

Paris Agreement Alignment Review

Nakkaş - Başakşehir Motorway, Turkey

Nakkaş Otoyol Yatırım ve İşletme A.Ş

26 October 2021

Project No.: 0580559

The business of sustainability

Document details	The details entered below are automatically shown on the cover and the main page footer. PLEASE NOTE: This table must NOT be removed from this document.
Document title	Paris Agreement Alignment Review
Document subtitle	Nakkaş - Başakşehir Motorway, Turkey
Project No.	0580559
Date	26 October 2021
Version	1.0
Author	Corinna Hausner, Fritz Jaax
Client Name	Nakkaş Otoyol Yatırım ve İşletme A.Ş

Signature Page

26 October 2021

Paris Agreement Alignment Review

Nakkaş - Başakşehir Motorway, Turkey

Raimund Vogelsberger
Partner

Serkan Kirdoğan
Project Manager

Corinna Hausner
Consultant

Fritz Jaax
Consultant

ERM GmbH
Siemensstrasse 9
63263 Neu-Isenburg

© Copyright 2023 by ERM Worldwide Group Ltd and/or its affiliates (“ERM”).
All rights reserved. No part of this work may be reproduced or transmitted in any form,
or by any means, without the prior written permission of ERM.

CONTENTS

1. INTRODUCTION 1
1.1 Background 1
1.2 Objective and Scope 2
1.3 Project Description 2
2. METHODOLOGY 4
2.1 Overview 4
2.2 Project Alignment with the Mitigation Goals 4
2.2.1 Approach Overview 4
2.2.2 ERM's Project-specific Approach 5
2.3 Project Alignment with the Adaptation Goals and Climate Resilience 7
2.3.1 Approach Overview 7
2.3.2 ERM's Project-specific Approach 8
3. ALIGNMENT REVIEW REGARDING MITIGATION GOALS 11
3.1 General Screening 11
3.2 Review Against NDCs, Including Other Policy Plans 11
3.3 Low-Carbon Pathway 13
3.4 Low-Carbon Readiness Review 19
3.5 Summary and Recommendations 21
4. ALIGNMENT REVIEW REGARDING ADAPTATION GOALS AND CLIMATE RESILIENCE 23
4.1 Evaluation of the Climate Risk and Vulnerability Context 23
4.2 Definition of Climate Resilience Measures 25
4.3 Appraisal of the Broader Climate Resilience Context 26
4.4 Summary 28
5. CONCLUSION 29

List of Tables

Table 2-1 Likelihood Rating 9
Table 2-2 Numerical Overall Physical Risk Score Rating 9
Table 3-1 Project Relevant Plans in Support of Turkey's NDC 12
Table 3-2 Assumptions and Adoption Growth – EV Pathway, Turkey 16
Table 3-3 EVs as Percentage of Total Vehicle Fleet 16
Table 3-4 Carbon Intensity Forecast, 2025-2040 17
Table 3-5 Assumptions of Carbon Emissions Savings 17
Table 3-6 Carbon Savings from EV Adoption 18
Table 3-7 Summary of the Project Alignment with the Mitigation Goals 21
Table 4-1 Climate Hazard based on Baseline and Projections Values 23
Table 4-2 Climate Hazards and Possible Impacts 25
Table 4-3 Mitigation Measures for Climate-related Physical Risks 26
Table 4-4 Project Alignment to Climate Resilience Strategies 27
Table 4-5 Summary of the Project Alignment with the Adaptation Goals 28

List of Figures

Figure 1-1 NMM & the Project 3
Figure 2-1 Approach to Assess Alignment with Paris Agreement Mitigation Goals 5
Figure 2-2 Alignment of Projects with the Adaptation Goals of the Paris Agreement 8
Figure 3-1 Distribution of Registered Cars in Turkey by Fuel Type, 2021 14

Acronyms and Abbreviations

AF	Associated Facilities
BAU	Business As Usual
BOT	Build-Operate-Transfer
CCRA	Climate Change Risk Assessment
CO_2 e	Carbon-Dioxide equivalent
COP	Conference of Parties
EBRD	European Bank of Reconstruction and Development
ERM	Environmental Resources Management GmbH
ESIA	Environmental and Social Impact Assessment
ESMMP	Environmental and Social Management and Monitoring Plan
EV	Electric Vehicles
GHG	Greenhouse Gas Emissions
H&S	Health and Safety
INDC	Intended Nationally Determined Contributions
ITS	Intelligent Transportation System
LCP	Low Carbon Pathway
LTS	Long-Term Strategies
MDB	Multilateral Development Banks
NDC	Nationally Determined Contributions
NNM	Northern Marmara Motorway
RCP	Representative Concentration Pathways
SUV	Sport Utility Vehicle
UNFCCC	United Nations Framework Convention on Climate Change

1. INTRODUCTION

1.1 Background

Environmental Resources Management GmbH (ERM) was contracted by Nakkaş Otoyol Yatırım ve İşletme A.Ş (the ”Client”) to conduct an Environmental and Social Impact Assessment (ESIA) in line with international Lender standards for the Nakkaş - Başakşehir Motorway (the “Project”) located in the Istanbul Province, Turkey. As part of the Lenders requirements (in this case specifically the EBRD), the Client must also demonstrate that the Project is “Paris Agreement Aligned”, i.e. is in conformance with the aims of the 2015 Paris Agreement[1]. The Client has asked ERM to undertake this assessment of Paris Alignment of the Project (the “Assignment”).

In 2021, the EBRD announced[2] that it will align all its activities with the goals of the Paris Agreement, aiming to actively promote a green transition by accelerating decarbonisation across its regions, and supporting them to reach net-zero emissions by mid-century. This means all projects directly financed by EBRD must demonstrate their alignment with the Paris Agreement. In June 2021, the EBRD published a Guidance Note on the “Methodology to determine the Paris Agreement alignment of directly financed EBRD investments”[3] (“EBRD Guidance Note (2021)”) for public consultation. This methodology sets out how to determine whether a project being considered for Bank financing is “aligned” or “non-aligned” with the mitigation and adaptation goals of the Paris Agreement.

The Paris Agreement is a legally binding international treaty on climate change adopted by 196 Parties at COP 21 in Paris, and entered into force in November 2016. Its goal is to limit global warming to well below 2, preferably to 1.5 °C, compared to pre-industrial levels, as well as building climate resilience to adapt to the increased impacts of climate change.

Implementation of the Paris Agreement requires economic and social transformation. The Paris Agreement works on a 5- year cycle of increasingly ambitious climate action carried out by countries. By 2020, countries submitted their plans for climate action known as nationally determined contributions (NDCs) and long-term strategies (LTS) towards a low-carbon economy.

The Paris Agreement Alignment refers to public and private financial flows aligning to the goals of the Paris Agreement. Article 2.1c of the Paris Agreement defines this alignment in such a way that financial flows are reconciled with a path to low greenhouse gas (GHG) emissions and climate resilient development. Such alignment will help increase the financial flows needed to strengthen the global response to the threat of climate change.

Turkey has signed the Paris Agreement and in October 2021 formally ratified the Paris Agreement before the next Conference of Parties (COP) in Glasgow held in the beginning of November 2021. Concerns about limitation of international finance, due to Turkey being listed in Annex I as industrialised country by the UNFCCC, are one of the main reasons having prevented Turkey from ratifying the international agreement. Turkey has formally submitted a proposal to the UNFCCC in September 2021 requesting that its Annex I country status to be revoked[4]. The proposal is to be discussed at the upcoming COP 26 in Glasgow from the 31st of October until November 12th. If this request will not be granted, a rejection should not have any effect on the country’s ratification status.

The process of ratifying to the Paris Agreements usually consists of each country submitting its Intended Nationally Determined Contributions (INDCs) before ratifying the agreement. Final NDCs

1 United Nations (2015) Paris Agreement. Available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf [28.09.2021].

2 EBRD (2021) EBRD announces full Paris alignment by end-2022. Available at: https://www.ebrd.com/news/2021/ebrd-announces-full-paris-alignment-by-end2022-.html [28.09.2021].

3 EBRD (2021) Methodology to determine the Paris Agreement alignment of directly financed EBRD investments. Available at: http://www.ebrd.com/ebrd-paris-alignment-methodology

4 UNFCC (2021) Proposal from Turkey to amend the list of Parties included in Annex I to the Convention. Available at: https://unfccc.int/sites/default/files/resource/cp2021_inf02.pdf [13.10.2021].

are then either submitted after ratification, or the INDCs automatically turn in to NDCs once the party has formally ratified.[5]

1.2 Objective and Scope

The main objective of the Assignment is to determine whether the Project is 'aligned' or 'non-aligned' with the goals of the Paris Agreement. This will be done via a high-level review of the Project per the methodology outlined in EBRD's Guidance Note 2021 with regard to climate change mitigation and adaptation.

The scope of work includes a desk-top assessment of the Project and its Associated Facilities based on the currently available Project information (as of September 2021).

Note that the EBRD methodology provides solely two outcomes, namely "aligned" or "not aligned" with Paris Agreement, and does not have any graded assessment categories (e.g. partly aligned or mostly aligned).

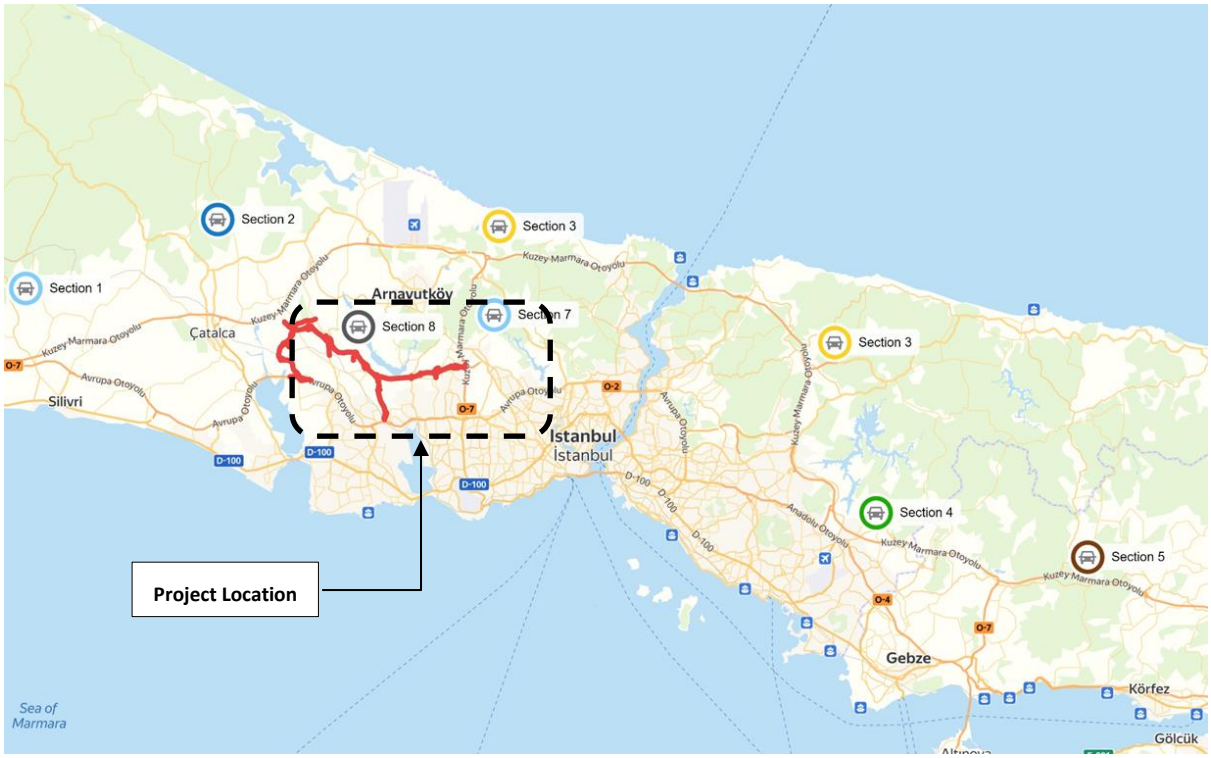
This review does not constitute an assessment of Turkey's NDC, or any national strategies or other climate change target to be in line with the Paris Agreement goals. Rather, it attempts to show whether the Project is compatible with the national climate goals of Turkey to align with the Paris Agreement.

