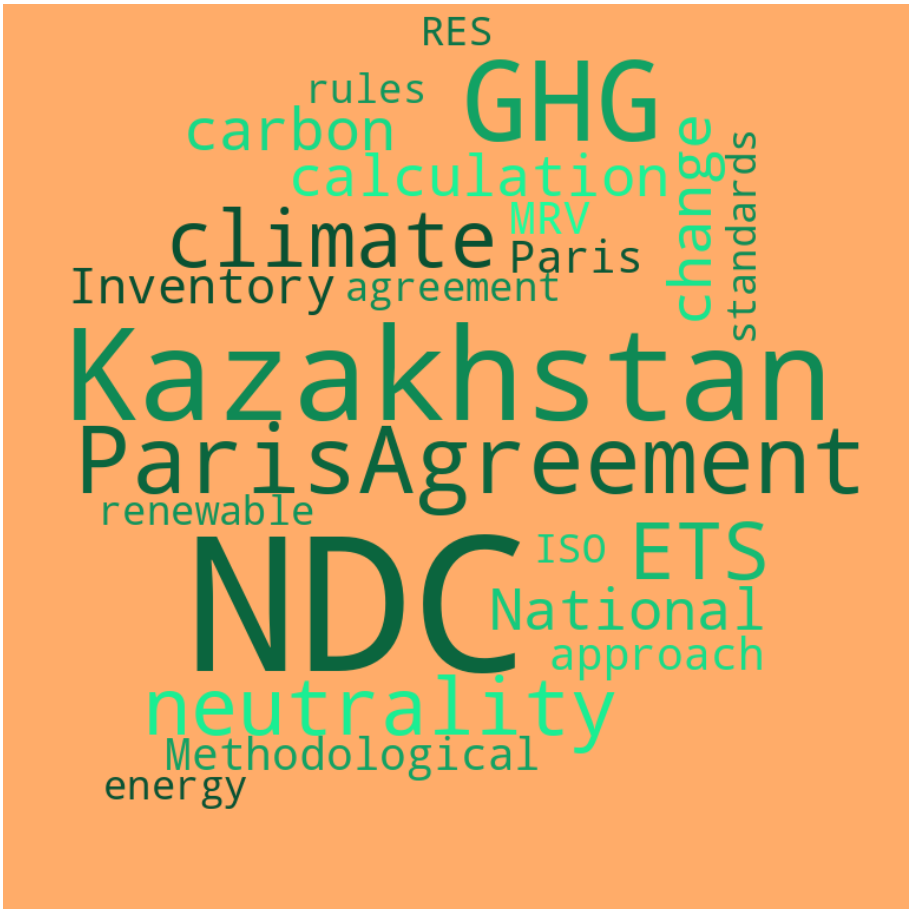
MINISTRY OF ECOLOGY AND NATURAL RESOURCES
OF THE REPUBLIC OF KAZAKHSTAN



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Updated Nationally Determined Contribution of the Republic of Kazakhstan to the global response to climate change

1. This updated Nationally Determined Contribution of the Republic of Kazakhstan is developed in accordance with Article 3 and Article 4 paragraph 11 of the Paris Agreement ratified by the Law of the Republic of Kazakhstan (hereinafter – Paris Agreement).
2. The updated Nationally Determined Contribution of the Republic of Kazakhstan to the global response to climate change (hereinafter – NDC) includes the following information dedicated to facilitate clarity, transparency and understanding of the nationally determined contributions:
   1) subject to the quantifiable assessment of information about the reference point:
      general description of the target;
      base year;
      quantifiable information on the reference indicators;
      circumstances to update the values of the reference indicators and other information;
   2) Time frames:
      period for implementation;
      type of the target;
   3) Scope and coverage:
      general description of the target;
      coverage of emissions and sectors;
   4) Planning processes:
      domestic institutional arrangements;
      best practices and experience related to the preparation of the NDC;
      [accounting for the global stocktake outcomes of implementation in preparation of the nationally determined contribution;]
      outcomes of the global stocktake in accordance with article 4, paragraph 9 of the Paris Agreement;
   5) Assumptions and methodological approaches:
      accounting for emissions and removals;
      methodologies and metrics used for estimating anthropogenic greenhouse gas emissions and removals;
      methodologies and metrics for specific sectors;
      the intention to use voluntary cooperation under Article 6 of the Paris Agreement;
   6) Fairness and ambitiousness of the nationally determined contribution:
      fairness and ambitiousness of the target;
      implementation of Article 4, paragraph 4 of the Paris Agreement;
   7) Role of the nationally determined contribution towards achieving the objective of the Convention as set out in its Article 2:
      contribution towards achieving the objective of the Convention as set out in its Article 2;
      contribution towards Article 2, paragraph 1(a), and Article 4, paragraph 1, of the Paris Agreement.
   8) Component on adaptation to climate change:

national circumstances, institutional arrangements and legal frameworks;
impacts, risks and vulnerabilities;
national adaptation priorities, strategies, policies, plans, goals, and actions;
implementation of adaptation actions and plans;
adaptation actions and economic diversification plans, including those that result in mitigation co-benefits;
how adaptation actions contribute to other international frameworks and/or conventions;
gender-responsive (and traditional/local/indigenous people knowledge) adaptation action.

