AYGM

HALKALI-ISPARTAKULE-CERKEZKOY RAILWAY LINE

Environmental and Social Impact Assessment



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MATERIALS AND WASTE

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13 MATERIALS AND WASTE

13.1 INTRODUCTION

13.1.1. This chapter reports the findings of the assessment of the potential materials and waste effects of the Project during the construction phase. For this phase of the Project, the type, source and significance of potential effects are identified, and the measures that will be employed to minimise these described. Operational phase effects have not been assessed as these are considered to not be significant and will comprise of minor repair and maintenance activities only.

13.2 LEGISLATIVE FRAMEWORK, POLICY AND GUIDANCE

INTERNATIONAL

EIA Directive (2014/52/EU)

13.2.1. The EIA Directive[200] provides the overarching legislative framework for assessing the significance of impacts and effects from projects on the environment.

13.2.2. The Directive requires that environmental assessment takes a full account of the “nature and quantity of materials” used on a project, to ensure that “resource efficiency (is) increased”. The Directive also requires a description of the “material assets” which will be significantly affected by a project, as well as a description of the “quantities and types of waste produced during the construction and operation phases”.

Waste Framework Directive (2008/98/EC)

13.2.3. The Waste Framework Directive[201] sets the basic concepts and definitions related to waste management and lays down waste management approaches such as the ‘polluter pays principle’.

13.2.4. It provides a comprehensive foundation for the management of waste across the European Community and provides a common definition of ‘waste’:

“…any substance or object which the holder discards or intends or is required to discard”

13.2.5. The Waste Framework Directive also sets out the Waste Hierarchy, depicted in **Figure 13-1**, against which action to reduce the production and disposal of waste shall be taken.

[200] European Commission (EC) (2014). The Environmental Impact Assessment Directive (2014/52/EU).
[201] EC (2008). The Waste Framework Directive (2008/98/EC).

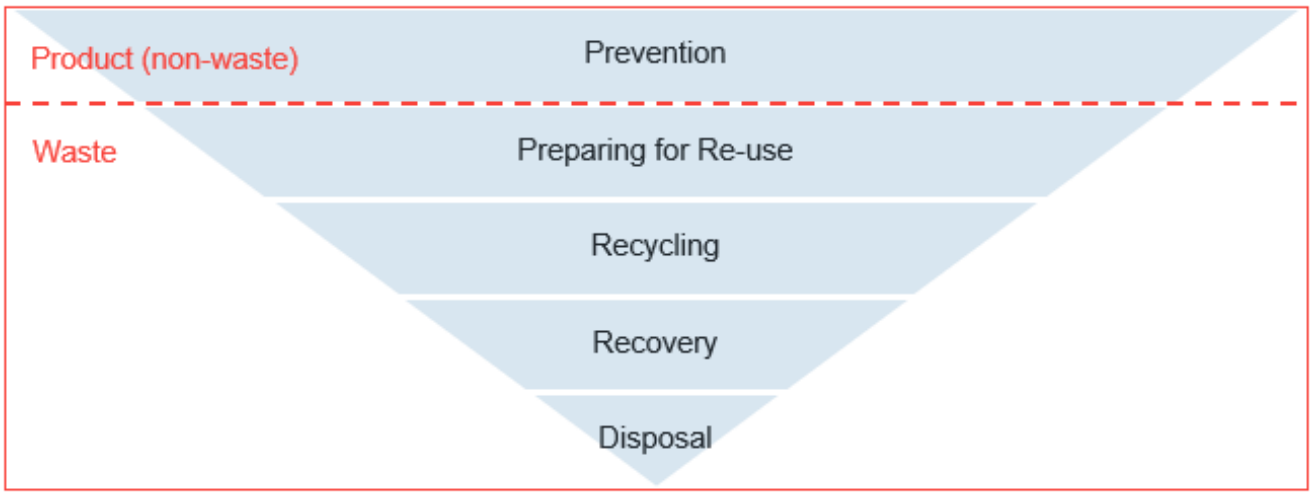


Figure 13-1 - Waste Hierarchy

13.2.6. The main principles of the Waste Hierarchy are[202]:

- Prevention – using less material in design and manufacture; keeping products for longer; re use; using less hazardous materials;
- Preparing for reuse – checking, cleaning, repairing, refurbishing, whole items or spare parts;
- Recycling – turning waste into a new substance or product; can include composting if materials meet quality protocols;
- Recovery – anaerobic digestion; incineration with energy recovery; gasification and pyrolysis which produce energy (fuels, heat and power); recovering materials from waste; some backfilling; and
- Disposal – landfill and incineration without energy recovery.

Directive 1999/31/EC on the Landfill of Waste

13.2.7. The Directive on the Landfill of Waste[203] aims to prevent, or reduce as far as possible, negative effects on the local environment (in particular the pollution of surface water, groundwater, soil and air) and on the global environment, including changes to the climate, as well as any resulting risk to human health, from the landfilling of waste, during the lifecycle of the landfill. The Directive sets out the waste acceptance procedures for different classes of landfill (hazardous, non-hazardous and inert). Although the Project will, wherever practicable, seek to minimise waste, some arisings are likely to require disposal to landfill.

[202] Defra (2011). Guidance on applying the Waste Hierarchy.
[203] EC (1999). Directive 1999/31/EC on the Landfill of Waste.

NATIONAL

13.2.8. The Environment Law No.2872 entered into law in 1983, being amended in 2006 and 2018 (Law No.5491 and Law No.7115 respectively). The Law forms the basis for all major environmental regulations in Turkey. Article 8 of the Law, titled 'Precautions and Prohibitions Regarding Environmental Protection – Prohibition of Pollution', states that "it is prohibited to diffuse, directly and indirectly, all kinds of waste and scraps into recipient environment, store, transport, avert, and conduct similar activities by violating the standards and methods determined by corresponding regulations, and causing damage to the environment"[204].

