previously unidentified archaeological remains during construction.

Most potential impacts are associated with construction activities involving excavation, tunnelling, earthworks and the movement of heavy equipment. Ground disturbance activities may create risks for archaeological resources known to exist within the Project area, as well as previously unidentified resources that may be encountered during construction. Therefore, particular attention will be required in areas where underground works and deep excavations are planned in the scope of the Project.

The ESIA studies considered both direct and indirect impacts on cultural heritage. Direct impacts may occur where heritage resources are physically affected by construction activities, while indirect impacts may arise through vibration, noise, temporary access restrictions or increased activity in the vicinity of heritage locations. Construction-induced vibration has been identified as a particular consideration for sensitive heritage assets located near certain sections of the alignment. The CHMP includes specific controls for vibration-generating activities and requires protection and monitoring measures in the vicinity of known heritage assets.

The Project seeks to avoid impacts on cultural heritage wherever practicable through route planning, design optimisation and implementation of appropriate management measures. Known cultural heritage sites will be avoided where feasible, and the applicable protection measures, buffer zones, monitoring requirements and authority approvals will be incorporated into detailed design and construction planning. Additional investigations, surveys and consultations may be undertaken in culturally sensitive areas where further information is required prior to construction.

Consultation and coordination with relevant authorities, Museum Directorates, Regional Councils for the Conservation of Cultural Property, Provincial Directorates of Culture and Tourism and other stakeholders will continue throughout Project implementation to ensure that cultural heritage resources are appropriately managed and protected. Cultural heritage management will be undertaken in consultation with qualified specialists to ensure that archaeological, historical and culturally significant resources are identified, documented and managed in accordance with applicable requirements.

A Chance Find Procedure will be implemented throughout construction. Under this procedure, construction activities will stop immediately at the location of the discovery if previously unknown archaeological remains, artefacts or other cultural heritage materials are discovered. A temporary buffer zone will be established and the site will be secured. The cultural heritage/archaeological monitoring expert will notify the Contractor's site management and the relevant Museum Directorate, and the find will be assessed in accordance with the applicable national procedures. Construction may resume only after the required assessment and actions under the Chance Find Procedure have been completed and the relevant clearance to resume work has been provided.

The D+B Contractors will implement the lot specific Cultural Heritage Management Plan and Chance Find Procedure and ensure that relevant personnel, including site supervisors and machine operators, receive appropriate cultural heritage awareness and Chance Find training. Cultural heritage incidents and chance finds will also be reported in accordance with the Project's E&S monitoring and incident-reporting requirements.

These measures are intended to ensure that cultural heritage resources are identified, protected and managed responsibly throughout the Project lifecycle while preserving their cultural, historical and archaeological value for future generations.

Management & Monitoring of E&S Impacts of the Project

Management of E&S Impacts

To ensure that environmental and social (E&S) risks and impacts are effectively managed throughout the Project lifecycle, a comprehensive E&S management framework will be implemented. This framework establishes the arrangements for identifying, assessing, mitigating, monitoring, and reporting environmental and social risks associated with the Project and ensures compliance with national legislation, the World Bank Environmental and Social Framework (ESF), the Project E&S instruments, and international good practice. An ESMP incorporating the mitigation and monitoring measures has been prepared and disclosed.

Assessment and Management of Environmental and Social Risks and Impacts

The Project E&S management framework includes a range of management plans and procedures developed by AYGM and the D+B Contractors.

The following plans have already been developed or will be managed by AYGM's Project Implementation Unit (PIU):

- SEA/SH Action Plan and Accountability Response Framework, addressing the prevention of sexual exploitation, abuse and sexual harassment and establishing response mechanisms.
- Cultural Heritage Management Plan and Chance Find Procedure, setting out measures to protect known cultural heritage resources and manage any unexpected archaeological or cultural heritage discoveries during construction. Lot specific Cultural Heritage Management Plan and Chance Find Procedure will also be prepared and implemented by the D+B Contractors in accordance with the Project E&S instruments.

