National climate change adaptation planning and strategies

Legal instrument: Regulation on the Governance of the Energy Union and Climate Action

Obligation: National climate change adaptation planning and strategies pursuant to Article 19(1) of the Governance Regulation 2018/1999

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National circumstances, impacts, vulnerabilities, risks and adaptive capacity

National circumstances relevant to adaptation actions

Biogeophysical characteristics relevant to adaptation actions

Slovakia lies between 47° and 50° north latitude and 16° and 23° east longitude. The surface of Slovakia is mainly characterised by its mountainous nature, with the Carpathian Mountains covering most of the northern half of the country. These mountain ranges include the high peaks of the Fatra-Tatra region (including the Tatras, Veľká Fatra and Mala Fatra), the Slovak Ore Mountains, the Slovak Central Mountains or the Beskydy Mountains. The largest lowland is the Danube Lowland in the south-west and the East Slovak Lowland in the south-east.The landscape in Slovakia is characterised by forested areas covering around 55% (26 803 km²) of the total land area, agricultural soil at approximately 38% (18 385 km²), built-up areas slightly below 5% (2 296 km²), and water bodies accounting for 1.9%.

Demographic situation relevant to adaptation actions

The population exceeds 5.4 million. The average population density is 111 inhabitants/km2. The majority of inhabitants are Slovaks (83.8 %). The largest national minority is made up of Hungarians (7.8 %). Other ethnic groups include Roma (1.2 %), Czechs (0.5 %), Rusyns (0.4 %) and other or unspecified minorities (6.3 %). In 2023, the average age of the Slovak population was 41,9 years. Projections for future population and age groups of Slovakia show an aging population. Especially the groups of 70+-year-olds will be growing, while all others will decline. Projections of the population development indicate a decline in the total population.
Source: https://statdat.statistics.sk/cognosext/cgi-bin/cognos.cgi?b_action=cognosViewer&ui.action=run&ui.object=storeID%28%22iF41FA7A868E74315A56CF26B722E3A07%22%29&ui.name=Indexy%20vekov%C3%A9ho%20zlo%C5%BEenia%20-%20SR%2C%20oblasti%2C%20kraje%2C%20okresy%2C%20mesto%2C%20vidiek%20%5Bom7005rr%5D&run.outputLocale=sk

Economic and infrastructural situation relevant to adaptation actions

Slovakia became an EU member in 2004 and implemented the Euro as its official currency five years later. Its economy is highly dependent on exports and manufacturing (with a significant car manufacturing sector). The industry sector accounted for 28.6 % of the gross domestic product (GDP) in 2022. GDP per capita amounted to € 22 090 in the year 2023.

The European Commission's country report on Slovakia from 2023 states that Slovakia's economy faces moderate growth prospects for the near future due to global slowdowns, high commodity prices, and rising labour costs. Inflation is projected to peak at 10.9 % in 2023, driven by energy costs, food prices and tight labour supply. Structural challenges include low labour productivity, significant regional disparities, high youth unemployment and inadequate investment in green and digital transitions. To enhance long-term productivity and competitiveness, Slovakia needs to advance its industrial transition towards sustainability, increase R&I spending, and address labour market mismatches, particularly through reskilling and upskilling initiatives.
Total primary energy consumption in Slovakia in 2023 was 186.6 TWh, whereby the share from fossil fuels lies at 63.7 %, 24.5 % from nuclear and 11.8 % from renewable sources (mainly hydropower) in 2023.
Looking at the electricity production the country produced a total of 29.63 TWh in 2023. There has been a decline in oil, gas, and coal-based energy in recent decades, however the biggest share of electricity production (61.9 %) stems from nuclear energy. Just over 22 % are based on renewables (hydro, bioenergy and solar). In line with Slovakia's coal phase-out strategy, lignite mining ceased in December 2023.
The Slovak transportation network is well-established. This includes an extensive network of roads and railways crucial for Slovakia's position as a manufacturing and transit hub. Nevertheless, the country now faces challenges in maintaining and modernising its aging infrastructure. Limitations exist in infrastructure capacity, hindering efficient handling of increased freight traffic and modern logistics needs. Additionally, gaps are evident in specific areas like high-speed rail and digital connectivity in rural regions.
Looking forward, opportunities exist to leverage EU Cohesion Funds for vital infrastructure projects, particularly in the transportation and energy sectors. Modernising infrastructure with a focus on sustainability, such as electric vehicle charging networks or energy-efficient buildings, presents another essential need.

Climate monitoring and modelling framework

Main activities on climate monitoring, modelling, projections and scenarios

State Hydrological Service and State Meteorological Service:
The Slovak Hydrometeorological Institute (SHMU) is a state-funded organisation that provides meteorological and hydrological services at national and international level. Under Act No. 201/2009 Coll. on the State Hydrological Service and the State Meteorological Service, a State Meteorological Network and State Hydrological Network have been established. These networks are managed by the SHMU. They are used for systematic monitoring of quantitative and qualitative parameters of air and water, complemented by radioactivity monitoring.
The state meteorological network consists of the monitoring subsystems (the number of devices

is given in brackets): surface synoptic stations (19), surface military synoptic stations (3), surface meteorological stations with climatological measurement (manual) (26), surface automatic meteorological stations (with observer) (82), surface automatic meteorological stations (without observer) (18), surface rain gauge stations (manual) (342), surface automatic rain gauge stations (with observer) (164),surface automatic rain gauge stations (without observer) (33), surface rain gauge measurements – totalizer (manual) (43), surface rain gauge measurements – totalizer (automatic) (2), a network of meteorological radars (4), a network of solar radiation and ozone measurements (7), reception and processing of meteorological satellites phenological stations (193).

The State hydrological network consists of the monitoring subsystems (the number of devices is given in brackets): surface water quantity (416), surface water quality (265), groundwater quantity (356 springs, 1,168 wells), groundwater quality (760).

Forestry Meteorological Monitoring Network:

This is a network of stations in the forest landscape covering all forest vegetation levels in the altitude range from 225 m above sea level to 1,560 m above sea level. The professional administration of this network is provided by the National Forestry Center and the Technical University in Zvolen. The extension of the terrestrial network of 35 stations is the electronic web application ForestWeather with the transmission and online display of operational data transmitted from the station network. The existing station network is thus integrated into a single platform, which contributes to the creation of a supporting tool for better understanding and revealing interactions between the changing state of the ground layer of the atmosphere and the forest ecosystem in the conditions of modern climate change.

Integrated Drought Monitoring System:

The drought monitoring is provided by organizations under the Ministry of Environment (MoE) of the Slovak Republic. Forestry organisations under the Ministry of Agriculture and Rural Development (MoARD) of the Slovak Republic shall cooperate in the implementation of monitoring on forest land that they manage or on which they are forest managers. The cooperation of the employees of the state enterprise Forests of the Slovak Republic (LESY SR) with SHMU within the "Intersucho" project is crucial. In 2024, based on the Agreement on Mutual Cooperation, Military Forests and Properties of the Slovak Republic state enterprise, also joined the monitoring of drought impacts on forests. The system consists of meteorological, soil and hydrological drought subsystems. In the area of soil drought, cooperation with Czech partners is ongoing, specifically in the area of soil water regime modelling. The results of drought occurrence, intensity and drought regime are presented on the SHMU website.

Projections and scenarios:

In 2024, a new series of climate change scenarios was developed, which is mainly based on the outputs of five models:

- MOHC (Met Office Hadley Centre) – developed in the UK, the model provides background data for regional downscaling within EURO-CORDEX, especially for the analysis and capture of extreme weather events in Europe with a resolution of 0.44° (~50 km),
- MPI (Max Planck Institute for Meteorology) – developed in Germany, this model captures a model of the general circulation of the atmosphere in combination with the ocean.

Thanks to this, it describes the complex carbon cycle in the interaction of land and ocean. In EURO-CORDEX, it describes the boundary values of RCMs,

- CNRM (Centre National de Recherches Météorologiques), developed in France, it is an integrated model of processes occurring at the atmosphere-ocean-land surface level. It also includes a complex physical parameterization of clouds and radiation. Within EURO-COEDEX, it helps to simulate the variability of the climate of Europe under different scenarios of greenhouse gas emissions,
- EC-Earth – developed by a consortium of European research institutions, works on the basis of the above-mentioned interactions but also includes sea ice. The model is characterized by its ability to simulate long-term climate development and extreme types of weather situations,
- NorESM (Norwegian Earth System Model) – a model focusing on northern Europe and the Arctic region with special attention to the development of the glacier area. It also represents the boundary conditions within EURO-CORDEX.

The following models were used to develop climate change scenarios for the Slovak Republic:

- RCP2.6 – also called the “peak” or “optimistic” scenario. This scenario assumes a maximum of incident radiation in approximately the middle of the 21st century at a level of 3.1 W/m2 and the value should then decrease to 2.6 W/m2 by 2100. This is the scenario with the lowest radiation value, which assumes negative emission values even after 2100. It also assumes a gradual decrease in the average global air temperature. The culmination of the CO2 concentration in the atmosphere should be approximately at a level of 490 p.p.m. by 2100. This scenario can be fulfilled if all countries ratify the climate conventions and achieve carbon neutrality as soon as possible.
- RCP4.5 – also known as the “stabilization” scenario, which assumes an increase in global average air temperature of +2°C by 2050 compared to the modern climate norm by 2050. Subsequently, air temperature and emission concentration should be stabilized by implementing climate policies and strategies of individual countries. It assumes stabilization of radiation at the level of 4.5 W/m2 and a maximum concentration of CO2 in the atmosphere at the level of approximately 650 p.p.m. after 2100.
- RCP8.5 – is called the so-called “pessimistic” scenario or “business as usual” because it does not assume any reduction in greenhouse gas emissions. This is a hypothetical scenario where humanity would adhere to the line of constant progress and economic growth regardless of the environment. In this scenario, radiation will be at the level of 8.5 W/m2 in 2100 and will continue to grow thereafter. Likewise, the maximum concentration of CO2 in the atmosphere will be approximately 1,370 ppm and will increase after 2100.

