Climate reporting of NC KTZ JSC
prepared in accordance with the IFRS S2 standard

October 2025

Climate reporting of NC KTZ JSC

Governance (1/6)

Paragraph 6 (a)(i)

The Board of Directors

The Board of Directors plays an important role in managing climate risks and opportunities. The role of the Board of Directors in managing climate risks and opportunities is carried out at a strategic level. According to the Charter of NC KTZ JSC, approved by the decision of the Sole Shareholder dated May 27, 2022 (Minutes No. 29/22), the exclusive competence of the Board of Directors includes the approval of:

- The development strategy defining the priority areas of activity of NC KTZ JSC, as well as monitoring the implementation of the development strategy of NC KTZ JSC ;
- Development Plan (business plan) of NC KTZ JSC and monitoring of its implementation;
- Risk management and internal control policy, risk appetite, risk register and risk map, quarterly risk reports of NC KTZ JSC;
- key performance indicators for members of the Management Board of NC KTZ JSC and their target values;
- reporting on sustainable development, etc.

Committees of the Board of Directors

on Audit

monitors the reliability and effectiveness of the risk management system, including the approval of policies and procedures, assessment of the integration of risks into strategy and business processes, analysis of the dynamics of key risks and the ability of the Company to adapt, as well as supervision of monitoring the risks of sustainable development and related reporting

on Strategy and Finance

reviews the Company's Development Strategy and Development Plan, strategic initiatives, including those aimed at adaptation, approves the action plan for their implementation, and monitors and analyzes progress reports on their implementation

on Safety and Environmental Protection

considers issues of environmental protection, sustainable development, including strategic documents, reports, action plans, as well as projects on energy efficiency and low-carbon development

by Appointment and Remuneration

considers key performance indicators for members of the Management Board, including their target values

Governance (2/6)

Paragraph 6 (a)(iii)

Board of Directors oversight of climate-related risks and opportunities (2024)

The Board of Directors:

- Report on the implementation of the Development Strategy of NC KTZ JSC until 2032 (annually);
- Registry and Risk Map of NC KTZ JSC, Risk appetite, Tolerance, Key risk indicators, Risk Response Plan (annually);
- Integrated Annual report of NC KTZ JSC for 2023 (annually);
- Results of the ESG rating of NC KTZ JSC (annually);
- Report on the state of occupational safety and environmental protection for NC KTZ JSC (quarterly);
- Consolidated Risk Report of NC KTZ JSC (quarterly).

Strategic session:

- Key aspects and steps necessary for the successful IPO of NC KTZ JSC (June 2024);
- Priority directions of digitalization of NC KTZ JSC (December 2024).

Nominating and Remuneration Committee:

- Maps of motivational key performance indicators of NC KTZ JSC executives for 2025 (annually);
- Development Plan of the Board of Directors of NC KTZ JSC for 2024-2025 (annually).

Strategy and Finance Committee:

- Recommendations on concluding major transactions within the framework of the investment project for the purchase of freight and passenger locomotives;
- The results of cooperation with the European Bank for Reconstruction and Development;
- Report on the implementation of the Development Strategy of NC KTZ JSC until 2032 (annually).

Audit Committee:

- Registry and Risk Map of NC KTZ JSC, Risk appetite, Tolerance, Key risk indicators, Risk Response Plan (annually);
- Consolidated Risk Report of NC KTZ JSC (quarterly).

Safety and Environmental Protection Committee:

- Information on the status of the implementation of the Roadmap for Low-carbon Development of NC KTZ JSC and its subsidiaries until 2060 (annually);
- The results of the ESG rating of NC KTZ JSC and the Roadmap for improving the ESG rating of NC KTZ JSC for 2024-2025 (annually);
- Results of the assessment of the effectiveness of the sustainable development of NC KTZ JSC in 2023 (annually);
- The action plan of NC KTZ JSC on industrial safety for 2024 (annually);
- Reports on the state of train safety in NC KTZ JSC, on the state of occupational safety and environmental protection in NC KTZ JSC (quarterly).

Governance (3/6)

Paragraph 6 (a)(iii)

Board of Directors oversight of climate-related risks and opportunities (for 9 months of 2025)

The Board of Directors:

- Registry and Risk Map of NC KTZ JSC, Risk appetite, Tolerance, Key risk indicators, Risk Response Plan (annually);
- Integrated Annual report of NC KTZ JSC for 2024 (annually);
- Results of the ESG rating of NC KTZ JSC (annually);
- Report on the state of occupational safety and environmental protection for NC KTZ JSC (quarterly);
- Consolidated Risk Report of NC KTZ JSC (quarterly).

Strategic session:

- Key ESG trends and their impact on the Company's operations. Interim Report on the Climate Strategy (June 2025).

Strategy and Finance Committee:

- Report on the implementation of the Development Strategy of NC KTZ JSC until 2032 (annually).

Audit Committee:

- Registry and Risk Map of NC KTZ JSC, Risk appetite, Tolerance, Key risk indicators, Risk Response Plan (annually);
- Consolidated Risk Report of NC KTZ JSC (quarterly).

Safety and Environmental Protection Committee:

- Information on the status of the implementation of the Roadmap for Low-carbon Development of NC KTZ JSC and its subsidiaries until 2060 (annually);
- Results of the ESG rating of NC KTZ JSC (annually);
- Results of the assessment of the effectiveness of the sustainable development of NC KTZ JSC for 2024 (annually);
- Reports on the state of occupational safety and environmental protection for NC KTZ JSC (quarterly);
- Information from consultants on improving corporate climate governance (September 2025);
- Information on the results of diagnostics of the current level of compliance of NC KTZ JSC with the ESG rating criteria in the environmental aspect, conducted by an external consultant (October 2025).

Governance (4/6)

Paragraph 6 (a)(iv)
Paragraph 6 (a)(v)

Board of Directors oversight of climate-related risks and opportunities

NC KTZ JSC actively implements ESG principles in its activities, ensuring that climate risks are taken into account when overseeing strategy, major decisions and risk management policies. One of the key initiatives of the Development Strategy is "Environmental Sustainability", which focuses on issues related to climate change.

Before implementing significant investment projects, the Company conducts a thorough risk analysis, impact assessment and potential consequences. If risks are identified, appropriate mitigation measures are developed, up to and including a decision to abandon the project, following the precautionary principle.

In order to reduce the negative impact on the environment and increase energy efficiency, NC KTZ JSC is implementing a program to upgrade the locomotive fleet: in 2025-2035, it is planned to purchase 875 locomotives combining economic benefits and environmental friendliness. Modern diesel locomotives and the first hybrid shunting locomotives (battery powered) will reduce fuel and maintenance costs in the long term and at the same time significantly reduce harmful emissions.

NC KTZ JSC has identified the following key performance indicators in the field of climate goals: the "Carbon Footprint" indicator, fixed in the Company's Development Strategy and Development Plan, as well as the "Energy Efficiency Level" indicator, provided in the system in the motivational efficiencies of the Company's Chief Engineer.

The achievement of the set goals is monitored by specialized departments: the Department of Industrial Safety and Ecology is responsible for monitoring the "Carbon Footprint" indicator, and the Department of Technical Policy is responsible for the "Energy Efficiency Level" indicator.

Progress on both indicators is assessed on an annual basis. These goals are integrated into the system of key performance indicators (KPIs), the fulfillment of which has a direct impact on the remuneration system, including the accrual of bonuses.

The Board of Directors approves KPIs for members of the Management Board of NC KTZ JSC and their target values, as well as KPIs with actual values and remuneration calculations are submitted for consideration by the Nominating and Awarding Committee and the Board of Directors.

Integrating climate goals into the reward system					
Climate goal / KPI	Responsible for achieving the goal	Goal for 2024	Fact for 2024	% of the premium impact (weight in the efficiency chart)	Comments
Reducing the carbon footprint	Chief Engineer	-2,7%	-6,0%	25%	The KPI is aimed at gradually reducing greenhouse gas emissions. The implementation of this indicator helps to reduce the negative impact of the Company on the environment, fulfill its obligations in the field of sustainable development and achieve national and international climate goals.
Energy efficiency level	Chief Engineer	13,8%	24%	25%	The KPI is aimed at ensuring the rational and efficient use of energy resources in the Company's production processes. The implementation of this indicator helps to reduce indirect greenhouse gas emissions, increase the Company's environmental sustainability and reduce total energy consumption costs.

Governance (5/6)

Paragraph 6 (a)(ii)

The assessment and determination of the competencies of the members of the Board of Directors is carried out annually as part of a formalized process provided for in the Methodological Recommendations for Evaluating the activities of the Board of Directors and its Committees, the Chairman, members of the Board of Directors and the Corporate Secretary of the organizations of Samruk-Kazyna JSC, approved by the decision of the Board of Samruk-Kazyna JSC dated 12/14/2017.Based on the assessment results, according to the best corporate governance practices, the need is determined and the members of the Board of Directors are trained on an annual basis.
Thus, in 2023, members of the Board of Directors received training on corporate ESG management, which addressed issues of climate risk management and opportunities, cross-border regulation of carbon emissions and other important aspects in the field of ESG.
In 2025, an assessment of the activities of the Board of Directors and its committees is expected to be conducted by external consultants.

Competence matrix of the Board of Directors of NC KTZ JSC				
Full name of the members of the Board of Directors	**Skill**	**Description**	**Relevance**	**Role**
	Climate awareness, management of climate risks and opportunities	Experience, qualifications and understanding required to oversee strategies aimed at responding to climate risks and opportunities	Understanding climate risks and opportunities, and their importance to business. Overseeing the setting of climate goals, policies, and climate-related decisions.	Monitoring the implementation of the Development Strategy
Ryskulov A.K.	V	V	V	V
Otynshiev E.M.	V	V	V	V
Utepov M.M.	V	V	V	V
Irubaev K.K.	V	V	V	V
J. McKay	V	V	V	V
U. Wokurka	V	V	V	V
Godunova N.N.	V	V	V	V
Schierhuber A.	V	V	V	V

Governance (6/6)

Paragraph 6 (b)(i)

The Management Board

The Management Board of NC KTZ JSC, being the collegial executive body of the Company in accordance with the Charter, approves and submits the Strategy and Development Plan (business plan) to the Board of Directors within its competence, as well as ensures their implementation. The Management Board approves internal rules and procedures in the field of the corporate risk management system, ensures the functioning and effectiveness of the risk management and internal control system in accordance with the adopted Policy of NC KTZ JSC on Risk Management and internal control. The powers, responsibilities and responsibilities for the implementation of individual procedures in this area are distributed among the heads of departments, owners of business processes and control procedures.

Chairman of the Management Board

carries out general management of the activities of NC KTZ JSC in determining strategic priority areas of activity and setting strategic goals and objectives of NC KTZ JSC, improving risk management systems, internal control and business continuity management of NC KTZ JSC

Chief Engineer

manages the activities of NC KTZ JSC in the following areas: defining and implementing a unified technical policy, as well as policies in the field of occupational safety and health management, fire safety, industrial safety, environmental and energy management for the group of companies of NC KTZ JSC, ensures the identification of risks and hazards in accordance with the established procedure. in the field of occupational safety and ecology, conducting risk assessment and responding to hazards and risks; development and implementation of a low-carbon development program, as well as the development, implementation, updating of comprehensive energy conservation and energy efficiency programs in NC KTZ JSC and monitoring their implementation, etc.

