Committee for Emergency Situations
Ministry of Internal Affairs
Republic of Kazakhstan

CESDRR

CLIMATE RISK MANAGEMENT

When?
What?
Where?

Mitigation!
Adaptation!
Reduction!

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The global problems of our time encompass all aspects of human life and affect all countries and peoples. In the current context, there is a need to rethink the relationship between humans and the surrounding world, in which new unprecedented threats to humanity are emerging, one of which is global climate change.

Scientists around the world have been sounding the alarm for a long time. Their research has been carefully studied and confirmed by facts that leave no doubt: climate change is a huge threat that also gives rise to new dangers. Climate change leads to an increase in anomalous phenomena, processes of mudflows, floods, droughts, and other natural and climatic disasters, which are increasingly resulting in severe consequences for many countries and peoples.

People's vulnerability to climate risks is increasing due to the growth in population size and density, associated intensive land use, rapid urbanization, and global environmental changes.

Society, driven by a natural desire for self-preservation, undertakes conscious, pre-planned measures aimed at ensuring the safety of life.

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The problem of protecting society from natural and climatic risks includes many aspects that must be considered when developing measures to ensure the safety of the population, especially the most precious thing we have—children, who are the most vulnerable and most in need of protection.

Children's safety should always be the most important priority for all adults, wherever they are: in kindergarten, school, at home, or on the street.

Children, as full citizens, must have guaranteed access to education, and adults—parents and educators—are obliged to provide them with the necessary information and teach them the basics of safe behavior in the event of a threat or occurrence of emergency situations. Children's safety is not just the sum of the knowledge they have acquired, but their ability to properly use this knowledge in various extreme situations.

This brochure was developed by experts from the Center for Emergency Situations and Disaster Risk Reduction in Almaty, as part of the implementation of the United Nations Development Programme project in Kazakhstan: "Strengthening Community Resilience to Negative External Impacts and Improving the Efficiency of Flood Risk Management in the Almaty Region."

The educational information on climate risk management is intended for children and adults to provide accessible and understandable information about the main processes of climate change, climate risks, natural disasters and their consequences for the environment, life and health of the population, and to familiarize them with a set of measures for mitigation, adaptation, counteraction to climate risks, disaster risk reduction, and reducing vulnerability to emergencies associated with climate risks.

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3 DISASTER RISK REDUCTION – the concept and practical actions aimed at reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of natural resources, and improved preparedness for adverse events.

4 DISASTER RISK – the potential losses resulting from disasters, expressed in human losses, material, economic, and environmental damages.

5 DISASTER – an event that seriously disrupts the life of local communities and society, causes casualties among the population, as well as extensive material, economic, or environmental damage and impact that exceeds the ability of the community or society to cope using its own resources.

Disasters occur when hazards such as earthquakes, mudflows, landslides, floods, accidents, and other dangerous natural and man-made processes and phenomena have a significant destructive impact on vulnerable groups of the population and overwhelm their ability to cope using their own resources.

A disaster is always the result of two interacting components – hazard and vulnerability. It is important to know that when we talk about disaster risk, we are talking about something that has not yet happened, but is quite likely to happen in the future.

6 HAZARD – a potentially damaging physical phenomenon (such as an earthquake, flood, landslide, or man-made accident) that may cause the loss of life or injury, property damage, social and economic disruption, or environmental degradation. In other words, hazards contain the probability of a dangerous event occurring, causing socio-economic damage.

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7 VULNERABILITY – a set of conditions and processes resulting from physical, social, economic, and environmental factors that increase the susceptibility of a community (children) to the impact of a given hazard. In the context of disaster risk reduction, vulnerability does not exist as a general static condition, but is defined in relation to specific hazards. THE VULNERABILITY OF PEOPLE (CHILDREN) can be briefly formulated as the lack of physical, social, and economic capacity of a person (child) or community to anticipate, cope with, resist, and recover from the impact of a given hazard. Vulnerability depends on exposure to hazards (e.g., living, staying (studying), or working in an area prone to earthquakes, droughts, etc.). The root causes of why people become vulnerable to