Information to facilitate clarity, transparency and understanding of nationally determined contributions	
1. Quantifiable information on the reference point	
1.1.General information about the target	Unconditional target: Reduction of GHG emissions by 15% by the end of 2030 relative to 1990 base year.
	Conditional target: Reduction of GHG emissions by 25% by the end of 2030 relative to 1990 base year, subject to significant additional international investments and significant grant assistance; access to an international technology transfer mechanism; co-financing and participation in international research projects, development of promising low-carbon technologies and initiatives to build local expertise.
1.2 Base year	1990 (article 283, paragraph 1 of the Ecological Code of the Republic of Kazakhstan (hereinafter – Code)
1.3 Quantifiable information on the reference indicators	The reference indicator will be based on the data of 1990 – 2030 greenhouse gas emissions inventory of the Republic of Kazakhstan submitted to the United Nations Convention on Climate Change Secretariat (hereinafter – UNFCCC) in 2032.
1.4 Circumstances to update the values of the reference indicators	Reference indicators will be reassessed in case of new data availability, changes in methodological approaches, use of national coefficients and other clarifications.
2. Time frames	
2.1 Period for implementation	1 January 2021 – 31 December 2030 (according to the first nationally determined contribution of the Republic of Kazakhstan uploaded in the UNFCCC website[1] and in accordance with Article 286, paragraph 6 of the Code).
2.2 Type of the target indicator	Single-year, 2030 (in accordance with Article 283 paragraph 1 of the Code)
3. Scope and coverage	
3.1 General description of the target	Economy-wide absolute reduction.
3.2 Coverage of emissions and sectors	Emission coverage in accordance with Article 281, paragraph 2 of the Code: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF6), other substances identified by the authorized body in the field of environment protection (in accordance with article 281 paragraph 3 of the Code). Sector coverage in accordance with the Intergovernmental Group of Experts on Climate Change (hereinafter – IPCC) Guidelines for National Greenhouse Gas Inventories, 2006: energy, industrial processes and product use, agriculture, forestry and other land use, waste.

[1] Kazakhstan First NDC (2016) https://unfccc.int/sites/default/files/NDC/2022-06/INDC%20Kz_eng.pdf

4 Planning processes	
4.1 Domestic institutional arrangements	1) Top-level strategic documents: The Development Strategy of the Republic of Kazakhstan until 2050 (hereinafter – Strategy 2050) (Statement of the President of the Republic of Kazakhstan dated 14 December 2012) and the Concept for the transition of the Republic of Kazakhstan to a green economy (hereinafter – Concept) (Decree of the President of the Republic of Kazakhstan #577 dated 30 May 2013) are the starting points for the implementation of climate policy, laying the foundations for deep systemic transformation in order to transition to green economy, improving the welfare and quality of life of the population while minimizing the footprint on the environment and degradation of natural resources. In particular, long-term goals are being set, such as reducing the energy intensity of GDP from the 2008 level by 50% by 2050, and increasing the share of alternative sources in electricity generation to 50% by 2050. The implementation of the goals of the Strategy and the Concept are supported by the National Development Plan of the Republic of Kazakhstan until 2025 (Decree of the President of the Republic of Kazakhstan #636 dated 15 February 2018) and the Action Plan for the implementation of the Concept for the Transition of the Republic of Kazakhstan to a "green economy" for 2021-2030 (Enactment of the Government of the Republic of Kazakhstan #479 dated 29 July 2020), which provides for the implementation of necessary measures to reduce greenhouse gas emissions in the energy sector, energy efficiency and energy conservation, development of sustainable transport, infrastructure for electric and gas vehicles, smart traffic management systems, sustainable municipal waste management, transition to sustainable land use methods and organic agriculture, afforestation and the formation of ecological culture. 2) The Environmental Code as a basis for reducing emissions: The institutional framework for reducing greenhouse gas emissions is laid down in article 283, paragraph 1of the Environmental Code of the Republic of Kazakhstan, which sets the target of reducing the carbon balance of the Republic of Kazakhstan by December 31, 2030 by at least fifteen percent of the level of the carbon balance of 1990. According to Article 283, the paragraph 3 of the Code the Ministry of Ecology and Natural Resources (hereinafter – MENR) has been designated as a working body for the implementation of international treaties in the field of climate change. MENR carries out state regulation in the field of greenhouse gas emissions and removals in order to ensure the achievement of the NDC of the Republic of Kazakhstan. Moreover, under the Article 283, paragraph 4 of the Code the state agencies of the Republic of Kazakhstan, within their competence, are obliged to take actions aimed at ensuring the NDC implementation. 3) Emissions trading system: In accordance with the Article 284, paragraph 2 of the Code there is a market mechanism for trading carbon units, which covers almost half of the total national emissions. For the current carbon budgeting period from 2021 to 2025, the carbon budget for 2021 is at least 1.5 percent lower than the carbon balance of 1990, and in subsequent years it is reduced by at least 1.5 percent annually from the level of the carbon budget of the previous year.