1.3 Project Description

Nakkaş - Başakşehir Motorway is a planned new motorway, 24,17 km long with 2x4 lanes, 6,47 km connection roads with 2x3 lanes and a 1,600 m long Cable Stayed Bridge connecting both sides of Sazlıdere creek; it is the last and eighth section of the "Northern Marmara Motorway" (NMM), as shown in Figure 1-1.

The NMM is designed to connect Asia and Europe as well as to ease the overall transportation load in the Marmara Region, which hosts the largest industrial zones and activities in Turkey.

[5] UNFCC (2021) Nationally determined contributions under the Paris Agreement. Available at: National determined contributions under the Paris Agreement. Synthesis report by the secretariat (unfccc.int)



Source: ERM (2021) ESIA

Figure 1-1 NMM & the Project[6]

The Project construction is planned to start in 2021 and planned to be completed in 3 years..

Nakkaş Otoyol A.Ş. is responsible as Build-Operate-Transfer (BOT) contractor to manage, operate, maintain, and repair the new Motorway during the BOT contract period, apart from the access roads, which will be handed over to the local authorities after construction. The main structures and related facilities of the Project are:

- Sazlıdere bridge;
- Motorway itself and all associated facilities located in the motorway's corridor;
- Toll plazas, management support buildings and all related facilities, equipment and systems;
- Service areas, parking areas and related facilities;
- Maintenance facilities for the motorway and the bridge;
- All signs related to the motorway and traffic safety; and
- Three off-site quarries to supply aggregate, identified as AF[7].

A Maintenance Programme will be developed and implemented by Nakkaş Otoyol A.Ş. as per the BOT contract to assure that specified conditions are met upon the hand-back of the bridge and motorway to the General Directorate of Highways Turkey (at the end of the BOT Concession Period.

[6] Section 7 is still under construction and planned to be completed by 2021.

[7] IFC Performance Standards define Associated Facilities (AF) as facilities which are not funded as part of the Project and that would not have been constructed or expanded if the Project did not exist and without which the Project would not be viable.

2. METHODOLOGY

2.1 Overview

In June 2021, EBRD issued a draft Guidance Note on its methodology to determine project alignment to the Paris Agreement. The guidance addresses the two topics of mitigation and adaptation for projects under consideration for Bank financing.

- The EBRD's approach to Paris alignment for **climate change mitigation** entails demonstrating that each project meets the following two conditions:
  - consistency with long-term low-carbon development, to give assurance that it is part of a transition to a future consistent with the Paris Agreement mitigation goals;
  - low likelihood of carbon lock-in, to give assurance that the Project does not enable an emissions-intensive asset to continue operating when economically preferable, lower-carbon options could replace it.
- The Bank's approach to Paris alignment for **climate change adaptation** entails demonstrating that each project meets the following two conditions:
  - that physical climate risks have been identified and addressed, and
  - that its activities do not undermine climate resilience in the context in which the Project operates.

For some projects, meeting the above four conditions will be straightforward (for example, projects with a limited carbon footprint), while for others (particularly those that entail significant GHG emissions or are exposed to material physical climate risks), this will require detailed analysis, drawing on complementary analytical tools and evidence.

2.2 Project Alignment with the Mitigation Goals

In the following text, the Bank's methodology on the alignment with **mitigation goals** is described, followed by ERM's project-specific assessment approach (Section 2.2.2).
Subsequently, in section 2.3, EBRD's approach assessing alignment to **adaptation goals** is described, again followed by ERM's project-specific assessment approach (Section 2.3.2).

2.2.1 Approach Overview

The high-level review of the Paris Agreement Alignment regarding mitigation goals is two-folded.

The "**general screening**" will use the "aligned" and "non-aligned" lists of Project types agreed by the Multilateral Development Banks (MDBs). If the general screening produces a conclusive determination, no further assessment is needed. Other projects will require a specific assessment.

The "**specific assessment**" will draw on a range of different and interrelated analytical steps:

(1) Review against Nationally Determined Contributions (NDCs)[8] of the host country, including the Long-term Low GHG Emissions Development Strategies (LTSs)[9] and other policy plans underpinning them;

(2) Review against Low Carbon Pathways (LCPs), including benchmarks and criteria derived from them;

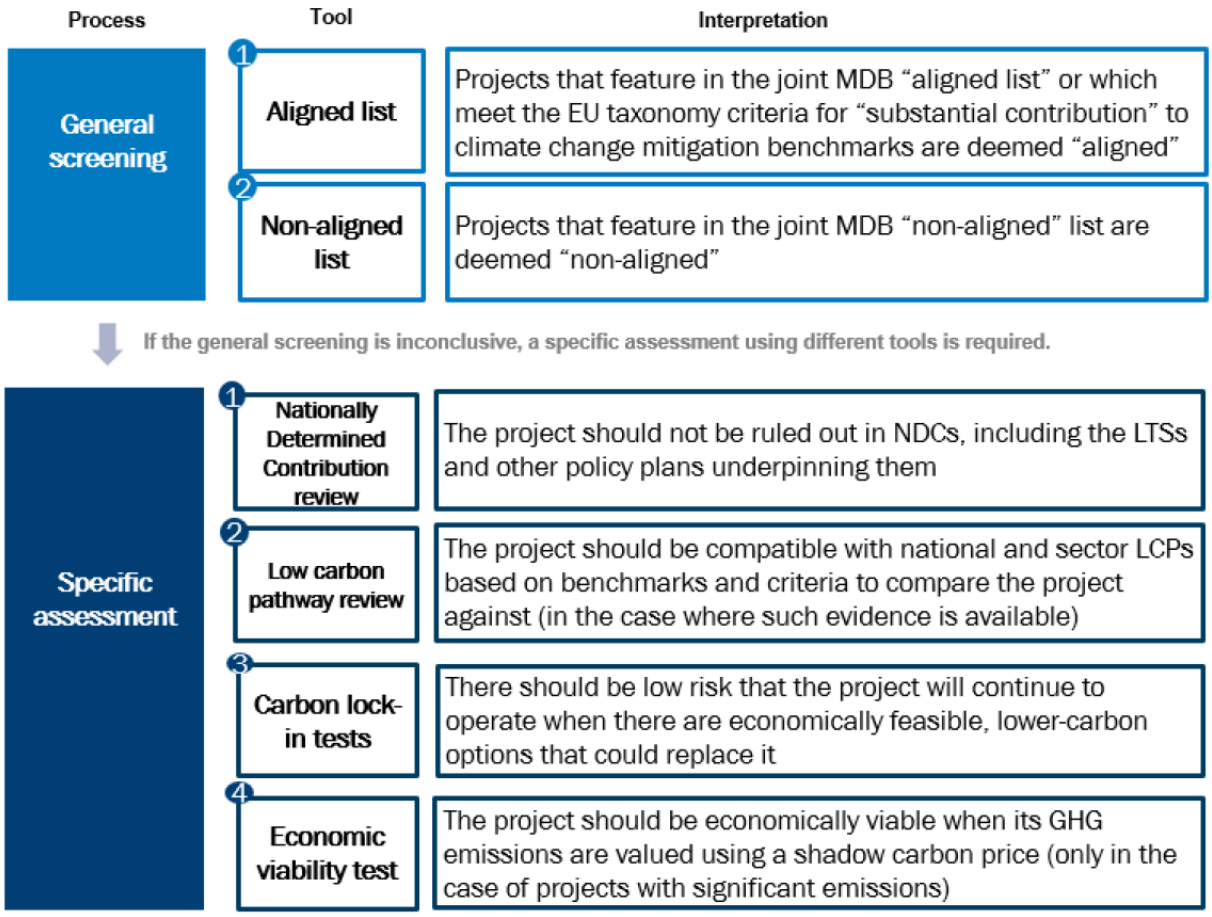
[8] Nationally determined contribution (NDC) embody efforts by each country to reduce national emissions and adapt to the impacts of climate change The Paris Agreement establishes binding commitments by all Parties to prepare, communicate and maintain a NDC and to pursue domestic measures to achieve them. It also prescribes that Parties shall communicate their NDCs every 5 years.

[9] In accordance with Article 4, paragraph 19, of the Paris Agreement, all Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies (LTS), taking into account their common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.

(3) Application of carbon lock-in tests; and

(4) For projects with significant GHG emissions, an economic viability test, based on an economic assessment using a shadow carbon price.

The overall approach is illustrated in Figure 2-1.



Source: EBRD (2021) Guidance Note

Figure 2-1 Approach to Assess Alignment with Paris Agreement Mitigation Goals

2.2.2 ERM's Project-specific Approach

ERM has split the assessment into five discreet steps, comprising the General Screening and the four steps of the Specific Assessment.

General Screening

The general screening filter is based on the 'aligned' and 'non-aligned' lists of activities jointly developed by the MDBs to help determine the Paris alignment of projects, which are set out in the Annex 2 of the EBRD methodology (2021). Projects that pass the general screening filter are deemed aligned or non-aligned without detailed analysis of the national context. No further action is required for such projects. The lists are screened for the Project and associated activities.

Nationally Determined Contribution

The Project should not be ruled out in Turkey's NDCs, including the LTSs and other policy plans underpinning them. If the Project entails investment in an activity that is explicitly ruled out by the

NDC, it will be determined “non-aligned”. In all other cases, even if the Project involves investment in an activity for which there is support in the NDC, it requires further assessment to determine alignment.