Scenarios were developed for the following indicators: air temperature, number of summer days, number of tropical days, number of tropical nights, number of frost days, number of ice days, heat waves, number of air conditioning days, heat Index, number of heating days, cold spells, averages of precipitation, number of days with precipitation >40mm/24h, climate indicator of irrigation, dry spell.

In general, the models predict a temperature increase across our territory comparable to similar

estimates for the Central European region. Rainfall estimates expect a small increase in the north and a decrease in the south. The outcome of future temperature and precipitation conditions would result in higher potential evapotranspiration and thus increased droughts.

Main approaches, methodologies and tools, and associated uncertainties and challenges

Climatological and Meteorological Information System (KMIS)
KMIS is an electronic database that contains 21 core data domains describing the physical state of the environment from the topsoil to the stratosphere. The database contains measurements of ground station networks with automatic or manual measurement mode, as well as the results of remote monitoring system measurements and observations (measurements in the upper air). KMIS stores measured elements (air temperature, soil temperature, air humidity, precipitation, sunlight, wind, snow cover, meteorological phenomena and others) or also subjectively determined elements and characteristics of the physical state of the environment (cloudiness, soil condition, visibility, phenological phases). The frequency of data storage ranges from 1 minute (automatic weather stations) to 1 year (phenological stations).
Summary Water Register (SEoV)
SEoV contains registers of data in the surface water and groundwater objects of the State Hydrological Network, as well as registers of data on the use of surface water and groundwater and on water quality. The observed elements (for surface water quantity: water status, water temperature, water turbidity – the content of algae in the water and water flow, quantified from the measured water status) are stored in the database once a year. Water levels, flow rates and water temperature are stored in hourly and daily increments, float levels in daily increments. The observed elements for groundwater quantity (spring yield, spring and probe water temperature, groundwater level) are stored in the database in daily and weekly increments once a year.

Integrated drought monitoring system
System consists of 4 subsystems:

- Meteorological drought: This subsystem is based on precipitation deficit (SPI index) and water deficit (SPEI index, Palmer's CMI). Results from around 40 weather stations are used in weekly increments, with monitoring taking place all year round. The meteorological drought monitoring also includes a 90-day deficit of atmospheric precipitation. The precipitation balance is calculated here as the difference between the current atmospheric precipitation and its long-term average for the last 90 days as of a given date. In 2024, testing of the transition of meteorological drought monitoring from discrete station values to gridded spatial maps was underway. Area monitoring will be made available during 2025. Also, a map layer of potential evapotranspiration will be added as part of climatological reporting, and an ensemble forecast

for the next 7-10 days will be implemented as part of the monitoring.

- Soil drought: An integrated soil drought monitoring system is involved – the so-called "Interdrought" mechanism. Soil moisture parameters are calculated using the proven water balance model "SoilClim". The daily meteorological data are interpolated to a 500 m grid, taking into account the parameters of the vegetation cover (or land use) taking into account the current degree of development, slope level, exposure and basic physical properties of the soil. The current soil moisture status estimated by the model is compared with long-term average (1961-2015) soil moisture determined for each day in a time window of ±10 days, with values expressed by a simple 7-point colour scale of drought severity. The final product is a drought intensity map, which for each grid is determined by comparing the current soil moisture content value on a given day with the distribution of soil moisture values achieved in the period 1961-2015 over a time span of ± 10 days from the date under consideration. The value obtained then expresses the probability of recurrence of a given soil moisture content on a given day and is used to assign the corresponding drought intensity (S0 – S5) according to the aforementioned scale. The results of the drought monitoring are validated by an independent analysis of the impacts of drought on vegetation thanks to the confrontation of current and archival satellite images of vegetation status obtained by the Aqua and Terra satellites – MODIS system and processed in cooperation with Mendel University, CzechGlobe and the Geografic Institute of Masaryk University. Impacts on vegetation are treated during the growing season. In 2024, the partners of the Intersucho project (CzechGlobe) implemented a new improved soil model for soil drought monitoring and also implemented a longer comparison period (1961-2015). For drought reporters, the previous bonus graphs were replaced with clearer ones and new products were also implemented (e.g. suitability of meteorological conditions for pest spray application).
- Hydrological drought: The Drought Monitoring/Hydrological Drought website provides an instant overview of the hydrological situation at selected gauging stations in relation to long-term values, with sub-normal conditions highlighted. Current flow values are compared with long-term hydrological characteristics (average monthly flows, M-daily flows) for the currently valid reference period 1961-2000, so that the current values can be assessed for their deviation from the long-term values. The current hydrological situation is displayed in simple map and graphical views.
- Groundwater and occurance of drough: The current groundwater table with a focus on drought assessment is displayed on a map on the SHMÚ website Groundwater and occurrence of drought. The assessment is based on operational online data of selected 111 groundwater objects (79 wells and 32 springs). Groundwater level and spring discharge values recorded once a day are compared to the average monthly quantiles (Q10, Q40, Q60, Q90) determined for the 1981-2010 reference period. These individual quantiles are distinguished in the map by a colour scale. For the evaluation for the annual reports, the number of objects evaluated online is increased by 30 objects with control measurements in the field. This treatment is based on average monthly values, which are compared with the aforementioned long-term values of the reference period 1981-2010.

Agriculture

A number of projects are underway to model the impacts of climate change on agriculture. The project "Managing farmland management for sustainability" aimed, based on detailed knowledge of soil properties and landscape analysis, to design models for deficiency-free management of soil organic matter at farm level under the current conditions of a changing climate.

Another project is "Data and knowledge support for decision-making and strategic planning systems for adaptation of agricultural landscapes to climate change and minimisation of degradation of agricultural soils", whose main activities are modelling of climate change impacts on soils, production of spatially differentiated information on soils in agrarian landscapes and design of adaptation measures to prevent negative impacts due to climate change in agriculture.

Monitoring changes in bee grazing due to changes in natural resources caused by climate change is a project to monitor the progress of new bee pests from southern European locations, as well as the spread of viral diseases. Once sufficient relevant data has been collected, model studies of the process of incoming change will be developed.

The Recovery Plan supported the measure Development and support of sustainable biomethane production, organic fertilizers and circular bioeconomy, which is implemented by NPPC together with UKSUP. The prepared outputs will enable farmers to apply agrotechnical procedures that will increase soil protection and its sustainable use and long-term productivity, including optimizing carbon capture in the soil. Operators of biogas and biomethane stations and potential investors will obtain spatial information on waste biomass sources in the form of an interactive map and information on the best technologies for these stations. This will enable them to effectively plan their further development. Part of the funding for the measure is directed towards laboratory equipment designed to analyze soil, especially its carbon content. This will enable the implementation of further activities aimed at carbon sequestration in the soil.

Forestry sector

The Ministry of Agriculture and Rural Development (MoARD) of the Slovak Republic provides forest monitoring, which is methodologically fully linked to the pan-European forest monitoring program ICP Forests. This monitoring system also includes forest meteorological monitoring stations, which also allows monitoring of the reactions of ecosystems (mainly forest trees) to the changing climate. The mortality of trees, vitality using defoliation and discoloration indicators, growth, etc. are determined here.

The MoARD is aslo responsible for the implementation of the greenhouse gas inventory in the LULUCF sector (Land Use, Land Use Change and Forestry sector). In the context of the Fit for 55 tasks, the model algorithms for calculating sink projections and CO2 emissions based on the results of the validation of the carbon balance models are continuously being improved. A new geo-referenced GHG inventory system with more precise spatial localisation is also being developed to fully comply with the requirements of Regulation (EU) 2018/841 of the European Parliament and of the Council. The modification of the model for the calculations of carbon sink projections is carried out based on the results of the validation of several carbon balance models, according to the requirements of Regulation (EC) No 2018/1999 of the European Parliament and of the Council of the European Union (EP and the Council of the European

Union). These activities better link forest management information with the assessment of mitigation options in the forestry sector.

Meteorological Services (1)

Name of the meteorological service

Slovak Hydrometeorological Institute

Status of the meteorological service

Established

Web link to the meteorological service

https://www.shmu.sk/en/?page=1

Climate projections and services (2)

Description of climate projections and services

Slovak Hydrometeorological Institute

Status of the climate projections and services

Established

Web link to the climate projections and services

https://www.shmu.sk/en/?page=1240

Description of climate projections and services

Adaptation on Climate Change

Status of the climate projections and services

Established

Web link to the climate projections and services

https://www.klima-adapt.sk/

Observed and future climate hazards

Overview of observed climate hazards and existing pressures and identification of key future climate hazards

General aspects on the assessment of climate hazards and pressures

In 2024, an "Assessment of Climate Change Risks and Vulnerability of Slovakia" was carried out in the Slovak Republic as part of the project "Revision and Update of the National strategy on adaptation to climate change in Cyprus and Slovakia" (REFORM/2021/OP/0006 Lot 1 – TSIC-RoC-20036). The assessment comprised several steps that were based on both literature and data analysis as well as participatory workshops with selected local stakeholders. In addition to a detailed analysis of sector-specific climate impacts, key risks, strategic directions, potential knowledge gaps and limitations, cross-sectoral interdependencies and connections as well as transboundary, cascading and emerging risks for Slovakia were incorporated in the assessment results. Further steps following the impact analysis to the comprehensive risk assessment included: a detailed risk assessment of high-priority climate change impacts, identification of key risks and determination of strategic directions.
For the purposes of assessing the significance and occurrence of climate risks, Methodological guidelines for the process of obtaining, collecting and evaluating data and information in the field of climate change adaptation for the purposes of fulfilling reporting obligations at the national and European level were developed in 2024. One of the objectives of the methodological guidelines was to identify, where possible, indicators suitable for quantifying assessments. For the purposes of assessing hazards, a list of indicators was proposed for assessing the occurrence and significance of individual chronic and acute hazards. Expert assessment will assess the current occurrence and expected future occurrence of the hazard based on an assessment of the development of individual indicators (e.g. whether or not the indicator records a statistically significant trend or extreme values).