hazards are often lack of preparedness, poverty, and social insecurity, and the state of vulnerability also depends on the socio-physiological status of a person – man, woman, young, elderly, adolescent, child, pregnant woman, nursing mother, chronic illness, disability, exposure to sexual violence and harassment, HIV/AIDS, and other infections. STRUCTURAL AND PHYSICAL VULNERABILITY – the degree to which a structure (buildings, facilities, communications) or service (educational process) is likely to be damaged, disrupted, or rendered inoperative as a result of a hazardous event. For example, a school building is considered vulnerable to earthquake shaking if its construction lacks elements that would withstand the impact of an earthquake of magnitude 6 or more. NON-STRUCTURAL VULNERABILITY – the lack among part of society and citizens (children) of an adequate level of knowledge and skills, a culture of life safety, awareness of personal responsibility for their health and life, as well as for the lives of relatives, friends, and people around them, and for the preservation of material and cultural values – which is one of the main reasons for a high degree of vulnerability to disasters.

8 A CULTURE OF SAFETY is understood as the level of development of a person (children) and society, characterized by the importance of ensuring life safety in the system of personal and social values, the prevalence of stereotypes of safe behavior in everyday life and in dangerous and emergency situations, and the degree of protection from threats and dangers in all spheres of life (while at school).

9 THE CONCEPTS OF HAZARD, VULNERABILITY, AND DISASTER RISK are dynamically linked to each other, meaning that for a risk to arise in the same place, two main components must be present – hazards and vulnerability. The relationship between these elements can be expressed as a simple formula: "RISK = HAZARD x VULNERABILITY"

10 Risk = Hazard x Vulnerability / Capacity. Risk = Probability of a climate event x Vulnerability to this type of event. VULNERABILITY = Exposure, Sensitivity, Adaptive Capacity.

11 ADAPTATION – the adjustment of natural and anthropogenic systems to new or changing environmental conditions. ADAPTATION TO CLIMATE CHANGE means adjustment in response to actual or expected climate change impacts or their consequences, which allows for reducing harm or taking advantage of beneficial opportunities. ADAPTATION to global climate change is the adjustability of natural or anthropogenic systems in response to actual or expected climatic changes, which allows reducing their own vulnerability and taking advantage of favorable conditions.

12 GLOBAL WARMING – the short-term intensification of the greenhouse effect caused by anthropogenic emissions of greenhouse gases.

13 "GREENHOUSE GASES" means gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation.

14 CLIMATE CHANGE means a statistically significant change either in the average state of the climate or in its variability over an extended period of time. Climate change – directly or indirectly caused by human activity.

15 CLIMATE – the average weather regime or statistical description of the average value and variability of relevant quantitative parameters over a period of time. The relevant quantitative parameters are most often variables such as temperature, precipitation, and wind.

16 "CLIMATE SYSTEM" means the totality of the atmosphere, hydrosphere, biosphere, and geosphere and their interactions.

17 NATURAL DISASTER – a natural phenomenon of significant destructive force, posing a threat to the life and health of people, leading to disruption of normal population activities, destroying and annihilating material assets, causing significant and/or irreversible changes in ecosystems and landscapes.

18 DISASTER RISK MANAGEMENT – the process of developing, implementing, and evaluating strategies, policies, and measures to understand disaster risk, reduce exposure, increase resilience, and ensure sustainable development.

19 RESILIENCE – the ability of social, economic, or natural systems to cope with the consequences of natural disasters or climate change trends: to withstand external impacts (continue to function effectively) without changes, or to return to their original state after disruptions.

20 VULNERABILITY – the susceptibility of a system to adverse impacts as a result of climate change and/or the inability to withstand these changes. Vulnerability is the degree to which a given system is susceptible to adverse impacts as a result of climate change and is unable to withstand the negative impacts of climate change, including climate variability and extreme climatic events.

21 EXTREME SITUATION – an event beyond human experience that cannot be predicted in advance and to which existing knowledge and skills cannot be applied.

22 RISK ASSESSMENT – a methodology for determining the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that could potentially harm exposed people, property, livelihoods, and the environment on which they depend.