Prior to construction, each D+B Contractor will prepare and implement a suite of management plans tailored to its respective Project lot. These plans will include:

- Contractor's Environmental and Social Management Plan
- Biodiversity Management Plan / Biodiversity Action Plan
- Waste Management Plan within the C-ESMP
- Chemical and Hazardous Material Management Plan within the C-ESMP
- Air Quality Management Plan within the C-ESMP
- Noise Management Plan within the C-ESMP
- Water and Wastewater Management Plan within the C-ESMP
- Pollution Prevention and Control Plan within the C-ESMP
- Occupational Health & Safety Plan and Procedures
- Emergency Preparedness and Response Plan
- Blasting Management Plan within the C-ESMP
- Traffic/Transportation Management Plan
- Community Health and Safety Management Plan
- Sexual Exploitation Abuse and Sexual Harassment Action Plan

- Cultural Heritage Management Plan and Chance Find Procedure
- Resource Efficiency Management Plan within the C-ESMP
- Restoration and Revegetation Plan within the C-ESMP
- Environmental, Social, Health and Safety Training Management Plan within the C-ESMP
- Labor Influx Management Plan within the C-LMP
- E&S Contractor Management Framework within the C-ESMP
- Preliminary Land Management Framework within the C-ESMP
- Security Management Plan
- Worker's Camp Management Plan within the C-LMP
- Excavated Material & Land Management Plan within the C-ESMP
- E&S Change Management Procedure

Together, these plans and procedures will define the mitigation measures, monitoring requirements, responsibilities, and reporting procedures necessary to manage Project-related environmental and social risks during construction and operation. The effectiveness of the Project E&S management framework and its associated management plans will be regularly monitored by AYGM, the D+B Contractors, and the relevant Project supervision and oversight entities throughout Project implementation.

Labour and Working Conditions

Key measures include:

- Implementation of the Project LMP and Contractor's Labor Management Plan (C-LMP), including applicable workforce management measures,
- Occupational health and safety training and supervision,
- Worker grievance mechanisms,
- Prevention of child labour, forced labour and discrimination,
- Management of worker accommodation facilities where required,
- Implementation of Codes of Conduct and GBVH prevention measures, and
- Monitoring of contractor and subcontractor compliance.

Resource Efficiency and Pollution Prevention and Management

Key measures include:

- Implementation of resource efficiency and pollution prevention measures in accordance with Project commitments and applicable requirements,
- Identification, assessment, and management of environmental risks and impacts related to emissions, waste, wastewater, noise, and hazardous materials,
- Efficient use of energy, water, raw materials, and other natural resources throughout Project activities,
- Monitoring and control of air emissions, effluents, waste generation, and greenhouse gas (GHG) emissions where applicable,
- Application of waste management measures based on the principles of reduction, reuse, recycling, recovery, and safe disposal,
- Prevention and mitigation of pollution incidents through appropriate operational controls, emergency preparedness, and response measures,

- Consultation and communication with relevant stakeholders regarding significant environmental risks and mitigation measures where required.

Community Health and Safety

Key measures include:

- Traffic and Transportation Management Plans and designated haulage routes,
- Road safety measures, vehicle controls and driver training,
- Community awareness and communication activities,
- Site security and controlled access to construction areas,
- Measures to manage noise, dust and vibration impacts,
- Emergency preparedness and response arrangements, and
- Ongoing engagement with affected communities.

Land Acquisition, Restrictions on Land Use and Involuntary Resettlement

Key measures include:

- Implementation of the Resettlement Framework through applicable RPs and, where required, LRPs prepared and implemented by AYGM,
- Consultation with affected persons throughout land acquisition processes,
- Compensation in accordance with Project commitments and applicable requirements,
- Livelihood restoration measures where required,
- Additional support for vulnerable households and affected persons,
- Accessible grievance mechanisms for land-related concerns, and
- Completion of the applicable resettlement measures and formal land-access clearance before the D+B Contractor accesses the relevant land or commences works.