Managing Director of Finance

manages the activities of NC KTZ JSC in the following areas: formation of the medium-term development plan of NC KTZ JSC and the development plan of the group of companies of NC KTZ JSC, development and implementation of programs to improve risk management systems, internal control and business continuity management of NC KTZ JSC

Managing Director of Strategy

manages the activities of NC KTZ JSC in the following areas: development, monitoring, up-to-date and coordination of work on the implementation of the Development Strategy of NC KTZ JSC, development of motivational key performance indicators for senior and managerial staff of NC KTZ JSC, coordination of issues related to the implementation and implementation of the principles of sustainable development in NC KTZ JSC

Climate reporting of NC KTZ JSC

Strategy (1/27)

Paragraph 9- 13

NC KTZ JSC is aware of the importance of climate risks for sustainable development, operational activities and long-term business value. Climate change is having an impact on the Company's infrastructure, logistics, supply chains, and financial performance.

As part of the strategic and long-term planning of NC KTZ JSC, an assessment of climate risks was carried out, including both physical and transitional risks. This assessment is aimed at identifying potential vulnerabilities, ensuring the sustainability of the business model and adapting to changing climatic conditions.

The Company considers climate risks as an integral part of its risk management system and an important factor influencing long-term sustainable development.

Approaches to climate assessment

Phase 1	Phase 2	Phase 3	Phase 4
Identification of climate risks and opportunities across the entire value chain	Selecting key assets for impact analysis	Scenario analysis of climate risks for key assets	Qualitative and quantitative analysis of financial impacts of climate risks and opportunities

Methodology of climate assessment analysis

Climate risk modeling

Physical climate risks				Transitional climate risks			
Scenarios IPCC SSP	Basic level	SSP2-4,5 Optimistic scenario +2.7oS in 2100	SSP5-8,5 Pessimistic scenario +4.4oS in 2100	Scenarios NGFS	Basic level	Well below 2°C The scenario of progressive climate policy	Net Zero Ambitious climate policy scenario
Time horizons	Historical	2030 is a long-term year	2050 is a long-term year	Time horizons	Historical	2030 is a long-term year	2050 is a long-term year

Strategy (2/27)

Paragraph 9- 13

Types of climate-related risks included in the risk assessment

Risks

1 *Short-term*

1 *Medium-term*

22, including 14 physical and 8 transitional *Long-term*

Opportunities

1 *Long-term*

The company has identified two climate risks for the short and medium term:

1) Shallowing of the Caspian Sea;
2) Risks associated with changes in the physical parameters of the climate;
3) These risk categories are related to the direct impacts of climate change on the environment and infrastructure and are physical risks.

№	Risk / Opportunity	Type	Horizon	Description of the impact	Connection to business planning
1	Shallowing of the Caspian Sea	physical	medium-term	Reducing the operational capabilities of port berths, shipping lanes, port water areas, hydraulic structures and maritime safety	The development plan is being developed taking into account measures aimed at reducing climate risks.
2	Risks associated with changes in the physical parameters of the climate	physical	short-term	the risk of floods, blurring of the roadway, artificial structures and other infrastructure facilities; risk of damage to infrastructure facilities due to extreme heat/severe frost, as well as drought in the regions; the risk of changes in the structure and volume of cargo due to natural disasters related to climate change.	The development plan is being developed taking into account measures aimed at reducing climate risks.

Strategy (3/27)

Paragraph 9- 13

Identified climate risks and opportunities – physical risks (long-term)

A segment of the value chain	Category (TCFD)	Climate danger	Impact Description – Direct Impact	Description of the impact – Indirect impact
Upper level	Acute	An increase in extreme weather conditions and phenomena (for example, a storm, a forest fire...)	**Impact on electricity suppliers:** • Property damage resulting in external power failure **Impact on fossil fuels and electricity generation:** • Destruction of pipelines passing through burnt forests, which leads to a reduction in production **Impact on suppliers of rolling stock, track, infrastructure:** • Damage to production facilities or vehicles, leading to disruption of equipment supplies	**Impact on the supply and operation of KTZ:** • Interruption of work due to the inability to use power lines or alarms caused by failures in the KTZ power supply • Decreased activity due to delayed deliveries of new equipment
	Acute	Drought	**Impact on electricity producers and distributors:** • Reduction of electricity production at Kazakhstan's hydroelectric dams, which accounts for 8% of Kazakhstan's total hydroelectric power	**Impact on the supply and operation of KTZ:** • Interruption of work due to the inability to use power lines or alarms caused by failures in the KTZ power supply
Operational	Chronic	An increase in the average temperature	**Impact on KTZ's rolling stock and operations:** • Increased cooling requirements (during transportation or storage of goods) • Inability to meet specific temperature requirements for specific cargoes (e.g. scrap metal, temperature-sensitive cargoes)	**Impact on KTZ's activities:** • Additional operating costs due to cooling requirements • Loss of customers and revenue when transporting temperature-sensitive goods • Loss of passengers due to the lack of cooling systems in individual wagons
	Chronic	Shallowing of the Caspian Sea	**Impact on KTZ infrastructure:** • Operational difficulties and disruption of shipping schedules • The need for modification of ports and docks, dredging, reconstruction of infrastructure	**Impact on KTZ's operations and investments:** • Significant capital expenditures • Delays in the delivery of goods and services
	Acute	Drought	**Impact on KTZ's infrastructure and water supply:** • Loss of stability of buildings due to shrinkage of clays, leading to asset depreciation • The shortage of water supply leads to the inability of Temirzholsu JSC to meet the water needs of other KTZ enterprises	**Impact on KTZ's operations and investments:** • Capital expenditures for infrastructure monitoring • Interruption of activities and loss of productivity due to lack of water

Strategy (4/27)

Paragraph 9- 13

Identified climate risks and opportunities – physical risks (long-term)

A segment of the value chain	Category (TCFD)	Climate danger	Impact Description – Direct Impact	Description of the impact – Indirect impact
Operational	Acute	Abnormal heat and extreme temperatures	**Impact on KTZ rolling stock and infrastructure:** • Electrical malfunction, rail expansion and loss of track stability due to overheating • Loss of stability of buildings as a result of expansion and compression of building material, which leads to asset depreciation **Impact on employees:** • Overheating of the cabin leads to an increased risk of accidents • Risks to the health of employees (heat exhaustion, stroke)	**Impact on KTZ's operations and investments:** • Interruption of activity due to overheating of equipment • Capital expenditures on infrastructure monitoring • Loss of productivity and revenue due to employee health conditions
	Acute	Increased likelihood and severity of wildfires	**Impact on KTZ rolling stock and infrastructure:** • Damage to property as a result of a forest fire occurring near railway infrastructure, or a fire caused by railway equipment (for example, sparks from exhaust pipes of locomotives, passenger cars, bonfires, lightning discharges), aggravated by the proximity of woodlands, which leads to deterioration of assets	**Impact on KTZ's operations and investments:** • Interruption of activity due to destruction of assets or interruption of movement due to a nearby forest fire • The cost of maintenance and repair operations
	Acute	Floods and heavy rainfall	**Impact on rolling stock and infrastructure:** • Damage to assets resulting in asset impairment • Inaccessibility of buildings and paths • Slippery track, risk of derailment	**Impact on KTZ's operations and investments:** • Business interruption due to asset destruction, unavailability, or inactivity • Capital expenditures to repair damage and increase maintenance costs for monitoring water exposure
	Acute	Earthquake and landslides	**Impact on rolling stock and infrastructure:** • Damage to assets resulting in asset impairment • Inaccessibility of buildings and paths	**Impact on KTZ's operations and investments:** • Business interruption due to asset destruction and/or unavailability • Capital expenditures for damage repair
	Acute	Storm and increased wind gusts	**Impact on rolling stock and infrastructure:** • Damage to assets resulting in asset impairment • Blocking of the track, risk of derailment (for example, falling of a tree on the railway, slippery track due to leaves) **Impact on KTZ's activities:** •Work interruption due to difficulties with port cranes and dock operations	**Impact on KTZ's operations and investments:** • Business interruption due to asset destruction • Track maintenance costs and capital costs for damage repair

Strategy (5/27)

Paragraph 9- 13

Identified climate risks and opportunities – physical risks (long-term)

A segment of the value chain	Category (TCFD)	Climate danger	Impact Description – Direct Impact	Description of the impact – Indirect impact
Operational	Acute	Snowfall	**Impact on KTZ rolling stock and infrastructure:** • Closure of railway tracks	**Impact on KTZ:** • Interruption of activity due to unavailability of railway track • Maintenance costs for clearing paths
	Acute	Frost/cold wave	**Impact on rolling stock and infrastructure:** • Cracked rails • Equipment malfunction (for example, icing of wires, freezing of switches, snow drifts on tracks, freezing of automatic locking)	**Impact on KTZ:** • Interruption of activity due to unavailability of railway track • Maintenance costs to monitor the condition of infrastructure and equipment, as well as capital costs to repair damage
The lower level is the Clients	Chronic	Changes in weather conditions (temperature rise, precipitation change)	**Evaluation of the customer's cargo (for example, raw materials from the manufacturer):** • Reduction of agricultural yields **Impact on customers (passengers):** • Passenger discomfort due to transportation conditions (e.g. extreme heat, lack of cooling)	**Impact on KTZ:** • The loss of revenue is associated with a decrease in demand for the transportation of agricultural products due to a reduction in agricultural production • Loss of income and impact on reputation related to passenger discomfort and changing customer preferences in choosing alternative modes of transport
	Acute	Increased extreme events (drought, storm)	**Evaluation of the customer's cargo (for example, raw materials from the manufacturer):** • Disruption of harvest due to acute events (for example, drought), leading to a reduction in agricultural production • Damage to the assets of producers of raw materials (for example, fuel, coal, etc.), leading to disruptions in the work of producers and a decrease in production volumes	**Impact on KTZ:** • The loss of revenue is associated with a decrease in demand for transportation of products due to a reduction in the production of raw materials.