23 CAPACITY – the combination of all the strengths, factors, and resources available to a local population, community, or organization that can be used to achieve agreed goals.

24 COPING CAPACITY – the ability of people, organizations, and systems to withstand and manage adverse conditions, emergencies, or natural disasters using available skills and resources.

25 PREVENTION – the complete avoidance of the negative impact of hazards and related disasters.

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· Greenhouse gas emissions associated with human activity have reached an historic high.
· Climate change, driven by economic growth and population increase, is having a widespread impact on humans and natural systems in every country on every continent.
· As air and ocean temperatures rise, the amount of snow and ice has decreased, and sea level has risen.
· According to current projections, the Earth's surface temperature will continue to increase during the 21st century, and in the absence of effective measures, the increase in this century is likely to exceed 3 degrees Celsius.
· Because climate change has a significant impact on economic development, natural resources, and poverty reduction, addressing this challenge has become an integral part of achieving sustainable development.
· Between 1880 and 2012, the average global temperature increased by 0.85 degrees Celsius. Moreover, each 1-degree increase in temperature leads to a reduction in grain yields of about 5 percent. Between 1981 and 2002, global yields of corn, wheat, and other major crops declined significantly – by 40 megatons per year.
· Rising ocean temperatures and decreasing snow and ice have led to rising sea levels. The temperature of the World Ocean will continue to rise, and glaciers will continue to melt. Average sea level is projected to rise by 24-30 centimeters by 2065 and by 40-63 centimeters by 2100.

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· It is virtually certain that as average global temperatures rise, extremely high temperatures will be observed more frequently and extremely low temperatures less frequently over most land areas on a daily and seasonal time scale.

Direct and indirect damages:

– Increase in morbidity and mortality from coronary heart disease, respiratory diseases, nervous system diseases, kidney diseases, etc., on days with hot weather, the number of which may increase in the summer period;
– Increase in the number of infectious and parasitic diseases associated with increased precipitation, increased wetlands, changes in the habitats of natural focal infections;
– Increase in the number of intestinal infections due to disruption of water supply, sewerage, and engineering structures;
– Increase in mortality and morbidity of the population due to air pollution with suspended particles and other dangerous components as a result of forest fires;
– Loss of land fertility due to water erosion, soil compaction, desertification, mineral starvation, salinization and waterlogging, pollution;
– Lack of water resources in arid regions and, conversely, an increase in floods and inundations in water-surplus regions;

– Unprecedented spread of traditional agricultural pests and microorganisms, including in regions where they were not previously found.

· Climate change, which has a serious and dangerous impact on the environment, is becoming a source of threat to the basic components of people's lives around the world, as it harms health and the environment and limits access to water, food, and land.
· As the world warms, people, including children, may in the future suffer from hunger, water shortages, and coastal flooding; crops and livestock will die, leading to hunger among children.

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· Worldwide, dwindling supplies of clean water seriously threaten health and livelihoods.
· Cutting down trees for firewood leads to deforestation and desertification and results in greenhouse gas emissions and climate change. In addition, the use of firewood affects health: women and girls spend more and more time collecting firewood each day and inhale huge amounts of smoke while cooking.
· Worldwide, 1.6 billion people do not have access to electricity. This lack of necessary energy infrastructure forces more than a third of humanity—three billion people—to cook and heat their homes using firewood, manure, and agricultural waste. These families face an unsolvable dilemma: cook using solid fuel and suffer from health problems, or do not eat hot food.
· Indoor soot leads to the death of about 800,000 children annually. Newborns and infants are often carried on their mothers' backs while cooking or held close to warm stoves. As a result, children breathe polluted air for many hours during their first year of life—just when their developing respiratory and immune systems put them at particular risk. Climate and weather affect the concentration of these substances.
· Nearly 700 million children worldwide are exposed to climate change risks. About 690 million children, out of a total of 2.3 billion, live in regions of the planet most susceptible to the adverse effects of climate change.
· Nearly 530 million children live in regions, primarily in Asia, that suffer from floods and tropical storms.
· Another 160 million children are in areas with severe droughts, putting minors at risk of exhaustion and dehydration.