	To ensure the achievement of NDC in the next carbon budgeting period from 2026 to 2030, the carbon budget for each calendar year will need to increase reduction from the planned 1.5 per cent to 2.25–5.1 per cent of the level of the carbon budget of the previous year. Due to the growth of emissions from sectors of the economy beyond the emissions trading system, from 2022 to 2024, options for introducing carbon pricing for the unregulated sectors of the economy will be considered. Decisions to strengthen carbon pricing will be accompanied by the best research knowledge, comprehensive modelling, in-depth scenario analysis, and cost-benefit analysis. 4) Green taxonomy: Concept of investment policy of the Republic of Kazakhstan till 2026 adopted by the Enactment of the Government of the Republic of Kazakhstan # 482 dated 15 July 2022 identifies the basic principles of investment policy including transition to green growth, development of sustainable tools and green financing and mainstreaming principles of ecological, social and corporative management. The taxonomy of green projects adopted by the Decree of the Government of the Republic of Kazakhstan #996 dated 31 December 2021 contains a classification of green projects eligible for financing through green bonds and green credits. The taxonomy aligns environmental and low carbon policy to various financial instruments and institutions for creating favourable conditions to implement projects with ecological benefits. 5) Best available technologies: Article 113 of the Code creates a basis for the introduction of the best available technologies aimed at reducing the negative impact on the environment, minimizing and controlling the negative anthropogenic impact on the environment, improving the efficiency of the use of resources that contribute to the transition of the Republic of Kazakhstan to a green economy and low-carbon development. According to Article 418, paragraph 4 of the Code since 1 January 2025, for facilities that have a significant negative impact on the environment, it is mandatory to have a comprehensive environmental permit, which requires the use of equipment with the best available techniques. 6) Energy policy: Since 2018, an auctioning mechanism for selecting projects of renewable energy sources (hereinafter – RES) has been introduced in Kazakhstan. This mechanism replaced the fixed tariffs that were in effect until 2018, which initially allowed the launch of the renewable energy sector in the Republic of Kazakhstan. The mechanism made it possible to reduce twice the tariffs for green energy. According to the statement of the President of the Republic of Kazakhstan, the share of RES in electricity production is increased to 15% by 2030. 7) Just Kazakhstan: Strategic political transformation and structural economic reforms launched after 2021 and integration by the President and Government of the Republic of Kazakhstan of the domestic system of inter-agency cooperation will lead in the mid- and long-term perspective to gradual and consequent demonopolisation of sectors of the economy and diversify the sources of energy with a focus to increase a share of RES and introduction of green

	hydrogen as well as other alternative sources of energy. Action plan on implementation of the election program of the President of the Republic of Kazakhstan "Just Kazakhstan – for all and everyone, Now and forever" adopted by the Decree of the President of the Republic of Kazakhstan # 2 dated 26 November 2022 contains the following activities that contribute to achieving the NDC target by 2030: to attract by 2029 not less than 150 billion USD worth of direct foreign investment; 60% gasification of the country area; 1,5 times increase of the volume of production using RES; 20% reduction of contaminants including strengthened environmental control at the industrial companies of the country; increase the forestry area till 14,5 million hectares; development of a complex plan for water sector aimed at the conservation of national water ecosystems. Protection of water ecosystems from contamination by the industry; creation of a required infrastructure for EVs in large cities of the country. 8) Science and education: In 2022, the Ministry of Science and Higher Education of the Republic of Kazakhstan was established in charge of higher and postgraduate education, science, quality assurance in the field of higher and postgraduate education and science, and digitalization of higher and postgraduate education. To ensure the achievement of NDC, it will be necessary to conduct a variety of assessment and foresight studies on the needs of the long-term low-carbon development of the Republic of Kazakhstan with the involvement of stakeholders using various methods to generate trans-disciplinary ideas. In 2022-2024, a concept or a program document for the NDC Roadmap will be developed, defining: 1. Key thematic areas, and research relevant to the Republic of Kazakhstan based on the R&D portfolio management approach, identifying promising topics and screening out low-impact projects. 2. competencies, courses and programs of formal education for the needs of decarbonization, and options for implementing digital multidisciplinary postgraduate education programs, including in partnership with foreign universities and online education platforms. 3. ways for integration and cooperation of organizations and industry with universities, by funding research programmes fellowships, setting up research centres focussing on sustainable development and carbon neutrality to prepare highly experienced personnel and carry out studies and research on decarbonization, taking into account the national circumstances. 4. approaches for creating an ecosystem for the development of new decarbonization solutions, including startup incubators and (or) integration with the existing ones. 5. information tools for increasing population awareness of climate change and its impacts, relevant policies and approaches for involving citizens and youth in climate policy development and implementation. 9) Roadmap for NDC implementation: The initial draft of the Roadmap for NDC implementation for 2021-2025 was developed with the involvement of all stakeholders in the consultation process. Sectoral and institutional decarbonization measures were included. For each measure, the potential for reducing greenhouse gas emissions, investment needs by funding source, spillover effects and risks of not achieving results

	were calculated. In addition, measures to eliminate barriers and risks, responsible parties and deadlines were described. Moreover, the document included measures to improve the national monitoring, reporting and verification system with key indicators to track progress towards achieving the NDC targets. Given the development of a long-term low-emission development strategy, NDC for 2030 and carbon neutrality strategy for 2060 are being harmonized. Further, options for harmonizing policies in the field of ecology, climate and energy will be considered, namely, scenarios for the introduction of the best available technologies, the share of renewable energy and fossil fuels, with different levels of the carbon budget of the emissions trading system and differential distribution of quotas by sectors. In 2023-2024, an updated draft of the Roadmap for NDC implementation will be presented, taking into account the main issues of long-term low-carbon development and harmonization with sectoral policies. 10) Monitoring, digitalization and open data Achievement of NDC targets and carbon neutrality will demand holistic digitalization first of all in the energy sector and the environment to track a carbon footprint and to ensure transparency as well as the creation of an innovation ecosystem both for applied research programs and new financial tools on decarbonization. Introducing intelligent systems in the power sector will touch all levels of the energy sector – systematic management, power generation, and distribution and it will enable the creation of conditions to integrate renewables (RES) and distributed generation and also strengthen the sustainability of the system due to better monitoring and maintenance. The use of satellite data and intelligent systems will enable to track and monitor any changes in land use and forests and will improve the quality of data collection. Digitalization of the energy system, large emitters and land users and other sectors in the manner of a united climate platform will provide operational access to credible and complete information on the data of both greenhouse gas emissions and other pollutants that will ensure credibility and coherence of the climate system of the Republic of Kazakhstan and will be a crucial element for the Monitoring, Reporting and Verification (MRV) system, and will increase trust from potential partners and citizens. Monitoring of the NDC implementation progress will be reported in the Biennial transparency report including the progress of the current plans and programs implementation, policy and practical indicators by using available data of the unified climate platform.
4.2 Best practices and experience related to the preparation of the nationally determined contributions	To prepare the NDC of the Republic of Kazakhstan, a team of national and international experts used advanced decision support tools, including a macroeconomic general equilibrium model and a technical and economic model of the entire energy system. During the preparation of the NDC and the long-term low-emission development strategy, local experts built up their competencies in the development and use of integrated models for long-term energy planning, macroeconomic modelling and systems analysis. In the future, this will allow for regular assessment of current decarbonization rates, reassessment of development plans, proposals for government policy improvements, and expert decision-making support for the development and