Time horizon for the future climate hazards

2030 for acute hazards, 2050 for chronic hazards

Acute hazards temperature related

Heat wave: Observed climate hazard

YES

Heat wave: Future climate hazard

+ significantly increasing

Cold wave / frost: Observed climate hazard

YES

Cold wave / frost: Future climate hazard

- significantly decreasing

Wildfire: Observed climate hazard

YES

Wildfire: Future climate hazard

+ significantly increasing

Acute hazards wind related

Cyclone: Observed climate hazard

NO

Cyclone: Future climate hazard

0 hazard not of relevance

Storm (including blizzards, dust and sandstorms): Observed climate hazard

YES

Storm (including blizzards, dust and sandstorms): Future climate hazard

+ significantly increasing

Tornado: Observed climate hazard

YES

Tornado: Future climate hazard

+ significantly increasing

Acute hazards water related

Drought: Observed climate hazard

YES

Drought: Future climate hazard

+ significantly increasing

Heavy precipitation (rain, hail, snow/ice): Observed climate hazard

YES

Heavy precipitation (rain, hail, snow/ice): Future climate hazard

+ significantly increasing

Flood (coastal, fluvial, pluvial, groundwater, flash): Observed climate hazard

YES

Flood (coastal, fluvial, pluvial, groundwater, flash): Future climate hazard

+ significantly increasing

Snow and ice load: Observed climate hazard

YES

Snow and ice load: Future climate hazard

- significantly decreasing

Glacial lake outburst: Observed climate hazard

NO

Glacial lake outburst: Future climate hazard

0 hazard not of relevance

Acute hazards solid mass related

Avalanche: Observed climate hazard

YES

Avalanche: Future climate hazard

+ significantly increasing

Landslide: Observed climate hazard

YES

Landslide: Future climate hazard

+ significantly increasing

Subsidence: Observed climate hazard

NO

Subsidence: Future climate hazard

0 hazard not of relevance

Chronic hazards temperature related

Changing temperature (air, freshwater, marine): Observed climate hazard

YES

Changing temperature (air, freshwater, marine): Future climate hazard

+ significantly increasing

Temperature variability: Observed climate hazard

YES

Temperature variability: Future climate hazard

= without significant change

Permafrost thawing: Observed climate hazard

NO

Permafrost thawing: Future climate hazard

0 hazard not of relevance

Chronic hazards wind related

Changing wind patterns: Observed climate hazard

YES

Changing wind patterns: Future climate hazard

+ significantly increasing

Chronic hazards water related

Changing precipitation patterns and types (rain, hail, snow/ice): Observed climate hazard

YES

Changing precipitation patterns and types (rain, hail, snow/ice): Future climate hazard

= without significant change

Precipitation and/or hydrological variability: Observed climate hazard

YES

Precipitation and/or hydrological variability: Future climate hazard

+ significantly increasing

Ocean acidification: Observed climate hazard

NO

Ocean acidification: Future climate hazard

0 hazard not of relevance

Saline intrusion: Observed climate hazard

NO

Saline intrusion: Future climate hazard

0 hazard not of relevance

Sea level rise: Observed climate hazard

NO

Sea level rise: Future climate hazard

0 hazard not of relevance

Change in sea ice cover: Observed climate hazard

NO

Change in sea ice cover: Future climate hazard

0 hazard not of relevance

Water scarcity: Observed climate hazard

YES

Water scarcity: Future climate hazard

+ significantly increasing

Chronic hazards solid mass related

Coastal erosion: Observed climate hazard

NO

Coastal erosion: Future climate hazard

0 hazard not of relevance

Soil degradation (including desertification): Observed climate hazard

YES

Soil degradation (including desertification): Future climate hazard

+ significantly increasing

Soil erosion: Observed climate hazard

YES

Soil erosion: Future climate hazard

+ significantly increasing

Solifluction: Observed climate hazard

YES

Solifluction: Future climate hazard

= without significant change

Observed climate hazards and existing pressures.

Overview of existing pressures

In urban areas, climate change is expected to increase risks to people, the economy and ecosystems, including risks from heat stress, storms and extreme precipitation, floods, landslides, air pollution, drought, water scarcity, etc.. The impacts of climate change are expected to exacerbate existing poverty and create new poverty traps, especially in urban areas. Climate change in Slovakia is likely to significantly affect the following environmental, economic and social pressures:
Environmental pressures: regional and local impacts on water availability, deterioration of water quality, drought, reduction in biomass production, deterioration of soil properties, reduction of soil organic carbon, soil salinization, increased water and wind erosion, alteration of ecosystem functioning and provision of ecosystem services, degradation of forest ecosystems and more frequent disturbances, fragmentation of habitats, spread of non-native and invasive species, loss of biodiversity, alteration of landscape pattern, floods, windstorms, wildfires, landslides.
Economic pressures: reduction in soil fertility and agricultural production, shift of agricultural production areas to more northern areas, changes in agro-climatic production potential, changes in crop mix, reduction in forest production, changes in forest species composition, emergence of pests, diseases and weeds, threats to drinking water sources and supply, irrigation problems, increasing vulnerability of residential and rural environments, need to reduce the energy intensity of buildings, deterioration in transport safety and fluidity, increased energy consumption, threats to the continuity of industrial operations, major industrial accidents, unstable supplies of supplies, raw materials and electricity, increased risk of breakdowns and material damage in energy and industry, the need to deal with emergencies and natural disasters, threats to human health and safety, threats to food security, changes in prices, increased demands for innovation and renewable energy, changes in the length and quality of the tourist season, threats to tourism potential, threats to competitiveness.
Social pressures: threats to the health of the population (change in the spread of infectious diseases, emergence of new pathogens, worsening of allergic conditions), deterioration in the quality of life, unemployment, migration.

Identification of key future climate hazards

(where relevant) Secondary effects of the selected hazards, such as forest fires, spread of invasive species and tropical diseases, cascading effects, and multiple hazards occurring at the same time.

Examples of cascading risks in Slovakia arising from transboundary and emerging risks are:

- Water stress/scarcity: Consequences in shared basins can significantly affect agriculture, energy, public health and transport (reduced crop yields and agricultural productivity, threatened livelihoods, increased food prices, reduced food security, reduced cooling capacity of power plants and threatened energy security, disrupted navigation and transport of critical goods – e.g. natural gas). Limited water availability also threatens hygiene and sanitation, (increasing the risk of waterborne diseases and public health crises). These cascading effects – economic hardship, food insecurity and public health challenges – can escalate social tensions as communities compete for increasingly scarce resources.
- Urban heat islands: Urban areas can experience higher temperatures due to the heat island effect. Increased heat waves can lead to higher demand for energy for cooling and strain on the electricity grid. This can lead to power outages and increased vulnerability of the population, especially the elderly and those with pre-existing health conditions, exacerbating public health problems and economic burden.

Slovakia is also exposed to other emerging risks:

- Impacts on human health, threats to critical infrastructure, water availability, energy security, changes in agricultural and productivity (including lengthening of the growing season of various crops), risk to agriculture and food security, risk to forestry (fires, changes in population dynamics of common biotic pests), tourism, loss of biodiversity.

Key affected sectors

Identify key affected sectors (applying the best available science to assess the different aspects of the vulnerability and risk analysis by the Intergovernmental Panel on Climate Change and the latest Commission guidance on the climate proofing of the EU-funded projects)

Affected Sectors (17)

Title of the sector

Natural environment and biodiversity

Primary key affected sector

biodiversity (including ecosystembased approaches)

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

high

Different rating of the observed impacts of key hazards for:

Describe your assessment

Biodiversity loss is inextricably linked to climate change. These two phenomena represent the most critical global environmental threat, not only at the global level, but also in the Slovak Republic conditions. There is ample evidence that climate change is affecting biodiversity, and it is clear that changes in biodiversity and ecosystem functioning affect climate processes. The greatest threats of climate change affecting Slovakia's biodiversity include temperature changes and variability, changing precipitation patterns and types, drought, and lack of water resources. This is directly related to the drying of the landscape, increased risk of wildfires, limited snow cover, the spread of invasive species and pests, increased water temperature in watercourses, and changes in the vegetation period, including vegetation zones and phenological phases. In addition to these direct impacts of climate change, related socio-economic changes, particularly

changes in land use, will also affect biodiversity, which may be more significant than the direct impacts.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

high

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

In connection with climate change, an increase in average annual air temperature, extreme weather events (decrease in annual precipitation, but at the same time increase in local precipitation), decrease in relative humidity, changes in snow cover and changes in CO2 concentration can be expected. This will have negative consequences for the state of biodiversity, ecosystems, plant and animal species. As a result, more frequent and intense local floods are already being observed in different parts of the country, as well as the occurrence of strong gusty winds with a significant impact on forest stands.
The increase in species extinction and loss of biodiversity, affecting genetic diversity, species diversity, ecosystem functions and soil biodiversity, as well as physiological and phenological changes, changes in the geographical distribution of species, and also the transformation of population structures are expected. The change in species composition due to temperature shifts and altered conditions are likely to result in the survival of fewer current species and increased migration of fauna and flora. Examples of changes in species composition might increase deer population leading to heightened forest damage.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