Turkey has signed, and recently ratified the Paris Agreement. Therefore, its INDC, becomes its NDC[10].

Turkey’s NDCs (including LTSs and other policy plans underpinning them) will be reviewed in relation to the Project activities based on Turkey’s formal NDC submission to the United Nations, collated in the UNFCCC NDC Registry. Other NDC “trackers” may be also used for context in assessing national climate-change ambitions (for example, climate action trackers).

Low Carbon Pathway review

When LCPs are available, they can provide information to inform the assessment of individual projects for Paris alignment. Currently, there is no country-endorsed LCP for Turkey available, therefore, two different studies have been used as a proxy for an LCP in this assessment.

One of these is from the SHURA Energy Transition Centre at Sabancı University[11], which published a study on transport sector transformation: Integrating electric vehicles into Turkey’s distribution grids. The second study used is based on this former study, in which Mott MacDonald[12] modelled the electrical vehicle pathway for Turkey from 2021 – 2040, including a respective carbon footprint and assumptions about possible GHG emission savings.

Carbon lock-in tests

Carbon lock-in occurs when technical, economic or institutional factors mean an asset will continue to operate in an emissions-intensive way, even when there are feasible and economically preferable, lower-carbon options that could replace it. A lower-carbon option in this context refers to an asset for which there is a high degree of certainty that it will be economically viable in a world in which the goals of the Paris Agreement are met.

If the Project credibly demonstrates low-carbon readiness, the risk of lock-in is low and no further review is required. This will be ascertained by assessing whether the Project can be developed for low-carbon use in the near future, potentially with limited investment, and taking into account the wider technological, economic and/or policy changes that may be needed to enable this. To credibly demonstrate low-carbon readiness, the Project must fulfil the following requirements:

(1) It must be technically feasible for the Project to be developed for low carbon use (with any investment to this end being limited);

(2) Technological, economic and/or policy changes that result in low-carbon use becoming economically viable must occur well before the end of the technical life of the asset; and

(3) There must be a high likelihood of a switch to low-carbon use – for example, because it will be commercially attractive to do so or because of a client commitment.

The approach to evaluating carbon lock-in – specifically, the depth of the analysis – will depend in part on the outputs of the other tools. For example, if a Project does not have a significant emissions footprint and is consistent with a conservative benchmark derived from an LCP, the lock-in risk is likely to be lower and the scope of the lock-in evaluation can be more limited. Alternatively, projects for which a suitable LCP (including benchmarks and derived criteria) is not available may require a more in-depth evaluation of lock-in risks.

[10] UNFCC (2021) Nationally determined contributions under the Paris Agreement. Available at: National determined contributions under the Paris Agreement. Synthesis report by the secretariat (unfccc.int)

[11] SHURA Energy Transition Centre – Sabancı University (2019) Transport sector transformation: Integrating electric vehicles into Turkey’s distribution grids. Available at: https://www.raponline.org/knowledge-center/transport-sector-transformation-integrating-electric-vehicles-turkeys-distribution-grids/

[12] Mott MacDonald (2021) PPP Road Nakkaş-Başakşehir – Feasibility Study Review and Vfm Analysis.

Upon a first screening, a demonstration of low-carbon readiness will be sufficient and a detailed assessment will not be necessary for the Project.

Economic viability test

A carbon price is a critical policy instrument in achieving the goals of the Paris Agreement. It seeks to put a monetary value on GHG emissions and corrects for associated market failure. For a given combination of policies, carbon prices can be set at levels that will lead to a pattern of economic activity that meets the mitigation goals of the Paris Agreement. In a world with a universal carbon price, only activities consistent with the goals of the Paris Agreement would be economically viable.

The tool of economic viability is used to determine the alignment of projects with a "significant" emissions footprint. Otherwise, only the first three tools are used. Emissions are considered "significant" if the Project leads to an increase of 25,000 tonnes of carbon dioxide equivalent (t CO_2 e) per year relative to a baseline or has a footprint of more than 100,000 t CO_2 e per year in absolute terms[13]. For projects with GHG emissions below these "significant" thresholds, an economic viability test is not required.

According to the Project ESIA[14], Scope 1 and Scope 2 emissions during operation are estimated approx. 8,300 t CO_2 e per year, which are below the threshold of 25,000 t CO_2 e per year relative to a baseline and 100,000 t CO_2 e per year in absolute terms. Therefore, the Project GHG emissions will likely not exceed the threshold limit, and an economic viability test will not be conducted.

2.3 Project Alignment with the Adaptation Goals and Climate Resilience

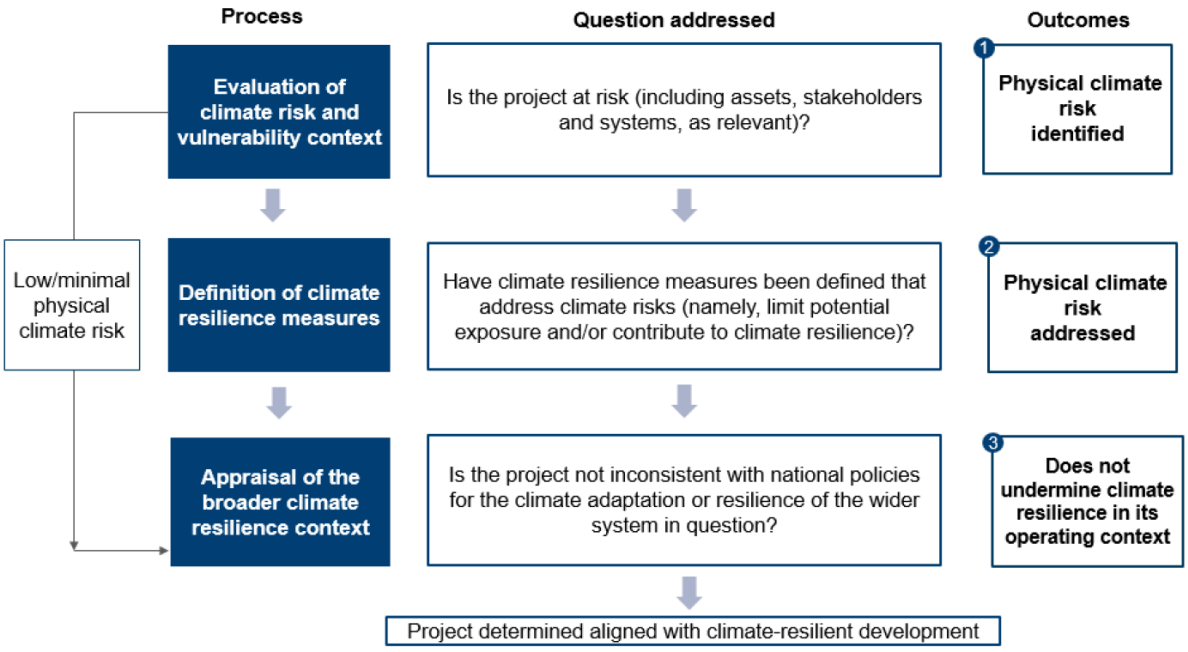
2.3.1 Approach Overview

The Bank's approach to Paris alignment for climate-change adaptation entails demonstrating that each project identifies and addresses physical climate risks and that project activities do not undermine climate resilience in the context in which it operates. EBRD will use a three-step process (summarised in Figure 2-2) to assess whether these conditions are met:

- **Evaluation of the climate risk and vulnerability** context of a Project to identify and assess physical climate risk. This will determine if the Project has materially relevant climate risks.
- Where climate risks are material, the **definition of climate resilience measures** to address physical climate risks and build climate resilience. This will identify concrete measures and investments to build into the project design.
- **Appraisal of the broader climate resilience** context of the project, ensuring it does not contravene national policies for adaptation or the climate resilience of the wider system in question (for example, exacerbate climate risks for communities or businesses in its vicinity or broader supply chain).

[13] To determine whether emissions are significant, the Bank, in line with its Environmental and Social Policy, will consider scope 1 (direct) and scope 2 (indirect or electricity) GHG emissions. Scope 3 GHG emissions (those related to the upstream and/or downstream impacts of the Project) will generally not be included, as there is no agreed methodology for these types of impact and there is a risk of double-counting.

[14] ERM (2021) Environmental and Social Impact Assessment: Nakkaş-Başakşehir Highway, Turkey.



Source: EBRD (2021) Guidance Note

Figure 2-2 Alignment of Projects with the Adaptation Goals of the Paris Agreement

This three-step process is based on principles agreed by MDBs for assessing the individual project's alignment with climate-resilient development. They consider the local nature of physical climate change impacts. This means there is no positive list of sectors or activities that are automatically aligned. Rather, each project needs to be assessed individually using a process-based approach that takes into account its specific circumstances based on location, sector, nature of business and assets.

2.3.2 ERM's Project-specific Approach

As in section 2.2.2, ERM also split its project specific approach for assessing adaptation goals in to multiple steps, evaluating climate risk and resilience measures, as well as whether a project is compatible with national adaptation policies.

Evaluation of climate risk and vulnerability context

The starting point is to describe the climate hazards to which the Project is exposed to and the magnitude of climate risks. Climate hazards are defined as "very low", "low" "medium", or "high".[15]

The Project ESIA[16] used climate baseline data to identify material climate hazards in the Project region as well as climate change projections to assess how hazard level may change in the future. The physical climate data and trends are interpreted in relation to the relative exposure of the Project, providing a review of risks posed to the Project.

For each climate hazard that presents a risk to the Project, a determination is made as to the likelihood of that hazard occurring at the Project location over the Project's lifetime. This determination makes use of a variety of publicly available geographical climate-risk tools. Likelihood

[15] The climate hazards include increasing in extreme heat, extreme cold, wildfires, flooding and flash flooding, landslides, coastal flooding, water stress, storms and cyclones.
[16] ERM (2021) Environmental and Social Impact Assessment: Nakkaş-Başakşehir Highway, Turkey.

is rated as "**not likely**", **"plausible**" or "**likely**" based on the ERM likelihood rating shown in Table 2-1.

Table 2-1 Likelihood Rating

		Climate Change Projection Rating				
		Significant Decrease	**Moderate Decrease**	**Minimal Change**	**Moderate Increase**	**Significant Increase**
Climate Hazard Baseline Rating	**Very low**	not likely	not likely	not likely	not likely	not likely
	Low	not likely	not likely	plausible	plausible	likely
	Medium	not likely	plausible	plausible	likely	likely
	High	likely	likely	likely	likely	likely

Source: ERM (2021) based on EBRD Guidance Note (2021)

Then a numerical score is assigned to each hazard with a "high" or "very high" risk, according to ERM's rating shown in Table 2-2. The Project is then given an overall physical climate risk score of 1 to 10, calculated by weighting the scores for each hazard. Projects with a physical climate-risk score of 6 or less will be deemed not significantly exposed to physical climate risks and will proceed directly to the next step. Projects with a score of 7 or more will require further analysis to identify options to reduce physical climate risks.