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[Diagram: Solar radiation / Future state / Schematic diagram illustrating the main mechanisms of human activity influence on monsoon precipitation. As the climate warms, the transport of water vapor from ocean to land intensifies because warmer air contains more water vapor. This also increases the potential for heavy precipitation. Warming-related changes in large-scale circulation affect the intensity and extent of the overall monsoon circulation. Changes in land use and atmospheric aerosol content can also affect the amount of solar radiation absorbed by the atmosphere and land, potentially reducing the land-sea temperature contrast.]

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13 CLIMATE CHANGE
Independent analyses of many components of the climate system, which are expected to change with global warming, indicate trends compatible with warming (arrow direction indicates sign of change).

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Phenomenon and trend direction Likelihood of future trends based on projections for the 21st century according to RCP scenarios
Agriculture, forestry and ecosystems
Warmer over most land areas, fewer cold days and nights, warmer and more frequent hot days and nights Virtually certain
Increased yields in cooler environments; decreased yields in warmer environments; increased insect outbreaks
Warm periods/heat waves. Frequency increases over most land areas Very likely
Decreased yields in warmer areas due to heat stress; increased wildfire danger
Heavy precipitation. Frequency increases in most areas Very likely
Crop damage; soil erosion; inability to cultivate land due to waterlogging
Area affected by drought increases Likely
Land degradation, reduced yields, crop damage, crop failure; increased livestock mortality; increased fire risk
Increasing intense tropical cyclone activity Likely
Crop damage; uprooting of trees by wind; damage to coral reefs
Increased incidence of extremely high sea levels (excluding tsunamis) Likely
Salinization of irrigation water, estuaries, and freshwater systems

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Water resources Human health Industry, Settlements, and Society
Impact on water resources dependent on snowmelt; impact on some water supply sources
Decreased mortality rates due to reduced cold exposure Decreased demand for heating energy; increased demand for cooling energy; worsening urban air quality; fewer transportation disruptions caused by snow and ice; impact on winter tourism
Increased water demand; water quality problems, e.g., due to algal blooms Increased risk of heat-related mortality, especially among the elderly, chronically ill, very young children, and socially isolated individuals Reduced quality of life for people in warm areas without adequate housing; impacts on the elderly, very young children, and low-income people
Adverse effects on surface and groundwater quality; contamination of water supply sources; water scarcity may be mitigated Increased risk of mortality, injury, infectious, respiratory, and skin diseases Damage to settlements, disruption of commercial activities, transport, and normal life of the population; strain on urban and rural infrastructure; loss of property
More widespread water stress Increased risk of food and water shortages; increased risk of malnutrition; increased risk of foodborne and waterborne diseases Water scarcity for settlements, industry, and population; reduced hydropower generation potential; potential for population migration
Power supply interruptions cause disruptions in municipal water supply Increased risk of mortality, injury, foodborne and waterborne diseases; post-traumatic stress disorders

Damage from floods and high winds; cancellation of insurance in vulnerable areas by private companies; potential for population migration; loss of property
Reduced freshwater availability due to saltwater intrusion Increased risk of flood-related mortality and injury; health impacts associated with migration Costs of coastal protection compared to costs of land-use change; potential for relocation of population and infrastructure; see also tropical cyclones above

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[Diagrams: Change in average surface temperature (1986-2005 – 2081-2100) / Change in average precipitation (1986-2005 – 2081-2100)]

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0°C 1°C 2°C 3°C 4°C 5°C
Food
Decrease in crop yields, especially in developing countries
Some increase in crop yields at high latitudes
Decrease in yields in many developed countries
Water
Disappearance of small mountain glaciers – threat to water supply in some regions
Significant reduction in water supply in many regions, including South Africa and the Mediterranean
Sea level rise threatens major cities
Ecosystems
Widespread destruction of coral reefs
Growing number of species on the brink of extinction
Extreme Weather Events
Increasing intensity of storms, wildfires, droughts, floods, and heatwaves
Risk of Abrupt and Irreversible Changes
Increasing risk of feedback loops that amplify negative effects; abrupt and large-scale changes in the climate system