Biodiversity Conservation and Sustainable Management of Living Natural Resources

Key measures include:

- Avoiding and minimising impacts on important habitats and biodiversity-sensitive areas during the final design process, including the consideration of ecological connectivity requirements,
- Limiting vegetation clearance and land disturbance to the minimum area required for construction,
- Restoring temporarily disturbed areas and implementing habitat reinstatement measures where practicable,
- Preventing pollution of soil, surface water, groundwater and air through the implementation of good construction practices and pollution control measures,
- Preventing the introduction and spread of invasive species through appropriate site management and biosecurity measures,
- Managing construction activities to reduce disturbance to wildlife from noise, vibration, lighting and human presence,
- Maintaining wildlife movement and habitat connectivity through the provision of appropriate crossing structures and fauna-friendly design measures,
- Installing measures to reduce the risk of small animals becoming trapped within railway infrastructure,
- Implementing measures to minimise collision and electrocution risks for birds and bats,
- Undertaking pre-construction surveys, ecological monitoring and adaptive management measures where required to protect sensitive species and habitats,
- Delivering biodiversity training and awareness programmes for construction personnel and contractors,

- Monitoring the effectiveness of mitigation measures throughout construction and operation and implementing corrective actions where necessary,
- Preparation and implementation of the Biodiversity Management Plan and, where required, Biodiversity Action Plan.

Cultural Heritage

Key measures include:

- Protection of known cultural heritage resources,
- Consultation with relevant cultural heritage authorities,
- Monitoring of works in culturally sensitive areas,
- Management of vibration-related risks where relevant, and
- Implementation of the Cultural Heritage Management Plan and the Chance Find Procedure.

Stakeholder Engagement and Information Disclosure

Key measures include:

- Implementation of the Stakeholder Engagement Plan (SEP),
- Ongoing information disclosure and stakeholder consultations,
- Community Liaison Officer (CLO) engagement activities,
- Operation of Project grievance mechanisms, and
- Monitoring and resolution of stakeholder concerns.

Implementation of these measures will be supported by regular monitoring, inspections, audits and reporting by the D+B Contractors and through supervision by the CSC/Engineer, with overall E&S oversight by AYGM. The PMC will support AYGM in coordination, review and reporting, while the PIOC will provide independent monitoring, audit and assurance. Monitoring results will be reviewed throughout Project implementation to verify compliance, assess effectiveness and identify any corrective or additional actions required to maintain environmental and social performance.

Monitoring of E&S Impacts

The Project will implement a comprehensive monitoring and reporting programme to verify that environmental and social commitments, mitigation measures and management plans are effectively implemented throughout the construction and operation phases. Monitoring requirements identified in the ESIA studies, ESMP and associated management plans will be integrated into Project implementation and contractor management processes.

Monitoring will enable the Project to assess whether impacts are occurring as predicted, evaluate the effectiveness of mitigation measures, identify unforeseen issues at an early stage and implement corrective actions where necessary. Monitoring activities will also support adaptive management, ongoing stakeholder engagement and continuous improvement of Project environmental and social performance.

Monitoring activities will include information obtained through stakeholder consultations, grievance mechanisms, site inspections, audits, contractor reporting and community engagement activities. This information will be used to identify emerging issues, recurring concerns and opportunities for improvement throughout the Project lifecycle.

Resource Use, Pollution Prevention and Management monitoring will include review of:

- Resource consumption, including water, energy, fuel and raw material use,
- Waste generation, segregation, storage, recycling and disposal practices,
- Hazardous materials and chemical storage, handling and management,
- Air emissions, including dust generation and the effectiveness of dust suppression measures,

- Surface water and groundwater quality, including the effectiveness of pollution prevention controls,
- Spill prevention, containment and response performance,
- Noise and vibration levels associated with construction activities,
- Compliance with waste management, pollution prevention and environmental permit requirements,
- Environmental incidents, non-conformities and corrective actions related to pollution events,
- Effectiveness of resource efficiency, waste minimisation and pollution control measures implemented during construction.

Labour and working conditions monitoring will include:

- Workforce numbers and composition,
- Employment practices and contractor compliance,
- Occupational health and safety performance,
- Worker training and awareness activities,
- Worker grievances and grievance resolution,
- Workforce welfare and accommodation conditions where applicable,
- Implementation of measures related to prevention of child labour, forced labour, discrimination and GBVH, and
- Performance of contractors and subcontractors against Project labour requirements.