Climate change affects the functioning of ecosystems and their services. Assessing the vulnerability of ecosystems and their services to the consequences of climate change is complex, depending on their location and ability to recover.
A shift in vegetation zones and vegetation stages is expected as a result of the increase in

average air temperature. This can threaten ecosystems, habitats, species and their communities. Changes in habitat structure and composition are expected. Ecosystems can become less resilient, less able to provide ecosystem services, or can decay. Drying out of the soil will lead to the loss of wetlands, bogs and fens. Extreme weather events can cause forest disturbance and amplify the negative effects of pests. In an extreme case, a shift towards shorter winter seasons and more frequent late spring frosts could cause the gradual extinction of cold-sensitive populations.
The adaptive capacity for the prioritised impacts was mostly rated low, mainly for financial capabilities, to medium, mainly for governance frameworks. The urgency to act is defined as high, primarily for the increase in species extinction and loss of biodiversity and habitats, as well as changes in water availability and seasonal distribution of precipitation.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

Describe your assessment

There are two key risks for the Biodiversity sector:
1/ Risk of loss of biodiversity and habitats (terrestrial & aquatic) – it is related to the climate impacts such as increase in species extinction, loss of biodiversity or habitats, as well as the spread of invasive species and hence, the change in species composition.
2/ Risk of decreasing ecosystem service provision from terrestrial and aquatic ecosystems – it is related to the loss of biodiversity as well as landscape and ecosystem degradation. For instance, flood protection in terms of water retention is adversely affected by climate change, which is in turn necessary for retaining water for dry periods and days with low water discharge in order to stabilise ecosystems and soil functions.
For both risks, the risk level increases throughout the century, resulting in risks rated as high or very high (respectively) for the far future.

Title of the sector

Civil protection and emergency management

Primary key affected sector

civil protection and emergency management

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

high

Different rating of the observed impacts of key hazards for:

Describe your assessment

The most common climate change-related risks in the Slovak Republic include: floods, landslides, heavy snowfalls, extreme storms, windstorms, fires and indirect induced negative impacts of hazardous substances (spills, explosions, discoveries in landfills).

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

high

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

Climate change will increase risks to citizens and critical infrastructure, and there is some uncertainty about the shape impacts will take or where they will physically take place. The climate-related disasters with the highest risk factor were floods and subsequent landslides, heavy snowfalls, extreme storms and wildfires. Droughts and water scarcity were also considered significant risks.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

With regard to climate impacts of high priority, the increase in (extreme) weather events and associated impacts such as damage from pluvial flooding on low-lying infrastructure or more generally speaking, damage to critical infrastructure, have to be particularly considered. According to the Civil Protection Information Service, floods make up approximately 45% of natural events. In addition, experts stated that prevention against impacts induced by landslides and mudslides is currently neglected in Slovakia, whereby necessary clean-up work after such events takes a long time.
Climate change has been identified as a safety risk by the Slovak government in their risk management planning docu-ments. The two underlying goals of risk management in Slovakia are the prevention of losses and harms, including the integration of mitigation measures into activities, and modernisation of crisis communication and situational awareness (strategic foresight). It is recognised as a cross-cutting topic in the Slovakian NAP, stressing the need to strengthen civil protection systems and modernising early warning and notification systems. Additionally, crisis plans on flooding ("flood plan") are commonly prepared to handle flood risk on the local level. An analy-sis of possible risks and potential emergencies is carried out regularly; however, while such assessments exist on the national and regional level, they are lacking on the local level.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

Describe your assessment

Three key risks are identified.
1/ The risk of widespread disruptions is associated with various climate impacts such as increase in forest- & wildfires, change in seasonal distribution of precipitation, increase in flood events (pluvial, fluvial), increase in extreme events, increase in damage to critical infrastructure or decrease in accessibility of central & critical infrastructures. The current risk rating as high reflects the exposure and sensitivity ratings of relevant impacts mostly ranging between high and very high. Besides, participants noted that e.g. prevention against consequences of landslides and mudslides are cur-rently neglected and is subject to further improvements.
2/ The second key risk reflects expected climate change induced increases in expenditures and costs for maintenance, e.g. caused by damage due to floods, and changing demands for emergency operations in terms of equipment and training.
3/ The third key risk focuses on individuals and communities adversely affected by increasing impacts of climate extremes, whereby particularly vulnerable groups are prone to such negative

consequences. The current risk rating as high reflects that relevant climate impacts are among those listed as high priority. Besides, participants noted that there is a need for a more sophisticated crisis management.
Against the background of expected changes of relevant climate indices, the risk is rated as very high consid-ering a pessimistic scenario for the far future for all three identified key risks.

Title of the sector

Health

Primary key affected sector

health

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

high

Different rating of the observed impacts of key hazards for:

Describe your assessment

The results of several assessments, research projects and national health impact assessments have confirmed that human health will be exposed to significant changes in the coming decades as a result of climate change, probably in particular more frequent and intense heat waves, storms, extreme precipitation, floods or droughts.
In addition to the direct threat to life and health during these events, the population is also at risk from deterioration of water resources, epidemiological risks of food contamination, the emergence of new vectors for the transmission of infectious diseases, and an extension of the pollen season.
These hazards will have adverse impacts on the health sector, mainly due to increased heat stress, increase in communicable diseases, increase in water temperature, increase in tropical days and nights, increase in urban heat island effect, changes in pollination, pollen load; spread of invasive plants and animals, increased exposure to (new) pathogens, increase in extreme events, increase in food-related diseases, increased water and food pollution, and increased air

pollutants.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

high

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

Climate change has a significant impact on health in Slovakia.
Rising temperatures affect the transmission and spread of vector-borne diseases, which are likely to worsen over time. Adverse impacts on mental and psychosocial health are expected, as well as an increase in non-communicable diseases, zoonoses, heat-related diseases, respiratory diseases and malnutrition. Similarly, the number of cases of tick-borne encephalitis and water-borne diseases (including hepatitis and diarrhoea) in Slovakia is expected to increase as a result of climate change. Another indirect health consequence of climate change is potentially changing ultraviolet radiation, which plays an important role in skin cancer, cataracts and other eye diseases and suppresses the immune system.
Furthermore, a recent OECD study identified high-risk areas in Slovakia prone to extreme events with health implications: southern districts like Bratislava, Rimavská Sobota, and Lučenec face extreme heat risks due to projected scenarios and limited healthcare access. In the southwest, including Bratislava and Žitný ostrov, droughts threaten water supply and agriculture. Northern districts like Tvrdošín and Dolný Kubín will be prone to extreme precipitation and landslides.
Under the high emissions scenario, the number of additional deaths per warm season is projected to rise to 1,276 deaths between 2071 and 2099, while emissions reductions could reduce this number to 517 over the same period. To illustrate, the WHO showed that under the high emissions scenario, the number of additional deaths per warm season is projected to increase to 1,276 deaths between 2071 and 2099, while emissions reductions could reduce this number to 517 over the same period.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

The highest priority is the increase in heat stress, which is associated with a rise in illnesses, mortality, and morbidity during heat waves, resulting particularly in increased numbers of heat strokes, heart attacks and collapses due to heat.
The number of emerging diseases and communicable diseases is also increasing. 10 out of 60 mosquito species that are involved in the spread of diseases in Slovakia are invasive. Ticks remain active during the winter due to higher winter temperatures.
The spread of invazive plants (increasing allergen concentrations) and animals (spreading diseases), changes in the pollen season and the allergenicity of pollen particles also contribute to health risks.
Extreme weather events affect the availability and quality of drinking water sources (particularly dangerous during floods and in communities where households use untested well water sources for economic reasons).
The increasing number of hot days and nights is associated with reduced work performance.
Mental health problems (anxiety and depression) are increasing due to climate change concerns, especially among younger generations.
Response options to decrease the impacts of climate change on human health include i) reducing exposure to climate-related hazards; ii) reducing vulnerability to such hazards, and iii) strengthening health system responses to future risks (including raising awareness of risks).

Rating for the risk of potential future impacts

medium

Different rating of the risk of potential future impacts for:

Describe your assessment

The participatory and expert-based climate risk assessment revealed a total number of four key risks for the sector Health.
1/ Risk to human health from extreme heat events and overall increase in heat. The risk is associated with increase in summer days and tropical nights, especially in urban and built-up areas, increases in UHI, overall increase in heat stress and increases in illnesses, morbidity and mortality during heat waves resulting from heat strokes, heart attacks and collapses. As mean temperatures will increase and extreme heat events are expected to become severe and frequent, the risk for the near future is rated as high and very high for the far future.
2/ Risk of increases in air-, in-sect-, water-and food-borne diseases, pathogens and allergens. This risk is exacerbated by changing the spatial distribution of invasive plants and animals, changing ecosystem and species composition, and agricultural practices (increased use of pesticides).

3/ Risk of a lack for access to public water infrastructure. This risk is driven by deteriorating water quality, the expected increase in water demand due to rising air temperatures and extreme temperatures, and an increase in extreme events (especially floods). This risk is currently assessed as low, but is becoming more acute in the future (assessed as medium in the short term, high in the long term).
4/ Risk of health-related increases in economic losses and burdens. Key risk 4 results from decreased work performance and productivity (very high exposure and high sensitivity) due to increases in heat extremes. Likewise, increases in psychological disorders like depression and anxiety due to climate change and insufficient responses and solutions are also of relevance. Further impacts resulting from behavioural changes and individual responses to climate extremes might generate shifts in revenues as everyday practices are altered.