Strategy (6/27)

Paragraph 9- 13

Identified climate risks and opportunities – transitional risks (long-term)

A segment of the value chain	Category (TCFD)	Climate danger	Impact Description – Direct Impact	Description of the impact – Indirect impact
Upper level	Politics and law	GHG emissions price increase	**Impact on electricity production:** • Higher cost of electricity generation due to carbon taxes • The need to import electricity from abroad to compensate for the ban on the production of electricity based on fossil fuels **Implications for construction subcontractors:** • Increased cost of raw materials dependent on fossil fuels (steel, cement)	**Impact on KTZ:** • Increased operating costs for electricity and fuel • Additional capital or maintenance costs related to the repair of railways and infrastructure
	Politics and law	Mandatory requirements and regulation of existing products and services	**Impact on rolling stock suppliers:** • Ban on future sales of low-performance diesel or gasoline locomotives/vehicles	**Impact on KTZ:** • Reduced activity due to the inability to use existing traction facilities or additional costs for adapting energy-efficient rolling stock
Operational	Politics and law	Mandatory requirements and regulation of existing products and services	**Impact on KTZ:** • Possible operational limitations • Possible cancellation of high-emission projects	
	Politics and law	Expanded emission reporting obligations	**Impact on KTZ:** •Additional compliance costs related to public emission reporting with scope 1 and 2, followed by scope 3 and climate-related information	
	Technology	The cost of moving to lower-emission technologies	**Impact on KTZ:** •Write-off of existing assets •Capital investments in network electrification and additional costs for adaptation and implementation of new processes for the railway network •Additional costs for replacing the fleet for freight and passenger transportation (for example, trains powered by hydrogen or batteries)	

Strategy (7/27)

Paragraph 9- 13

Identified climate risks and opportunities – transitional risks (long-term)

A segment of the value chain	Category (TCFD)	Climate danger	Impact Description – Direct Impact	Description of the impact – Indirect impact
Customers	Politics and law	Mandatory requirements and regulation	**General description:** National carbon regulation of greenhouse gas emissions from fossil fuel extraction (NCF) could potentially affect the distribution of KTZ's carbon-intensive products with financial penalties or even business bans. **Impact on customers (trucking):** • Derogations for assets exceeding the emission limits set by the decree • Decommissioning of old polluting facilities • The risks of a ban on operating activities and restrictions on activities • Risks of fines or penalties • Risks associated with the need for purchase quotas • Reduced earnings • Possible cancellation of projects • Potential impairment of individual assets	**Impact on KTZ:** • Loss of customers and related revenues, which are subject to severe regulatory restrictions
	Market	Changing customer behavior	**General description:** Commitments to reduce greenhouse gas emissions and transition to carbon neutrality and related climate policies may affect potential consumer demand for hydrocarbons, including coal, one of the main cargoes transported by KTZ. **Impact on customers (trucking):** Reduced activity due to lower demand for fossil fuels	**Impact on KTZ:** • Loss of customers and related revenue
	Reputation	Stakeholders' concerns	**General description:** Exposure to climate risks can worsen investor confidence and lead to a decrease in the company's valuation if investors do not see mitigating actions on the part of the company. Stakeholders will expect companies to have public carbon reduction goals. **Impact on customers (trucking):** Financial and operational difficulties due to a decrease in investor interest and pressure to fulfill public climate commitments. **Impact on KTZ:** Financial and operational difficulties due to a reduction in the number of investors and demands from investors and clients to achieve government climate targets.	**Impact on KTZ:** • Loss of clients with negative reputations

Strategy (8/27)

Paragraph 9- 13

Identified climate risks and opportunities – opportunities (long-term)

A segment of the value chain	Category (TCFD)	Climate danger	Impact Description – Direct Impact	Description of the impact – Indirect impact	A segment of the value chain
Operational	Energy source	Using low-emission energy sources	Switching to low-carbon fuels	• Reducing greenhouse gas emissions • Reducing exposure to carbon costs and rising diesel prices and being able to communicate about it (e.g. CO2 emissions are avoided by projects)	• Reducing local pollution and improving operator health • Contribution to the achievement of national emission reduction targets
	Energy source	Using new technologies	Implementation of clear alternative drive technologies	• Reducing greenhouse gas emissions • Improving energy efficiency through the use of alternative fuels such as hydrogen or electricity from renewable sources to power locomotives and trains.	• Reducing local pollution and improving operator health • Contribution to the achievement of national emission reduction goals
	Products and services	Development and/or expansion of production of low-emission goods and services	Modernization of tracks	• Reduction of maintenance costs and downtime of railway infrastructure • Increasing the capacity and speed of railway transport	• Improved safety, reliability, and performance • Increased customer satisfaction • Less sensitivity to natural physical risk
	Market	Access to new markets	Developing new partnerships with clients	• Increase revenue by attracting new customers • An opportunity to improve the company's reputation	• An opportunity to improve the company's reputation
Customers	Products and services	A shift in consumer preferences	Transition to low-emission projects	• Increasing the competitiveness and attractiveness of the company for passengers and freight customers, who are increasingly aware of the environmental impact. • Attracting new customers (freight and passenger) who would like to replace the existing motorized transport with low-emission vehicles	• An opportunity to improve the company's reputation. • Reducing pollution at the local level and contributing to national reduction goals

Strategy (9/27)

Paragraph 9-13

Impact analysis

In 2025, an analysis of exposure to physical hazards was conducted at 12 sites located in the Northern, Western, Southern and Central regions, covering various types of assets: railway stations, port, bridge, tunnel and rolling stock factory:

1. Astana
2. Pavlodar
3. Uralsk
4. Almaty-1
5. Altynkol
6. Dostyk
7. Arys- 1
8. Karaganda
9. Port Aktau
10. Bridge
11. Tunnel
12. Stadler Factory

The selection of facilities was based on the criteria of their location in different climatic zones (North, West, South and Center) and a variety of asset types. The sample includes railway stations with different line characteristics, as well as ports, bridges, tunnels, and a rolling stock manufacturing plant.

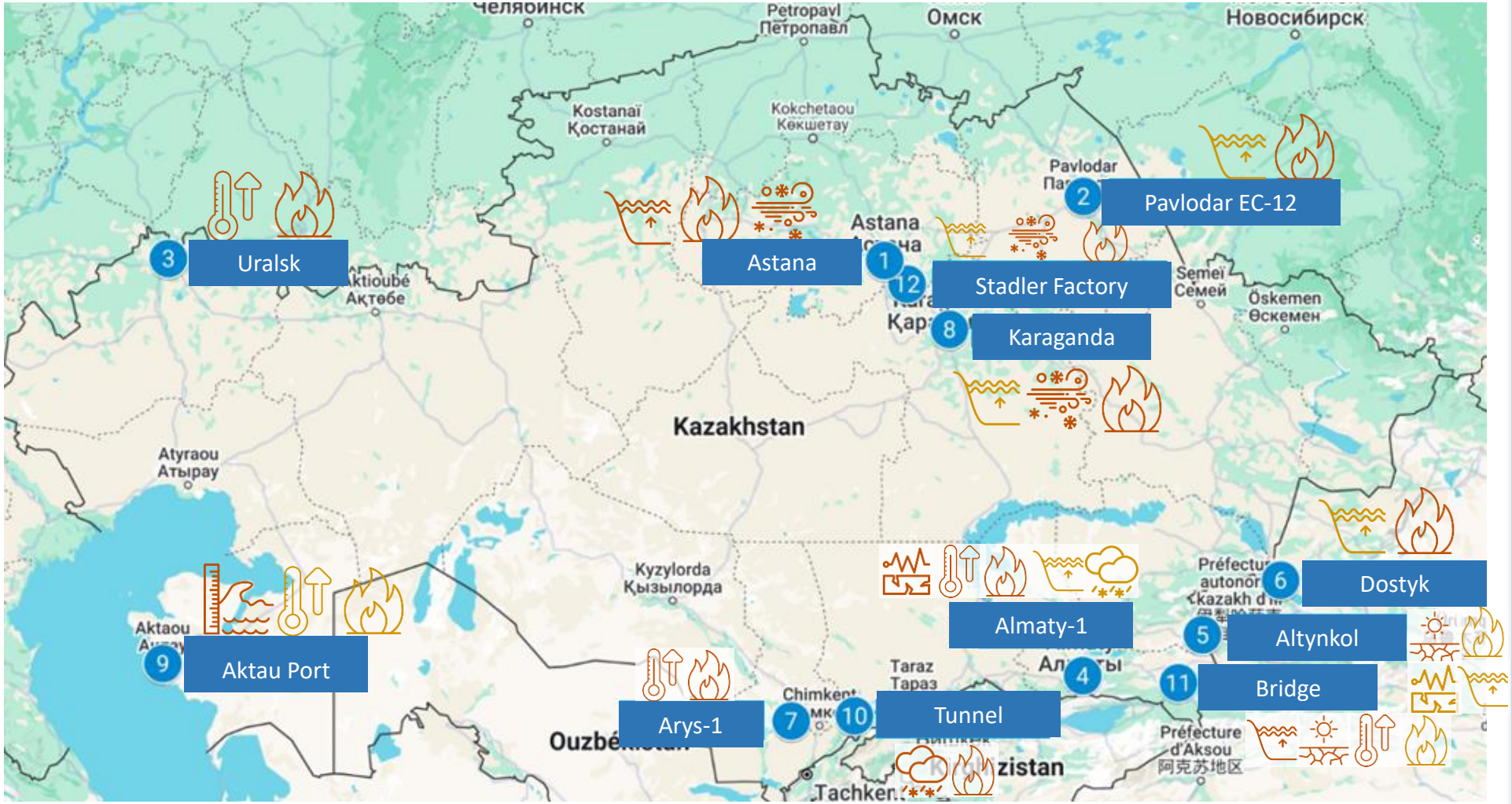
Strategy (10/27)

Paragraph 9-13

Impact analysis

The Company's exposure to climatic and physical risks:

- Flood
- Sea level change
- Wind
- Storm
- Drought
- Fire
- High temperature
- Earthquake
- Precipitation



High impact Average impact

Strategy (11/27)

Paragraph 9-13

Climate scenario analysis

IPCC scenarios for physical risk:

SSPX-Y scenarios are classified according to two numbers. The first number X refers to this socio-economic narrative, the second number Y refers to the level of radiation exposure (in W/m2), which will be achieved in 2100 and is associated with this increase in global temperature in 2100.

- **SSP2-4.5** It is described by the IPCC as an interim scenario. Greenhouse gas emissions peak around 2040 and then decline. SSP2-4.5 can be considered as an interim scenario (absence of a strong climate policy), given the exhaustible nature of non-renewable fuels. Modern social, economic, and technological trends persist, and development and growth are uneven depending on the country and region. National and international institutions are working to achieve the Sustainable Development Goals, which are progressing slowly. Compared to 1850-1900, the global average surface air temperature in the period 2081-2100 is likely to reach 2.1°C-3.5°C, with a best estimate of 2.7°C.
- **SSP5-8.5** predicts a reasonable worst-case scenario and is widely used for climate risk assessment and stress tests. SSP5-8.5 was specifically chosen as a high-end baseline scenario and was not intended to be portrayed as the most likely outcome of "business as usual" without politics. It is characterized by development based on the active use of heavy fossil fuels and marked by large investments in healthcare, education and new technologies. It is also the adoption of a resource- and energy-intensive lifestyle around the world. Finally, there is high economic growth and rapid technological progress. It is important to note that the values of climate variables and their effects will differ greatly from other scenarios only in the long term (2070-2100 years), while up to 2050 they will be close to others. Compared to 1850-1900, the global average surface air temperature in the period 2081-2100 is likely to reach 3.3°C-5.7°C, with a best estimate of 4.4°C.

NGFS scenarios for Transition risk:

NGFS scenarios are based on the IPCC SSP2 scenario, which defines the state of the world in terms of economic growth, demography, urbanization, education, etc. NGFS scenarios add a layer of assumptions about actions to combat climate change.

- **Net Zero 2050:** Net Zero 2050 limits global warming to 1.5°C through strict climate policy and innovation, achieving global zero CO2 emissions by 2050. This scenario assumes that an ambitious climate policy will be introduced immediately. Net CO2 emissions will reach zero by about 2050, giving at least a 50% chance of limiting global warming to below 1.5°C by the end of the century, with a limited excess (< 0.2°C) of 1.5°C in earlier years. The physical risks are relatively low, but the risks of the transition period are high.
- **Below 2°C:** Below 2°C gradually increases the rigidity of climate policy, giving a 67% chance of limiting global warming to below 2°C. This scenario assumes that climate policy is introduced immediately and gradually becomes stricter, although not as high as in Net Zero 2050. Zero CO2 emissions will be achieved after 2070. The physical and transition risks are relatively low.

For each NGFS scenario, economic variables (carbon price, energy price, energy demand) were predicted using various integrated models. The analysis uses the results of the REMIND-MAgPIE 3.2-4.6 reference model.