Zero Waste Regulation (2019)

13.2.9. The Regulation to establish and develop a zero-waste management system in Turkey was published in the Official Gazette No. 30829 in 2019. The Regulation regulates the principles and processes of a zero-waste management system including training, waste prevention and recycling.

13.2.10. The regulations are compulsory for a range of industries including public institutions, iron, steel and plastic industries, recycling facilities and local administrations. Train terminals are required to obtain more than the basic level certification (either silver, gold or platinum) depending on the points awarded under the scoring system regulated by the Ministry of Environment and Urbanisation[205].

Regulation on Waste Management (2015) (amended 2017)

13.2.11. The Regulation on Waste Management was published in the Official Gazette No.29314 in 2015[206]. The overarching aims of the Regulation are to ensure that waste is managed and disposed without harming the environment or human health. The use of natural resources should be reduced through action that minimises waste generation, recovers and reuses waste, and encourages recycling and energy recovery from waste.

13.2.12. Responsibilities for the waste producer and owner are set out in Article 9 of the Regulation, which includes minimising and segregating waste; developing a waste management plan; record keeping and disposal of waste to licenced waste facility operators.

13.2.13. The amended regulation (2017) Official Gazette number 30016 in 2017, Article 13 introduced a deadline for temporary waste storage, which is 1 year for non-hazardous waste and six months for hazardous waste. In accordance with Article 9 waste producers must now submit a waste management plan to the Ministry's Provincial Directorate, which outlines the producer's plans to avoid and reduce wastes and obtain approval.

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[204] Environment Law No.7115 (2018).
[205] Mondaq (2019). Turkey: Zero Waste Regulation Has Been Published in The Official Gazette. What Obligations Does the Zero Waste Regulation Impose? Available at: https://www.mondaq.com/turkey/waste-management/830842/zero-waste-regulation-has-been-published-in-the-official-gazette-what-obligations-does-the-zero-waste-regulation-impose (Accessed 17/07/20).
[206] Ministry of Environment and Urbanisation (2015). Regulation on Waste Management (Official Gazette No.29314 of 02 April 2015). Available at: https://www.resmigazete.gov.tr/eskiler/2015/04/20150402-2.htm (Accessed 17/07/20).

Regulation of the Control of Excavation Soil and Construction and Demolition Waste (2004)

13.2.14. The Regulation of the Control of Excavation Soil and Construction and Demolition Waste was published in the Official Gazette No. 25406 in 2004[207]. The overall goal of the Regulation is to manage excavated soil, construction and demolition waste in a manner that will not harm the environment. Management approaches covered comprise collection, temporary storage, transportation, recovery, evaluation and disposal.

13.2.15. Article 9 of the Regulations describes obligations placed on waste producers. These include obtaining permission for waste generation, transport and storage, waste segregation and disposal of waste to authorised facilities. The location of any disposal sites will be determined by the relevant municipality.

13.2.16. Article 34 sets out requirements for the storage of waste. It is stated that were excavated soil and construction or demolition waste cannot be reused or recycled, the wastes must be stored in a controlled manner. Excavation soils can only be stored in 'spoil disposal areas' specified in the project and selected for this purpose with the necessary permissions.

13.2.17. Article 35 set out requirements for establishing waste storage sites. They are not permitted in areas with highly productive soil, high flood risk, in valleys or stream beds that prevent the flow of rainwater, in landslide, avalanche and erosion zones. They are also not permitted in the protection areas for drinking, irrigation or utility water reservoirs. They must be over 200m from the nearest settlement and 100m from cemeteries.

13.2.18. Article 36 details the documents required for applications for excavated soil waste storage areas. These documents are to be completed by organisations wishing to obtain a storage permit; documents are submitted to the Construction / Demolition Waste Inspection Board. The documents include (but are not limited to):

- Trade registry record and documentation showing ownership status of the land.
- Consent document from the relevant Directorate depending on the current land use (for example General Directorate of Forestry, or Real Estate, or Provincial Special Administration Directorate).
- Topographic map and ground studies of the land to determine the geology, hydrogeology, geotechnical and tectonic characteristics of the land.
- Personnel to be employed and plant and equipment to be used.
- Approved rehabilitation plan.

13.2.19. Articles 39 to 43 provide further detail on waste permitted and acceptance procedures, storage of waste, closing and rehabilitation of a storage area.

Regulation on the Control of Hazardous Wastes (2005)

13.2.20. The Regulation entered into law in 2005 with amendments in 2010 and 2013. The purpose of the regulation is to control the production and transportation of hazardous wastes, minimise their

[207] Ministry of Environment and Forestry (2004). Regulation of the Control of Excavation Soil and Construction and Demolition Waste (Official Gazette No. 25406 of 18 March 2004). Available at: https://www.resmigazete.gov.tr/eskiler/2004/03/20040318.htm#25 (Accessed 17/07/20).

production, and control their disposal. The regulation also outlines technical requirements for the management and inspection of hazardous wastes and their disposal. The Regulation prohibits the importation of hazardous waste.

EBRD REQUIREMENTS

13.2.21. The EBRD's project requirements, as summarised in EBRD's Environment and Social Policy[208], relevant to this Chapter, are as follows:

- The Project shall be structured to be compliant with applicable legislation, strategies and standards;
- Reasonable measures shall be included to avoid, minimise or mitigation any adverse change in environmental and social conditions and impacts; and
- Compliance with the following requirements:
  - **PR1: Environmental and Social Appraisal and Management** – establishes the importance of integrated assessment to identify the environmental and social impacts and issues associated with projects, and the client's management of environmental and social performance throughout the life of the project; and
  - **PR3: Resource Efficiency and Pollution Prevention and Control** – recognises that increased economic activity and urbanisation can generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels.