[Diagram: Carbon flows under the Le Chatelier principle]

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· Despite the ambiguous consequences of climate change, serious risks are already being observed in Kazakhstan. Climate change is placing a great strain on Kazakhstan's natural ecosystems.
· One of the serious problems will be the shortage of water resources and the impact on the agricultural sector. Climate change will also have consequences for human health.
· Projections suggest an increase in the expected average annual temperature of 1.4°C by 2030, 2.7°C by 2050, and 4.6°C by 2085.
· By 2050, projected precipitation in winter and spring will increase by 9% and 5%, respectively.
· In Kazakhstan, by 2085, all northern regions could turn into a semi-desert zone.

· The degradation of mountain glaciation is expected to affect river resources in the Lake Balkhash basin, one of the largest and most densely populated areas of Kazakhstan.
· The frequency of forest and steppe fires is expected to increase as a result of global warming. These fires will impact public health by increasing the concentration of smoke in the atmosphere.
· Climate change is projected to significantly impact Kazakhstan's water resources, exacerbating existing water scarcity problems.
· Rising temperatures in Kazakhstan are expected to lead to adverse consequences for grain production in some parts of the country.

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· Water shortages are expected to worsen, which could create unfavorable conditions for the agricultural sector, as well as for pastures and sheep farming.
· Climate change scenarios suggest that expected weather conditions will be unfavorable for grain production – especially for winter wheat cultivation – in certain regions of Kazakhstan (Kostanay, Akmola, and Pavlodar).
· Impacts on pastures and sheep farming – potential negative consequences such as reduced pasture productivity due to an increased likelihood of abnormally cold winters and abnormally hot summers.
· Mountain river runoff will significantly decrease due to the reduction in glacier area; an additional transitional inflow of water into some rivers is expected as a result of rapid glacier melting.
· The melting of glaciers in the Northern Tien Shan, which began in the 19th and 20th centuries, will continue due to climate change.
· Desertification is a serious concern and could affect up to 66% of Kazakhstan's total territory, contributing to reduced crop yields.
· Irrigation needs for water-intensive agricultural crops (cotton and rice) could lead to acute water shortages – especially in the southern regions of Kazakhstan, from which most of the water for irrigation needs comes.
· Kazakhstan's geographical location determines the country's high susceptibility to various natural disasters, which hinder the life activities of the population and limit opportunities for obtaining livelihoods, including access to adequate nutrition and drinking water. About 75% of the country's territory falls under this category.
· Weather cataclysms, frequent severe blizzards disrupt transportation and interfere with work. Severe frosts lead to forced reseeding of grain and other agricultural crops. Mudflows pose a threat to residents of rural and mountainous areas.

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· Projected climate warming will affect public health. The direct impact is an increase in morbidity and even mortality as a result of dangerous weather phenomena.
· In the mountains, the area and thickness of glaciers are visibly decreasing. Climate warming is confirmed by experimental observations: over the past 30 years, temperatures have been constantly rising, and 2013 became the warmest in 73 years of continuous observations in Kazakhstan.

· Scientists are recording the appearance of insects from neighboring Central Asian countries in Kazakhstan that were not present here before. The problem of the spread of infectious diseases transmitted by insects is becoming more urgent.
· Botanists note that desert and semi-desert vegetation is moving northward in Kazakhstan. The growing season for some plant species is starting earlier. That is, climate change is definitely occurring.
· Naturally, problems are exacerbated by the unsolvable issues of water resource distribution of transboundary rivers in the Central Asian region, pollution of domestic water resources, and mismanagement in their use. Farmers in the south and southeast of Kazakhstan have long complained about these problems.
· In Kazakhstan, about 45% of the population lives in rural areas. The country aspires to a prominent position in global grain exports and links the solution to the task of getting rid of the "oil needle," including by increasing the efficiency of the agricultural sector.
· Climate change leads to an increased risk of natural disasters: floods, mudflows, landslides, flash floods, fires, droughts, avalanches, inundations, rising groundwater levels, heavy rains, strong winds, hailstorms, heavy snowfalls, blizzards, frosts, extreme cold, extremely high temperatures, lightning, tornadoes, storms, tsunamis, typhoons, hurricanes, dust storms, fogs, dry winds, and others.