Occupational Health and Safety monitoring will include review of:

- Occupational health and safety incidents, near misses and lost-time injuries,
- Compliance with site health and safety procedures, permits-to-work and safe systems of work,
- Use and adequacy of personal protective equipment (PPE),
- Workforce training, competency and health and safety awareness programmes,
- Hazard identification, risk assessments and implementation of control measures,
- Workplace inspections, audits and corrective action tracking,
- Management of high-risk activities, including working at height, lifting operations, excavation works, confined space entry and electrical works,
- Worker welfare facilities and occupational health arrangements,
- Emergency preparedness, response drills and incident investigation outcomes,
- Compliance with applicable occupational health and safety legislation, standards and project-specific management plans.

Community health and safety monitoring will include review of:

- Traffic incidents and road safety performance,
- Implementation of Traffic and Transportation Management Plans,
- Community complaints and grievances,
- Noise, dust and vibration-related concerns,
- Community health and safety incidents associated with construction activities,
- Effectiveness of measures implemented for vulnerable groups and sensitive receptors, and
- Emergency preparedness and response performance.

Land acquisition and livelihood restoration monitoring will include:

- Progress of land acquisition activities,
- Delivery of compensation and assistance measures,
- Implementation of livelihood restoration activities,
- Support provided to vulnerable households and affected persons,
- Resolution of land-related grievances,

- Verification of commitments established under the Resettlement Framework, and applicable RP/LRPs,
- Monitoring of livelihood restoration outcomes and recovery of affected households where applicable.

Biodiversity Conservation and Sustainable Management of Living Natural Resources

- Contractor daily and weekly records of BMP implementation and mitigation measures, with monthly reporting through the Project E&S reporting arrangements.
- Seasonal biodiversity monitoring reports prepared following each monitoring period.
- Integration of seasonal monitoring results into regular biodiversity performance reporting.
- Recording and reporting of biodiversity-related incidents and corrective actions.
- Construction-phase biodiversity monitoring will include habitat monitoring, terrestrial flora monitoring, terrestrial fauna monitoring, topsoil monitoring, aquatic habitat and fauna monitoring, and monitoring of habitat restoration and reinstatement activities.
- Operational biodiversity monitoring will include surveys of birds, bats, terrestrial fauna, aquatic fauna and habitats, flora, and invasive species, together with monitoring of the effectiveness and use of wildlife crossing structures, including overpasses and underpasses, by animal species.
- Biodiversity monitoring will be implemented on a Lot-specific basis using measurable habitat- and species-level indicators and will support adaptive management where monitoring identifies unexpected impacts, underperformance or ineffective mitigation.

Cultural Heritage

Cultural heritage monitoring will include implementation of cultural heritage management measures, monitoring of sensitive heritage locations, oversight of construction activities in culturally sensitive areas and verification that the Chance Find Procedure is correctly applied whenever required.

Grievance Management

The Project will maintain separate grievance mechanisms for workers and external stakeholders throughout the Project lifecycle. Information received through these mechanisms will be reviewed regularly to identify recurring issues, emerging trends and areas requiring additional management attention.

Monitoring activities will be undertaken by the D+B Contractors and relevant specialists, with routine supervision and verification by the CSC/Engineer and overall E&S oversight by AYGM. The PMC will support AYGM in coordination, review and reporting, while the PIOC will undertake independent monitoring, audit and assurance activities. Monitoring results will be reviewed on a regular basis and reported through Project management systems. Where monitoring identifies non-compliance, unforeseen impacts or areas requiring additional attention, corrective and preventive actions will be developed, implemented and tracked to closure.

The D+B Contractors will submit monthly E&S monitoring reports, including monitoring results and trends, labour and grievance information, incidents and corrective actions, training activities and summaries of ESHS inspections, audits and non-compliances.

Through this adaptive management approach, the Project aims to ensure compliance with Project commitments, applicable national requirements and relevant Project standards, including WB requirements, while maintaining and continuously improving environmental and social performance throughout construction and operation.

Stakeholder Engagement

Stakeholder engagement has been an important component of the Project development process and will continue throughout construction and operation. The Project seeks to maintain open, transparent

and inclusive communication with affected communities, government authorities, businesses, civil society organisations and other interested stakeholders.