Table 2-2 Numerical Overall Physical Risk Score Rating

		Likelihood Rating		
		Not likely	**Plausible**	**Likely**
Climate Hazard Baseline Rating	**Very low**	0	0	0
	Low	0	0	0
	Medium	1	2	3
	High	1	2	3

Source: ERM (2021) based on EBRD Guidance Note (2021)

Definition of climate resilience measures

This step will examine whether higher risk projects have appropriate climate resilience measures that correspond to the specific physical climate risk identified. For each of the relevant physical climate risks identified, corresponding climate resilience measures will need to be integrated into project design.

The proposed climate resilience measures are assessed to determine whether they are appropriate and meaningful responses that limit potential financial exposure and/or contribute to climate resilience. They should correspond to the relevant physical climate risks identified. This is done by identifying the expected climate resilience outcomes associated with each climate resilience measure.

Climate resilience measures may include changes to physical infrastructure, for example, to address a greater risk of flooding, or changes to the choice of technology, for example to reduce reliance on water in water-stressed regions.

Projects that demonstrate appropriate and meaningful climate resilience measures that correspond to the relevant physical climate risks, verified by the identification of corresponding expected climate resilience outcomes, will move on to the next step. Projects that do not will be deemed non-aligned.

Appraisal of the broader climate resilience context

All projects will be subject to checks to ensure that they do not present any inconsistency with national policies or strategies related to climate adaptation or resilience and to ensure they are not expected to impair the climate resilience of the wider system in which the Project is located or of which it forms part.

This step recognises that, in some cases, projects that may not be exposed to physical climate risks may exacerbate climate risks for communities or businesses in their vicinity. For example, projects that use large volumes of water may not be exposed to water stress themselves, but could create climate risks for farmers dependent on the availability of water downstream from their business activities

This step makes use of the Bank's existing processes to guide climate-resilient investment and manage risks (for instance, a Project's environmental due diligence, especially in relation to potential impacts on ecosystems and communities). To undertake the appraisal, the Project is assessed against the national climate resilience context (for example, international/transboundary agreements, national policies/strategies, sectoral policies/strategies and local/community considerations). This ensures that projects are not inconsistent with applicable national climate resilience strategies and policies. In this assessment, a desktop review is conducted, evaluating whether national climate adaptation strategies against the physical climate risks affecting the project, are in line with the Project.

3. ALIGNMENT REVIEW REGARDING MITIGATION GOALS

3.1 General Screening

The General Screening filters out projects that are either listed as “aligned” or “non-aligned” in the Annex 2 of the EBRD Guidance note[17]. The Project and associated activities are **not** listed in the Annex 2 lists therefore, a specific assessment is required to determine alignment.

3.2 Review Against NDCs, Including Other Policy Plans

By 2020, countries submitted their plans for climate action known as nationally determined contributions (NDCs) and long-term strategies (LTS) towards a low-carbon economy.

NDCs are self-defined goals to meet the global climate targets set out in the Paris Agreement by the individual countries. While parties to the Paris Agreement are legally obligated to have NDCs, and to pursue measures with the aim of achieving it, achievement of the NDC is not a legally binding or enforceable commitment. Each country that has ratified the Agreement must submit their NDCs to the UNFCCC secretariat every five years. These must represent a progression compared to the previous NDC and reflect its highest possible ambition. LTSs differ from NDCs in that they set long-term deadlines, or concrete timeframes. They are a central component of national climate planning and can help updating successive, short-term NDCs[18].

Until the Paris Agreement, Turkey was listed as an industrialised country, but was not subject to emissions restrictions and not liable to support the other countries. In the Paris Agreement, developed countries are expected to conduct emission reductions and provide financial assistance to developing countries, while developing countries are only expected to contribute to these mitigation efforts voluntarily. However, under the Paris Agreement, Turkey's status is neither classified as a developing nor a developed country. Therefore, Turkey's categorization under the Agreement is ambiguous[19].

Submitted to the Paris convention in 2015, Turkey’s main NDC is to reduce their GHG emissions up to 21% from the Business as Usual (BAU) level by 2030[20]. Efforts to achieve this are done economy wide, covering multiple sectors such as energy, industrial processes and products use, agriculture, land-use change and forestry, and waste sectors. Currently, Turkey has not formally communicated their LTSs to the UNFCCC. However, the Turkish cabinet has approved a goal to reach net zero emissions by 2053 and the strategy for meeting this target will be developed early 2022[21]

Turkey has developed wider national climate change policies[22], which include;

- 10th National Development Plan (2014-2018);
- National Strategy on Climate Change (2010-2023);
- National Climate Change Action Plan (2011-2023);
- National Strategy on Industry;
- Strategy on Energy Efficiency (2010- 2023);

[17] EBRD (2021) Methodology to determine the Paris Agreement alignment of directly financed EBRD investments. Available at: http://www.ebrd.com/ebrd-paris-alignment-methodology

[18] WRI (2021) What is a long term strategy. Available at: What is a Long-term Strategy? | World Resources Institute (wri.org)

[19] Mondaq.com (2021) The Paris Agreement, Turkeys Ambiguous Positions. Available at: Climate Change Mitigation – The Paris Agreement, Turkey's Ambiguous Position, And Need For Policy Change In Various Areas - Environment - Turkey (mondaq.com) [28.09.2021].

[20] UNFCC (2015) The INDC of Turkey. Available at: The_INDC_of_TURKEY_v.15.19.30.pdf (unfccc.int)

[21] Climate Change News.com (2021) Turkey ratifies the Paris Agreement after approving a 2053 net zero goal. Available at: Turkey ratifies the Paris Agreement after approving a 2053 net zero goal (climatechangenews.com) [11.10.2021].

[22] Low Carbon Turkey.org (2018) Turkey Climate Change Policies. Available at: CLIMATE POLICIES - LOW CARBON TURKEYLOW CARBON TURKEY

- National Waste Management and Action Plan (2016-2023);
- National Legislation on Monitoring, Reporting and Verification of GHG emissions (1983 and 2014);
- National Intelligent Transportation Systems Strategy Document (2014-2023) and its Action Plan (2014-2016).

Turkey's NDC was prepared in a participatory approach, through multiple stakeholder meetings and analytical studies conducted over the course of a year. Plans and policies about Transport, specifically relating to the Project outlined in its NDC are as follows[23]:

Table 3-1 Project Relevant Plans in Support of Turkey's NDC

Plans and Policies regarding Transport supporting Turkey's NDC	Relevance to Project
Enhancing combined transport	**Relevant** – Motorway will enable intermodal transport, by transporting goods by truck to and from the hub of Istanbul.
Implementing sustainable transport approaches in urban areas	**Relevant** – May connect green fuelled cars or heavy vehicles in between urban and suburban areas.
Promoting alternative fuels and clean vehicles	**Relevant** – A toll for non- clean/alternative fuelled vehicles could be implemented on motorway and enable the use of these.
Reducing fuel consumption and emissions of road transport with National Intelligent Transport Systems Strategy Document (2014-2023) and its Action Plan (2014-2016)	**Relevant** – Free-flow tolling system (an open system with cameras instead of a closed system with barriers), will be preferred to avoid vehicles slowing and stopping at the tolls as well as sensors and digital displays for empty islands to improve traffic efficiency at the service station.
Realizing high speed railway projects	**Not relevant** – Project does not involve high speed railways.
Increasing urban railway systems	**Not relevant** – Project does not involve urban railways.
Achieving fuel savings by tunnel projects	**Not relevant** – Project does not include tunnels.
Scrapping of old vehicles from traffic	**Not relevant** – doesn't directly involve the scrapping of old vehicles, but could be relevant if old (diesel) vehicles may be banned from using the motorway.
Implementing green port and green airport projects to ensure energy efficiency	**Not relevant** – Project does not include ports or airports.
Implementing special consumption tax exemptions for maritime transport	**Not relevant** – Project does not include maritime transport.

Source: ERM (2021) based on Turkey's NDC from UNFCC (2015)

Discussion

Regarding the plans and policies Turkey has outlined in its NDC, represented in the Table 3-1 above, most are relevant for this Project context. However, some are not applicable. For instance, reducing the share of road transport and increasing the share of maritime rail transport, realising high speed and urban railway systems, achieving fuel savings by tunnel projects, implementing green port and airport projects, as well as implementing special consumption taxes for maritime transport. The other strategies and goals related to road transport, are relevant to the Project for reasons given in the right hand column outlined in Table 3-1. Thus, Turkey's NDC does seem to be

[23] UNFCC (2015) The INDC of Turkey. Available at: The_INDC_of_TURKEY_v.15.19.30.pdf (unfccc.int)

supported by strategies relevant to the Project context, including wider climate action plans such as the overarching National Climate Change Action Plan[24].

Within the National Climate Change Action Plan, the Ninth Development Plan for the term 2007 – 2013 states that "a balanced, rational and effective transportation infrastructure utilizing all modes of transport in technically and economically feasible ways shall be established"[25]. The plan envisages a sustainable, extensive intercity transport strategy that will be binding for the public sector and guiding for the private sector; laying the groundwork for an intercity transport that offers equal opportunities to all levels of society. Furthermore, the National Climate Change Action Plan also pushes towards regulating CO_2 emissions from vehicles by promoting energy efficient vehicles, which is in line with the Project. The plan also envisages enhancing transportation of goods and passengers via railways, which is not in line with the motorway construction Project. However, railways are not always a feasible option.

The first strategic goal of the National Intelligent Transportation Systems Strategy Document aims in its actions 1.4 and 1.5 to deploy road and provincial traffic control centres and sensor infrastructures to collect data on instant traffic flow in order to make future planning and event forecasts[26]. Such traffic control centres may be implemented along the motorway and inform other provincial control centres or municipalities of real time vehicle flows with the goal of avoiding congestion and the higher amount of GHG emissions associated with it. The fourth strategic goal in this report is largely about reducing GHG emissions by using alternative fuel sources and encouraging the use of public transport. The motorway may facilitate the use of interurban bus transport and electricity powered vehicles, therefore aligning with these policy objectives.

All of the national climate policies outlined in Turkey's NDC and, are made for medium-term implementation, this means a long-term strategy towards climate change mitigation and adaption is lacking.

Independent think tanks such as Climate Action Tracker and Climate Transparency remain critical on Turkey's path towards achieving its NDC's. Climate Action Tracker suggests that Turkey's contribution is 'critically insufficient', however, this is mostly due to their reliance on fossil fuel powered energy sources[27]. Climate Transparency argues that policy instruments in Turkey are lacking to improve fuel efficiency and reducing GHG emissions[28]. They highlight that in order to stay within a 1.5°C limit, passenger and freight transport need to be decarbonised and emissions from aviation need to decrease[29].