13.3 ASSESSMENT METHODOLOGY

SCOPE

13.3.1. The following topics have been assessed in this Chapter:

- The consumption of material resources (from primary, recycled or secondary, and renewable sources, and including products offering sustainability benefits) including the generation and use of arisings recovered during construction phase of the Project; and
- The generation of waste from the construction phase of the Project.

13.3.2. This has been completed for the major construction works where material type and quantity data are available, and excludes ancillary components such as signalling systems, transformer and substations. Waste generated by construction worker accommodation has also been excluded as this is not considered likely to have a significant effect on landfill capacity, and it will be segregated and managed in accordance with the measures in the ESMP.

13.3.3. Minimal environmental effects are envisaged during the operational stage of the Project. This is due to limited material resource usage (mostly associated with planned / unplanned maintenance) and waste generation on the trains and at stations. Due to the minimal effect, anticipated material uses and waste generation during operation have not been considered further within this assessment. Furthermore, environmental effects from wastes generated during the operational phase, will

[208] EBRD (2014). Environment and Social Policy.

minimised by the development and implementation of the **Operational Waste Management Plan** in the **ESMP**.

METHODOLOGY

13.3.4. In the absence of National guidance, the assessment methodology for this Chapter is based on the IEMA Guide to Materials and Waste in Environmental Impact Assessment[209], which is aligned with the EIA Directive. The assessment considers material resources (including site arisings and waste) and identifies potential for significant environmental effects.

13.3.5. Baseline data for material resources has been collected through a desktop study of published information on the regional or national availability (stocks, production and/or sales) of the main materials resources required for the Project.

13.3.6. Baseline data for waste has been collected through a desktop study of published information on remaining landfill void capacity within the region or nationally. Trends in waste recycling and recovery infrastructure have also been collected where available.

13.3.7. Key design information collated and analysed included:

- The type and volume of materials to be consumed by the Project, including details of any recycled materials content.
- The type and volume of waste to be generated by the Project, with details of planned recovery and / or disposal method (for example on-site re-use, off site recycling, disposal to landfill).
- The cut and fill balance.
- Details of any materials to be specified, where sustainability credentials (particularly those that improve resource efficiency) afford performance beyond expected industry standards.

13.3.8. Data relevant to the Project has been provided by TCDD and AYGM in combination with information contained in the National EIA (2017)[210].

13.3.9. The sensitive receptors that have been incorporated into this assessment are:

- **Material resources** – consumption impacts on their immediate and long-term availability, resulting in depletion of natural resources.
- **Landfill void capacity** – reductions in regional and national infrastructure, resulting in unsustainable use or loss of resources and temporary or permanent degradation of the natural environment.

13.3.10. The magnitude of impacts from the Project that have been considered in this assessment include:

- Anticipated reductions in availability (stocks, production and/or sales) of materials regionally and within Turkey.
- Anticipated reductions in the landfill void capacity of regional and national infrastructure.

13.3.11. The likely types and estimated quantities of material resources required (including site arisings generated) for the Project have been assessed. Impacts have been evaluated against data for the

[209] IEMA (2020). Materials and Waste in Environmental Impact Assessment.
[210] Sweco Mühendislik Müşavirlik ve Tasarım Ltd. Şti.(2017). Halkali – Kapikule Railway Project EIA Report.

regional and national material availability, where information is available, to determine the potential for significant effects.

13.3.12. The likely types and estimated quantities of waste to be generated by the Project have also been assessed. Impacts have been evaluated against the capacity of regional (or if appropriate, national) waste management infrastructure, determine the potential for significant effects.

MAGNITUDE, SENSITIVITY, AND SIGNIFICANCE CRITERIA

Magnitude

13.3.13. **Table 13-1** sets out the criteria for assessing magnitude of materials and waste. For the purposes of this assessment, method V1, void capacity, as set out in the IEMA guidance[209] has been used. The category titles have been altered to align with **Chapter 5: Approach to the ESIA**, but this does not affect the application of the method or outcome of the assessment.

Table 13-1 - Materials and Waste Magnitude Criteria

Magnitude	Materials Criteria (the assessment of the Project is made by determining whether the consumption of…)	Non-hazardous Waste Criteria (the percentage depletion of remaining landfill void capacity)	Hazardous Waste Criteria (the percentage depletion of remaining landfill void capacity)
No change	...no materials are required	Zero waste generation and disposal from the Project.	Zero waste generation and disposal from the Project.
Slight	...no individual material type is equal to or greater than 1% by volume of the regional* baseline availability.	Waste generated by the Project will reduce regional* landfill void capacity baseline$ by <1%.	Waste generated by the Project will reduce national landfill void capacity baseline$ by <0.1%.
Moderate	...one or more materials is between 1-5% by volume of the regional* baseline availability.	Waste generated by the Project will reduce regional* landfill void capacity baseline$ by 1-5%.	Waste generated by the Project will reduce national landfill void capacity baseline$ by <0.1-0.5%
Large	...one or more materials is between 6-10% by volume of the regional* baseline availability.	Waste generated by the Project will reduce regional* landfill void capacity baseline$ by 6-10%.	Waste generated by the Project will reduce national landfill void capacity baseline$ by <0.5-1%.
Very Large	...one or more materials is >10% by volume of the regional* baseline availability.	Waste generated by the Project will reduce regional* landfill void capacity baseline$ by >10%.	Waste generated by the Project will reduce national landfill void capacity baseline$ by >1%.