Stakeholder engagement activities undertaken to date covered 53 settlements located within the Project Aol across Kocaeli Province and the districts of Tuzla, Pendik, Sultanbeyli, Sancaktepe, Çekmeköy, Beykoz, Sarıyer, Eyüpsultan, Arnavutköy and Çatalca. The total population of settlements located within the Aol is estimated at approximately 539,236 people.

As part of the Project-level ESIA process, stakeholder engagement activities have been undertaken to provide information about the Project, understand stakeholder concerns and gather feedback regarding potential environmental and social impacts. Information received during these consultations has been considered during Project planning and assessment.

A Stakeholder Engagement Plan (SEP) has been prepared in the scope of the Project-level ESIA process to guide stakeholder engagement activities throughout the Project lifecycle. The SEP identifies key stakeholder groups, defines engagement objectives and outlines the methods that will be used to disclose Project information and obtain stakeholder feedback.

According to the SEP prepared as part of the Project-level ESIA process, stakeholder engagement activities were undertaken through a multi-phase consultation programme and followed by further social studies and consultations. These activities included consultations with local communities, households, mukhtars, municipalities, government authorities, NGOs, media organisations and other interested stakeholders located along the Project corridor.

In total, Project-level ESIA consultations covered 53 settlements located within the Project Aol and included interviews with approximately 802 households, consultations with 48 mukhtars, focus group discussions, meetings with local authorities and engagement with NGOs and other stakeholders located along the Project corridor. Of the 53 planned mukhtar interviews, 48 were completed, including 10 remotely and 38 face-to-face. Feedback received during consultations highlighted concerns related to construction traffic, road safety, noise, vibration, dust, access restrictions, housing damage, land acquisition and community safety. These issues have been considered during the impact assessment and development of mitigation measures.

Stakeholder engagement will continue and will be further refined during detailed design and implementation. The stakeholder list and engagement arrangements will be updated by the D+B Contractors, as applicable, to reflect the final design, Project footprint, land-acquisition requirements, construction methodology and Lot- and site-specific areas of influence. Continued engagement with municipalities, local authorities, affected communities and other relevant stakeholders will support consideration of local development plans, land-use issues, access arrangements and emerging Project-related E&S risks and impacts.

Key stakeholder groups identified for the Project include:

- Local communities located within or near the Project area,
- Landowners, land users and potentially affected households,
- Local businesses and economic actors,
- Municipalities and other government authorities,
- Community representatives and local organisations, and
- Vulnerable or disadvantaged groups who may experience Project impacts differently from the general population.

The SEP also identified Project-Affected Parties (PAPs), other interested parties and disadvantaged or vulnerable individuals and groups. Particular attention has been given to women-headed households, elderly people, persons with disabilities, illiterate individuals and non-Turkish-speaking community members to ensure meaningful participation throughout the Project lifecycle. During implementation, the D+B Contractors will also assess potential barriers to participation for vulnerable groups and apply targeted and inclusive engagement measures, including through the Vulnerability Assessment.

The Project is committed to ensuring that stakeholders are provided with timely, accurate and accessible information regarding Project activities, potential impacts and proposed mitigation measures. Engagement activities will be tailored to the needs of different stakeholder groups and will seek to encourage meaningful participation throughout Project implementation.

Engagement methods may include public meetings, community consultations, meetings with local authorities and community representatives, disclosure of Project information through appropriate communication channels and targeted engagement activities with vulnerable groups.

In accordance with the SEP, Project information will be disclosed through a combination of public consultation meetings, brochures, posters, presentations, a Project-specific website, social media platforms and Frequently Asked Questions (FAQ) documents. Information will be provided in formats accessible to different stakeholder groups and, where necessary, interpretation and translated materials will be made available to facilitate participation of non-Turkish-speaking stakeholders.

Stakeholder engagement will continue throughout construction and operation to ensure that communities remain informed about Project progress and have opportunities to provide feedback on Project activities and performance.

CLOs will support engagement activities during construction and operation, facilitate communication between the Project and local communities, and help ensure that stakeholder concerns and feedback are appropriately communicated and addressed.