	presentation of the second and subsequent NDCs and low-emission development strategies. It is worth noting that additional technical assistance to build local expert multidisciplinary potential, train scientific personnel, organize professional exchange programs will play a critical role in strengthening climate policy and implementing decarbonization.
4.3 Accounting for the global stocktake outcomes of implementation in preparation of the nationally determined contribution	The outcomes of the first global stocktake will be taken into account in the preparation of the second and subsequent NDCs of the Republic of Kazakhstan
5.Assumptions and methodological approaches	
5.1 Accounting for greenhouse gas emissions and removals	The Republic of Kazakhstan will use current and future principles for GHG reporting and NDC decisions. Data on 2030 emissions and NDC target achievement will be based on 1990-2030 inventory data available in 2032.
5.2 Methodologies and metrics used for estimating anthropogenic greenhouse gas emissions and removals	Methodological approaches are based on the use of the following methods: 1. IPCC Guidelines for National Greenhouse Gas Inventories, 2006. 2. 2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands. 3. 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. 4. Global warming potential values according to recent available the UNFCCC Decisions adopted.
5.3 Methodologies and Metrics for specific sectors	Emissions as a result of natural anomalies on managed lands and emissions from harvested wood products, as well as approaches used, assumptions and their compliance with IPCC guidelines will be available in the National Greenhouse Gas Inventory Report.
5.4 The intention to use voluntary cooperation under Article 6 of the Paris Agreement	The Republic of Kazakhstan plans to reduce greenhouse gas emissions at the national level but retains the opportunity to participate in the mechanisms of Article 6 of the Paris Agreement through various international mechanisms, including through the linking of emissions trading systems.
6. Fairness and ambitiousness of the nationally determined contribution	
6.1 Fairness and ambitiousness of the target	Kazakhstan's NDC implementation faces the following barriers that complicate the achievement of the target and demand serious considerations: 1. The introduction of carbon pricing can lead to an increase in prices for fuel and energy resources and dependent services, and to a significant increase in inflation, which in turn can significantly worsen the welfare of the population. 2. Lack of access to cheap loans for low-carbon projects, while brown assets have access to guarantees and financing with a potentially lower interest rate.

	3. Lack of consideration of climate criteria and criteria of Sustainable Development Goals in the budgetary process, which leads to risks of financing and potentially stranded assets. 4. The risk of a shortage of natural gas for decarbonization of energy. Achieving NDC targets implies an increase in natural gas supplies, which requires field development and investment, as well as tariff revisions. 5. About half of the river flows are generated in neighbouring countries, which increase water extraction, and taking into account climate change, the uncertainty of the potential of hydropower is also increasing, which affects both energy security and the carbon intensity of the electric power industry. 6. The risk of integration into regional organizations. Starting from 2025, the Unified Electric Power Market of the EAEU countries, in which greenhouse gas emissions are not regulated, will be launched. This can lead to both an increase in the cost and a reduction in the cost of electricity within the country, leading to energy security issues and an increase in costs. 7. The impact of the COVID-19 pandemic and its unpredictable consequences, increase both endogenous and exogenous risks, such as price increases due to disrupted supply chains. 8. The ripple effect of neighbouring countries. Regional problems of neighbouring countries such as the imposition and implementation of sanctions, military conflicts, waves of immigration due to policies, increased prices for food and accommodation, etc. can reduce trade turnover, disrupt the supply chain and weaken the economy of the Republic of Kazakhstan, worsen the social conditions of the population, and accordingly reduce the window for decarbonization. It is important to understand that the Republic of Kazakhstan is a country with a low population density and a large territory with a sharply continental climate, without access to the world ocean. 41.3 percent of the population of Kazakhstan lives in rural settlements with poorly developed infrastructure, remote from industrial centers, with a small capacity of the domestic market and with a predominance of energy-intensive export-oriented sectors of the economy, which provide the main revenues of the state budget, and significantly affect economic policy and the exchange rate of the national currency. The Republic of Kazakhstan will need to introduce new and significantly strengthen existing carbon pricing mechanisms in order to achieve its NDC, which has a double dependence on fossil fuels (coal and oil) in the country. It will also be necessary to increase the share of renewable energy sources (solar and wind) in the balance of electricity production, and to use previously unused capacities to increase the maneuverability of the system. It will be necessary to change the existing dispatching modes of the power grid to more adaptive ones, digitalize the aging energy fleet and introduce the use of digital twins. At the same time, it is necessary to significantly modernize science and education, increase research and human resources, establish programs for the development and transfer of critical technologies for low-carbon development, develop a portfolio approach for research in the field of decarbonization; reduce investment risks and establish mechanisms for obtaining cheap loans for capital-intensive low-carbon