Title of the sector

Soil environment

Primary key affected sector

rural development

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

high

Different rating of the observed impacts of key hazards for:

Describe your assessment

Changes in the soil environment are closely linked to other natural processes. Heavy rainfall leads to waterlogging or flooding in areas with limited drainage capacity. Additionally, it causes landslides and soil erosion, necessitating changes in land use. Water erosion is a particularly serious problem in the mountainous regions of Slovakia, where it negatively affects cultivated agricultural land. The reduction of the soil profile leads to the loss of organic matter and nutrients, further deteriorating soil properties and structure. Soil acidification is also considered a significant threat.

Forest soils are generally more resilient to climate change and play an important role in its mitigation due to their carbon storage capacity. The changes observed so far mainly concern the water regime, while organic matter and carbon stocks remain stable without signs of degradation.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

medium

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

Given the anticipated changes in climatic conditions, the likelihood of floods, landslides, and soil erosion is expected to increase significantly in the future. The high frequency of heavy rainfall and subsequent flash floods will raise the risk of water source contamination and degrade soil quality. Rising temperatures are expected to reduce soil moisture and water availability, worsening conditions for agricultural production and increasing the risk of drought. In the coming decades, a decline in groundwater levels and disruption of the water cycle are also expected, potentially leading to hydrogeological droughts, particularly due to reduced surface water flows.
Forest soils will respond differently to climate change depending on the region. In areas with higher productivity, there may be a temporary increase in organic matter input, which could improve certain soil properties. However, overall, a gradual deterioration of the water regime and a slight decline in other soil characteristics are expected.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

Soil protection and sustainable management are essential in the current climate to adapt the rural landscape to the negative consequences of climate change. One of the main problems is

the increase in erosion and changes in water availability, which reduce the water retention capacity of the soil and lead to its drying out. It is also important to minimize soil compaction in agriculture. Although soil salinization due to drying was initially considered less significant, increased evapotranspiration and its impact on soil ecosystem services make it a persistent issue.
According to the NAP, Slovakia focuses on soil protection under Specific Objective 2 related to "sustainable agriculture". Soil protection measures are aimed at increasing water retention in the soil, minimizing wind and water erosion of the soil, as well as implementing soil protection measures.

Rating for the risk of potential future impacts

medium

Different rating of the risk of potential future impacts for:

Describe your assessment

The participatory and expert climate risk assessment identified one key risk for the land sector: the risk of soil degradation, including erosion. This risk is associated with extreme events, particularly droughts, landslides, and mudslides, with medium to high urgency, while framework measures have been assessed as low. As the frequency and intensity of such events are expected to increase, the risk becomes more severe and is assessed as high in the long term under an optimistic scenario and very high under a pessimistic scenario. The regional distribution and occurrence depend, among other factors, on the bedrock and topography.

Title of the sector

Water management

Primary key affected sector

water management

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

high

Different rating of the observed impacts of key hazards for:

Describe your assessment

Water resources are directly linked to climate change as the hydrological cycle is highly dependent on climatic factors. Changes in rainfall patterns, and temperature have implications on the availability of surface and subsurface water, as volume and timing of precipitation, as well as evaporation are driving factors of the water balance.
Water resource management in Slovakia is based on water availability which is driven by non-stationary meteorological, climatological and hydrological processes. Infrastructural measures such as water reservoirs have already been used in the past to deal with seasonal to perennial precipitation variations. Successful future management of water resources involves knowledge on hydrological extremes such as floods and droughts.
Considering the hydrological input, mean annual precipitation has been increasing in general, but very slightly on a national level; a regime shift (i. e. the timing and spatial distribution of precipitation e.g. on a monthly or seasonal basis) is more pronounced. However, in the period 1981 – 2013 for instance, decreasing trends in mean precipitation were detected in December months in the northern area of Slovakia, whereas the central and southern areas showed increasing trends. At the same time, most of the analysed stations revealed increasing summer precipitation trends.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

high

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

The hydrological regime or river regime is not only affected by changes in rainfall, but also by changes in land use and the landscape as a whole. Forests play an important role in surface runoff and river flooding.
A case study in two small river basins in the Low Tatras shows an increase in extreme discharges in the future, as water retention capacity decreases. An increase in winter runoff is also expected for various mountain catchments as a result of more rainfall and less snowfall as well

as earlier snowmelt. High flow hydrological simulation results (100-year flood) for eleven medium-sized to large basins indicate an increase (> +5 %) for seven basins, a decrease (<-5 %) for three basins and for one basin no change for the analysed future period. The results of the study of the increase in extreme 5-day precipitation totals in medium-sized to large Central Slovakian mountain basins indicate a median change in the maximum mean daily discharges ranging from 16–28% for 2025, 15–24% for 2050 and 28–49% for 2075. The main findings are: 1) More frequent occurrence of dry periods prior to significant 5-day precipitation events will lead to amplified floods, and 2) Extreme precipitation events can be even more significant due to more intense thunderstorms.
The occurrence of low flow conditions and droughts are also dependent on region and season. A case study in a large catchment (Laborec River) in eastern Slovakia reveals the highest number of low flow days in August and September and highlights potential impacts on water supply, agriculture and energy production during summer and autum. Future changes in low flow are shown in various catchment studies in Tatras. A significant temperature increase and a slight precipitation decrease in the far future (2071-2100) under a moderate to high emission scenario will lead to an increase in evapotranspiration, a decrease in water yield and a shift in runoff timing during summer with impacts on ecosystems and biodiversity.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

The increase in extreme events, particularly pluvial and flash floods, and the resulting damages are of significant concern. There is also a critical reduction in the yield of drinking water from springs and a general decrease in the availability and supply of drinking water. This issue is arising on the national level and is prominent in regions such as the south, east and Záhorie. During droughts (e.g. in 2024), municipalities in these regions had to prohibit the use of public water supplies for anything other than personal hygiene, drinking and cooking. Some municipalities have already had to import drinking wa-ter by tankers during dry seasons in the last five years. Concomitant with decreases in water availability, though currently not rated as a high priority, are increasing water demands for private use, irrigation, agriculture and businesses.
Another significant problem is the changed seasonal distribution of precipitation and runoff patterns, with increased winter and spring runoff and decreased summer and autumn runoff. This affects sewer systems, wastewater treatment plants and energy production based on

hydropower. Water conservation efforts and the interest in retaining water within the country have led to sewers struggling with waste dilution during droughts. Additionally, during short-term heavy rains, wastewater treatment plants must process larger volumes of wastewater than designed.

Rating for the risk of potential future impacts

medium

Different rating of the risk of potential future impacts for:

Describe your assessment

The participatory and expert-based climate risk assessment revealed a total number of four key risks for the sector Hydrological Regime & Water Resource Management: 1/Risk to population and infra-structure from flooding, 2/ Risk of unreliable water supply, 3/ Risk to wastewater infrastruc-ture and sewage systems, 4/ Risk of decreasing groundwa-ter availability and quality. There is also a risk of damage to infrastructure due to extreme flood events, expected to increase under climate change conditions, as well as due to changed seasonal distribution of precipitation. Areas that are currently not affected by such events might be in the future, resulting in a heightened risk (very high for both scenarios in the far future). Therefore, regulating ecosystem services have to be considered, (i.e. (natural or nature-based) flood protection and water retention.
Already in the current NAP, specific objectives address the protection of health and life of people and animals from climate-related extreme events . According to the strategic directions derived in course of the risk assessment process, nature-based solutions and ensuring healthy ecosystems and soils are essential building blocks for enhancing resilience. In addition, adapting water and wastewater infrastructure to changing climatic conditions and implementing sufficient and effective measures concerning water management can also contribute to a more resilient, climate-adapted Slovak society.

Title of the sector

Agriculture

Primary key affected sector

agriculture and food

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

high

Different rating of the observed impacts of key hazards for:

Describe your assessment

Agricultural land covers 48.4% of Slovakia, with arable land being the most dominant. Some regions with the most fertile soils are facing worsening water availability, especially during the summer months due to a lack of precipitation. Climate change is impacting agroclimatic conditions, such as temperatures during the growing season and its extension, which can lead to an earlier start of spring and a prolonged autumn period. A decrease in rainfall in April leads to reduced soil moisture and limits the growth of agricultural crops. At the same time, heavy rainfall contributes to soil erosion. In 2023, an area of 219,719 hectares in Slovakia was at risk of water erosion of varying intensity, representing 12.3% of the total agricultural land area. Another important factor is drought, which tends to last longer, and in recent decades, its main period has shifted from autumn and winter to spring and summer. In 2003, 2012, and 2015, Slovakia experienced extensive droughts, and in 2024, nearly one-third of districts were affected by severe soil drought. Heatwaves are also becoming more frequent, causing heat stress for livestock, such as shortening milking time for dairy cows.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

high

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

Research indicates an increasing likelihood of changes in agroclimatic indicators, such as higher temperatures and longer growing seasons. While the extension of the growing season could be seen as positive, water scarcity and the growing need for irrigation may limit agricultural

production. Future climate scenarios suggest that central European regions will become increasingly susceptible to soil erosion due to extreme rainfall events. Droughts are becoming more frequent and prolonged, with the main drought periods shifting to spring and summer. Significant droughts are also expected in the future, impacting water supplies for agricultural production.
A decline in April rainfall is expected to continue, leading to reduced soil moisture and worsening growth conditions for crops. Heatwaves are also expected to occur more frequently, which may negatively affect crop yields as well as livestock production, particularly the health of farm animals.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

The consequences of climate change on water availability, demand, and use, as well as factors related to heat, pests, and natural hazards, are of particular importance. Regarding natural risks, the increased potential for natural hazards associated with higher insurance costs ranks highest among all climate change consequences, as higher operating costs and damages are expected in the agricultural sector. This results in income loss due to extreme events, which require immediate action.
The significance of heat and drought is reflected in several high-priority climate change consequences, including increased drought stress for plants and animals, as well as growing water scarcity and the subsequent need for irrigation. Low adaptive capacity and financial constraints necessitate immediate action, particularly in rainwater capture during the winter. A potential solution would be to evenly distribute medium-sized water reservoirs across the country, with the option of revitalizing historic water reservoirs.
Given the link between increased pests and harmful organisms in plants and animals with high exposure and susceptibility, it is crucial to consider the use and effectiveness of pesticides in the context of climate change. Extreme droughts and rains can limit agricultural practices and reduce pesticide effectiveness. Additionally, wild pollinators must be considered, particularly with the desynchronization of pollinator and plant phenology.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