Magnitude	Materials Criteria (the assessment of the Project is made by determining whether the consumption of…)	Non-hazardous Waste Criteria (the percentage depletion of remaining landfill void capacity)	Hazardous Waste Criteria (the percentage depletion of remaining landfill void capacity)
Notes	* or where justified, national. $ forecast as the worst-case scenario, during a defined construction phase.		

Sensitivity

13.3.14. **Table 13-2** sets out the criteria for assessing sensitivity of materials and waste.

Table 13-2 - Materials and Waste Sensitivity Criteria

Sensitivity	Materials Criteria (On balance, the key materials required for the construction of the Project…)	Non-hazardous Waste Criteria (Landfill void capacity (in the absence of the Project) is expected to…)	Hazardous Waste Criteria (Landfill void capacity (in the absence of the Project) is expected to…)
Negligible	▪ Are forecast (through trend analysis and other information) to be free from known issues regarding supply and stock. and/or ▪ Are available comprising a very high proportion of sustainable features and benefits compared to industry-standard materials*.	...remain unchanged or is expected to increase through a committed change in capacity.	...remain unchanged or is expected to increase through a committed change in capacity.
Low	▪ Are forecast (through trend analysis and other information) to be generally free from known issues regarding supply and stock.	...reduce minimally: by <1% as a result of wastes forecast.	...reduce minimally: by <0.1% as a result of wastes forecast.

Sensitivity	Materials Criteria (On balance, the key materials required for the construction of the Project…)	Non-hazardous Waste Criteria (Landfill void capacity (in the absence of the Project) is expected to…)	Hazardous Waste Criteria (Landfill void capacity (in the absence of the Project) is expected to…)
	and/or ▪ Are available comprising a high proportion of sustainable features and benefits compared to industry-standard materials.		
Medium	▪ Are forecast (through trend analysis and other information) to suffer from some potential issues regarding supply and stock. and/or ▪ Are available comprising some sustainable features and benefits compared to industry-standard materials.	...reduce noticeably: by 1-5% as a result of wastes forecast.	...reduce noticeably: by 0.1-0.5% as a result of wastes forecast.
High	▪ Are forecast (through trend analysis and other information) to suffer from known issues regarding supply and stock. and/or ▪ Comprise little or no sustainable features and benefits compared to	...reduce considerably: by 6-10% as a result of wastes forecast.	...reduce considerably: by 0.5-1% as a result of wastes forecast.

Sensitivity	Materials Criteria (On balance, the key materials required for the construction of the Project…)	Non-hazardous Waste Criteria (Landfill void capacity (in the absence of the Project) is expected to…)	Hazardous Waste Criteria (Landfill void capacity (in the absence of the Project) is expected to…)
	industry-standard materials.		
Very High	▪ Are known to be insufficient in terms of production, supply and/or stock. and/or ▪ Comprise no sustainable features and benefits compared to industry-standard materials.	... reduce very considerably (by>10%); end during construction or operation; is already known to be unavailable; or, would require new capacity or infrastructure to be put in place to meet forecast demand.	... reduce very considerably (by >1%); end during construction or operation; is already known to be unavailable; or, would require new capacity or infrastructure to be put in place to meet forecast demand.
Notes	* Subject to supporting evidence, sustainable features and benefits could include, for example, materials or products that: comprise reused, secondary or recycled content (including excavated and other arisings); support the drive to a circular economy; or in some other way reduce lifetime environmental impacts.		

Effect Threshold

13.3.15. The effect thresholds are outline in **Chapter 5: Approach to the ESIA, Table 5-3**. Effects that are classified as moderate, large or very large are considered to be significant effects. Effects classified as minor or below are considered to be not significant.

13.4 ASSUMPTIONS AND LIMITATIONS

13.4.1. The following assumptions and limitations are applicable to this Chapter:

- The availability of data for material resource trends, landfill capacity and waste recovery is limited in Turkey and not available at a regional level. The most up-to-date sources of publicly available information at the time of writing have been used and referenced accordingly. Material resource availability has been taken from relatively recent data sets (2017 and 2020). National waste baseline data has been produced for the year 2016. Construction and demolition baseline data at a more regional level (Istanbul City) is from 2011. As such, the use of this data to suggest trends should be treated with some caution, although the data is considered to be the best available data to allow a robust assessment.
- The assessment of material resource use and waste generation / disposal for the Project has been based on data provided by TCDD and AYGM. Bulk construction items (such as aggregate, concrete, steel, and plastic) have been included in the assessment where volume and type data

were available. Other non-bulk construction items (such as waterproofing, rubber, rock bolts and electrical equipment) have been excluded as the volumes of such materials are unknown. Waste generated by worker accommodation has been excluded as this is not considered to have a significant effect on landfill capacity, and it will be segregated and manged in accordance with the measures in the **ESMP**. Works at the substations were not included in the materials and waste quantities, as the design in relation to the upgrade of one substation and the replacement of another is still being progressed. The contractor will be required to adhere to legislation, policy and guidance when undertaking the substation works. The volumes of bulk construction materials required, and waste generated, by the Project may alter as the design progresses, however this would not be expected to materially alter the assessment findings.

13.5 BASELINE CONDITIONS

13.5.1. This section provides an overview of baseline material consumption, and waste generation and disposal information, in the context of which the assessment is undertaken. Material resources assessed are those relevant to the Project such as stone reserves for aggregate and ballast, steel for track construction and structures and cement for structures.

MATERIALS

Materials Currently Required

13.5.2. The majority of the Project alignment comprises of vegetated and agricultural land. The Project alignment also passes over existing roads, rivers and industrial areas. As such, it is expected that the baseline consumption of construction material resources along the Project alignment (beyond minor maintenance and repair activities on developed land), is limited in the context of national supply.