3.3 Low-Carbon Pathway

Low-Carbon Pathways in Road Transportation

The largest contributor to transport emissions is the road sector[30]. Besides the fuel combustion to power the vehicle causing GHG emissions, indirect GHG emissions arise during the construction of infrastructure, manufacture of vehicles, and provision of fuels. Low-carbon options and alternatives may become more prevalent, especially if they are subsidized or the high carbon alternative

[24] Turkey Ministry of Environment and Urbanization (2011) National Climate Change Action Plan. Available at : 29675_turkeynationalclimatechangeactionpl.pdf (preventionweb.net)

[25] Turkey Ministry of Environment and Urbanization (2011) National Climate Change Action Plan. Available at : 29675_turkeynationalclimatechangeactionpl.pdf (preventionweb.net)

[26] Turkey Ministry of Transport (2020) National Smart Transportation Systems Strategy Document. Available at: ulusal-akilli-ulas-im-sistemleri-strateji-belgesi-ve-2020-2023-eylem-plani-eng.pdf (uab.gov.tr)

[27] Climateactiontracker.org (2021) Climate Action Tracker- Turkey. Available at: Turkey - Assessment - 06/11/2017 | Climate Action Tracker

[28] Climate-transparency.org (2020) Turkey. Available at: Turkey-CT-2020-WEB.pdf (climate-transparency.org)

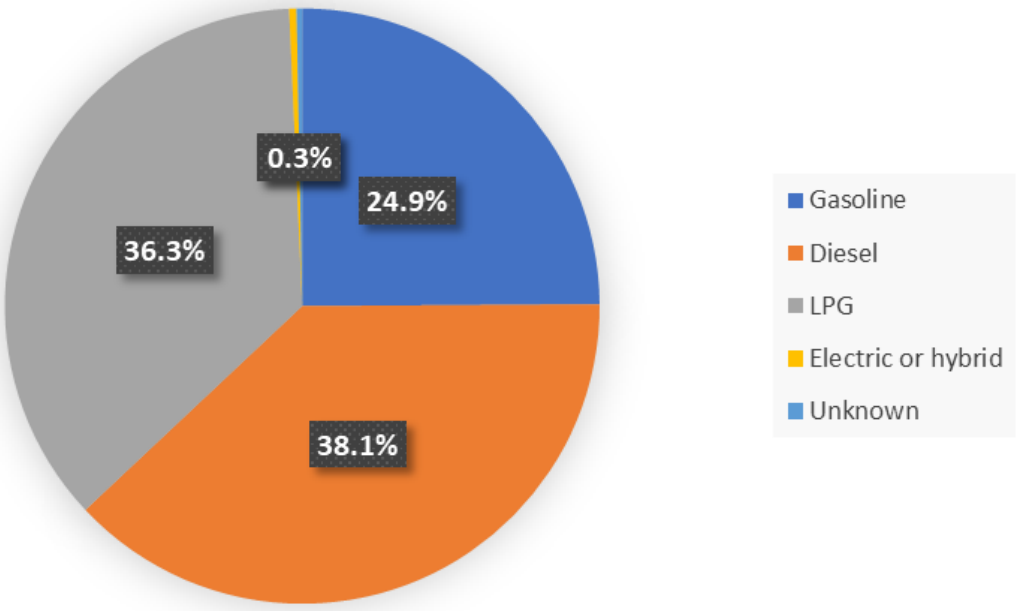
[29] Climate-transparency.org (2020) Turkey. Available at: Turkey-CT-2020-WEB.pdf (climate-transparency.org)

[30] IPCC (2014) Transport. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

becomes economically unattractive due to carbon taxes or even unfeasible due to environmental restrictions.

There are several ways to reduce GHG emissions from the road sector, including technological and behavioural change, such as alternative means of transportation (public transport, car sharing, cycling), fuel efficiency, and alternative fuels. Low-carbon fuel options comprise e.g. electricity, hydrogen, biofuels or other alternative fuels.

The vast majority of vehicle sales and registered cars in Turkey are vehicles with an internal combustion engine[31]. Figure 3-1 shows the breakdown of Turkey's vehicle fleet by type of engine in 2021.



Source: TurkSTAT Corporate (2021)

Figure 3-1 Distribution of Registered Cars in Turkey by Fuel Type, 2021

Mainly vehicles with combustion engines fuelled with fossil fuels will use the Nakkaş-Başakşehir motorway. However, a modal shift to low-carbon pathway like electric mobility is generally possible. In Turkey, currently only a small share of vehicles are electric. In 2011, there were only 47 electric vehicles (EV) registered, but the share of electric or hybrid vehicles in Turkey's car fleet has increased slowly since 2011; by 2020, 36,487 EV and hybrid cars were registered[32].

Of these, approx. 1,169 EV are registered in Istanbul along with 582 charging stations, and the trend is rising[33]. Local governments and industries are forecasting EV sales to grow nearly 30% by 2030 in order to meet global decarbonisation goals. An action plan to encourage the use of EVs – including extending the current tax incentives and planned new legislation already exists[34].

Turkey offers tax incentives to EV owners. For EVs and hybrid vehicles, an excise tax imposed on the import, manufacture and initial acquisition of a range of goods, has been reduced for two classes

[31] TurkSTAT Corporate (2021) Distribution of vehicles registered to the traffic according to fuel type. Available at: https://data.tuik.gov.tr/Bulten/Index?p=Road-Motor-Vehicles-January-2021-37411&dil=2
[32] TurkSTAT Corporate(2021) Distribution of vehicles registered to the traffic according to fuel type. Available at: https://data.tuik.gov.tr/Bulten/Index?p=Road-Motor-Vehicles-January-2021-37411&dil=2
[33] Kaya, Ömer, Kadir D. Alemdar, Tiziana Campisi, Ahmet Tortum, and Merve K. Çodur (2021) The Development of Decarbonisation Strategies: A Three-Step Methodology for the Suitable Analysis of Current EVCS Locations Applied to Istanbul, Turkey. Energies 14, no. 10: 2756. https://doi.org/10.3390/en14102756.
[34] Yalçın, D.; Arıkan, F. Electric Vehicle Regulation and Law in Turkey. Progr. Plann. (2000), 54, 199–278.

of EVs: from 90% to 45% for the smallest EVs by engine volume; and from 180% to 90% for medium class EVs[35]. Further amendments to the tax regime in Turkey are expected. Under the National Energy Efficiency Action Plan (2017-2023), which sets the country on course to implement a reduction of 14% of primary energy consumption by 2023[36], a differentiating tax regime based on fuel consumption and carbon dioxide emissions might be developed.

Turkey has also started manufacturing EVs for public transportation: electric buses are produced by TEMSA, which plans for half of the buses it produces to be electric by 2025. Domestic production of electric SUVs under the TOGG brand is expected to start 2022, with sedan and hatchback models also in development[37]. The Turkish government has pledged to purchase 30,000 TOGG vehicles by 2035 in order to support the EV production line.

As EV become more prevalent in the composition of the vehicle fleet in Turkey, this is likely to decrease the emissions associated with transport on Turkish roads and on the Nakkaş–Başakşehir motorway, compared to a Business as Usual (BAU) counterfactual scenario under which EV are not adopted.

Electric Vehicles Pathway for Turkey, 2021-2040

Mott MacDonald[38] modelled an EV pathway based on the estimates provided by the future pathway of EV adoption study of Sabancı University[39].

The estimates are based on a study of European EV markets, which utilises a computer-based model of the world's economic and energy systems and the environment[40]. Two EV market scenarios have been developed, with the high-growth scenario projecting more than 2.5 million EVs in the total vehicle stock by 2030 (around 10% of the total passenger vehicle stock in the same year) and the moderate-growth scenario at 1 million vehicles, or 4% of the total passenger vehicle fleet. The model also forecasts that the sales of EVs (battery and plug-in hybrid) and hybrids reach 65% of all vehicle sales by 2030 in the "High-Growth", and 30% in the "Medium-Growth" scenario. The increase in sales follows the current slow trend until 2022/23, the year when Turkey plans to introduce its locally manufactured EV. From 2023 onwards, sales grow at a much faster rate until 2030. Table 3-2 gives an overview of the assumptions used in this analysis.

[35] CMS (2021) Electric Vehicle Regulation and Law in Turkey. Available at: https://cms.law/en/int/expert-guides/cms-expert-guide-to-electric-vehicles/turkey

[36] CMS(2021) Electric Vehicle Regulation and Law in Turkey. Available at: https://cms.law/en/int/expert-guides/cms-expert-guide-to-electric-vehicles/turkey

[37] Elektrek, (2019) Turkey plans to produce electric vehicles with a $3.7 billion investment. Available at: https://electrek.co/2019/12/30/turkey-electric-vehicles-togg/

[38] Mott MacDonald (2021) PPP Road Nakkaş-Başakşehir – Feasibility Study Review and Vfm Analysis.

[39] SHURA Energy Transition Centre – Sabancı University(2019) Transport sector transformation: Integrating electric vehicles into Turkey's distribution grids. Available at: https://www.raponline.org/knowledge-center/transport-sector-transformation-integrating-electric-vehicles-turkeys-distribution-grids/

[40] Cambridge Econometrics (2018) Low-carbon cars in Europe: A socioeconomic assessment. Available at: http://www.camecon.com/wp-content/uploads/2018/02/Fuelling-Europes-Future-2018-v1.0.pdf

Table 3-2 Assumptions and Adoption Growth – EV Pathway, Turkey

Assumptions	Value	Source	Parameter	Value
Proportion of EV, as % total vehicle fleet, 2021	0.4%	TURKSTAT Corporate. Distribution of vehicles registered to the traffic according to fuel type.	-	-
Proportion of EV, as % of total vehicle fleet, 2030 estimate, high-growth scenario	10.0 %	SHURA Energy Transition Centre – Sabancı University, 2019, Transport sector transformation: Integrating EVs into Turkey's distribution grids.	Annual growth rate, 2021-2030, high-growth scenario	1.06 %
Proportion of EV, as % of total vehicle fleet, 2030 estimate, moderate-growth scenario	4.0		Annual growth rate, 2021-2030, moderate-growth scenario	0.4 %

Source: As shown in the table and Mott MacDonald (2021)

Since these estimates are provided for the year 2030, Mott MacDonald has interpolated the figures for the EV adoption for the period between 2021 and 2030 and extrapolated for the period after 2030 based on the current and projected introduction rates for 2030. Based on these assumptions, the interpolated and extrapolated growth rates are calculated, as well as the expected proportions taken up by electric vehicles as part of Turkey's vehicle fleet for the years 2025, 2030, 2035, 2040, 2045 and 2050 (see Table 3-3).