At the same time, according to the approved Concept of low-carbon development of the Company until 20260, the main goal is to achieve carbon neutrality of the Company until 2060. In general, carbon neutrality does not mean the complete elimination of greenhouse gas emissions – emissions that cannot be reduced must be compensated.

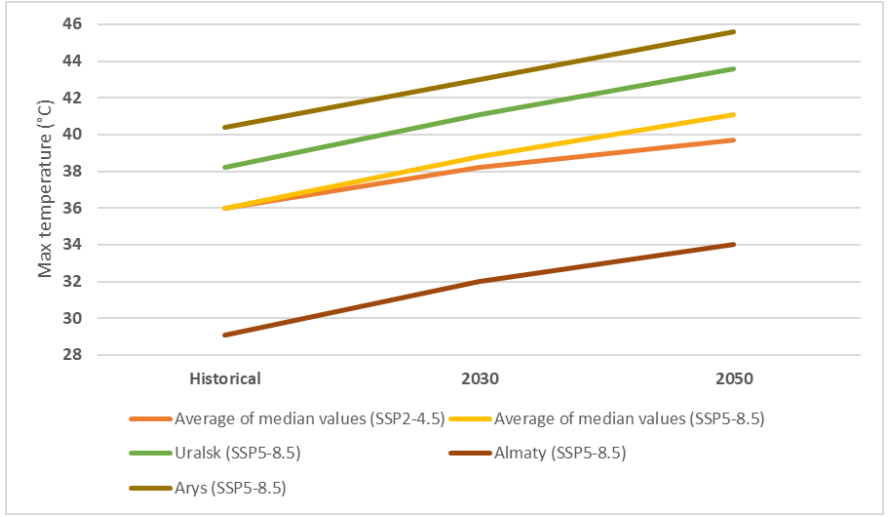
Strategy (12/27)

Climate scenario analysis

Forecasting of dangerous climatic events

High temperature and heat wave

Kazakhstan is particularly susceptible to global warming with rising temperatures and increasing heat waves in number and intensity. The figure below shows the evolution of the maximum temperature in the selected areas. The orange and red lines show the maximum temperature averaged over all sites; the blue lines show the noticeable extremes that can be achieved in one site for scenarios SSP5-8.5.



Dynamics of maximum temperature in Kazakhstan

By 2050, the maximum temperatures in the selected areas are expected to reach from 32°C to 46°C, with an average of about 40°C. The distribution of maximum temperatures varies by region:

- Almaty region: This area is considered less at risk of high temperatures, with maximum temperatures not exceeding 34°C, even in the worst-case scenario. Heat stress indicators in this region are also low: on average, 4 days a year the temperature of the humid thermometer exceeds 28°C in the worst-case scenario for 2050, and there is not a single day when it exceeds 32°C.
- Uralsk, Arys and the analyzed bridge: these areas are particularly at risk of extreme heat. Maximum temperatures in both scenarios could exceed 42°C to 44°C by 2030 and 44°C to 46°C by 2050. This temperature increase also extends throughout the year, especially in Arys, where the global humid thermometer temperature will exceed 28°C by more than 100 times in the worst-case scenario for 2050 (an increase of more than 70% compared to historical data) and exceed 32°C by more than 50 times in the worst-case scenario for 2050 (compared to 10 times in history).
- Aktau Port: This area is at an average risk of extreme temperatures, with maximum temperatures close to the average across all sites. However, heat stress conditions are expected to increase. The global temperature of the humid thermometer will exceed 28°C by more than 100 times (an increase of 55-70% compared to historical data) and exceed 32°C by more than 80 times (compared to 22 times historically).

Strategy (13/27)

Climate scenario analysis

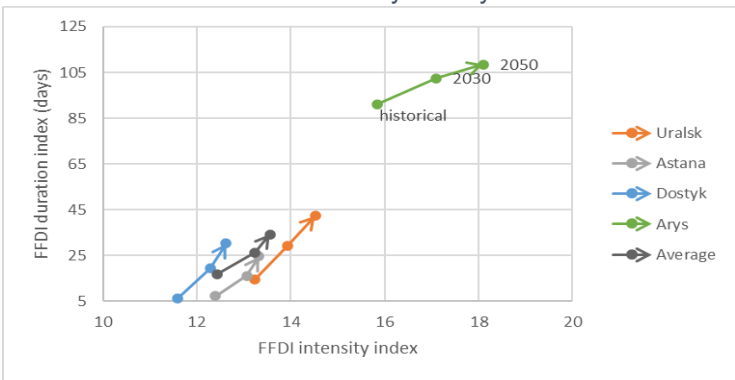
Forecasting of dangerous climatic events

Low temperature and snow

According to all indicators related to cold waves, there is a tendency to reduce the risk of frost, which is consistently observed in all areas.:
• Frequency: -25% by 2030 and -40% to -50% by 2050
• Duration: -30% by 2030 and -50% to -60% by 2050
For most assets, a decrease in the frequency of cold events is also expected, and the number of snowfalls will also decrease.
However, for some localities, such as Pavlodar, Dostyk and Uralsk, the amount of snow falling in one day should either remain the same or increase slightly.
In addition, the number of days with temperatures below 17°C is decreasing. This reduction in the number of cold days makes it possible for KTZ to reduce the need for heating in public areas such as stations and offices. By 2030, the number of heating days will decrease by about 10%, and by 20-25% by 2050.

Fires

Kazakhstan is at high risk of fires. Forecasts of changes in the occurrence of fires were analyzed by two dimensions: the duration of fire alerts through the FFDI duration index and the intensity of fire changes through the FFDI intensity index.
In the figure below, each arrow point corresponds to a different time horizon, as shown by the green arrow for Arys: the first point corresponds to the historical time horizon, the second point corresponds to the time horizon of 2030, and the third point corresponds to the time horizon of 2050. While all sites show relatively similar levels of fire risk, the Arys site stands out as historically high risk, and the trend continues to grow.
The FFDI intensity index above the value of 12 is considered a high fire risk[1]. In the moderate scenario, SSP2-4.5 (Figure below), it is observed that while the fire intensity remains relatively stable, the duration of fire alerts increases significantly (+100%) by 2050. This indicates a higher risk of fire. The worst-case scenario shows a similar trend with stable FFDI intensity as the values in the moderate scenario, but an increase in duration of about 40% in 2050 compared to the moderate scenario. Only Almaty is not at risk of fires according to the forecast.



Exposure of KTZ assets to fire hazards under the SSP2-4.5 scenario

[1] The Forest Fire Hazard Index (developed by CSIRO scientist A. G. MacArthur) combines vegetation dryness with air temperature, wind speed, and humidity. Forest Fire Hazard Index – A Guide to best practices in Forest Fire Management– A guide to best practices in forest fire management

Strategy (14/27)

Climate scenario analysis

Forecasting of dangerous climatic events

River spill analysis

Danger of floods

Floods are a serious danger in Kazakhstan. These events occur periodically and cause serious damage. When analyzing the flood level, a buffer zone is used around the coordinates of the site to account for the entire size of the infrastructure. Two cases were analyzed:

- Case 1: Flood impact on KTZ buildings (stations and ports) with a buffer zone of 90 meters around the site, representing an analyzed area of 30,000 m2.
- Case 2: Impact of flooding on KTZ railways, covering much larger areas along typical 1 km long railway tracks with a buffer zone of 500 meters.

Of the analyzed assets, only Astana, Arys, Karaganda, the bridge and the Stadler plant are at risk due to their proximity to the river. As for the bridge, although technically the point is above water and there has been no significant rise throughout the year, the river level may fluctuate seasonally (for example, due to snowmelt).

The variability of the riverbed in relation to the selected assets

Name of the asset	Proximity to the river[1]	Name of the river	Height difference between the river and the plot[1]
Astana	5 km	Ishim River	7 м
Pavlodar	3,5 km	Irtikh River	30 м
Uralsk	3 km	Chagan River	7 м
Almaty-1	NA	NA	NA
Altynkol	50 km	Dubunskaya River	NA
Dostyk	NA	NA	NA
Arys 1	5 km	Arys River	7 м
Karaganda	NA	NA	NA
Port Aktau	NA	NA	NA
Tyulkubassky tunnel	NA	NA	NA
Bridge	0 m	Ili River	Bridge height
Stadler Factory	5 km	Ishim River	20 м

Height of river flooding in meters for the at-risk facility (and % of the buffer zone at risk)

	Name of station	Historical	SSP2-4.5		SSP5-8.5	
			2030	2050	2030	2050
Case 1	Astana	-	1,1 (28%)	1,1 (28%)	1,1 (28%)	1,1 (28%)
	Bridge	4,0 (100%)	4,1 (100%)	4,1 (100%)	4,1 (100%)	4,1 (100%)
Case 2	Astana	1,5 (52%)	1,5 (68%)	1,6 (68%)	1,6 (68%)	1,6 (68%)
	Arys	-	-	-	-	0,1 (<1%)
	Karangada	-	*0,45 (<1%)*	*0,46 (<1%)*	*0,44 (<1%)*	*0,47 (<1%)*
	Bridge	4,4 (86%)	4,5 (86%)	4,5 (86%)	4,5 (86%)	4,5 (86%)
	Stadler factory	0,8 (6%)	*0,9 (13%)*	*0,9 (13%)*	*0,9 (13%)*	*1,0 (13%)*
		Legend	***Very low exposure***	***Low Exposure***	***Medium exposure***	***High exposure***

[1] Based on map visualizations

Strategy (15/27)

Climate scenario analysis

Forecasting of dangerous climatic events

Analysis of pluvial floods

Danger of floods

Only 5 of the 12 analyzed KTZ assets are considered to be at risk of flooding due to precipitation. Among them, Dostyk, Altynkol and Pavlodar are potentially not at risk at the station itself, but only within a radius of 500 meters, with very small affected areas (less than 1% of the surrounding area). If you look at the infrastructure (case 1), Dostyk is at the greatest risk, 33% of the station's territory is in the flood zone.

However, the flood level remains relatively low for some places, such as Almaty and Pavlodar, where the water depth does not exceed 30 cm. On the contrary, other settlements will be more affected - for example, flooding in Altynkol may reach 70 cm.

In general, floods do not pose a significant risk to the selected KTZ assets, as the flooded areas are generally small, with the exception of Astana and Most, which are considered to be at high risk of river flooding, and Dostyk, which faces the risk of pluvial flooding.