Describe your assessment

Four key risks are expected in the agricultural sector. The risk of agricultural land loss is linked to increased soil erosion, reduced fertility, degradation of soil structure, shifting cultivation areas, and rising soil salinity. Currently, it is assessed as low, with medium exposure and sensitivity. However, by the end of the 21st century, the risk will increase, reaching high levels under a pessimistic climate scenario.
The risk of failure of water management systems in agriculture – this risk involves several climate change consequences, such as increased natural risk potential (higher insurance costs, e.g., due to hail damage), crop loss from extreme events, increased drought stress on plants, increased heat stress on animals, reduced yield potential, increased pests and harmful organisms affecting plants and animals, and pesticide use and effectiveness related to climate change. Given these aspects, the current risk is assessed as medium and is expected to rise to very high by the end of the century (pessimistic scenario).
The risk of poor water management in agriculture – this risk is assessed as high due to low to medium adaptive capacity. There is a significant lack of irrigation systems due to insufficient investment, which leads to the need to address damaged irrigation systems requiring restoration and the need to introduce functional water capture and storage systems. This issue affects the most productive parts of Slovakia in the lowlands of the southwest and southeast.
The risk of reduced food security and food shortages is closely related to the dysfunctionality of water management and irrigation systems, resulting in comparable assessments of current and future risks.

Title of the sector

Transport

Primary key affected sector

transport

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

high

Different rating of the observed impacts of key hazards for:

Describe your assessment

A wide range of risks related to climate change may be affected by a threat to transport infrastructure: heat waves, uneven rainfall distribution, or more often extreme precipitation causing tidal floods and mud flows, or other extreme weather situations. They manifest themselves immediately, intensely and with significant negative consequences: they lead to extending the time of transport of goods, extending the time of travel and increasing the likelihood of accidents and damage to the transport infrastructure. In general, the consequences vary depending on the geographical position and type of infrastructure. Excessive runoff during heavy rains and low water levels during the dry periods are a call for existing sewage systems and wastewater treatment plants, which are often not adapted to these more extreme flow, and consequently the road may occur rapidly flooding.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

high

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

A higher likelihood of natural threats related to climate change, which potentially endanger the operation or structural integrity of the transport infrastructure (including roads and buildings) is expected. High and low temperatures, intense storms and snow calamities whose frequency and intensity will increase due to climate change will cause serious complications for almost all types of traffic. Regarding climate change as a high priority, it is necessary to take into account the increase in (extreme) weather phenomena and the related consequences, such as damages caused by floods on low -lying infrastructure or more general damage to critical infrastructure. More frequent occurrence of extreme weather phenomena leads to greater wind and water erosion and to an increase in soil and mud landslides that damage transport infrastructure and transport facilities.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

Transport adaptation measures focus on reducing safety risks in transport due to weather extremes and measures aimed at improving the quality of transport infrastructure in risk sites. The method of control of climatic risks in infrastructure and related sectors is to prevent, protect and manage as a whole. Adaptation measures should be integrated already in projects planning processes and the appropriate and cost -effective possibilities of adapting the projects to climate change should also be determined. For this purpose, Slovakia developed the guideline 'Methodological Handbook on Assessing Climate Change Impacts on Major Transport Projects' to aid in the assessment of climate change on major projects in the transport sector.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

Describe your assessment

Transport infrastructure projects are characterized by long life and high investment and operating costs. For this reason, they must be resistant to extreme manifestations of natural risks, including natural risks related to climate change. On the basis of participatory and expert assessment of the risks of climate change, one key risk was identified for the transport and infrastructure sector: the risk of damage to infrastructure and buildings e.g. due to landslides/mudslides & pluvial floods and loss of livelihoods.

Title of the sector

Finance and insurance

Primary key affected sector

finance and insurance

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

medium

Different rating of the observed impacts of key hazards for:

Describe your assessment

Key hazards associated with the insurance sector include an increase in extreme events, including wildfires. The Slovak financial sector is aware of these risks and is taking measures to manage them. The National Bank of Slovakia (NBS) is aligning its priorities with the European Central Bank (ECB) and is working to make financial institutions aware of climate-related risks, to establish clear standardised procedures and to develop robust risk assessment frameworks. The NBS has started to work with the ECB and other national central banks of eurozone countries to develop experimental indicators related to climate change.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

high

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

The only identified biophysical consequence of climate change in this sector, an increase in extreme events, is estimated to be very high, leading to a high urgency to take appropriate action.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

Costly climate extremes will lead to reduced tax revenues, increased government spending, additional fiscal challenges, and solidarity funds that are strained due to excessive interest due to extreme events,. Risks to housing and insurance markets could also be significant with potentially rising insurance costs, widening protection gaps, and exacerbating the vulnerability of disadvantaged groups. Based on an analysis of risk factors, climate change may pose a challenge to insurers' business models because it may reduce the insurance industry's interest in providing insurance coverage for specific classes of activities, assets, or customers.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

Describe your assessment

The participatory and expert-based climate risk assessment revealed a total number of three key risks:
1/ Risk of fiscal and individual financial instability and instability of bank portfolios due to climate-related events, in particular ex-treme weather events.
2/ Risk of increase in insurance costs and uninsurable cli-mate impacts potentially leading to a loss of risk transfer possibilities.
3/ Risk of rising costs of inac-tion due to insufficient mitigation and adaptation to climate change. Insurance and related costs play a significant role in the financial sector, and the relevant climate impact is rated as high priority, along with high urgency to act and low adaptive capacity. Therefore, the current risk rating is already assumed to be high. Raising awareness and building the required knowledge and competencies can contribute to transforming the financial sector towards climate resilience. This is particularly important as the impacts of climate change will reach levels that cannot be insured, which may lead to insufficient risk transfer.

Title of the sector

Urban environment

Primary key affected sector

buildings

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

high

Different rating of the observed impacts of key hazards for:

Describe your assessment

Important manifestations of climate change that affect the condition of buildings and the conditions for their use and maintenance include rising air temperatures in buildings and cities, including the urban heat island effect, hot days, tropical nights and heat stress. Measures require increased shading and adaptation of buildings to maintain comfortable indoor temperature and humidity levels during summer. Buildings are also damaged by wind and water erosion or landslides and mudslides.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

high

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

The urban population spends approximately 90% of its time indoors. With the increasing impacts of climate change in the urban environment, serious consequences are expected for buildings, monuments, urban infrastructure, public spaces, but also for the natural component of the urban environment (land, greenery, green infrastructure), water resources (drinking water supply and management, water reservoirs), land use in the urban environment, health and social affairs, transport, technical and energy infrastructure, trade, industry and tourism. The quality of life of building users, especially in cities, is further impaired by the heat island effect, the lack of green spaces around buildings, the absence of vegetated roofs, together with the densification of buildings, as well as inappropriate high-rise zoning.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

The vulnerability of buildings is related to temperature increases, the urban heat island effect, changes in indoor temperature and humidity, but also to an increase in extreme events, increasing wind and water erosion, and the threat of landslides and mudslides. These manifestations of climate change lead to socio-economic consequences, including e.g. increased cooling requirements for buildings, increased need for shading, increased damage to buildings, increased secondary damage due to natural hazards (e.g. mould formation), increased maintenance expenditure and costs, but also reduced demand for heating in winter.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

Describe your assessment

For the Buildings sector, together with the Transport sector, two key risks have been identified: 1/ Risk of damage to infrastructure and buildings, e.g. due to landslides/landslides and wetlands; flooding caused by flooding and loss of livelihoods and 2/ Risk to people's comfort and health due to increased heat in urban centres and buildings.

Title of the sector

Tourism

Primary key affected sector

tourism

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

high

Different rating of the observed impacts of key hazards for:

Describe your assessment

In the tourism sector, climate impacts are mainly manifested in the form of a reduction in the reliability of natural snow, a decrease in winter snowfall, an increase in extreme events, an increase in heat waves, an increase in the urban heat island effect, an increase in and forest fires, a change in water availability, and a decrease in water quality. These impacts lead to a number of socio-economic consequences, including a reduction in the number of winter holiday tourists, an increase in the demand for cooling in summer (water mist, drinking fountains, air conditioning), an increase in conflicts over the use of water resources between different user groups (tourists, agriculture, local population), increase in negative impacts on safety of tourists, shortening of winter season and disturbance of conditions for winter leisure activities, an increase in the number of summer holiday tourists, extension/shift of the touristic season.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

high

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

Even though Slovakia is not very well known on international level yet, an increasing interest and potential for touristic growth has been observed within the last years. A potential boost in rural tourism is expected due to the country's picturesque landscapes, traditional villages and other features such as attractive natural sights. Hence, the sector is becoming increasingly important for Slovakia's economy. The future projections for the tourism sector expect an annual growth rate of 3.2 %, which would result in a market volume of € 1,609m by 2028. Since a great part of Slovakia has favourable natural, cultural and historical conditions for tourism development like pro-tected areas, UNESCO World Heritage cultural memories, waterfalls, mineral swimming pools, etc., tourism should be considered a key sector for regional development. A significant share of tourist overnight stays and revenues are related to the

wellness and spa sector.
Another part of tourism is comprised of skiing as a recreational sport with more than 100 ski resorts in Slovakia, mainly in the northern and central mountain areas. Since the majority of Slovakian ski resorts lie below an altitude of 1,000 m above sea level, they are highly vulnerable to climate change.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

A significant concern is the decrease in snow precipitation and snow reliability during winter, threatening winter tourism revenue and employment. This, as well as the shortening of winter seasons, will necessitate changes in tourism products and services. Ski slopes may rely on artificial snowmaking, albeit potentially for shorter periods. At higher altitudes (above 2,000 meters on northern slopes), snow storage from previous seasons might be possible, requiring substantial funding. The lack of snow could lead to fewer winter holiday tourists, who may prefer destinations like the Alps, Dolomites, or Bulgarian mountains, forcing Slovak winter recreation centres to diversify their offers to remain competitive.
Conflicts over water use, essential for tourism facilities and services, are expected both during dry spells in summer and for technical snowmaking in winter. Water-dependent tourism providers, wellness centres and other water-dependent activities will be particularly affected. Heat waves may have mixed impacts, benefiting water parks and pools while exacerbating UHI effects in cities. Solutions like green and blue infrastructure are being implemented to mitigate these effects, particularly for vulnerable groups.