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KAZAKHSTAN: EXPOSURE TO CLIMATE RISKS

MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF KAZAKHSTAN
SCIENCE COMMITTEE
JSC "National Scientific and Technological Holding "PARASAT"
Institute of Geography

ATLAS OF NATURAL AND MAN-MADE HAZARDS AND RISKS OF EMERGENCY SITUATIONS IN THE REPUBLIC OF KAZAKHSTAN

KAZAKHSTAN - EXPOSURE TO CLIMATE RISKS

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[Rivers with stable ice cover / Rivers with unstable ice cover / Significant flooding of territory (from 30 to 50% and above) / Partial flooding of territory (up to 30% of territory) / Territory without local runoff / Boundaries of emergency situations of various levels of danger]

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DEGREE OF DANGER OF WATER LEVEL RISE ON RIVERS

Degree of Danger Maximum Water Level Rise (in m)
Weak 0.5 – 2.0
Moderate 2.0 – 3.0
Strong more than 3.0

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WATER LEVEL RISE DURING ICE JAM AND ICE GORGE PHENOMENA (in m)

Water Level Rise (in m) Degree of Danger Ice Jam Ice Gorge Ice Jam/Gorge Phenomena
less than 2 Weak ● ▲ ▲
2 – 4 Moderate ● ▲ ▲
4 – 6 Significant ● ▲ ▲
more than 6 Strong ● — —

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[Page headers: KAZAKHSTAN: EXPOSURE TO CLIMATE RISKS]

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DURATION OF PERIODS (DAYS) WITH AIR TEMPERATURE BELOW SPECIFIED LIMITS

Temperature, °C Stations Temperature, °C Stations Temperature, °C
-25 -30 -35
Western Kazakhstan
Akkudyk 5 2 - -
Atyrau 24 5 - -
Taipak 39 6 0.1 -
Uralsk 140 42 7 -
Southern Kazakhstan
Almaty 10 - - -
Kyzylorda 26 7 - -
Naimansuyek 22 5 6 8
Shymkent 3 - - -

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CLIMATE RISK MANAGEMENT:

Mitigation Adaptation Reduction

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The first important step towards adaptation is to identify who is exposed to impacts and in what form. This information helps to carry out strategic planning for adaptation purposes at all levels, from global to local.

Stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Reducing greenhouse gas emissions is necessary by reducing the use of fossil fuels for energy production and turning to alternative energy sources such as solar, wind, and water power.

Improving water resource management and use practices today to more easily solve the problems that will arise tomorrow. More economical use of scarce water resources. Balanced allocation of limited land and water resources for biofuel production alongside other key uses.

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Application of new technologies to reduce the energy intensity of seawater desalination or the use of groundwater to meet the growing demand for fresh water. Reducing water consumption, preventing unnecessary water losses.

Use of containers for collecting and storing rainwater in households, reservoirs that allow households and communities to manage variability in water supply.

Changing existing building codes to ensure buildings are resilient to future climate conditions and extreme weather events.

Construction of protective dams and canals against floods, regulation of river flow and creation of water reserves in reservoirs, construction of mudflow reservoirs. Utilizing the potential of water resources for electricity production.

Improving the culture of water consumption. Creating drought-resistant crops, selecting forest flora, and developing methods of forest management that will reduce vulnerability to pests and fires.

Modernization of waste treatment and disposal systems, reduction of air pollution, ensuring the development, conservation, and sustainable use of biological resources. Development of hydrometeorological services. Environmentally friendly business and technologies. "Green" economy standards. Proper management of water supplies and improved sanitation are key. Recycling and reuse of water can become not only more cost-effective but also critically necessary.

The transition from solid fuels to clean energy – such as liquefied petroleum gas, biogas, or solar energy – can potentially lead to a very significant reduction in indoor air pollution levels and minimize the impact of energy production and consumption on the environment.