The height of pluvial flooding in meters for an exposed object (and % of the buffer zone at risk)

	Name of station	Historical	SSP2-4.5		SSP5-8.5	
			2030	2050	2030	2050
Case 1	Dostyk	0,55 (33%)	0,56 (38%)	0,57 (38%)	0,57 (39%)	0,62 (33%)
	Bridge	0,53 (9%)	0,55 (9%)	0,55 (9%)	0,55 (9%)	0,56 (9%)
Case 2	Almaty	0,32 (~1%)	0,33 (2%)	0,33 (2%)	0,34 (2%)	0,30 (~1%)
	Altynkol	0,48 (<1%)	0,67 (2%)	0,69 (2%)	0,68 (2%)	0,71 (<1%)
	Dostyk	0,56 (20%)	0,61 (22%)	0,60 (22%)	0,60 (22%)	0,60 (20%)
	Pavlodar	0,15 (<1%)	0,25 (<1%)	0,26 (<1%)	0,25 (<1%)	0,26 (<1%)
	Bridge	0,43 (3%)	0,43 (3%)	0,44 (3%)	0,43 (3%)	0,45 (3%)
Legend			***Very low exposure***	***Low Exposure***	***Medium exposure***	***High exposure***

Strategy (16/27)

Climate scenario analysis

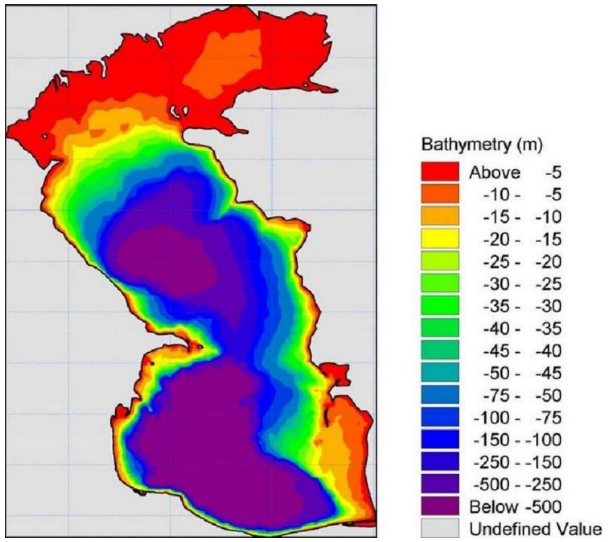
The level of the Caspian Sea

Forecasting of dangerous climatic events

The Caspian Sea is an inland sea located in a semi–arid climatic environment that is not associated with global sea level rise due to glacier melting and thermal expansion, and therefore requires special analysis and modeling of the local climate to represent the basin and accurately predict future evolution. The Caspian Sea is particularly vulnerable to climate change, as its water balance is mainly maintained by precipitation and evaporation flows, as well as by inflows of streams and effluents. Even small fluctuations in these flows on a long-term scale can affect the delicate balance of the total amount of water and, consequently, sea level. The Caspian Sea has previously experienced dramatic changes in water levels: in the 20th century, the water level dropped by 3 m, and then rose until 1995. Recent observations of the Caspian Sea indicate a drop in water levels of almost 7 cm per year from 1996 to 2015 and an increase in recent years with a drop of 10 cm per year from 2006 to 2021.

In both climate scenarios, projected evaporation increases due to rising temperatures, and global warming significantly exceeds the increase in precipitation integrated across the Caspian Sea basin, leading to an increasingly negative water balance during the 21st century. The red and orange zones in the figure below (representing the depth of the sea from 0 to 10 meters) will dry up by the end of the century. In both climate scenarios, especially in the SSP5-8.5 worst-case scenario, most of the northern Caspian Sea will dry up by 2050, leaving significant parts of Kazakhstan and Russia without direct access to the sea.

As for the Aktau port, the total sea level of the Caspian Sea is expected to decrease by 3 m in 2050 according to the SSP2-4.5 scenario and by 5 m in 2050 according to the SSP5-8.5 scenario. By 2085, the water level is projected to decrease by 8 meters compared to 2020 according to the SSP2-4.5 climate scenario and up to 14 meters according to the SSP5-8.5 climate scenario. The depth of the Caspian Sea near the port of Aktau is less than 10 meters (in 2019 it was 5.3 meters), therefore, the projected sea level change will have a strong impact on this area. As in the case of Kuryk port, dredging operations will be required in this area to adapt Aktau port to future sea levels.



Map of the depths of the Caspian Sea

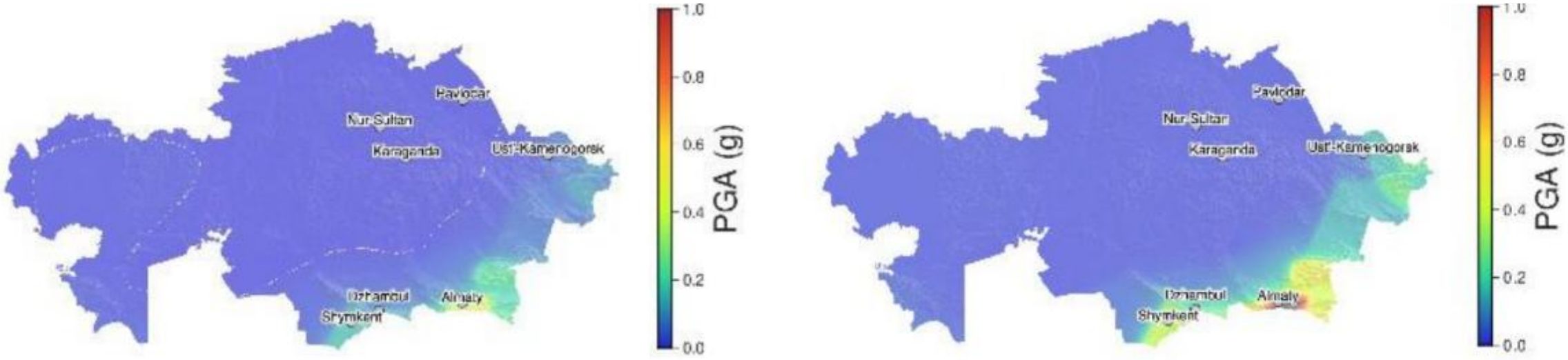
Strategy (17/27)

Climate scenario analysis

Forecasting of dangerous climatic events

Landslide and earthquake

Most of Kazakhstan is located in a stable zone with minimal or no significant seismic activity. Seismic activity in the country is mainly concentrated along the southern border with China, Kyrgyzstan and Uzbekistan. Almaty has a high exposure with a peak ground acceleration related to an event with a frequency of 475 years (probability exceeding 10% in 50 years) reaching 0.45g, Altynkol has an average exposure with a peak ground acceleration reaching 0.28g. All other objects have low or no exposure. None of the analyzed sites is at risk of landslides caused by earthquakes or heavy rains.



Seismic hazard for peak ground acceleration (PGA) with a probability of exceeding 10% (left) and 2% (right) in the next 50 years

Strategy (18/27)

Climate scenario analysis

Forecasting of dangerous climatic events

Other dangers

Precipitation should not be a risk to which KTZ is highly exposed, with a cumulative increase in precipitation from 5% in SSP2-4.5 to 10% in SSP5-8.5. As for extreme events, the number of days with precipitation exceeding 20 mm is very low for most areas (less than 1 day per year), with the exception of Almaty and Arys (about 5 days per year) and the tunnel (about 16 days). Historically, the tunnel has been highly susceptible to a maximum annual daily precipitation of 40 mm. In 2030, this exposure may increase to 48 mm, which will increase the risk of a lack of adhesion around and in the tunnel.

Drought should not be a significant risk for most selected assets. For almost all assets, severe drought, measured by the SPI-12 indicator, decreases over time, and by 2050 it will decrease by -50% to -4%. Two medium- and high-risk assets that will experience increased drought in the future are Altynkol (with an increase of +30% by 2030 and more than +90% by 2050) and Bridge (with an increase of more than +80% by 2030 and up to +140% by 2050).

Storms pose a potential risk to KTZ. Historically, all selected sites have not been exposed to high CAPE (Convective Available Potential Energy) values. In the future, the exposure to favorable conditions for the development of storms (CAPE values above 2500 J/kg) is expected to increase for all areas except the port of Aktau. The exposure is high for the sites in Astana and Karaganda. In addition, the most susceptible to the maximum wind gust is Karaganda, with a maximum wind gust of 24 m/s, which can damage the contact network. However, for all assets, the exposure to strong wind gusts does not change between historical and future values, indicating that there is no additional risk.

Strategy (19/27)

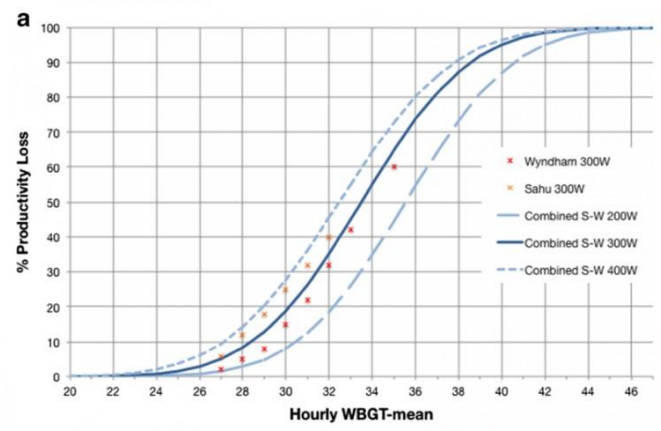
Climate scenario analysis

The impact of heat stress on employees

An increase in temperature can lead to heat stress for workers. Heat stress can occur at ambient temperatures above 35°C in manual workers. The body's inability to dissipate heat above a certain air temperature and humidity, especially as a result of manual labor, or excessive dehydration can lead to heat exhaustion and heat stroke, especially if workers are not used to such temperatures. Workers working outdoors are even more exposed to direct exposure to ambient temperature and sunlight, with the potential absence of protective shelters.
For KTZ, heat stress can lead to a decrease in staff productivity (slowing down work and maintenance, increasing the number of errors and the risk of injury).

The impact of heat stress on workers is measured using the Global Temperature indicator on a wet thermometer (WBGT), which combines variables of temperature and relative humidity. This indicator is usually used to calculate the decrease in employee productivity. Epidemiological studies have established a relationship between the WBGT (Wet Bulb Globe Temperature) index and the loss of labor productivity for different levels of labor intensity[1] . It is assumed that the work intensity is moderate at the station level (300 W work intensity, for example, when loading and unloading trains) and high at the railway level (400 W work intensity, for example, when repairing tracks and construction workers). Calculations are performed for the WBGT threshold value above 28°C. The relationship between WBGT and productivity has been established for workers working in the shade (indoors and outdoors) (Figure below).

The most affected facilities in terms of productivity losses are the port of Aktau, Arys and Dostyk, where productivity losses will reach up to +25 additional days of loss by 2050 compared to the historical value (for an employee at an intensity level of 400 watts) under the worst-case scenario. This represents 7% of the annual losses based on the corresponding results. Productivity losses have been steadily increasing between 2030 and 2050 and are significantly higher under high-emission scenarios. Some facilities, such as Almaty and Karaganda, remain relatively unaffected in all scenarios.



Percentage of productivity loss (for one day)			
Work intensity	wbgt28	wbgt30	wbgt32
400W	14%	27%	44%
300W	8,%	19%	34%

The relationship between the effects of heat stress and loss of labor productivity with different working capacity based on an epidemiological study

[1] Kjellstrom T., Lemke B., Otto M. (2013) Mapping workplace heat exposure and its effects in Southeast Asia: Current time trends 1980-2009 and future estimates to 2050 Dust Health 51:56-67

Strategy (20/27)

Climate scenario analysis

The impact of various hazards on infrastructure

Fire

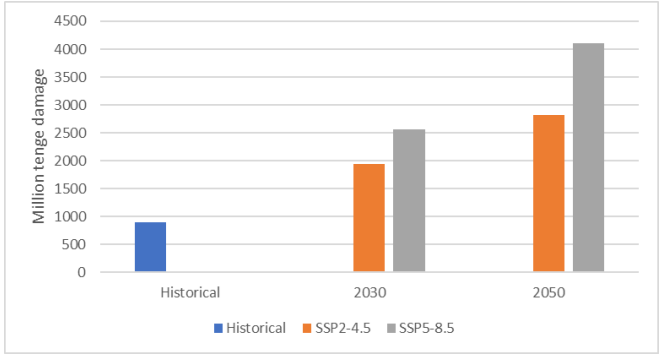
Most of the analyzed assets are subject to fire danger. The table below shows the percentage of damage that stations will receive in the event of a fire for the worst-case scenario SSP5-8.5 2050.
The damage function used to calculate the percentage of damaged assets by fire hazard is based on an extensive literature review and uses the following parameters:
• the probability of fire related to the FFDI intensity and duration values;
• the fuel factor based on the local cover of the earth from the map of the European Space Agency;
• the intended type of building material (concrete);
• Maximum damage at the specified fire index values.