Table 3-3 EVs as Percentage of Total Vehicle Fleet

Scenario	2025	2030	2035	2040	2045	2050
High growth	3.6%	10.0%	15.3%	20.7%	26.0%	31.3%
Moderate growth	1.6%	4.0%	6.0%	8.0%	10.0%	12.0%

Source: Mott MacDonald (2021)

Carbon Footprint of Electricity Consumption in Turkey

In order to estimate the carbon savings resulting from the increasing adoption of EVs in Turkey, the emissions associated with electricity consumption are modelled.

In 2019 (the latest year for which data is available), the carbon intensity of the power sector in Turkey was 441 g CO_2 e/kWh of energy. The intensity of the power sector is underpinned by the mix of sources in the system of power generation. In order to calculate the pathway of carbon intensity, Mott MacDonald[41] has used a forecast for the energy mix in Turkey in 2025, 2030, 2035 and 2040 by the Istanbul International Center for Energy and Climate at Sabancı University[42].

Turkey's energy supply is expected to become more diversified and less carbon intensive in the years to 2040. The share of renewables (hydro, wind, solar, geothermal) and nuclear is forecast to increase to 72% by 2040, from 42% in 2019. The share of fossil fuels is projected to decrease to 28%, from 58% in 2019.

The carbon intensity for each year has been calculated as a weighted averaged of the carbon intensities with the weightings equal to the projected percentage share in the energy mix that each source contributes in a given year (see Table 3-4).

[41] Mott MacDonald (2021) PPP Road Nakkaş-Başakşehir – Feasibility Study Review and Vfm Analysis.

[42] Istanbul International Center for Energy and Climate (2020) Turkish Energy Outlook 2020. Available at: https://iicec.sabanciuniv.edu/teo

Table 3-4 Carbon Intensity Forecast, 2025-2040

Parameter	2025	2030	2035	2040
Carbon intensity, g CO_2 e/kWh	395	348	271	211

Source: Mott MacDonald (2021)

Carbon Emissions Associated with Nakkaş-Başakşehir Motorway

The CO_2 emission savings through EV adoption were calculated by comparing the scenario with an increasing proportion of EV in the total fleet with a base scenario that is linked to the proportion of EVs in 2021. As the projected shares of EV adoption calculated based on the Sabancı University study are for the passenger car fleet, emissions related to passenger cars only have been calculated. The assumptions used in calculating the emission savings are summarised in Table 3-5.

Table 3-5 Assumptions of Carbon Emissions Savings

Assumptions	Value	Unit	Source
Vehicle kilometres, Project, passenger cars, 2025	978,672	km	Steer Group, 2020 – outputs of the traffic model
Vehicle kilometres, Project, passenger cars, 2030	2,008,741	km	Steer, 2020 – outputs of the traffic model
Vehicle kilometres, Project, passenger cars, 2035	2,816,060	km	Steer, 2020 – outputs of the traffic model
Vehicle kilometres, Project, passenger cars, 2040	3,396,588	km	Steer, 2020 – outputs of the traffic model
Energy efficiency of most efficient EV model, 2021, Tesla 3	0.15	kWh/km	US Department of Energy, 2021, EPA MPG. In order to remain conservative, it is assumed that the energy efficiency of EV will remain at the level of the most efficient EV throughout 2021-2050.
CO_2 e emissions of average new car, Turkey	120	g/km	International Council on Clean Transportation, 2019, Passenger Car Emissions in Turkey.

Source: Mott MacDonald (2021)

Based on the above assumptions, the emissions associated with the Nakkaş-Başakşehir motorway are calculated for the moderate- and high-growth scenarios of EV adoption, as presented in the modelling of the SHURA Energy Transition Centre at Sabancı University[43]. Table 3-6 summarises the forecasted CO_2 emissions for the high-growth and moderate scenario and for the worst-case scenario of EV share staying at the 2021 level as well as the respective savings calculations.

[43] SHURA Energy Transition Centre – Sabancı University (2019) Transport sector transformation: Integrating electric vehicles into Turkey's distribution grids. Available at: https://www.raponline.org/knowledge-center/transport-sector-transformation-integrating-electric-vehicles-turkeys-distribution-grids/

Table 3-6 Carbon Savings from EV Adoption

Scenario	2025	2030	2035	2040
High-growth				
Emissions based on projected shares of EV penetration, t CO_2 e	115.4	227.4	303.7	345.5
Emissions based on a constant 2021 share of EV penetration t CO_2 e	117.4	240.9	337.7	407.3
Carbon savings t CO_2 e	2.1	13.5	34.0	61.8
Moderate-growth				
Emissions based on projected shares of EV penetration t CO_2 e	116.5	235.6	324.5	383.6
Emissions based on a constant 2021 share of EV penetration, t CO_2 e	117.4	240.9	337.7	407.3
Carbon savings, t CO_2 e	0.9	5.3	13.2	23.7

Source: Mott MacDonald (2021)

In case of a high-growth pathway the carbon savings in 2030 could be 13.5 t CO_2 e which is a reduction of 5% and in 2040 61.8 t CO_2 e equating to 15% emission reduction. For the moderate-growth pathway the carbon savings are smaller, eg. in 2030 the carbon savings could be 5.3 t CO_2 e (2%) and in 2040 emission savings of 23.7 t CO_2 e equating to (6%).

Discussion

The Paris Agreement aims to decarbonise transport as much as possible by 2050 by shifting to a more sustainable and diverse range of transport modes and vehicle technologies. EVs are envisioned as one of the crucial means of reducing CO_2 e emissions associated with road transport. This is reflected in Turkey's policy measures, including a favourable tax regime for EVs and government support for domestic EV manufacturers.

The extent to which EVs can contribute to reducing transport emissions depends on the carbon intensity of the electricity mix used for power generation. If a country's energy system decarbonises efficiently, this would increase the impact of EVs on decreasing emissions. It is predicted that Turkey's electricity mix will diversify towards renewables and nuclear, both of which have a low carbon footprint, and away from fossil fuels, especially coal. This process will lead to a lower CO_2 e intensity of electricity generation, meaning that one kWh of electrical energy has less CO_2 e embedded in its generation.

If a high-growth pathway is followed in the adoption of EVs, transport-related CO_2 e emissions from traffic on the Nakkaş-Başakşehir motorway are likely to be 6% lower by 2030 and 15% lower by 2030, compared to a counterfactual scenario in which EV adoption remains at the 2021 level. Comparing these projected carbon savings with Turkey's commitment to reduce its overall emissions by 21% below BAU scenario, it is clear that the introduction of EVs is an important step towards achieving this target, even assuming a number of conservative assumptions regarding their efficiency compared to internal combustion engine vehicles. A medium-growth pathway in the adoption of EVs will not be sufficient.

It is important to note that, as the electricity grid decarbonises, domestic production of EV batteries is likely to reduce the embedded emissions associated with EV production. These emissions usually depend on the energy intensity of the battery production process. Thus, it is expected that the estimate provided is conservative, and the impact of EV adoption on emissions from traffic on the Nakkaş-Başakşehir motorway is likely to be even higher. The carbon savings realised through the use of EVs of the Motorway will contribute to aligning with the provisions of the Paris Agreement and the achievement of Turkey's stated policy goal of reducing emissions by a fifth by 2030.

3.4 Low-Carbon Readiness Review

Carbon lock-in means that the Project would continue to operate in an emissions-intensive way, even when there are feasible and economically low-carbon pathways available. For the Project operation, this is mainly concerned with:

- Usage of the motorway in form of prevailing transportation system; and
- Material and machinery for maintenance of the motorway.

If the Project credibly demonstrates low-carbon readiness, the risk of lock-in is low. This will be ascertained by assessing whether the Project can be developed for low-carbon use in the near future, potentially with limited investment, and taking into account the wider technological, economic and/or policy changes that may be needed to enable this.

Turkey's Climate Change Action Plan, 2011-2023[44] states that until 2023 Turkey envisions to increase the share of railroads in freight transportation and in passenger transportation as well as decreasing the share of highways in freight and passenger transportation. The action plan also states Turkey will expand the use of alternative fuels, new technology engines and environmentally-friendly hybrid transportation vehicles, the use of alternative fuels and clean vehicle technologies in public transport vehicles, as well as the improvement of smart transportation systems. Further, until 2023 necessary legislation, institutional structure and guidance documents for the implementation of sustainable transport planning in cities should be developed.

Different Forms of Transportation

The motorway Project is not necessarily designed for public transport use. Even though the location is in Istanbul, the toll motorway is an alternative transit route that bypasses the metropolis' severe traffic congestion and enable drivers to reach quickly the industrial zones.

However, new forms of using transportation including car sharing, ride sharing, car-pooling, park and ride, as well as kiss and ride[45] can save GHG emissions and are possible with the current setup of the Project operation.

The Ministry of Transport and Infrastructure's Strategic Document (2014-2023) and the Supplementary Action Plan (2014-2016) on National Intelligent Transportation Systems (ITS) envisions a human and environment oriented transportation system in Turkey built with advanced information technologies. In order to create a sustainable, productive, safe, efficient, innovative, dynamic, environment-friendly intelligent transport network, which creates added value and integrated with all transport modes using latest technology while making use of national resources the strategic document recommend the use of ITS application.

ITS are information and communication-based systems that enable multi-directional data exchange between user-vehicle-infrastructure-centre and monitoring, measurement, analysis and control mechanisms. Control mechanisms are developed with the intention of reducing travel time, increasing road safety, ensuring efficient use of the existing road capacity, increase mobility, fuel savings and limit environmental damage.

According to the Project ESIA[46] a free-flow tolling system (an open system with cameras instead of a closed system with barriers), will be preferred to avoid vehicles slowing and stopping at the tolls and thereby reducing carbon emissions as well as sensors and digital displays for empty islands to improve traffic efficiency at the service station.

[44] Ministry of Environment and Urbanization (2011) National Cliamte Change Action Plan, 2011-2023. Available at: https://www.preventionweb.net/files/29675_turkeynationalclimatechangeactionpl.pdf
[45] The term 'Kiss and Ride' denotes a facility designed to allow commuters to be dropped off by car and complete their journey by public transport.
[46] ERM (2021) Environmental and Social Impact Assessment: Nakkaş-Başakşehir Highway, Turkey.

Based on this, it is further recommended to explore options to integrate different “mobility as a services” schemes and ITS technology for “smart transportation”. For instance, considering additional parking spaces at intersections that might be useful for park and ride or car pool meet ups or to improve traffic flow and fuel efficiency with e.g. sensor technology.

Alternative Fuels

Electric mobility is a potential LCP for Turkey to align to the goals of the Paris Agreement. There is a high likelihood for an increase of electric mobility in Turkey. A shift towards electric mobility or other forms of alternative fuels like biofuels do not affect the Project. It is technical feasible to drive EVs or alternatively fuelled vehicles on the Nakkaş-Başakşehir motorway. However, for a successful modal shift, sufficient electric mobility infrastructure needs to be in place. Electric mobility infrastructure refers to the charging infrastructure and connections needed for new energy vehicles. The broad acceptance of EVs can only be achieved if a safe, reliable and convenient charging infrastructure is in place. This is an important factor for consumer acceptance.