More than 46% of the world's population is now under 25 years old – that's a total of three billion people. The decisions they make can and will determine the future of our world. The next ten years are critical, and they present us with incredible opportunities.

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Young people's knowledge regarding water, environment, and health represents a largely untapped resource. They are the next generation of water consumers and environmental stewards in their families and communities. The ability of these young people to live in harmony with nature and effectively manage local water, air, and land resources is extremely important.

Community-based monitoring and outreach activities have been initiated in selected countries to create opportunities for young people to participate in activities to reduce water-quality-related and deforestation-related diseases, as well as to clean up degraded community habitats and watershed areas in order to improve living conditions for themselves and their families.

Children's participation in these activities has led to increased awareness of their role as agents of change. But experience shows that much remains to be done to get adults to change their minds and treat children as partners in solving a common problem.

Based on the assumption that what children learn today will shape the world tomorrow, it can be said that raising environmental awareness at a young age is an effective way to protect the environment.

Implementing programs to increase the availability and quality of environmental education is key to long-term change.

In order for children to become effective agents of change, it is necessary to provide pathways for transforming their knowledge into action and advocacy.

Ensuring children's access to education, helping boys and girls attend school – especially girls who collect firewood or other types of natural fuel for cooking and heating.

Developing and implementing education, awareness, and public information programs on climate change issues and its consequences, ensuring access to information and participation in the development of appropriate response measures.

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46 CLIMATE RISK MANAGEMENT
Concepts of adaptation and disaster risk management in the context of climate change

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Sector Adaptation Measures
Water Resources Expanding rainwater harvesting; water storage, conservation, and efficient use techniques; water reuse; desalination; water-use and irrigation efficiency
Agriculture Adjusting planting dates and crop selection; shifting cultivation zones; improving land management, e.g., erosion control and soil protection through planting shelterbelts
Health Heat-health action plans; emergency medical services; sanitary-epidemiological surveillance and control of climate-sensitive diseases; safe water and improved sanitation
Infrastructure/ Settlements (including coastal zones) Relocation; dikes and storm surge barriers; dune reinforcement; land set-aside and creation of wetlands as buffers against sea level rise and flooding; protection of existing natural barriers
Energy Strengthening power line infrastructure and distribution; burying utility cables; energy efficiency; use of renewable energy sources; reducing dependence on a single energy source

1. United Nations Framework Convention on Climate Change, 1992.
2. IPCC, 2007: Climate Change, Synthesis Report of the Intergovernmental Panel on Climate Change, Geneva, Switzerland, 104 p.
3. IPCC, 2013: Summary for Policymakers, Climate Change 2013: The Physical Science Basis. Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
4. Second National Communication of the Republic of Kazakhstan to the Conference of the Parties to the United Nations Framework Convention on Climate Change. Ministry of Environmental Protection of the Republic of Kazakhstan. – Astana, 2009. – 192 p.
5. Climate Change. Glossary of terms used in the work of the UNFCCC, WWF Russia, Moscow, 2015, 92 p.
6. IPCC, 2013: Summary for Policymakers, Climate Change 2013: The Physical Science Basis. Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
7. Kazakhstan: Overview of Climate Change Activities, October 2013.
8. National Report on the State of the Environment and Use of Natural Resources of the Republic of Kazakhstan for 2011-2014, http://ecodoklad.kz.
9. Official Internet Resource of the Committee for Emergency Situations of the Ministry of Internal Affairs of the Republic of Kazakhstan, http://emer.gov.kz.
10. National Report on the State of the Environment and Use of Natural Resources of the Republic of Kazakhstan for 2011-2014, 2015, p.
11. IPCC, 2012: Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. Cambridge University Press, Cambridge, UK and New York, NY, USA, 19 p.
12. UNISDR Terminology Glossary on Disaster Risk Reduction, 2009.
13. UN Website (www.un.org/ru/climatechange/children/index.shtml), page: Children and Climate Change.
14. Atlas of Natural and Man-made Hazards and Risks in the Republic of Kazakhstan. MES RK, 2009.