Vulnerability of assets of NC KTZ JSC to fire hazard SSP5-8.5 2050

Active	The level of impact	Percentage of damaged assets (%)	Damaging assets	
			(tenge)	($)
Astana	Very high	0,4%	2,3 billion	4,4 million
Altynkol	Tolerable	0,5%	506 billion	961 thous.
Dostyk	Tolerable	0,9%	405 billion	770 thous.
Karaganda	High	0,4%	342 billion	650 thous.
Arys	Very high	1,0%	275 billion	523 thous.
Pavlodar	High	0,3%	197 billion	373 thous.
Uralsk	Very high	0,6%	48 billion	92 thous.
Almaty	High	0,0%	2.9 billion	5 thous.
Port Aktau	Tolerable	0,0%	-	-

On average, in the event of a fire, the asset will be destroyed by about 0.5%. For the station in Astana, this will be damage in the amount of 2.3 billion tenge. For all assets selected for analysis, the sum of all losses will amount to 4.1 billion tenge of losses.

Total damage due to fire hazard in different time horizons and scenarios for selected assets



Strategy (21/27)

Climate scenario analysis

Danger of floods

The impact of various hazards on infrastructure

Two stations are at risk of flooding. The table below shows the percentage of damage that stations can receive in the event of a flood, with a repeat period of 100 years for SSP5-8.5 2050.
The damage function used to calculate the percentage of damaged assets due to flood hazards is based on a combination of international reference standards such as the Hazus methodology or the JRC framework from the EU Commission, which produce hundreds of impact reference tables based on the asset types and geographical regions considered.
In case of a flood hazard, the affected asset will be damaged by about 4% at a water level of 0.6 m for Dostyk station and 1.1 m for Astana. For Astana station, this risk will amount to 29 billion tenge of damage if the event occurs with a recurrence period of 100 years. Annual impact over a repeat period of 100 years, this will amount to 290 million tenge of annual impact.

Vulnerability of assets of NC KTZ JSC to river and storm floods according to the SSP5-8.5 scenario for 2050

Type of flood	Station	The level of impact	Flood level (m)	Percentage of damaged assets(%)	Damaging assets	
					(tenge)	($)
River flooding	Astana Railway Station	High	1,1	4.3%	29 billion	54 million
Pluvial flood	Dostyk station	Tolerable	0,6	3.8%	1,8 billion	3,4 million

Strategy (22/27)

Climate scenario analysis

The impact of various hazards on infrastructure

Earthquake

The table below shows the percentage of damage that stations can receive in the event of an earthquake with a recurrence period of 475 years (the probability of exceeding 10% in 50 years) based on historical data.
The damage function used to calculate the percentage of damaged assets due to flood hazards is based on a combination of international reference standards such as the Hazus Fema specifications[1].
The Almaty and Altynkol stations are the two assets most susceptible and vulnerable to earthquakes.
In the case of Almaty, approximately 75% of assets may be damaged, which represents an estimated loss of 207 billion tenge.
The earthquake indicator has a recurrence period of 475 years. On an annual basis, over a 475-year period of repeatability, this corresponds to an average annual loss of 435 million tenge.

Historical vulnerability of assets of NC KTZ JSC to earthquakes

Active	The level of impact	PGA (r)	Percentage of damaged assets (%)	Damaging assets	
				(tenge)	($)
Almaty	High	0,45	75%	207 billion	393 million
Altynkol	Tolerable	0,275	56%	60,7 billion	115 million
Dostyk	Low	0,165	37%	17,4 billion	33 million
Arys	Low	0,165	37%	10,6 billion	20 million
Astana	Very low	0,005	1%	6,9 billion	13 million
Port Akyau	Very low	0,025	4%	1,1 billion	2,2 million
Karaganda	Very low	0,005	1%	969 million	1,8 million
Pavlodar	Very low	0,005	1%	608 million	1,1 million
Uralsk	Very low	0,005	1%	89 million	169 thous.

Danger of floods

The impact of various hazards on infrastructure

Floods can seriously affect the railway infrastructure. Such events can lead to failures in critical components, including railway embankments, slopes, tracks, electrical systems, and even bridge structures, which can lead to the collapse of railway infrastructure and widespread disruptions to railway networks.
Despite the fact that no publicly documented cases of flooding-related rail disruptions have been identified in Kazakhstan, flooding is not a serious risk, as cargo transportation is redirected to alternative routes, similar cases in neighboring countries highlight the potential risks.

[1] Hazus Earthquake Model Technical Manual (fema.gov)

Strategy (23/27)

Climate scenario analysis

Extreme temperatures

The impact of various hazards on infrastructure

Extreme heat can lead to thermal expansion of the steel railway track (changing the shape and volume of the steel). The accumulated stress due to the expansion of each rail can lead to a loss of stability of the track (lateral distortions in the railway track) during discharge when reaching a critical point. The effect of heat on rails depends on the method used to connect the rails. On jointed rails (CWR), each rail is welded to the other, forming a continuous path, whereas on butt rails, the rails are connected using fishplates, and a gap is left between them to compensate for thermal expansion and compression. Buttless rails have gradually replaced butt rails since the 1950s, as they provide higher travel speeds and require lower maintenance costs compared to outdated butt rails. However, this type of rail is very susceptible to loss of track stability due to the accumulation of expansion forces along the continuous rail, while the joints of the former articulated rails allowed thermal expansion of each steel rail at regular intervals. For articulated tracks, there may still be some displacement between track sections with significant temperature fluctuations. Although high temperatures cause thermal expansion of the steel, loss of track stability often occurs due to the complex stress resulting from the train passing over the rails.

KTZ tracks at the analyzed railway stations include both non-jointed and jointed sections. Given the widespread use of Continuous Welded Rails (CWR) in modern railway networks and their high sensitivity to temperature influences, the main attention of researchers is focused on studying the thermal effect on CWR rails. However, there is a shortage of scientific publications devoted to modeling the effects of high temperatures on butt rails.

For CWR, rails are laid on the ground at Stress Free Temperature (SFT), which is the temperature that the rail was designed to operate at. The SFT of the railway is usually 75% of the expected maximum temperature of the region. Based on the exposure analysis, the SFT ranges from 22°C to 30°C for selected assets and averages 27°C. The SFT defines the threshold at which rails can experience bending from forces acting on the rails, since the relationship between temperature and the probability of loss of stability can be determined using the SFT. Using this function, the probability of loss of stability was determined for both scenarios and time horizons. The risk of loss of stability on days reaching maximum temperatures increases over the years, reaching 100% in 2050 under the worst-case scenario for certain locations already identified in the impact analysis. By 2050, for all facilities, the risk will double in the intermediate scenario and triple in the worst-case scenario. The most common measures to reduce the risk of track loss and derailment are to limit the speed of the train to reduce the forces acting on the rail at a certain air temperature correlated with the temperature of the rail.

Forecasting the probability of loss of stability based on the annual maximum daily temperature

	Historical	SSP245		SSP585	
Active	Historical	2030	2050	2030	2050
Port Aktau	29%	41%	57%	49%	74%
Uralsk	31%	56%	77%	60%	100%
Almaty	24%	31%	41%	35%	57%
Astana	30%	47%	64%	53%	84%
Altynkol	29%	43%	60%	51%	84%
Dostyk	30%	47%	63%	56%	90%
Arys	34%	55%	80%	62%	100%
Karaganda	29%	47%	65%	52%	85%
Pavlodar	31%	51%	69%	56%	91%

Strategy (24/27)

Climate scenario analysis

The impact of various hazards on infrastructure

The impact of climate change on transported agricultural goods

In Kazakhstan, the main agricultural commodities are wheat crops, which are mostly rich.
The main agricultural commodities transported are wheat and barley.In both scenarios, the effects of climate change have a positive impact on wheat and barley yields, which increase over both time horizons (up to 2030 and 2050):
• For wheat: from +17% to +25% by 2030 and from +18% to +44% by 2050.
• For barley: from +18% to +26% by 2030 and from +20% to +43% by 2050.
Although Kazakhstan suffers from water shortages, it is less common in the north of the country, where most wheat crops are grown. Global warming may extend the growing season of wheat and barley, while temperatures will become more favorable in areas currently limited by cold, which will change production cycles and expand acreage.
Considering that in 2023 the cargo turnover amounted to about 1,682.6 billion tenge, and grain accounted for 9% of this turnover. Assuming an elasticity equal to one between grain yield and volume transported by KTZ (since KTZ is the main train operator in Kazakhstan), and that the proportion of grain transported between Wheat and Barley has remained constant over the years, annual capacity could range from 22 billion tenge to 32 billion tenge in 2030 and from 23 billion tenge to 56 billion tenge in 2050 . Based on these forecasts, the transportation of agricultural goods may become a climate-related opportunity instead of a climate-related risk.

Wheat and barley yield forecast

	SSP2-4.5		SSP5-8.5	
	2030	2050	2030	2050
Wheat	25%	44%	17%	18%
Barley	26%	43%	18%	20%

Storm and wind

Aktau Port is particularly vulnerable to extreme winds and storms, as such conditions directly affect the implementation of operational programs, as strong winds prevent the port from carrying out its main activities. As for the equipment, crane operations are suspended when the wind speed exceeds 18 meters per second, which makes it impossible to continue transshipment operations. In addition, during precipitation, the operation of the crane is also suspended to ensure industrial safety.
Sudden gusts of wind significantly disrupt loading and unloading operations. In such extreme conditions, emergency protocols must be activated, such as securing cranes with limiters while on site.