Material Availability

13.5.3. The South Marmara Region Plan[211] notes that Turkey has healthy mineral reserves. In relation to key construction materials, natural stone is identified as a key national export. Other construction materials such as sand, gravel, limestone, and natural stone are noted to be prevalent in the Balikesir Provence (in South Marmara Region).

13.5.4. A Mineral Quarry Report[212] provided by the General Directorate of Mining and Petroleum Affairs, for the Project, provides a summary of the local quarry reserves. **Table 13-3** indicates the following reserves and distance from the Project alignment (at the closest point). Quantities of materials required for the Project are set out in **Table 13-8**. The granite and basalt could potentially be used for the ballast, provided it meets the required specification. The granite and hard forms of limestone could potentially be used for the rock and stone (rip-rap and stone columns) in **Table 13-8**.

[211] South Marmara Development Agency (undated). TR22 South Marmara Region 2014 - 2023 Regional Plan.
[212] Su Yapi – KMG Proje Is Ortakligi (2017) Malzeme Ocaklari Raporu

Table 13-3 - Mineral (quarried) Reserves Identified for the Project

Quarry Name	Material	Distance to the Project	Reserve Quantity (approximate tonnage based on 1.25t/m^3)
Kűçűksinekli KO	Sand - gravel	2km	1,000,000m^3 (1,254,000 tonnes)
Çatalca-Muratbey TO	Limestone	3km	40,000,000m^3 (50,000,000 tonnes)
Vize-Okçular TO	Granite	37km	1,000,000m^3 (1,254,000 tonnes)
Çorlu-Karatepe TO	Basalt	30km	20,000,000m^3 (25,000,000 tonnes)
Tekirdağ-Biyikali TO	Basalt	65km	1,500,000m^3 (1,875,000 tonnes)
Vize-Soğucak TO	Limestone	52km	900,000m^3 (1,125,000 tonnes)
Total			64,400,000m^3 (80,508,000 tonnes)

13.5.5. Data regarding steel production in Turkey[213] indicates 2,400,000 tonnes was produced in 2015, rising to 3,400,000 tonnes in 2018. At the start of 2020 the production figure was 3,000,000 tonnes, however, production fell sharply in April and May 2020. This is anticipated to be due to the impacts of lockdown restrictions imposed during the COVID-19 pandemic.

13.5.6. Statistics on ready mix concrete production in Turkey[214],[215] between 2012 and 2017 indicate an increasing trend from 93 million m^3 in 2012 to 115 million m^3 in 2017. Figures in 2018 and 2019 have however indicated a fall in production from 100 million m^3 to 67 million m^3 due to a slowing of the construction industry.

13.5.7. In summary, available data suggests there are sufficient mineral resources within Turkey for the main bulk construction materials (aggregate, concrete and steel) required for the Project (see **Table 13-8**). The recent decline in steel production is not anticipated to result in long term decline in steel availability given the previous trend in production.

SITE ARISINGS

Site Arisings Currently Generated

13.5.8. Site arisings from current land uses within the Project alignment are anticipated to be minimal given the current land use is predominantly occupied by vegetated and agricultural land. Where the existing railway or railway stations are present, arisings may be generated through routine maintenance or repair works to assets, such volumes would be limited.

[213] Trading Economics (2020) Turkey Steel Production https://tradingeconomics.com/turkey/steel-production
[214] European Ready Mix Concrete Organisation (2017) Ready Mix Concrete Industry Statistics http://ermco.eu/new/wp-content/uploads/2018/07/ERMCO-Statistics-2016-18.02.04.pdf
[215] Turkey Ready Mixed Concrete Association (2021) https://www.thbb.org/sektor/turkiyede-sektor/

Transfer, Recovery / Recycling Rates and Capacity

13.5.9. Using the latest available statistics from 2016[216] the number of waste recovery facilities and the tonnage of waste treated in Turkey is summarised in **Table 13-4**. The data suggest an increasing trend in waste recovery within Turkey. The data provided do not delineate between waste types, so it is reasonable to presume that wastes accounted for include municipal, commercial and industrial, and construction and demolition waste types.

Table 13-4 - Turkish Waste Recovery Facilities (tonnage processed)

Type of Waste Recovery	2014		2016	
	Number of Facilities	Tonnes of Waste Treated	Number of Facilities	Tonnes of Waste Treated
Recovery (metal, plastic, paper, minerals)	825	19,097,879	1516	32,204,025
Incineration with Energy Recovery	39	532,343	35	738,908
Composting	4	94,019	7	140,467

13.5.10. Figures for construction and demolition waste recovery in Istanbul City[217] (20km east of Halkali Station) as detailed in **Table 13-5** suggest an increasing historical trend for construction and demolition waste recovery, but a decreasing trend for excavated soil recovery.

Table 13-5 - Istanbul City Construction and Demolition Waste Recovery (tonnage processed)

Type of Waste Recovery	2008	2009	2010	2011
Soil Excavation Recovery	102,000	176,000	34,000	36,000
Construction and Demolition Waste Recovery	13,000	78,000	73,000	117,000

13.5.11. In summary, waste recovery facilities are present within Turkey, despite data for construction and demolition waste – for this report – only been publicly available in relation to Istanbul City. From the data provided, it is not possible to establish why the recovery of soil excavations between 2009 and 2010 declined.

[216] Turkish Statistical Institute (2017). Waste Disposal and Recovery Facilities Statistics, 2016.
[217] Construction and Demolition Waste Management in Turkey (2012). Hakan Arslan, Nilay Coşgun and Burcu Salgın.

WASTE

Waste Currently Generated

13.5.12. Wastes generated from the current land use within the Project alignment are expected to be the result of agricultural activities, commercial business activities and from maintenance and repair of existing infrastructure. The scale and nature of the wastes generated are anticipated to be minimal in the context of national disposal.