For the Project this would require a sufficient amount of reliable charging stations connected with the electricity grid. These charging stations are needed, e.g. at the management support buildings, service areas, parking areas and all related facilities.

Currently, The Ministry of Environment, Urbanization and Climate Change has developed a new regulation regarding parking space. It says 2021 to 2023 for newly constructed residential buildings which would need a minimum number of 20 parking lots, 2 % of the parking spaces will be spared for EVs. After 2023, this rate will increase to 5 %. At the parking lots of shopping malls or the multistory car parks, this rate will be 5 % until 2023, and will increase to 10 % after 2023.

It is not entirely clear whether a similar regulation will be developed for office buildings or rest areas at motorways. Nevertheless, it is a first political sign in the direction of electric mobility. The Project developer should consider to already installing a certain amount of charging stations at parking and rest areas.

According to the Project ESIA[47], Nakkaş Otoyol A.Ş. is considering international best practices during the design of the service stations, including fast EV charging stations in the service stations.

Construction Material

For reconstruction and maintaining project materials such as cement, concrete, asphalt and steel will be needed. Options to reduce the CO_2 e emissions associated with the production and use do already exist in from of:

- Recycling and reuse of excavation masses, asphalt and steel;
- Material efficiency;
- Replacement of cement clinker as a binder in concrete;
- Green Material, such as Low Temperature Asphalt;[48]
- Transport optimisation; and
- Improve traffic management for reconstruction and maintenance to reduce congestion and emissions.

The Project already commits to the partly implementation of international best practices to reduce GHG emissions during construction and later on maintenance.

[47] ERM (2021) Environmental and Social Impact Assessment: Nakkaş-Başakşehir Highway, Turkey.

[48] Carbon Trust (2014) Lafarge Tarmac and Carbon Trust launch low energy road building materials with potential to save industry £46m. Available at: https://www.carbontrust.com/es/node/408

3.5 Summary and Recommendations

(I)NDCs are part of a larger system of national strategies, policies and plans, including national development plans and economic strategies underpinning the goals of climate change mitigation and adaptation. Turkey's goal of reducing GHG emissions from BAU level up to 21% by 2030 is supported by several national strategies and action plans, including sector-specific objectives, most of them valid until 2023. For the transportation sector, Turkey envisions a shift to low-carbon and smart transportation, as well as clean and energy efficient vehicle technologies.

The Project's GHG inventory shows for Scope 1 and Scope 2 during operation including road rehabilitation a yearly amount of approx. 8,300 t CO_2 e. However, the main carbon source of the Project is within Scope 3, including material production and supply and usage of the motorway.

Increase in Railway transportation is a possible pathway towards low-carbon transportation. However railways are not feasible everywhere or fit every purpose (like in the Project's case of 24,17 km bypass motorway). Other options including shared-economy, such as car sharing, ride sharing, car-pooling, park and ride, as well as kiss and ride, smart transportation reducing congestions, combined transportation, alternative fuel, and improvement in material sourcing are low-carbon options that can be implemented with the current Project setup.

The LCP for electric vehicles in Turkey shows that with a high-growth pathway in the adoption of EVs, transport-related CO_2 e emissions from traffic on the Nakkaş-Başakşehir motorway are likely to be 6% lower by 2030 and 15% lower by 2030, compared to a counterfactual scenario in which EV adoption remains at the 2021 level. In combination with other mitigation measures the emissions savings can be even higher.

The following Table 3-7 summarises the findings and outcome of the Project alignment review against mitigation goals of the Paris Agreement. It shows that the Project is aligned.

Table 3-7 Summary of the Project Alignment with the Mitigation Goals

Process	Findings	Outcome
General Screening	Project activities neither in the "aligned" or the "non-aligned" list.	Specific Assessment required
Review against NDCs, Including Other Policy Plans	Project relevant policies aiming at achieving the NDCs have been identified.	Aligned with policies aiming at encouraging intercity public transport and alternative fuel sources.
Low-Carbon Pathways	Mainly vehicles with combustion engines fuelled with fossil fuels will use the Nakkaş-Başakşehir motorway. However, a modal shift to electric mobility is possible.	In a high-growth pathway scenario, transport-related CO_2 e emissions from traffic on the Nakkaş-Başakşehir motorway are likely to be 6% lower by 2030 and 15% lower by 2030, compared to a counterfactual scenario in which EV adoption remains at the 2021 level.
Low-Carbon Readiness Review	Different forms of transportation including sharing economy and alternative fuels are possible with the current Project setup.	A low-carbon use of the motorway is feasible. Carbon-lock in is unlikely.
ALIGNED		

Source: ERM (2021)

The following recommendations have been made in the Project ESMMP to mitigate GHG emissions:

- Optimize transport logistics (locations/routes) to ensure efficient carriage of raw materials for maintenance;

- Reducing vehicle idling times through focus on scheduling of construction operations during maintenance;
- Prioritise the use of fuel efficient transportation vehicles and ensure regular maintenance of vehicles;
- Provide efficient driving guidelines to transportation vehicle drivers to promote fuel efficiency;
- Engines will not be left running unnecessarily;
- Refuelling shall be done from authorised fuel stations;
- Toll booths, service station, rest stops and other buildings can be equipped with photovoltaics so that they can produce their own renewable electricity;
- Motion sensors on the buildings (e.g. service station) can ensure that lightning is on when people or vehicle are in the vicinity only;
- A speed limit significantly reduces CO_2 emissions;
- Older vehicles with an old engine should pay a higher toll as they generate more CO_2;
- Traffic jams and slow-moving traffic should be avoided as they cause vehicles to generate more CO_2. This can be achieved through intelligent management of the access roads;
- A general possibility to reduce emissions in road traffic is the Transition to low carbon transportation.by using hybrid vehicles for operation and maintenance and promoting electro mobility, with electric charging stations installed at the rest areas; and
- Optimization of the timing for works implementation (Traffic management) to minimize traffic delays due to rehabilitation, widening or maintenance work zones on existing road sections.

Further recommendations for increased alignment are, e.g.:

- GHG accounting and transparent reporting at project/corporate (Nakkaş Otoyol) level;
- Supporting “mobility as a services” with suitable parking options at intersections;
- Incorporate ITS technology for “smart transportation”;
- Considering low-carbon material options for road rehabilitation; and
- Considering company fleet with EVs for road operation and maintenance.

4. ALIGNMENT REVIEW REGARDING ADAPTATION GOALS AND CLIMATE RESILIENCE

4.1 Evaluation of the Climate Risk and Vulnerability Context

The Project ESIA[49] used climate baseline data to identify material climate hazards in the Project region as well as climate change projections for two different Representative Concentration Pathways (RCP 4.5 and RCP 8.5) to assess how hazard level may in the future significantly increase or decrease, moderately increase or decrease or only change minimal depending on the RCP (see Table 4-1). Climate change hazards material in the Project region[50] are potential wildfire, landslide and flash flooding as well as water scarcity. Extreme heat, river flooding, coastal flooding have only a low hazard level.

Table 4-1 Climate Hazard based on Baseline and Projections Values

Climate Hazards	Baseline Conditions for Istanbul	Projections for Turkey					
		Year	2030		2060		
	Hazard level	Parameter	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5	Rating
Extreme Heat	Low	Change in Air temperature in °C[51]	1.1 °C	1.2 °C	2.0 °C	2.9 °C	Moderate Increase
Wildfire	High	Land fraction annually exposed to Wildfires in %	0.1%	0.2%	0.3%	0.4%	Minimal Change
Flooding	Low	Change in Maximum Daily Rainfall in mm[52]	-0.82 mm	0.43 mm	0.18 mm	0.99 mm	Minimal Change
Coastal Flooding	Very Low	-	-	-	-	-	-
Landslides /Flash Flooding	Medium	Change in Maximum 5-day Rainfall in mm	1.35 mm	1.25 mm	1.67 mm	2.42 mm	Moderate Increase
Water Scarcity	Medium	Projected Change In Water Stress[53]	1.4x increase	2x increase	2x increase	2x increase	Significant Increase

Source: ERM (2021) ESIA

[49] ERM (2021) Environmental and Social Impact Assessment: Nakkaş-Başakşehir Highway, Turkey.

[50] The Global Facility for Disaster Reduction and Recovery (GFDRR) Think Hazard. Available at: https://thinkhazard.org/en/report/3056-turkey-istanbul [18.06.2021]

[51] Climate Analytics, based on ISIMP Models. Available at: http://climate-impact-explorer.climateanalytics.org/impacts/

[52] World Bank, Climate Change Knowledge Portal. Available at: https://climateknowledgeportal.worldbank.org/country/turkey/climate-data-projections [05.07.2021]

[53] WIR Water Risk Atlas, available at: https://www.wri.org/applications/aqueduct/water-risk-atlas
The Atlas provides global water stress data in seven categories from 2.8x greater increase to 2.8x or greater increase.

In the following Table 4-2 the physical scenario data used for the assessment is listed including:

- hazards causing material impacts under baseline conditions;
- the trend in the hazard out to the future based on the projections scenario data used;
- the description of the potential impacts that might stem from the shortlisted climate-hazards;
- the likelihood of that hazard occurring at the Project location over the project's lifetime; and
- the overall physical climate risk score of 1-10. Possible Impacts have been based on the Project specific exposure to the climate hazards.

On basis of the climate change projections, potential impacts on the Project may occur due to e.g. variations in precipitation pattern, increase in temperature and increase in frequency and intensity of heavy rainfall events. Physical damage to assets as well as possible health issues or risk to life in case of wildfires, landslides and flash flooding are potential impacts. The risk of decreased water availability for the construction and operation of the Project poses a potential impact. All other identified negative impacts are of minor significance.

Table 4-2 Climate Hazards and Possible Impacts

Climate Hazards	Baseline Conditions for Istanbul	Projections for Turkey	Possible Impacts on the Project	Likelihood Not Likely / Plausible / Probable	Numerical Score
	Hazard level	Rating			
Extreme Heat	Low	Moderate Increase	The climate data results show that present and future extreme heat conditions are not likely to have an impact on the Project.	Not Likely	0
Wildfire	High	Minimal Change	Disruption of operation of the motorway due to life threating risks. Possible health issues or risk to life from smoke inhalation during wildfires. Fire damage to assets (eg. gas station), including to bunker fuels due to wildfires.	Likely	3
Flooding	Low	Minimal Change	Sections of the proposed motorway are located in close proximity of water courses. However, climate data results show that present and future flooding conditions are not likely to have an impact on the Project.	Not Likely	0
Coastal Flooding	Very Low	-	Climate data results show that coastal flooding is not likely present in the Project area.	Not Likely	0
Landslides /Flash Flooding	Medium	Moderate Increase	Physical risk to construction site, through flash flooding and landslides. Physical risk to buildings and other road infrastructure, through flash flooding and landslides.	Plausible	2
Water Scarcity	Medium	Significant Increase	Decrease in the availability of surface water used for construction and during operation.	Likely	3
			Sum		**8**

Source: ERM (2021) ESIA

The Project has an overall physical climate risk score of 8, calculated by weighting the scores for each hazard. Projects with a physical climate-risk score of 7 or more will require further analysis to identify options to reduce physical climate risks.