Strategy (25/27)

Climate scenario analysis

Risk analysis of the transition period

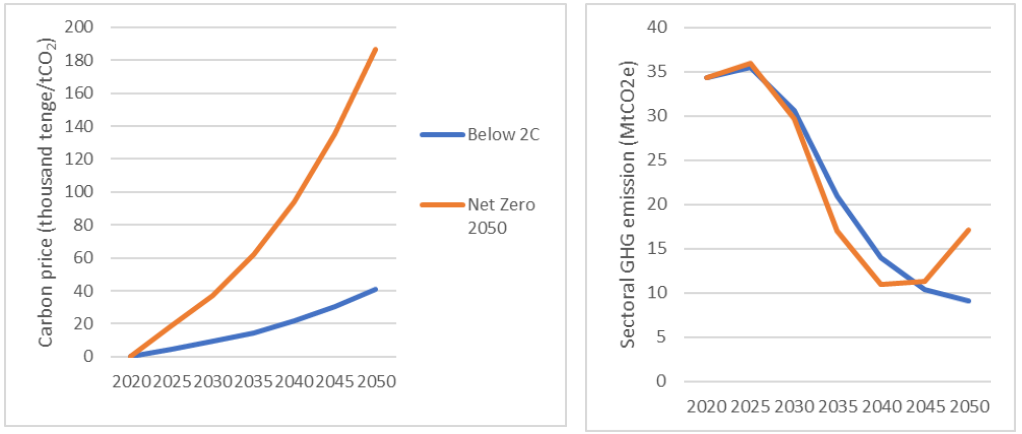
The price of carbon

Currently, Kazakhstan's Emissions Trading system mainly covers companies operating in the energy, oil and gas, mining and chemical sectors, in particular, those whose installations emit more than 20,000 tons of CO_2 per year. To date, the railway sector is not included in the scope of Legislation. This exclusion may be due to a combination of factors, including the current emissions structure in the railway sector, existing policy and regulatory priorities, and technical or institutional challenges related to the integration of this mode of transport into the emissions trading system. Nevertheless, Kazakhstan is actively exploring options for expanding the use of carbon pricing mechanisms in other sectors. As part of these ongoing efforts, rail inclusion remains a potential area for future government expansion or additional carbon pricing regulations.
In NGFS scenarios, the carbon price reflects the marginal cost of reducing carbon emissions and serves as a proxy for the overall rigor and ambition of the climate policy framework (taxes, environmental standards, prohibitions). This is the price level required to achieve a given climate goal (for example, Net Zero by 2050), modeled as if it were implemented through policy. It does not represent a real regulatory cost today, but serves as a promising indicator of how vulnerable an organization would be if a carbon price were introduced or raised in line with global decarbonization efforts. Even for companies that are not currently subject to the carbon pricing mechanism, such as the railway sector, it allows organizations to model potential future regulatory scenarios and prioritize decarbonization investments accordingly (for example, the railway sector may still face increasing pressure due to the demands of electrification, decarbonization of sources energy or broader shifts in industry policy).

Carbon price forecast for scope 1 and 2 emissions

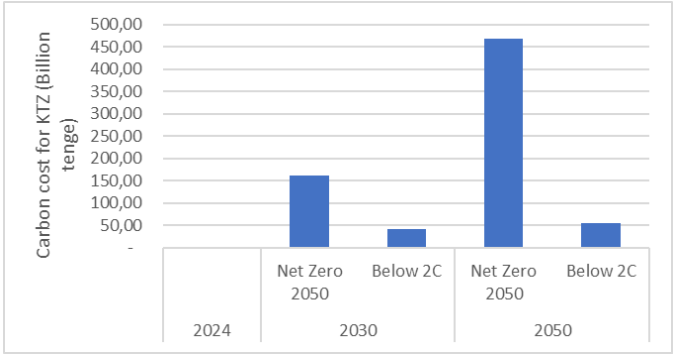
Future carbon prices are based on the NGFS forecast. Future KTZ emissions are modeled using a top-down approach: based on KTZ's greenhouse gas emissions data for 2024, future KTZ emissions have been extrapolated based on the assumption that they will follow trends and variations similar to NGFS projections for emissions in the transport sector of Kazakhstan. After emissions are determined, the gross cost is calculated using the appropriate carbon price.:

Gross expenditures in years (2030, 2050)=Emissions in years (2030,2050) x Carbon price in years (2030,2050)



Estimated carbon price (left) and industry emissions for transportation (right)

In 2024, KTZ's CO_2 emissions were estimated at 5 million tons. In accordance with Net Zero scenarios and Below 2°C, the carbon price ranges from 9,000 to 37,000 tenge in 2030, and by 2050 it will rise to 41,000 -177,000 tenge.



Carbon costs for NC KTZ JSC in various time horizons and scenarios

The cost of carbon dioxide emissions incurred by KTZ is steadily increasing, and under the Net Zero scenario they are more significant, despite the expected reduction in emissions in the sector.
From a more operational point of view, the carbon price is likely to have an indirect impact on KTZ's energy purchases. This should take into account not only the price of carbon, which can be shifted to the price of energy, but also other market and demand factors.

Strategy (26/27)

Climate scenario analysis

Risk analysis of the transition period

The price of energy resources

Currently, the Treasury is already influencing energy production in the country, both directly through taxes on energy producers and on the oil and gas sector. The structure of the Treasury[1] assumes a gradual increase in these taxes, and their intensity will depend on the specific scenario of decarbonization. This tax increase is likely to have a direct impact on energy purchase prices. The following energy prices were considered for the analysis:

- Electricity: 74 tenge/MWh is equivalent to 21 tenge/GJ
- Coal: 100 USD/ton equivalent to 1800 tenge/GJ
- Fuel oil: 263 tenge/ton, equivalent to 6 tenge/GJ
- Natural gas: 50 $/microns equivalent to 671 tenge/GJ

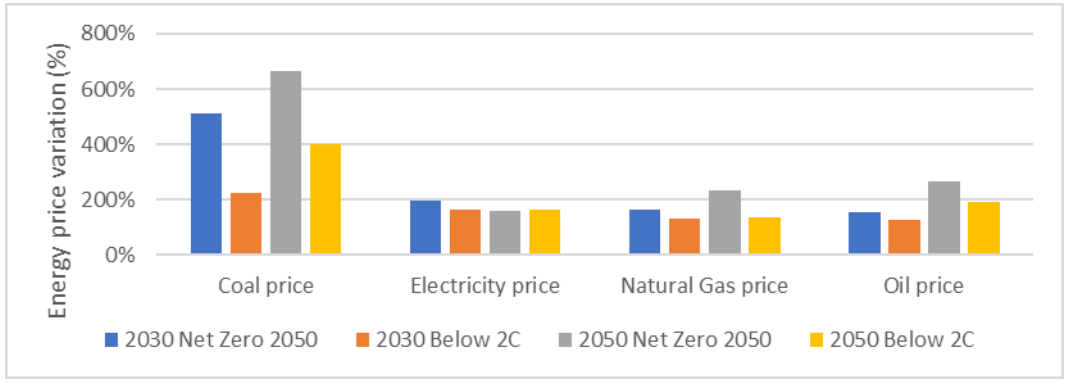
Future energy prices are based on the NGFS forecast and current energy prices described above. KTZ's future energy consumption is modeled using a top-down approach: based on KTZ's energy consumption for 2024, future KTZ consumption has been extrapolated based on the assumption that it will follow trends and variations similar to NGFS forecasts for global energy consumption in the transportation sector.

After determining the energy consumed, the gross cost is calculated using the appropriate energy price:

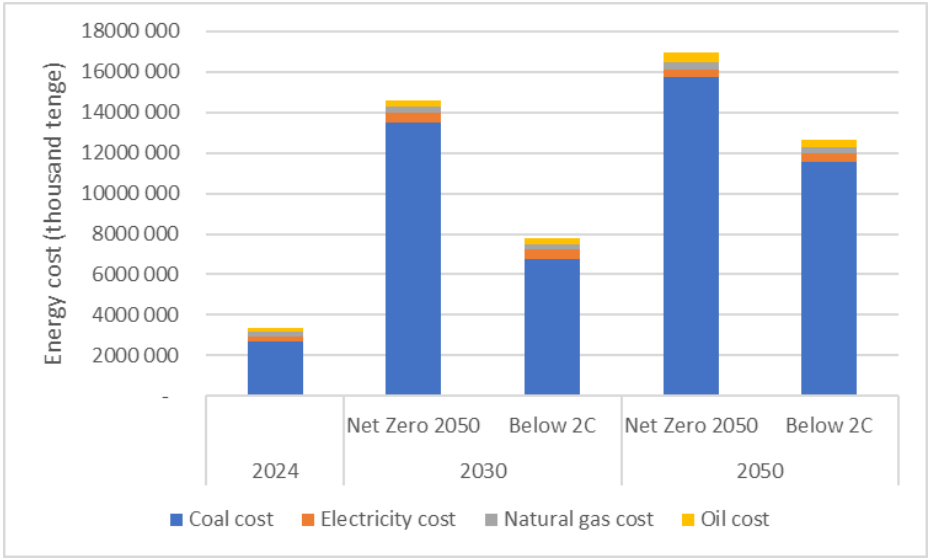
Gross costs in years (2030,2050)= Energy consumed (2030,2050)x Energy price in years (2030,2050]

The simulation results show an overall increase in energy costs, with the sharpest jump in coal prices. Coal prices are projected to rise from +200% to +500% by 2030 and up to +400% to +600% by 2050. By comparison, electricity prices are expected to rise until 2030, after which they should stabilize. However, this initial growth still poses a major challenge for infrastructure dependent on electrification. Prices for natural gas and diesel fuel are also expected to rise, which will further affect KTZ's operating expenses. An analysis of the energy components shows that KTZ's energy consumption is mainly due to coal purchases.

Given the Company's dependence on this type of fuel, the projected spike in coal prices is likely to increase operating costs.In some regions of the Company's operations, where there is a shortage of electricity, full electrification has become impossible. As a result, the expected energy transition for KTZ may be in jeopardy, and continued reliance on coal and fossil fuels may expose the Company to rising fuel prices and market volatility, which will increase economic pressure in the medium and long term.



Projected change in energy prices compared to 2024



Forecast of energy costs for KTZ

[1] International Partnership on Carbon Measures, Kazakhstan Emissions Trading System (Access: International Partnership on Carbon Measures)

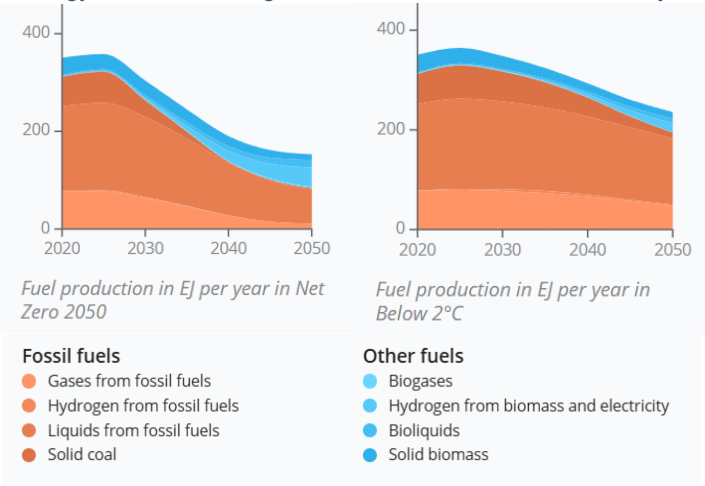
Strategy (27/27)

Climate scenario analysis

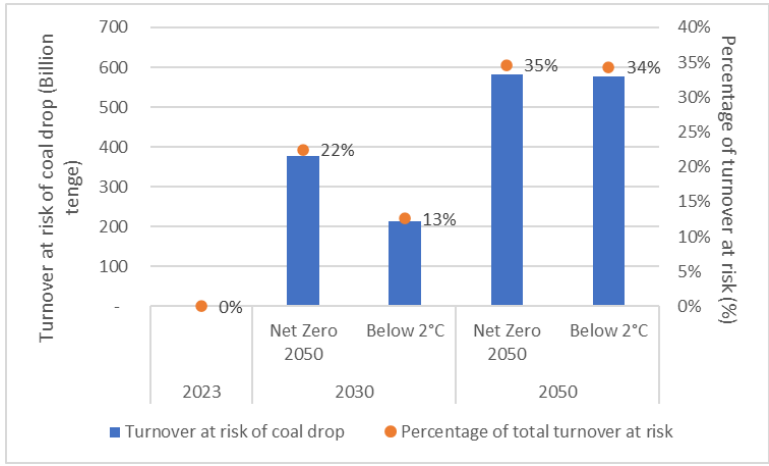
Risk analysis of the transition period

Risks of the transition period for the demand for transported goods

Kazakhstan ranks 8th in the world in terms of coal production, with about 2 million terajoules (TJ) produced in 2022. Most of this coal (about 73%) is consumed domestically. Coal plays a crucial role in Kazakhstan's energy mix, accounting for about 70% of electricity production in 2023 and serving as the main source for heat generation in thermal power plants and boiler houses. It is also used in the building materials industry and for residential heating. Over the past two decades, the growing demand for energy has led to a 44% increase in coal production between 2000 and 2022[1], along with a corresponding increase in coal shipments for both domestic consumption and export. However, this upward trend is expected to be reversed. According to the National Framework Program for "Green" Scenarios (NFGS), demand for coal could fall by 36% under the "below 2°C" scenario and by 64% under the "Net Zero 2050" scenario by 2030 compared to the level of 2023 (see figure below).In accordance with its national Strategy to achieve carbon neutrality by 2060, Kazakhstan intends to gradually abandon coal in favor of alternative and renewable energy sources. Although coal remains dominant in electricity and heat production today, it will gradually be displaced as the country moves towards a low-carbon future.