Rating for the risk of potential future impacts

medium

Different rating of the risk of potential future impacts for:

Describe your assessment

Three key risks are identified for the tourism sector:
1/ Risk of decreasing tourism competitiveness due to increas-ing costs for tourism providers

(adaptation, energy, water, labour) - risk related to in-creases in conflicts over water use (tourists, agriculture, local population), changes in water availability, increase in demand for cooling in summer, shortening of winter season and disturbance of conditions for winter leisure activities. In particular, water is considered as an urgent issue by involved stakeholders.
2/ Risk of newly emerging, com-peting destinations at national and international level - risk highlights that Slovakia or various regions of Slovakia might have to deal with newly emerging, competitive destinations at international and national level.
3/ Risk of loss of touristic attrac-tiveness, key sources & limited accessibility of tourist attrac-tions due to extreme heat and damage induced by other ex-treme events (floods, storms, fires) - the risk related to climatic consequences such as increase in extreme events, increase in heat waves, increase in urban heat island effect, reduction in water quality, increase in negative impacts on tourist safety (risk of loss of tourist attractiveness, key resources and limited availability of tourist attractions due to extreme heat and damage caused by other extreme events (floods, storms, fires)).
With the exception of the risk listed second, the associated risks are expected to become more severe throughout the century for both scenarios.
Risks resulting from a loss of biodiversity, degrading ecosystem services or inadequate forest management as well the risk due to floods are considered as relevant too.

Title of the sector

Energy, Industry and Certain Other Business Sectors

Primary key affected sector

industry

Key affected sector

business

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

medium

Different rating of the observed impacts of key hazards for:

Describe your assessment

In particular, an increase in flooding and low water levels in summer pose significant risks. Low water levels reduce the availability of water for industrial purposes, requiring adjustments to water management practices. In this context, an increase in the degradation of physical assets due to frequent changes in weather conditions or direct damage to buildings and industrial infrastructure must also be considered.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

medium

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

Although there has been a significant increase in extreme events, the level of business exposure to natural hazards has remained less pronounced. In particular, the increase in low water levels in summer highlights the high urgency for action combined with low current adaptive capacity, which requires targeted measures to support water-dependent businesses and industry. Businesses are becoming increasingly aware of the risk impacts, particularly of extreme weather events associated with climate change, on their operations, with the aim of building resilient operations to the impacts of climate change. Businesses' activities to date have been directed towards mitigation rather than adaptation measures. The introduction of innovative processes for cleaner production and processing, the integration of RES, changes in product design for energy and raw material efficiency, as well as changes in supply chains for long-term stabilisation and security of supply of commodities, for example, are expected to be phased in. Various examples show that the Slovak economy is highly exposed to risk due to its industrial structure, especially in terms of supply chain disruption.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

The vulnerability of Slovak businesses to the effects of climate change is well known, especially in the industry and energy sectors. Consequences and risks arise from the nature of individual

plants, equipment and processes, the effects and consequences can pose a potential threat to the continuity of industrial operations, serious industrial accidents, instability in the supply of supplies, raw materials and electricity, rising commodity prices, as well as human safety and health. It is therefore in the interest of businesses to take measures to identify and anticipate risks, tools to change production systems and other action posed by climate change. Industry's resilience to the adverse impacts of climate change inevitably requires the progressive development and implementation of appropriate, timely and effective adaptation measures. For specific categories of workers, especially those exposed to heat, changes in working hours are expected, which may lead to increased production downtime. Additional safeguards against potential industrial disruptions are also needed, as such events can pose huge risks in terms of civil protection.

Rating for the risk of potential future impacts

medium

Different rating of the risk of potential future impacts for:

Describe your assessment

Based on a participatory and expert assessment of climate change risks, three key risks have been defined:
1/ Risk to business and industries due to extreme events (floods, droughts) - related to the impacts of climate change, such as an increase in extreme events, e.g. floods as well as loss of water levels in summer and droughts. Both affect the availability of water for industrial purposes, with strict regulations ensuring that businesses take precautions against extreme events. However, their increased occurrence in the future may result in increased risk in the long term.
2/ Risk of missed opportunities and unutilised innovation potential - this risk relates to process and product innovation, highlighting the need to harness such innovation through funding schemes and the implementation of appropriate framework measures. As these innovations and specialised developments are already emerging at international level, attention needs to be focused at national level to ensure proactive and long-term competitiveness.
3/ Risk of loss of jobs and lack of skilled workers.

Title of the sector

Energy

Primary key affected sector

energy

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

high

Different rating of the observed impacts of key hazards for:

Describe your assessment

Key climate risks for energy:
Temperature change, windy conditions, precipitation, heat or cold waves, storms, drought, floods, snow and ice, as well as landslides.
The energy sector is affected by various climate hazards, including temperature changes, wind conditions, precipitation, heatwaves or cold waves, etc.
Significant climate impacts on the energy sector include the increasing number of floods, changes in seasonal distribution of precipitation, increase in extreme events, changes in the runoff regimes, increase of days with low water discharges, as well as impairment of the energy supply, increased damage to high-voltage lines, impairment of electricity generation from biomass, and changes in energy demand.
Concerning energy generation from hydropower, the concrete impacts of climate change may vary from facility to facility, i.e. how severely a hydropower plant is affected by changes in runoff regimes depends on the specific facility. Other relevant impacts on hydropower include an increase in bed load in watercourses as well as the increase of days with low water discharge, both of which are closely interconnected.
Rising temperatures during the summer months are expected to drive an increase in cooling demand and requirements for electricity grids. This growing demand for energy and cooling is particularly relevant for nuclear power generation. In Slovakia, nuclear energy remains one of the key energy sources and faces increased risk due to climate change.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

medium

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

The warming trend is expected to alter energy demand patterns, increasing the need for cooling while reducing the need for heating. Although Slovakia is not often affected by cyclones, windstorms and thunderstorms can still significantly impact its energy system.
Slovakia is increasingly feeling the effects of climate change, with more frequent floods and droughts. An increase in the number of floods is anticipated to have a high impact on energy infrastructure, operations and resources. The southern region is experiencing gradual desertification and a reduction in usable water sources. By 2030, freshwater runoff is expected to decrease by 29 % in the lowlands and by 35 % in southern central Slovakia
Extreme weather events, floods, heatwaves, or droughts could impact demand and supply for the energy system and reduce nuclear power production due to a lack of cooling water.
To address these challenges, it is crucial to enhance the security of power plants and ensure their resilience against extreme weather conditions.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

The vulnerability of the sector is primarily related to the impacts of climate change on electricity and heat supply, as well as the demand for securing their delivery (increased energy consumption for air conditioning in summer and reduced energy consumption in winter due to milder weather).
Extreme weather conditions could raise the incidence of blackouts by 10 to 20% by 2050 compared to the reference period of 2000–2010. Slovakia relies significantly on nuclear energy, and drought and heat may affect energy generation. At the same time, prolonged dry periods could intensify the competition for water between agricultural irrigation and nuclear power plants.
Renewable energy sources are crucial for climate mitigation. In parallel, their use depends on natural systems like wind, sunlight and water, they are generally less affected by heatwaves and droughts.

The consequences of climate change highlight that climate change impacts lead to the necessity to adapt energy/electricity infrastructure in order to ensure reliable and resilient energy supply
The main adaptation strategies for the energy sector include:
i) Enhancing overall energy efficiency, for instance, through energy labelling for appliances and promoting smart energy consumption that accounts for seasonal variations.
ii) Strengthening safety measures at power facilities and preparing precautionary arrangements to ensure reliable system operation during extreme weather events.

Rating for the risk of potential future impacts

medium

Different rating of the risk of potential future impacts for:

Describe your assessment

The participatory and expert-based climate risk assessment revealed a total number of two key risks for the energy sector:
1/ Risk of failure and impairment of energy generation, supply and disruption of infrastructure due to extreme events – This risk is associated with several climate impacts that are considered high priority, such as increase in the number of floods, impairment of energy supply, and increased in damage to high-voltage lines. Other climate impacts are also relevant (e.g., increase in risk of the electrical system failure, increase in extreme events). It is expected that the current risk increases and is rated as high (optimistic scenario) to very high (pessimistic scenario) for the far future.
2/ Risk of energy generation fluctuations – The generation of energy from renewable sources is subject to fluctuations and disruptions, e.g. due to extreme events (unreliability). Furthermore, Slovakia is still depended on imports of coal, gas and oil and these imports might be subject to global market dynamics. At the same time, energy generation from nuclear power plants plays a major role in Slovakia's energy mix, potentially cushioning the effects of these fluctuations.