Remaining Landfill Capacity

13.5.13. The latest available statistics from 2016[218] indicate that 44 million tonnes of waste (of which 6 million tonnes was hazardous) was disposed of across 134 controlled landfill sites in Turkey. Landfill sites are reported to have a total capacity of 834 million m^3. Data from 2018[219] indicates that 90% of municipal waste is disposed of to landfill, with only 10% recycled or composted.

13.5.14. The number of controlled landfill sites has increased from 113 in 2014, where 41 million tonnes of waste was disposed of.

13.5.15. Available statistics do not provide a breakdown of waste disposal types, and hence it is reasonable to presume that municipal, commercial and industrial, and construction and demolition waste are included in the analyses.

13.5.16. Data for construction and demolition waste disposal for Istanbul City[220] are provided in **Table 13-6.**

Table 13-6 - Istanbul City Construction and Demolition Waste Disposal (tonnes)

Waste Type	2008	2009	2010	2011
Soil Excavation Disposal	17,000	16,000	24,000	48,000
Construction and Demolition Waste Disposal	4,000	4,000	5,000	6,000

13.5.17. The increasing trend in waste disposal to landfill may be reflective of expanding infrastructure, improved data collection and/or augmented waste legislation, however, this cannot be ascertained with any certainty.

13.5.18. Data for remaining regional landfill capacity was not available at the time of the assessment.

13.6 POTENTIAL IMPACTS AND EFFECTS

13.6.1. **Table 13-7** summarises potential impacts associated with material consumption, and waste generation and disposal during construction. The indirect impacts noted in the same table are assessed, as applicable to the chapter scope, in **Chapter 7: Noise and Vibration**; **Chapter 8;**

[218] Turkish Statistical Institute (2017) Waste Disposal and Recovery Facilities Statistics, 2016.
[219] Organisation for Economic Co-operation and Development (2019). OECD Environmental Performance Review Turkey Highlights 2019.
[220] Construction and Demolition Waste Management in Turkey (2012). Hakan Arslan, Nilay Coşgun and Burcu Salgın.

Ecology; **Chapter 10: Landscape and Visual**, **Chapter 11: Surface Water**, **Chapter 12: Geology and Hydrology**; **Chapter 14: Climate Change** and **Chapter 15: Social**, of this ESIA.

Table 13-7 - Environmental Impacts

Element	Direct Impacts	Indirect Impacts
Materials	Consumption of natural and non-renewable resources.	▪ Release of greenhouse gas emissions (through transportation). ▪ Water consumption. ▪ Visual impacts, noise, vibration and other nuisance issues. ▪ Human health.
Waste	Reduction in landfill capacity.	▪ Release of greenhouse gas emissions (through transportation and management). ▪ Ecological impacts. ▪ Visual impacts, noise vibration and other nuisance issues.

MATERIALS

13.6.2. Key construction materials required for the project are presented in **Table 13-8**; data were provided by TCDD in June 2020. The information describes the material type, estimated quantity based on the current design stage and any available information relating to the use of the material in the construction of the Project. Sustainable features, material source or recycled content will be determined by the Contractor. The quantities have been rounded up to the nearest hundred tonnes.

Table 13-8 - Material Resources Required for Project Construction

Material Type	Quantity (tonnes)	Use in the Project
Aggregate	3,278,400	Aggregates materials will predominantly be used for sub-base and ballast (this could potentially be imported from the granite or basalt quarry identified in Table 13-10, provided it meets the required specifications)
Asphalt	75,800	For base and surface course

Material Type	Quantity (tonnes)	Use in the Project
Concrete[221]	24,165,700	This includes reinforced concrete and will include construction of piles and poles, structures, foundations, drainage features and buildings
Earthworks (imported material)[222]	80,700	Used for fill material
Earthworks (reused arisings from earthworks cut)	33,750,000	Used for fill material
Metals	114,400	Including iron for drainage features and guard rails, steel for rail lines and structures.
Plastic	600	Pipework
Precast Concrete	1,500	Used for bridge facades and drainage features.
Rock	5,625,000	Fill material (as described in Table 13-10) imported from quarry sites
Stone	373,300	Comprising grouted rip-rap and stone columns (this could potentially be imported from the quarry sites identified in Table 13-10)
Total	67,465,400	Tonnes

13.6.3. As noted in the baseline under **Table 13-3**, data from the Mineral Quarry Report[223], suggests that there are sufficient local quarry reserves for the Project. On the assumption that the aggregate, rock fill material and stone will be sourced from these reserves, 9,276,700 tonnes of material will be required which is approximately 12% of the available reserves documented in the Mineral Quarry

[221] Concrete will either be delivered to the areas where construction activities are taking place either by concrete / cement mixers, or the materials (i.e. water, sand, aggregates and cement) will be delivered and mixed onsite using concrete batching plants. As the Contractor is yet to be appointed the details how concrete will be delivered to site, including the possible location of construction

[222] Imported earthwork material required for the Project may be obtained from borrow pits or from other local or regional sources. As the Contractor is yet to be appointed the details of the material source are unknown. The **Materials Management Plan** will set out the criteria to manage the potential risks associated with the selection of borrow pits.
[223] Su Yapi – KMG Proje Is Ortakligi (2017). Malzeme Ocaklari Raporu

Report. On this basis, the existing mineral quarries will be sufficient to provide the needs of the Project with no new quarry facilities required.

SITE ARISINGS

13.6.4. The quantity of earthworks generated from the cut and quantity of those earthworks that can be re-used on the Project is summarised in **Table 13-9**.

13.6.5. Batching plants are unknown. Once onsite the concrete will be transferred into it's in-situ location using concrete pumps.