Forecasting fuel production in EDGE[2]



Coal exports are at risk of falling in two scenarios (Net Zero and Below 2°C)

A reduction in coal shipments may lead to lower revenue and potential cash flow losses. In addition, changing customer preferences and stricter carbon emissions quotas may accelerate the decline in demand for coal-related logistics. The changes in coal demand are based on the NGFS forecast of coal demand in the territory of the "former Soviet Union". The share of KTZ cargo turnover in the risk zone for each NGFS scenario is extrapolated from the share of coal shipments in KTZ cargo turnover in 2023 and the projected decrease in demand for coal, assuming elasticity between coal demand and KTZ cargo turnover equal to 1.It should be noted that the use of coal can be directed to chemical valorization (gasification, production of ammonia and methanol), where coal is not burned, but converted.
The use of coal for coal chemistry represents a significant potential for the economic development of Kazakhstan. These uses are not necessarily modeled in the scenarios used. Moreover, coal demand evolution is modeled at the regional level (former Soviet Union), and the downward trend will not necessarily reflect a specific national policy in Kazakhstan to valorize its significant coal resources.
As a result, it is estimated that a significant proportion of KTZ turnover may be at risk — from 13% to 22% by 2030. In both scenarios, coal is projected to be almost completely decommissioned by 2050, which means that all the revenue currently generated from coal transportation will be at risk.

[1] IEA, Kazakhstan, 2023 (Access:Kazakhstan-Countries and Regions - IEA)

[2] NFGS, Fuel production in EJ per year (Access: Script Portal NGFS)

Risk management (1/1)

Paragraph 25

Risk management is an integral part of the Company's strategic planning and corporate governance process, as well as maintaining its financial stability. The Company's fundamental risk management document is the Policy of NC KTZ JSC on Risk Management and Internal Control.

Climate-related risk management is carried out within the framework of the corporate risk management system and is the process of developing and implementing measures to reduce the negative effect and the likelihood of losses or to receive financial compensation in the event of losses related to the risks of the Company's activities.

Risk identification is important as a method of optimizing the Company's expenses, since early identification of risks, determination of adequate measures to minimize and eliminate their consequences, allows you to plan sources and amounts of financing for such activities, which ultimately affects the effectiveness of the Company.

Risks are actively identified both during the periodic inventory on an annual basis during the formation of the Register, and during the Company's current operating activities on a quarterly basis during the preparation of risk reports.

If a significant risk is detected that was not previously included in the Register, the risk owner must inform the Risk Department about it. The Risk department analyzes the information received and, if necessary, includes the new risk in the Risk Register. Also, during the inventory, risk owners identify possible cases of risk, real or potential, negative trends indicating increased risk, analyze the factors that caused the risk, and assess the extent of the expected loss.

The register and risk map of NC KTZ JSC are developed and approved on an annual basis. The risk map is divided into zones of influence and probabilities. The risk assessment is carried out in accordance with the position of each of the risks on the risk map:

- The first priority risks are those with the highest priority, the potential damage from the implementation of which ranges from 90% and from 3 billion tenge and above;
- The second priority risks, the damage from the implementation of which remains in the range of 70-90% and 1-3 billion tenge;
- The third priority risks, the damage from the implementation of which remains in the range of 40-70% and 0.5-1 billion tenge;
- The fourth priority is risks, the damage from the implementation of which remains in the range of 0-40% and 0.2-0.5 billion tenge.

Climate risks are an important component of the corporate risk management system, given their impact on the Company's operations and the achievement of strategic goals. The Risk Management and Internal Control Policy of NC KTZ JSC, approved by the decision of the Board of Directors of NC KTZ JSC dated December 18, 2019, pays attention to the elements of ESG risk management.:

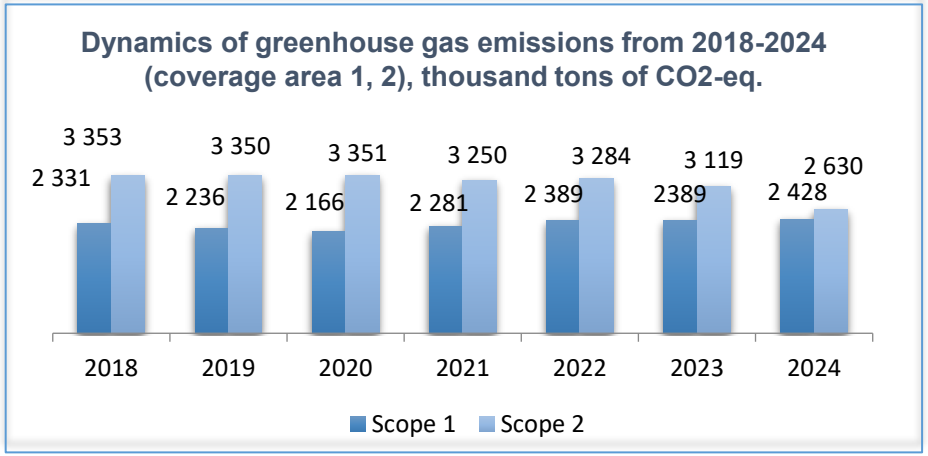
1) adoption of corporate governance necessary for effective CSR and VC;
2) understanding the business context and strategy of the Company;
3) identification of ESG risks;
4) assessment and ranking of ESG risks;
5) Response to ESG risks;
6) Review and revision of ESG risks;
7) Communication and reporting on ESG risks.

ESG risk management is integrated into the overall process of the Company's corporate risk management and internal control system.

Metrics and targets (1/2) – GHG emissions (coverage 1 and 2)

Paragraph 29 (a)(i-v)

In 2024, total emissions amounted to 5,058.3 thousand tons of CO2-eq., including direct emissions – 2,428.3 thousand tons of CO2-eq., indirect – 2,630 thousand tons of CO2-eq.The scope of disclosure of information on greenhouse gas emissions includes the Company's subsidiaries under the operational control of NC KTZ JSC.



Methodology for calculating emissions

The calculation of direct greenhouse gas emissions and emission reductions by scope 1 was carried out according to the approach specified in the GHG Protocol Guidelines and using the Guidelines of the National Greenhouse Gas Inventories of the Intergovernmental Panel on Climate Change (IPCC), 2006, When converting the values of methane and nitrous oxide into tons of CO2 equivalent, current values of Global warming Potential (methane – 28, nitrous oxide – 265), adopted in accordance with the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, paragraph 4 of Decision of the Conference of the Parties 6/CP.27 dated November 17, 2022. Scope 1 and GHG reduction from direct emissions include emissions from carbon dioxide, methane and nitrous oxide. Carbon dioxide emissions are included in scope 2 and reduction of GHG emissions from indirect emissions.

To calculate indirect GHG emissions and reduce emissions by scope 2, the approach specified in the GHG Protocol scope 2 Guidance is used, and specific GHG emission coefficients are adopted according to the "List of Benchmark coefficients in Regulated Sectors of the Economy" approved by the Order of the Acting Minister of Ecology, Geology and Natural Resources of the Republic of Kazakhstan dated July 19, 2021. year No. 260.

Starting from July 1, 2023, Kazakhstan introduced a new system for purchasing electricity through a Single Buyer (Order No. 212 of the Minister of Energy of the Republic of Kazakhstan dated July 01, 2023, LLP "Settlement and Financial Center for Support of Renewable Energy Sources"). This entails changes in the methods of calculating greenhouse gas emissions. At the same time, NC KTZ JSC does not use other contractual mechanisms that affect the calculation of greenhouse gas emissions of the scope 2 category.

The base year for GHG emissions (scope 1 and 2) according to the Concept of Low–carbon Development of NC KTZ JSC until 2060 is 2021, and for GHG emissions reduction (scope 1 and 2) - 2023.

Currently, the Company does not account for emissions by scope 3. However, in 2025, a Methodology for calculating greenhouse gas emissions by scope 3 has been developed, and calculations and disclosure of this indicator are planned in the next reporting period.

Metrics and targets (2/2) – Climate Goals

Paragraph 33-36

In December 2020, Kazakhstan announced its goal to achieve carbon neutrality by 2060, reaffirming its commitments under the Paris Agreement to control global temperature growth by 1.5-2 degrees C.

In February 2023, the Decree of the President of the Republic of Kazakhstan approved the "Strategy for achieving Carbon neutrality of the Republic of Kazakhstan until 2060". Samruk-Kazyna JSC has adopted a Low-carbon Development Concept and a Plan for the Fund's transition to a low-carbon business model.

To contribute to efforts to reduce greenhouse gas emissions, in 2022 NC KTZ JSC adopted its own Concept of Low-carbon Development until 2060, aimed at reducing the carbon burden through the implementation of measures to improve energy efficiency, use renewable energy sources, electrification of railways and the introduction of locomotives using more environmentally friendly fuels. The goal is to achieve the Company's carbon neutrality by 2060.

In general, carbon neutrality does not mean the complete elimination of greenhouse gas emissions – emissions that cannot be reduced must be compensated.

A serious reduction in greenhouse gas emissions from rail transport requires fundamental changes in the consumption of energy resources, a rapid and efficient transition from low-environmental burning of fossil energy resources to carbon-free technologies, and the introduction of "green" innovations.

To demonstrate the reduction of CO2 emissions by 2060 as a result of the implementation of relevant measures, 2020 is set as the base year.

Greenhouse gas emission targets within the framework of the Low-carbon Development Concept of NC KTZ JSC until 2060

As part of the implementation of the Concept's measures, it is planned to reduce direct emissions from diesel locomotives from 1.8 million tons of CO2 to 1.3 million tons, or by 25% of the 2020 level, until 2030.

In addition, reducing the carbon footprint is a strategic goal of the Company, as the Development Strategy of NC KTZ JSC until 2032 defines short-, medium- and long–term goals in the field of managing risks and opportunities related to climate change - Carbon Footprint efficiency with targets until 2032:

Short–term (until 2025) - (-2.5)% compared to the previous year;

Medium-term (until 2027) – (-3.2)% compared to the previous year;

Long–term (until 2032) - >(-3.5)% compared to the previous year.

Strategic objectives	KPI	2023	2024	2025	2026	2027	2028	2029	2032
Implementation of ESG principles	The carbon footprint, %	-2,5	-2,7	-2,5	-3,0	-3,2	-3,3	-3,4	>-3,5

Note: GHG emissions are not recorded for scope 3.