	projects, which requires the demonopolization of certain industries, and conduct comprehensive market, regulatory and economic reforms. At the same time, it is necessary to prevent an increase in inflation and a significant increase in energy tariffs and basic needs of the population; it is also necessary to take into account that external factors, such as the consequences of a worldwide pandemic, global market volatility, and instability in neighboring states have negative social and economic consequences for the economy and population of the Republic of Kazakhstan and significantly reduce the window of intervention and reforms even for achieving the current NDC target.
6.2 Implementation of Article 4, paragraph 4 of the Paris Agreement	The Republic of Kazakhstan aims for an absolute economy-wide reduction to ensure the achievement of NDC.
7. Role of the nationally determined contribution towards achieving the objective of the Convention as set out in its Article 2	
7.1 Contribution towards achieving the objective of the Convention as set out in its Article 2;	Kazakhstan's NDC and carbon neutrality goals contribute to the transition to low-emission development and the achievement of the long-term temperature goal set out in Article 2 of the Convention and the Paris Agreement.
7.2 Contribution towards Article 2, paragraph 1(a), and Article 4, paragraph 1, of the Paris Agreement.	The Republic of Kazakhstan aims to achieve carbon neutrality by 2060, which contributes to the accelerated achievement of the global peak of greenhouse gas emissions in the first half of the 21st century and also takes into account the constraints imposed by the principles of equity, sustainable development and poverty eradication.
8. Component of Adaptation to climate change	
8.1. National circumstances, institutional arrangements, and legal frameworks	In the adaptation planning processes, the following national circumstances of the Republic of Kazakhstan have been considered: 1. Kazakhstan is the biggest country in Central Asia and the 9th largest in the world, covering 2724.9 thousand sq. km. 2. The climate of Kazakhstan is rather dry with annual precipitations of 592 mm and great diversity in the rainfall. The highest levels of precipitation are observed in the mountains, while most of the territory of Kazakhstan falls within arid and semi-arid zones. However, due to its vastness, the country spans nearly all climatic zones characteristic of Central Asia: arid, semi-arid, dry sub-humid, sub-humid and humid from 2,500 m above sea level. 3. Average monthly temperatures range from minus 16 to 18 °C in January in the north (with minimum temperatures up to minus 46-54 °C and even lower) to plus 29-30 °C in July in the south (with maximum temperatures up to +49-54 °C). 4. The landscape is characterized by diversity, with mountains in the Central, East, and South-East parts of the country, deserts and semi-deserts in

	the South-West, and vast steppes combined with forest-steppe in the North of Kazakhstan. 5. Current forest cover in Kazakhstan is low: it amounts to 12.9 million ha or 4.74% of the territory. Shrubbery and protective plantings cover about 10 million hectares, while only 3.3 million hectares are occupied by principal wood species: coniferous, soft-wooded, and hard-wooded broadleaved species. Much of the area recognized as forests is not covered by woods, as confirmed by the satellite data, according to which the Kazakhstan woodlands cover just 1.24% of the total country area or 3.48 million hectares. Nearly all forests are state-owned and protected, with restrictions on cutting. Felling of principal wood species removes forest from an area of 10 thousand ha per annum. Felling of saxaul and cutting of shrubbery, registered mainly in the South of Kazakhstan, cleared some additional 40 thousand ha per annum, according to the official statistical data. Since 2015, cutting saxaul is prohibited, and from 2017 this ban was extended to the trade of saxaul. 6. There are over 7 thousand rivers and about 48 thousand lakes in the country, while Kazakhstan borders also both, the Caspian Sea and the Aral Sea. The majority of rivers feed the Caspian and Aral Seas, lakes Balkhas and Tengiz. Three major rivers: Ertis, Esil, and Tobol flow to the Arctic Ocean (Kara Sea). Some of the major rivers are transboundary. 7. Kazakhstan has 18,767 million inhabitants. 59% of the population lives in 88 cities and towns. The remaining 41% of the nation lives in the countryside. Institutional arrangements and legal frameworks: The Ministry of Ecology and Natural Resources of the Republic of Kazakhstan (hereinafter – the Ministry) is responsible since 2019 for developing and coordinating climate change policy. Climate policy planning and implementation is supported by the Ministry in cooperation with relevant sectoral ministries. Mainstreaming climate change and climate adaptation will depend on close cooperation between the ministries. The required transformation will not be achieved without the engagement of the NGOs, businesses, the general public, young people, and women's organizations. Adaptation activities planned by the government envisage the involvement of stakeholders, support of the local executive bodies of regions and cities of Republican significance, and inclusion of measures to promote gender equality in project portfolios. Adaptation planning will improve by drawing from systematic research on impacts and climate modelling. Climate change presents a global problem, but its impacts are experienced locally with an intensity that departs from the global average. Long-term planning of responses to climate change and adaptation has to rely to some extent on climate models that present decision-makers with scenarios to support the selection of respective policies and measures. Further research is needed to understand how the physical risks of climate change will impact the economy and ecosystems of Kazakhstan. The mechanism for implementing adaptation plans also provides for the creation of a system of sectoral and local centers based on existing organizations to support the efforts of state and local government bodies in planning and implementing measures on adaptation to climate change.