Table 13-9 - Site Arisings Generated During Project Construction

Arisings	Quantity	Comments
Cut volume	38,750,000 tonnes	The cut material will be gravel-sand units of Inece formation and medium-coarse grained sand units of Çorlu formation, excavated as part of the Project construction.
Re-useable earthworks from cut	33,750,000 tonnes	The Project is anticipated to utilise 87% of the cut material within the Project.

WASTE

13.6.6. Estimates for construction waste that will be disposed of to landfill was provided by TDCC in June 2020 and are presented in **Table 13-10**. Additional waste items (hazardous waste and general construction waste) have been included in the list as, based on professional judgement, they are likely to be generated.

Table 13-10 - Waste Generated for Disposal to Landfill During Project Construction

Waste type	Quantity (tonnes)	Source of Waste
Aggregate	43,800	Ballast from the dismantling of the track.
Concrete	3,600	Sleepers from the dismantling of the track.
Excavated foundations / structures	965,200	Foundations (likely to be concrete) from the demolition of structures and excavation of foundations.
Earthwork arisings unsuitable for re-use	5,000,000	At this time, 5,000,000t of earthwork arisings are expected to be disposed of to landfill; the exact quantity will depend on the tests that will be undertaken on the material once it has been excavated. All material that is suitable for re-use, will be re-used on site, to reduce the need to import material. Wherever arisings are disposed of, this will be managed in accordance with the relevant authorities' requirements, and if spoil disposal sites are developed for the Project, they will also be subject to the

Waste type	Quantity (tonnes)	Source of Waste
		Lender's requirements, and the Lender's Technical Advisor (TA) will be notified, as set out in the **ESMP**.
Hazardous wastes	Undefined	Hazardous wastes have not been specified within the material and waste data provided, however the National EIA for the Project (2017) notes that hazardous waste generated during construction would be segregated, transported by licensed companies to licenced disposal sites in line with the Regulation on Waste Management. Hazardous wastes on the Project may include: land, demolition wastes, track or ballast arisings contaminated with asbestos[224] (due to possibility of it having been used as a fire retardant or in brake pads), polychlorinated biphenyls (PCBs) (it may have been used in the substation transformers), waste oils, fuels, solvents and/or train foul discharge.
General construction waste	Undefined	Waste may comprise packaging, surplus material or damaged items. Anticipated to be disposed of to landfill.
Total	6,012,600	Tonnes

13.6.7. Waste metals, anticipated to be in the region of 1,600 tonnes, are to be diverted from landfill. Waste management practices deployed in this context is expected to comprise of recycling, as is undertaken by the contractor on the adjacent, under construction, Çerkezköy to Kapikule railway.

SIGNIFICANCE OF EFFECTS

Materials

13.6.8. Based on the baseline data and availability of bulk material resources within Turkey, there are no known issues regarding supply and stock. Information on the inclusion of sustainable features such as recycled content, is limited to the re-use of earthwork arisings on the Project. Using professional judgement to apply the criteria set out in **Table 13-2**, the sensitivity of material resources is considered to be **Medium**.

13.6.9. Where data are available, as reported in the Baseline (**Section 13.3**), the percentage of material resource consumption for the Project has been calculated and presented in **Table 13-11**. The

[224] The Project will not be constructed with any asbestos containing materials, in accordance with the Lenders requirements. There remains a risk that waste materials containing asbestos may be present in the study area, this will be manage by requiring the Contractor to disposed of in accordance with the Asbestos Management Plan in the ESMP.

project construction timeframe is anticipated to be over a 5-year timeframe. As such, the annual national production data for steel and concrete have been scaled up to a 5-year timeframe.

Table 13-11 - Material Resource Consumption

Material	Production Data	Project Requirement Data	Project Consumption Percentage
Steel (national)	3,000,000 tonnes per annum.	114,400 (includes all metal types)	0.8%
Concrete (national)	109,000m^3 (approximately 135,160,000 tonnes) per annum.	24,165,700	4%
Regional quarry resources	80,508,000 tonnes remaining reserves.	9,276,700	12%

13.6.10. Given that the quarry resources are at a local scale, the magnitude of impact nationally, and therefore comparatively with the other materials, will be reduced. Based on the criteria set out in **Table 13-1** and using professional judgement and taking into account the scale of the Project, the magnitude for material resources consumption is considered **Moderate**.

13.6.11. The significance of effect for material resource consumption is therefore considered to be **Minor Adverse (not significant).**

Waste

13.6.12. Data for regional and national remaining landfill capacity in Turkey is not publicly available. The assessment of sensitivity (remaining landfill void capacity) for non-hazardous waste and hazardous waste cannot therefore be quantifiably assessed. Therefore, the magnitude of impact of waste generation by the Project has been determined using professional judgement.

Waste Diverted from Landfill

13.6.13. Earthwork arisings generated from the cut which can be re-used during Project construction is anticipated to be in the region of 38,750,000 tonnes. This figure may alter depending on the suitability of the material for re-use, once it has been excavated and tested. Where earthworks cannot be re-used on the Project, the materials will be stored temporarily until such a time that it can be usefully deployed. The storage location for these arisings will be determined by the contractor, be subject to approval by the relevant authorities and conform to regulatory requirements. Further measures relevant to the positioning of stockpiles are set out in **Section 11.6** of **Chapter 11: Surface Water Environment** and specified in the **ESMP**.

13.6.14. Waste metal (1,600 tonnes) generated through the construction process is expected to be recycled and therefore diverted from landfill. This is considered a reasonable assumption, as the metal from the adjacent under construction Cerkezkoy to Kapikule railway is being recycled, indicating that there is a market for this material. This re-use of earthworks and recycling of metals represents a reduction in the adverse impacts of waste generation by the Project.