The Project recognises that meaningful stakeholder engagement contributes to better Project outcomes by strengthening communication, promoting transparency and supporting effective management of environmental and social issues.

The environmental and social documentation are disclosed through the AYGM website: <https://aygm.uab.gov.tr/istanbul-kuzey-demiryolu-gecisi-projesi>

Grievance Mechanism

The Project will maintain accessible grievance mechanisms to allow stakeholders and Project workers to raise concerns, submit complaints, request information or provide feedback regarding Project activities. In line with the SEP, the grievance mechanism has been designed to provide an accessible, transparent and structured process for receiving, recording, investigating and resolving stakeholder concerns throughout the Project lifecycle. The grievance mechanisms are intended to support transparent communication, encourage early identification of issues and facilitate timely and effective resolution of concerns.

A Project-level Community Grievance Mechanism will be available throughout construction and operation. The mechanism will be accessible to all stakeholders including affected communities, landowners, businesses, community organisations and vulnerable groups. Stakeholders will be able to submit concerns and complaints free of charge and without fear of retaliation.

Grievances may relate to a variety of Project issues including:

- Construction traffic and road safety,
- Noise, dust and vibration,
- Community health and safety,
- Land acquisition and livelihood impacts,
- Access restrictions,
- Environmental impacts,
- Construction-related disturbances, and
- General Project enquiries and requests for information.

To ensure accessibility, grievances may be submitted through multiple communication channels. These channels include, and will be further supplemented as Project implementation progresses, direct contact with CLOs, contractor public relations offices, telephone and e-mail communication, online submission channels and nationally established systems such as CİMER. Other existing official channels, including YİMER and the World Bank's grievance redress mechanisms, will also remain available, as applicable. The Project will also provide opportunities for anonymous submissions.

In accordance with the SEP, grievances will be recorded in the grievance tracking system, acknowledged within two (2) working days, and managed through defined review and resolution procedures. A substantive response will be provided within fifteen (15) working days, including proposed corrective actions where applicable. Where resolution cannot be achieved within this period, the complainant will be informed of the reasons for the delay and the expected timeframe for resolution. Corrective actions will be monitored until closure.

CLOs will play an important role in facilitating communication between the Project and local communities and will serve as one of the primary points of contact for stakeholder enquiries and grievances. Information regarding grievance channels and procedures will be disclosed to stakeholders throughout the Project lifecycle.

All grievances will be recorded, reviewed and tracked through a structured grievance management process. Grievance records, status, trends, response times, corrective actions and overdue cases will form part of Project monitoring and reporting.

Where complainants are not satisfied with the proposed resolution, escalation and appeal mechanisms will be available through higher-level review processes.

In addition to the community grievance mechanism, the Project will maintain a dedicated Worker Grievance Mechanism for Project workers, including contractor and subcontractor personnel, in accordance with the applicable LMP/C-LMP arrangements. This mechanism will enable workers to raise concerns related to working conditions, occupational health and safety, accommodation, discrimination, harassment and other employment-related matters. Workers will be able to submit concerns confidentially and without fear of retaliation. Special provisions will also be available for sensitive complaints including those related to GBVH.

If a complainant is not satisfied with the proposed resolution, the grievance may be referred to higher-level review processes including a Grievance Redress Committee (GRC), in accordance with Project procedures. The GRC will be activated where a grievance cannot be satisfactorily resolved at the initial level.

The grievance mechanism will include special provisions for sensitive complaints including those related to GBVH. Such complaints will be managed confidentially and in accordance with survivor-centred principles. Separate grievance channels will also be available for Project workers through the Worker Grievance Mechanism. SEA/SH-related complaints may also be submitted anonymously and will be handled through dedicated confidential procedures in accordance with the SEP and applicable E&S instruments.

Information obtained through grievance mechanisms will be reviewed regularly to identify recurring issues, emerging trends and opportunities for improving Project performance. Grievance statistics, resolution outcomes and corrective actions will form part of the Project's environmental and social monitoring programme and will support ongoing engagement with stakeholders throughout the Project lifecycle.

Further Information & Contact Details

Project preparation documents are available on the AYGM website (<https://aygm.uab.gov.tr/>).

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