	A mechanism for monitoring public policy already exists in Kazakhstan. The implementation of sectoral policies and adaptation measures will be monitored, and annual reports will be submitted to the Ministry in accordance with paragraph 33 of the Rules for the Organization and Implementation of the Process of Adaptation to Climate Change, approved by Order No. 170 of the Minister of Ecology, Geology and Natural Resources of the Republic of Kazakhstan dated June 2, 2021, for the preparation of international reporting in accordance with subparagraph b of paragraph 7 of the Paris Agreement.
8.2. Impacts, risks and vulnerabilities	The Republic of Kazakhstan is already experiencing the effects of climate change. Air temperatures in Kazakhstan have increased significantly over the past few decades. The average annual temperature increased by 0.32°C every 10 years. The highest temperature was observed in 2020 when the average anomaly in the country was 1.92°C. These figures demonstrate that the average annual air temperature in Kazakhstan is growing faster than the global average. In several regions of Kazakhstan, there is an increase in the number of days with temperatures above 35°C. Other key stress factors associated with climate change include an increase in the number and intensity of extreme weather events (heavy rain, heavy snowfall, storm and hail), drought and glaciers melting. Further temperature increases are expected on average by 1.7-1.9°C before 2030 and 2.4-3.1°C by 2050, increasing by 3.2-6.0°C before 2100. The lower limit of the range corresponds to the scenario of greenhouse gas concentrations RCP4.5, and the upper limit to RCP8.5. Along with an increase in precipitation during the winter months, the country is likely to experience an increase in the frequency and intensity of dry periods in other seasons. In mountainous areas, even with an increase in precipitation, higher temperatures will lead to a reduction in precipitation in the form of snow and further melting of glaciers. Since 2000, droughts of varying severity have already affected more than 50% of the total land area of Kazakhstan in two out of every five years. The likely consequences include the continued expansion of deserts and arid areas with the possible loss of coastline due to the lowering of the Caspian Sea level. On the other hand, the increase in severe storms with intense rains will cause an increase in the frequency of river floods, overrunning events and the number of flash floods and mudslides. The most serious consequences of climate change include growing water scarcity and desertification. The growing shortage of water, including due to transboundary factors, and the associated degradation of aquatic ecosystems, are among the most pressing problems for Kazakhstan. Most of the water intake goes to agriculture. Kazakhstan is also a major supplier of wheat in the region. It is expected that climate stressors such as increased droughts, changes the river flow regimes and precipitation patterns, increased temperatures, and increased occurrence of extreme weather events are expected to bring agricultural losses to the country, engendering food insecurity in the region by 2050. High soil salinity is already affecting arable lands and impacting crop productivity. Apart from reduced crop yields, rising temperature and changes in rainfall patterns could result in outbreaks of agricultural pests and diseases, including those traveling across national borders. Livestock production and the traditional agro-pastoral grazing systems will also face significant consequences due to climate

	variability and change. Feeding sources and grazing areas, particularly pastures, which already face degradation and overgrazing, will be affected by desertification, droughts, and storms. Variability in temperature and precipitation patterns combined with a decrease in water access could contribute to biological stress on animals, affect growth and reproductive patterns, and increase the spread of infectious diseases among livestock. The impact of climate change on agricultural production disproportionately affects the well-being of different population groups. One of the most vulnerable groups are women living in rural areas, where, along with agricultural work, women traditionally take care of the family and housework. Climate change will also affect the availability of water for drinking and sanitation activities, as well as for energy generation, including regional and transboundary water cooperation. Among other reasons, public health will be affected by heatwaves, reduced food security, limited access to clean drinking water and the spread of vector-borne zoonotic diseases. Heatwaves and droughts can increase mortality, especially among vulnerable groups such as children and the elderly. All big cities of Kazakhstan are situated on the banks of major rivers and therefore prone to flooding. Urban heat islands will eventually exacerbate all climate change-related problems affecting human health in cities. Extreme weather events resulting in floods or mudslides may critically endanger infrastructure such as roads, bridges, and buildings.
8.3. National adaptation priorities, strategies, policies, plans, goals, and actions	National adaptation priorities: The priorities of the government of Kazakhstan focus on the adaptation needs of the key sectors impacted by climate change: 1) Agriculture; 2) Water resources management; 3) Forestry; 4) Disaster risk reduction. Strategies, policies, plans, goals, and actions: 1. The Development Strategy of the Republic of Kazakhstan until 2050 is a long-term basis for all state planning documents, including the strategic plans of ministries and departments as well as programs. One of the strategic objectives of the state is the transition to a low-carbon green economy, leading to a decrease in the impacts of climate change and reduction of GHG emissions. 2. In 2019, a new Chapter dedicated to climate change adaptation was included in the new Environmental Code which was adopted in 2021. 3. In 2018, the Government decided to update its 2015 NDC by adding, among others, a component on adaptation to climate change during the national NDC review process. 4. On 29 July 2020, the government of the Republic of Kazakhstan has adopted Resolution No 479 on the Action Plan for the implementation of the Concept for the transition of the Republic of Kazakhstan to a „Green Economy" for 2021-2030 (the 2021-2030 Action Plan) which is aligned with the NDC of Kazakhstan. 5. With the adoption of the Environmental Code in 2021, the country has laid the foundations for the process of adaptation to climate change.