13.6.15. The diversion of 38,751,600 tonnes of waste from landfill by the re-use of earthworks and recycling of metals will reduce the adverse effects on landfill void capacity

Waste to Landfill

13.6.16. Waste anticipated to be disposed of to landfill comprises, aggregate ballast, concrete sleepers, excavated foundations and structures, earthwork arisings which do not meet re-use criteria, hazardous wastes and general construction wastes. The quantity of such wastes are anticipated to comprise over 6 million tonnes (as set out in **Table 13-10**).

Waste Generation Significance of Effect

13.6.17. Given the absence of data to quantify remaining landfill capacity regionally and nationally, it is considered, using professional judgement, that the disposal of approximately 6 million tonnes of waste generated by the Project could (using a reasonable worst case scenario) reduce non-hazardous landfill capacity by 6-10% and hazardous landfill capacity by <0.5-1%, resulting in a moderate adverse magnitude of impact. Although sensitivity of landfill capacity cannot be fully assessed, overall it is considered that the significance of effect of waste generation (both non-hazardous and hazardous) is considered to be **Large Adverse (significant).**

13.7 MITIGATION AND ENHANCEMENT MEASURES

13.7.1. As set out in the **ESMP**, a **CESMP** will be prepared by the Contractor, which outlines how the construction phase of the Project will be managed to minimise the effects on the surrounding environment.

MATERIALS

13.7.2. The assessment has concluded that material resource consumption is not significant. Therefore, mitigation measures are not required.

Nevertheless, the following best practice design and construction methods should be implemented to minimise impacts from using construction and other materials:

- Ensure that the specification of recycled and secondary content in imported materials (such as earthwork, stone and aggregate, cement and asphalt), is set out during detailed design.
- Maximise the use of off-site construction and pre-fabrication methods to encourage a process of assembly rather than construction.
- Capture and communicate actions already undertaken (or planned) within the design for deconstruction and disassembly, to encourage reuse and recycling at assets' end of life. Items that can be readily reused include the following: ballast (can be washed and sold for construction), sleepers, rails, small steel components, switches and crossings (can be refurbished and used on lower track categories).
- Specify material and products that afford higher sustainability performance than typical industry standards e.g. closed loop plasticised cable troughing / walkways; low carbon materials (timber), or technology that is powered through renewable energy sources.

WASTE

13.7.3. Mitigation measures required to minimise the effects of waste generation and disposal (to a point where they are no longer significant) are outlined below:

- Seek to maximise reuse or recovery of site arisings on-site. This may include generation of hardcore material from excavated foundations, reuse of earthworks, recycling of other removed or demolished features.
- The Contractor will be required to develop and implement a **Waste Management Plan** and **Materials Management Plan**, as specified in the **ESMP**, to drive performance in the highest tiers of Waste Hierarchy, thereby maximise reuse and recycling. Testing of site arisings shall be a critical step in validating suitability reuse in different structural and non-structural applications. This will include the segregation and reuse of waste from the construction workers accommodation. It also includes an **Asbestos Management Plan,** to manage the risks associated with disposal of any asbestos containing materials that may be present.
- Where on-site reuse (or other forms of recovery) cannot be achieved, the arisings should be sent to licenced off-site reuse, recycling or recovery facilities. If it is not possible to use the materials off site, then they should be temporarily stored on site, in locations approved by the relevant authorities. They will then be disposed off-site, at locations provided on application to the relevant Municipality. The Municipality's selection of sites takes into consideration the environmental considerations set out in the Regulation of the Control of Excavation Soil and Construction and Demolition Waste (2004). The Lender's TA will be notified of the need for both temporary on-site and permanent off-site disposal site in advance of any requests to the Municipality to identify permeant sites or applications for the use of temporary on-site disposal locations. The Lender's TA will be provided with the waste management plan prior to the commencement of construction and will be notified of any updated required to the plan during construction, as specified in the **Spoil Management Plan** in the **ESMP**.
- Ensure arisings are stockpiled suitably to maximise re-use. Stockpiles should be designed to minimise quality degradation, damaged and loss of material. Measures to consider include the stockpile location, soil type and condition, prevention of erosion and leachate generation and use of appropriate signage and are set out in the **ESMP**.
- Segregate waste streams to prevent cross contamination and maximise recovery.
- Engage early with contractors to identify possible enhancement and other opportunities to reduce waste through collaboration and regional synergies.

13.8 RESIDUAL EFFECTS

13.8.1. Implementation of the mitigation measures provided in this assessment are expected to reduce the adverse effects on material resource consumption and generation and disposal of waste and align the Project to EBRD Performance Requirement 3: Resource Efficiency and Pollution Prevention Control.

13.8.2. With the application of mitigation, the effects for materials and waste have the potential to be reduced and be **Not Significant**.

13.9 SUMMARY

Table 13-12 - Summary of Potential Impacts, Effects and Mitigation (Materials and Waste)

Topic	Baseline Summary	Phase	Potential Impact(s)	Effect (without mitigation)	Mitigation Measures	Residual Effects (after mitigation)
Materials	Using professional judgement, resource availability within Turkey is considered to be sufficient to supply the materials required for construction without significant detriment to overall stocks, supplies and production.	Construction	Material resource consumption	Minor adverse (Not Significant)	Not applicable. Best practice methods should be implemented.	Not Significant
Waste	Remaining landfill capacity data is not available to establish a clear baseline from which the assessment can be undertaken.	Construction	Generation and disposal of waste to landfill	Large adverse (Significant)	Maximise reuse and recovery of site arisings and waste generated. Develop and implement a Waste Management Plan and Materials Management Plan.	Not Significant (professional judgement would indicate that if all mitigation measures are adopted, the effects of the Project would be not significant)