4.2 Definition of Climate Resilience Measures

In this section, it will be examined whether the Project has appropriate climate resilience measures that correspond to the specific physical climate risk identified. For each of the relevant physical climate risks identified above, corresponding climate resilience measures will need to be integrated into Project design.

Climate change hazards material in the Project region are potential wildfire, landslide and flash flooding as well as water scarcity. Specific mitigation measures, in order to reduce the impact of climate change on the Project, are included in the Environmental and Social Management and

Monitoring Plan (ESMMP) for the Project based on the outcome of the ESIA[54]. The measures shown in Table 4-3 may be adapted in relation to specific construction and operational activities.

Table 4-3 Mitigation Measures for Climate-related Physical Risks

	Resources/Area	Mitigation Measures	Responsibility	Timelines/ Frequency of Monitoring
	Occupational H&S	■ International best practice regarding ESHS risks and mitigation will be implemented ■ Emergency Preparedness and Response Plan will be in place with a set of specific pre-established procedures for coordination, alert, mobilisation and response to the occurrence or imminence of a particular event, such as natural hazards as for wildfires, flooding and storm surge, landslides, etc	EPC Contractor/ Nakkaş Otoyol	Construction Operation
	Resources	■ Water permits will be obtained for using boreholes and/or river or lakes as source.	EPC Contractor/ Nakkaş Otoyol	Construction
	Community H&S	■ Possibility of increase in flash flooding and landslides occurrence will be considered in the detailed design of the motorway by the Technical Planner. ■ The drainage/runoff systems, culverts, bridges, potential flooding areas such will be designed to handle the peak flows and floods. ■ Enhancement of road segment resistance will be considered, e.g. on embankments, creating deeper road foundations on slopes, enhancing drainage structures. ■ Roadside fire fuels eg. certain vegetation will be reduced to a minimum.	Nakkaş Otoyol	Detailed Design

Source: ERM (2023) ESMMP

In the Project ESIA the anticipated residual impacts referring to those potential impacts predicted to remain after the application of mitigation measures have been assessed. All potential impacts can be mitigated so that only impacts with minor risk significance remain. Therefore, the proposed climate resilience measures in the Project ESMMP are appropriate and meaningful responses that can limit potential financial exposure and/or contribute to climate resilience.

4.3 Appraisal of the Broader Climate Resilience Context

Now that the climate risks and related resilience measures for the Project have been identified, it is sought in this part to evaluate whether the Project is in line with broader policies and strategies aimed at adapting to such climatic risks in its wider area. The national climate change adaptation plans assessed in the Table 4-4 below were chosen to be assessed here on the basis that they aim to adapt to physical risks potentially affecting the Project's assets and operations (see section 4.1). As water stress and the risk of wildfires were found to be physical risks affecting the Project area, adaptation action strategies against such risks were chosen to be assessed below. The adaptation strategies assessed below were taken from Turkey's National Climate Change Adaptation Strategy

[54] ERM (2021) Environmental and Social Impact Assessment: Nakkaş-Başakşehir Highway, Turkey.

and Action Plan (2011)[55]. The right hand column of the Table 4-4 describes whether the Project is in line or not with the adaptation strategies outlined in the middle column.

Table 4-4 Project Alignment to Climate Resilience Strategies

Adaptation Action Plans [56]	Strategies against risks in Project Area	Project alignment to these strategies
Turkey Agricultural Drought Action Plan	■ Monitoring agricultural drought for the various regions and provinces ■ Increasing effectiveness of water management	■ During construction phase, the Project might stress local water resources due to water intensive construction activities. However, during the operation phase no detrimental impact on surrounding water resources are foreseen, as once in operation the motorway will not require any further water resources.
National Forestry Program (2004–2023)	■ Early warning systems ■ Use of sudden fire risk maps prepared according to meteorological data ■ Risk preparation and prevention issues necessary for forest fires caused by climate change are taken into the scope of local and regional planning works.	■ During construction phase, Project might reduce forest cover. On the other hand, once constructed, the Project may enforce adaptation strategies against forest fires as tarmac and built up areas provide a barrier to the spreading of fire and present less fuel.
National Climate Change and Health Adaptation Strategies Development Project (2010/2011)	■ Temperature and Heat Waves Action Plan: ■ timely warning system for heat-health, heat-related health information plans ■ reducing exposure to indoor heat, special care for high-risk groups, etc.	■ Project neither aligned nor non-aligned as this strategy is about health impacts of heat stress. Project may slightly increase temperature in the surrounding area; however, this slight increase is unlikely to exacerbate health impacts.
Flash flooding/landslides	■ Early warning systems and risk maps to identify floods, landslides and other risks ■ Integration of these in land use plans	■ Project may increase the risk of flash floods through a higher built up area of impermeable surface ■ Due to a rapid accumulation of water in the ground and less vegetation the risk of landslides could increase in the Project area, however, only minimally.

Source: As shown in table and ERM (2021)

The Project is aligned to the national climate resilience strategies, especially during its operation phase it does not impair the functioning of any of the relevant adaptation strategies for the given Project area. The Project may exacerbate some risks like heat stress or flash flooding due to the increase in built up area replacing green cover or other natural vegetation, however, for the most part does not hamper the broader climate resilience context.

[55] Ministry of Environment and Urbanization (2011) Turkey's National Climate Change Adaptation Strategy and Action Plan. Available at: untitled (fao.org)
Ministry of Environment and Urbanization (2011) Turkey's National Climate Change Adaptation Strategy and Action Plan. Available at: untitled (fao.org)

4.4 Summary

The Project has a climate change risk assessment (CCRA) in place, to determine which climate hazards could possible occur in the Project area and impact the Project assets and operation.

Climate change hazards material in the Project region are potential wildfire, landslide and flash flooding as well as water scarcity. Extreme heat, river flooding, coastal flooding have only a low likelihood to occur in the Project region. On basis of the climate change projections, potential impacts on the Project may occur due to eg. variations in precipitation pattern, increase in temperature and increase in frequency and intensity of heavy rainfall events. Physical damage to assets as well as possible health issues or risk to life in case of wildfires, landslides and flash flooding as well as the risk of decreased water availability for the construction and operation of the Project are potential impacts.

Specific mitigation measures, in order to reduce the impact of climate change on the Project, are included in the Project ESMMP. Based on the Project ESIA all potential impacts can be mitigated so that only impacts with minor risk significance remain. Therefore, the in the Project ESMMP proposed climate resilience measures are appropriate and meaningful responses that can limit potential financial exposure and/or contribute to climate resilience.

A review of the national climate change adaptation strategies shows that the Project does not obstruct any of these adaptation strategies and thus is aligned to the broader climate resilience context.

The following Table 4-5 summarises the findings and outcome of the Project alignment review against adaptation goals of the Paris Agreement.

Table 4-5 Summary of the Project Alignment with the Adaptation Goals

Process	Findings	Outcome
Evaluation of the Climate Risk and Vulnerability Context	Potential Climate Risks are: ■ Wildfires ■ Landslides and flash flooding ■ Decreased water availability	■ The Project has an overall physical climate risk score of 8, ■ Definition of Climate Resilience required
Definition of Climate Resilience Measures	All potential impacts can be mitigated so that only impacts with minor risk significance remain.	The Project demonstrates appropriate and meaningful climate resilience measures.
Appraisal of the Broader Climate Resilience Context	National climate change adaptation strategies against physical risks potentially affecting project area have been identified.	Project is in line with the adaptation strategies and thus is aligned to the broader climate resilience context.
ALIGNED		

Source: ERM (2021)

5. CONCLUSION

This review of the Paris Agreement Alignment of the Project was conducted based on the currently available information. During the development of this document Turkey's parliament ratified the Paris Agreement on the 6th of October 2021, five years after it signed the treaty. The review shows that the Project is materially aligned with both the mitigation goals as well as the adaptation and climate resilience goals of the Paris Agreement.

This review revealed that the Project neither meets the 'aligned' or 'non-aligned' lists in the Annex 2 of the EBRD Methodology during the general screening. Therefore a specific assessment was conducted evaluating whether Turkey is aligned with the Paris Agreement. First, it was determined that the Project is aligned with the national climate mitigation goals, through the review against NDCs, the LCPs and the Low Carbon Readiness Review. The latter two are aligned due to an increase in EVs use and alternative fuels, notably projected to increase in the future. The Project is also aligned for the most part with national policies aimed at reducing GHG emissions and achieving its NDC. However, although Turkey´s NDC is supported by a wide array of policies and plans, these are mostly not long-term, rarely spanning over 13 years or going up until after 2023. Thus, the veritable *long term* in Turkey's climate strategy is lacking. Additional specific climate mitigation measures of the Project are outlined in the ESIA for further reference.

Regarding adaptation, it has been found that the Project incorporates various appropriate climate resilience measures and does not impair the functioning of wider climate change adaptation strategies in the area. In other words, the physical climate risks posing the largest threat to the Project are water scarcity, wildfires, landslides and flash floods. Then it was assessed whether the Project may exacerbate or mitigate these climate risks, to determine its resilience to the wider climate context. As it has not found to hamper climate adaption policies aimed at reducing these risks affecting the Project in its area, the Project is deemed aligned to Turkey' relevant national adaptation goals.

Looking in to the future and taking into account Turkey's ratification of the Paris Agreements and goal of reaching net zero emissions in 2053, one may expect the nation to bolster up its climate change policies in the near future. Turkey submitted its NDC to the UNFCCC in 2015, before the COP 21. Thus, it is possible that Turkey will soon submitted its new or updated NDC - presumably with more comprehensive and stringent goals towards achieving the Paris Agreement Goals.

ERM has over 160 offices across the following countries and territories worldwide

Argentina
Australia
Belgium
Brazil
Canada
Chile
China
Colombia
France
Germany
Ghana
Guyana
Hong Kong
India
Indonesia
Ireland
Italy
Japan
Kazakhstan
Kenya
Malaysia
Mexico
Mozambique
Myanmar
The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Russia
Senegal
Singapore
South Africa
South Korea
Spain
Sweden
Switzerland
Taiwan
Tanzania
Thailand
UAE
UK
US
Vietnam

ERM GmbH
Siemensstrasse 9
63263 Neu-Isenburg
Germany

T: +49 6102 206-0
F: +49 6102 771 904 0

www.erm.com

The business of sustainability

ERM