	6. The general objective of the adaptation chapter of the Environmental Code is to promote the reduction of climate risks in Kazakhstan by building climate resilience while addressing the impacts of climate change, minimizing climate risks, and implementing measures enabling adaptation of natural ecosystems, economic activities, and infrastructure, safeguarding public health, ensuring food security and access to water and gender equality. Adaptation activities will be prioritized based on sectors' vulnerability to climate change. 7. Taking into account international recommendations for nature-based solutions, sectoral and administrative-territorial planning in the field of environmental protection and climate change has been supplemented by the ecosystem/ basin approach. For Kazakhstan, this approach is strategically important, since limited water resources require intersectoral and interregional cooperation. The basin approach also makes it possible to clarify the goals and strengthen the mutual links and synergy of sectoral and territorial programs on adaptation to climate change. 8. The implementation of the national adaptation policy will undergo periodic review and revision in 5-year cycles, in line with the government policy monitoring and evaluation cycles, including gender issues and reflecting relevant MRV processes under the UNFCCC and the Paris Agreement. Information obtained during the periodic reviews will provide the feedback necessary to track progress on the implementation and achievement of policies and measures. The revision of policies and measures will create opportunities to improve the planning and implementation of adaptation measures in line with the latest science and enabling deployment, to the extent possible, of the latest available technologies. An NDC Implementation Roadmap till 2025 contains a section on adaptation to climate change and identifies effective adaptation programs, projects, actions, and activities that could also contribute to mitigation while reducing vulnerabilities to climate change.
8.4. Implementation of adaptation actions and plans	Progress and results achieved until now: Kazakhstan recognizes the importance of reducing the country's vulnerability to climate change and has initiated developing policies and measures addressing adaptation to climate change. National Communications to the UNFCCC have outlined possible climate change scenarios with corresponding proposals of adaptation measures for agriculture, water resources management, health, protection of ecosystems, and socio-economic development and currently such measures have been introduced into national policies and legislative framework. The 2021-2030 Action Plan contains several measures linked to adaptation to climate change, especially those concerning a reduction in the intensity of the use of water, transformation of agriculture, energy efficiency, modernization of housing and communal services, development of sustainable transport but also conservation of ecosystems and enhancement of forest cover. Several of these measures bring additional benefits to other sectors affected by climate change. For example, afforestation, apart from economic benefits and additional mitigation outcomes, will enable the government to address land erosion, increase water retention and improve groundwater quality. Thermal modernization of buildings will not only save energy but improve the quality of citizens' lives. Greening cities and creating forest belts around the biggest

	towns will not only support groundwater management and retention but will improve the quality of air and create a pleasant living environment for city dwellers. Mainstreaming of adaptation measures into sectoral and territorial policies is one of the expected outcomes of the chapter 22 "Public administration in the field of adaptation to climate change" of the Environmental Code. A separate „Roadmap for energy conservation and energy efficiency in the Republic of Kazakhstan for 2022-2026" has been planned in the 2021-2030 Action Plan. Cooperation on enhancing adaptation on the national, regional, and international level: 1. The implementation of the 2021-2030 Action Plan is monitored by the Ministry of Ecology and Natural Resources. 2. A permanent coordination mechanism for mainstreaming adaptation policies and measures into sectoral and territorial policies will follow the channels of the existing government coordination mechanism, linking the Ministry of Ecology and Natural Resources with other ministries in charge of national planning, finance, and development, agriculture, forestry, energy, health and education. 3. Regional and international cooperation is carried out within the framework of projects of international financial institutions. Barriers, challenges and gaps Existing gaps and barriers to climate change adaptation (CCA) planning, monitoring, and reporting in Kazakhstan comprise insufficient institutional and technical support for mainstreaming adaptation into sectoral and local development plans, lack of permanent inter-ministerial and cross-regional platform for discussion of adaptation issues, lack of inventories of existing climate information, combined with fragmented and outdated vulnerability assessments, strong need to harmonize techniques for climate-related data collection, analysis and documentation, lack of required trained personnel (numbers and expertise) to meet adaptation objectives. These gaps and barriers will be addressed in the course of implementing the provisions of the Environmental Code and in the process of implementing the adopted programs and plans. Monitoring and evaluation A system of annual monitoring and reporting on the implementation of the 2021-2030 Action Plan has been established by the Government of the Republic of Kazakhstan Resolution No 479 of 29 July 2020 on the Action Plan for the implementation of the Concept for the transition of the Republic of Kazakhstan to a "Green Economy" for 2021-2030. A similar mechanism will be established to monitor the implementation of the Roadmap for the NDC implementation when it is adopted. Evaluation of the implementation of the Roadmap for NDC implementation will culminate in a review every five years, enabling corrective planning and implementation of further measures. The success of implementation will be judged against a set of indicators specific for each sector. Apart from reports submitted by public administration bodies on an annual basis, scientific data will be used, where possible.
8.5. Adaptation actions and	Several actions have already been planned in the 2021-2030 Action Plan. Agriculture:

economic diversification plans, including those that result in mitigation co-benefits	Actions already partially undertaken in the agricultural sector include crops diversification, gradual move away from water-intensive crops, shift to water-saving technologies, modernization of drip irrigation and corresponding infrastructure in view of any hypothetical change and redistribution of river runoff in a year, shift to modern organic farming and better soil management to maintain its carbon content, change in fodder for animals to reduce methane emissions from cattle and prevention of overgrazing, responsible management and protection of pastures. One of the planned measures would be to conduct updated agroclimatic zoning of the territory of the Republic to take into account the observed changes in conditions for the growth of the crops. Water resources management: To improve water management and water use, while ensuring a stable water supply, Kazakhstan introduces basin management and integrated water resources management (IWRM) principles, implements projects increasing the coverage of the population with wastewater treatment in cities, projects implementing measures to reduce water losses during transportation in water supply networks, construction of water reservoirs, and emergency water reservoirs to catch excess rainfall, modernization and reconstruction of water canals and hydraulic structures, the introduction of modern irrigation methods and modern water-saving technologies, popularizing the use of drip-irrigation, promoting water efficiency in industry, transition to less water-intensive crops in agriculture. The government plans to improve incentive mechanisms for the deployment of water-saving technologies in industrial, agricultural, and residential use. The water-saving drive will have implications for energy production. Conventional power plants are cooled with water and are using large quantities of it in the process. The planned development of renewable energy will also lower water use and improve its efficiency, easing stress on water resources and thereby facilitating adaptation. Forestry: Kazakhstan pledged to restore at least up to 1.5 million ha of degraded land through afforestation and reforestation until 2030 under the Bonn Challenge. Afforestation of at least up to 1.5 million ha of degraded land under the Bonn Challenge would bring substantial mitigation benefits. Forestry planting programmes will, apart from boosting carbon sequestration on an unprecedented level, support land rehabilitation projects, convert unproductive land to forestry, rejuvenate damaged landscapes and create jobs in the sustainable forestry and timber industry. Afforestation and reforestation mitigation outcomes under three different scenarios until 2030 were modelled with the use of CBM-CFS3 (Carbon Budget Model of the Canadian Forest Sector) software. In the first three years [after planting] each hectare of coniferous, soft-wooded, or hardwood trees absorbs the average of 1 ton of carbon per year that is equivalent to 3.67 tons of CO2 per year per hectare subject to lack of disturbances. However, later this parameter drops to 0.7 tons of carbon per year per forest hectare. This can be explained by forest aging which is leading to a decrease in carbon dioxide absorption. The 25-year lifespan of commercial forests will provide the country with adaptation benefits (water retention, wood for construction, etc.) as well as increase carbon sinks offsetting anthropogenic emissions that cannot be further mitigated or reduced by other means.

	To increase forest cover, the government is planning to improve in the 2022-2030 period the mechanism of support incentivizing the setting up of private industrial plantations and forest nurseries, and implementation of pilot projects in this field supported by public-private partnerships. Further measures are planned to ensure the protection of forests. In 2020, National Action Plan for the implementation of the Address of the Head of State to the people of Kazakhstan dated September 1, 2020 "Kazakhstan in a new reality: time for action". It aims to ensure planting of more than 2 billion trees in the forest fund and 15 million in settlements within five years, and it is aligned with the Bonn Challenge goals. Disaster risk reduction: Changing climate will negatively impact agriculture and water resources, ecosystems and human health in Kazakhstan. However, it is the anticipated increased frequency of natural disasters and emergencies, on top of the slow onset events, that will require mobilization of the government reaction and strengthening of the DRR component in the adaptation planning and implementation. Since the adoption of the Sendai Framework for Disaster Risk Reduction (2015-2030) by Kazakhstan progress has been made in implementing activities aligned with the four priorities of the Sendai Framework. The DRR-related legislative and institutional framework will enable integrated mainstreaming of adaptation to climate change and risk management at both, national and sub-national levels, with the involvement of stakeholders such as vulnerable communities and youth, taking into account gender considerations and enhanced cooperation regionally, enabled through the Center for Emergency Situations and Disaster Risk Reduction, set up in Almaty in 2016 and serving Kazakhstan and its neighbors, Kyrgyzstan, and Afghanistan. Transboundary cooperation with neighboring countries: The 2021-2030 Action Plan will support a Central Asian regional program on adaptation to climate change and implement agreements on the protection of water quality and the joint use and protection of transboundary rivers. Education and awareness rising: The Action Plan for 2021-2030 provides for a separate area of work related to education and awareness-raising of the population of Kazakhstan, through the formation of ecological culture. Actions will be developed to popularize green policies and measures through publications, awareness-raising through targeted informing of the business community, explaining the rules and principles of the green economy and awarding special industry awards for high results and achievements. Within the framework of the Concept of Education Development of the Republic of Kazakhstan for 2022-2026, approved by the Decree of the Government of the Republic of Kazakhstan dated November 24, 2022 No. 941, measures are planned to involve young people in improving environmental culture and respect for the environment. Within the national project "Green Kazakhstan" adopted by the Decree of the Government of the Republic of Kazakhstan dated October 12, 2021, No. 731 there is a direction "Ecology of Bolashagi" "Ecology for Youth", aimed at improving the level of environmental education and culture of the population. Two tasks have been defined in this direction:

	- integration of environmental aspects into the formal education system; - formation of an eco-oriented information space.
8.6. How adaptation actions contribute to other international frameworks and/or conventions	Implementation of the Plan will contribute to the achievement of the SDGs, the Bonn Forest Challenge and the Sendai Framework for Disaster Risk Reduction. The state policy of the Republic of Kazakhstan in the field of adaptation to climate change will also address biodiversity loss, reflecting the principles and goals of the UN Convention on Biological Diversity as well as the UN Convention to Combat Desertification.
8.7. Gender-responsive (and traditional / local / indigenous people knowledge) adaptation action	The role of women in the adaptation of agricultural practices to climate change, participation in decision-making processes, planning and implementation of projects, awareness-raising and shifting public behaviour towards more responsible use of water and energy, climate risks understanding, and other identified challenges will be addressed by relevant state programs on priority areas of public and local administration for adaptation to climate change.