Title of the sector

Forestry

Primary key affected sector

forestry

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

high

Different rating of the observed impacts of key hazards for:

Describe your assessment

The current bioclimatic conditions for Slovakian forests can be described as cool, mountainous-temperate and moderately humid. However, changes due to climate change are expected to affect lowland and mountain regions dramatically. Risk factors for forest growth are abiotic aspects such as heatwaves, droughts, storms and forest fires but also biotic factors like pathogens and pests, all of which greatly affect forest management in negative ways. Even though rising temperatures, changing precipitation patterns and higher probabilities of severe droughts fuel the risk of wildfires, they occur mostly as a consequence of human activity and are not the most common cause of forest damage in Slovakia. Statistical data shows that fires were responsible for a tree cover loss of 1.74 kha from 2001 to 2023, representing a share of 0.71 % of the total tree cover loss of 242 kha.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

high

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

When looking at future climate projections, models and scenarios predict the emergence of warm-temperate zones with xerothermic forests in the southern regions of Slovakia. Alpine communities, on the other hand, are expected to go extinct and be substituted by bioclimatic conditions of subalpine, very humid mountainous forests. Furthermore, climate change will quite possibly lead to an upward shift of the tree line to the present subalpine zone, where, however, the forest area is limited. Spruce stands are damaged frequently due to harmful

agents like bark beetle outbreaks whose dynamics are intertwined with factors like droughts, storms and other stressors and thus progressively replaced by beech and maple. In mixed forests, mainly conifers are predicted to gradually fall out and to be superseded by oak, maple, ash, elm and agate.
In addition to the increased likelihood of direct damage to forests (wind calamities, drought, forest fires), the response to climate change for most of our pests is expected to be an increase in the number of breeding sites, the establishment of more generations or the spread of host trees. A separate risk is the potential emergence of new pests and diseases that can significantly affect the condition and development of forests.
From a forestry perspective, a decline in timber production can be expected at lower and middle altitudes for spruce and beech. The aforementioned impacts of climate change on forests also have negative impacts on the non-productive functions of forests, especially carbon sequestration and regulation of the water regime of stands and watersheds. Models for water balance changes show that the spruce and mountain pine vegetation seem to be sufficiently supplied by precipitation water, while other vegetation zones will be characterised by a deepening deficiency of water balance in the vegetation period.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

Climate change puts increasing pressure on forests and deteriorates functions provided by these ecosystems. The forestry sector is one of the most vulnerable sectors to climate change due to the longevity of forest tree species and their limited natural ability to migrate, the high forest cover of the landscape (almost 45%) or the importance of all forest ecosystem services, especially non-productive ones.
Particularly adverse effects of climate change can be expected in forests that are exposed to long-term negative effects of other factors (air pollution, areas with altered soil environments or unfavourable tree composition). In these cases, even minor climate stress can cause forest degradation over large areas, and the impacts of climate change can be particularly adverse.
Several factors can contribute to ensuring forest adaptation: mainstreaming adaptation principles and design measures from the national level to the forest management level, promoting adaptation based on an ecosystem approach, improving cross-sectoral cooperation, and increasing stakeholder awareness of climate change. Alternative forest management models can play an important role in forest adaptation, in particular nature-based forest management, which implies higher species and structural diversity, as well as assisted migration

of tree species and genotypes suitable for a changing climate.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

Describe your assessment

There are three key risks for the forestry sector:
1/ Risk of loss of ecosystem services provided by forests (e.g. water regulation, carbon sequestration) due to forest degradation and forest disturbances – as these climate impacts are among those considered as high priority (e.g. increase in drought stress, increase in pests and harmful organisms, increase in large-scale disturbances of ecosystems due to extreme events, increase in forest- and wildfires), the current risk is rated as high and as very high for the far future.
2/ Risk of inadequate forest management (e.g. due to lack of knowledge and insufficient flexibility of legislation), in particular under changing climate conditions – because forest management also plays a key role to ensure healthy forests, its deficient implementation is a reason of concern, and therefore the current risk assessment is rated as high.
3/ Risk of loss of economic viability of forestry – this risk is expected to increase in the next decade, resulting in a high risk by the end of the century.

Title of the sector

Urban Environment

Primary key affected sector

urban

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

high

Different rating of the observed impacts of key hazards for:

Describe your assessment

Climate change is felt even more intensively in urban settings due to the urban morphology as well as high infrastructure and population densities, increasing both exposure and vulnerability to climate impacts. Therefore, urban areas have to face hazards such as flash/surface flooding, heat waves, rainstorms, extreme hot days and droughts and water scarcity, with particularly high vulnerability against heatwaves, droughts and floods.
These adverse impacts affect human health, livelihoods and key infrastructure in cities, as mortality and morbidity in-crease and infrastructure can be damaged by extreme weather events, causing secondary damages and high reconstruction costs.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

medium

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

More than half of Slovakia's population currently lives in urban areas (approx. 54 %). A total number of 141 towns and cities exists, with Bratislava and Košice being the biggest. Climate change induced impacts such as extreme events are also of relevance in these urban areas. For instance, projected increasing numbers of tropical days and the occurrence heat waves in summer put Slovak cities and towns under pressure and further investigations and implementation of measures are needed. In particular against this background, urban green areas are of importance, providing benefits in terms of health and well-being (e.g. improvement of mental health, decrease of adverse consequences from chronic diseases, lowering temperatures, improving air quality). Such green spaces are particularly relevant for vulnerable groups such as children and elderly people as staying in these areas enhances their physical and mental health and provides an environment for supporting social well-being. Besides, urban green spaces are important for biodiversity and associated functions. The mapping of urban green spaces in Bratislava shows that the most important green spaces are forests, woodlands,

private and cottage gardens as well as allotments, all of which are distributed differently throughout the city.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

These and other climate change induced impacts are well covered by the impacts identified for the various sectors. Sectors such as Spatial Planning, Hydrological Regime & Water Resource Management, Transport, Infrastructure & Buildings, Health as well as Disaster Risk Management, Civil Protection & Critical Infrastructure are essential for tackling climate change related impacts on urban areas. It is key to consider different levels of vulnerabilities. Senior citizens, children, those in poor health and economically disadvantaged groups, are consistently among the groups most affected by climate impacts, either immediately during or after extreme weather events or in the long term.
With regard to climate change adaptation, many possible adaptation pathways are known. For instance, the IPCC differentiates three main adaptation realms, i.e. social infrastructure, nature-based solutions and grey/physical infrastructure. Likewise, in the current NAP of the Slovak Republic it is differentiated between grey, green and blue infrastructure as important realms to be considered in the context cli-mate change adaptation. However, only a modestly growing number of Slovak cities have developed climate change adaptation strategies/policies.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

Describe your assessment

Serious consequences are expected for the urban environment (buildings, monuments, urban infrastructure, public spaces), the natural component of the urban environment (land, greenery, green infrastructure), water resources (drinking water supply and management, water reservoirs), land use in the urban environment, health and social affairs, transport, technical and energy infrastructure, trade, industry and tourism. Impacts in the urban environment will vary depending on the geographic location, size and type of city.

Climate change impacts are most pronounced in urban areas characterised by high population density, a high proportion of built-up areas and impermeable, paved surfaces, and a high concentration of economic activity and infrastructure. The urban population spends approximately 90% of its time indoors. A relatively high proportion of buildings constructed in Slovakia are designed according to technical standards developed mainly in the second half of the 20th century on the basis of past climatic conditions, technical possibilities and quality of construction. At the same time, the buildings themselves contribute significantly to energy consumption. These two facts bring the issue of buildings and their management in terms of adaptation and mitigation to the fore. The quality of life of building users, particularly in cities, will be further impaired by the heat island effect, the lack of green spaces around buildings, the absence of vegetated roofs, together with the densification of buildings, as well as inappropriate high-rise zoning.

Title of the sector

Information and Communications Technology

Primary key affected sector

ICT (information and communications technology)

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

medium

Different rating of the observed impacts of key hazards for:

Describe your assessment

Climate change poses significant challenges for the ICT sector, categorised into acute events and chronic stresses. Acute events, such as floods, hurricanes and heatwaves, are short-lived but can severely damage ICT infrastructure by destroying physical assets. In contrast, chronic stresses result from gradual climate changes, including temperature extremes and humidity, leading to asset degradation, more frequent failures and shorter lifespans, with significant financial implications due to the need for frequent upgrades and replacements. Data centres, which use

substantial amounts of water for cool-ing, are particularly vulnerable. A third type of stress, termed ‘chronic crisis,’ combines elements of both acute and chronic stresses, such as prolonged flooding.
The NAS of Slovakia does not explicitly refer to ICT adaptation, but it includes several measures where ICT tools are uti-lised for adaptation in other sectors.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

high

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

A significant challenge in supporting the business environment's adaptation to climate change lies in the management of electricity consumption patterns. This includes accommodating new climate-friendly technologies such as smart grids. According to study in 2024, electricity consumption in Slovakia has declined resulting from greater ICT investments. Promoting the broader adoption of smart concepts in the energy sector is crucial. While some smart concepts, like electromobility and smart cities, are already in place, others, such as smart grids, smart homes, and smart buildings, need further development. In the tourism sector, ensuring the security of critical infrastructure requires linking early warning and agrometeorological information systems as well as creating comprehensive information systems for weather alerts, flood risks, and fire warnings.
In the draft updated NECP, Slovakia references the EU Action Plan on Digitalising the Energy System, highlighting the need for modernising and digitalising its transmission system and regional distribution networks. The creation of a digital data platform for monitoring the energy performance of buildings is also supported.
Additionally, Slovakia plans to prioritise the digitalisation and automation of transport to develop intelligent transport systems, as well as to enhance digital security and cybersecurity of nuclear power plants.

Rating of the vulnerability, including adaptive capacity

medium

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

The need to raise awareness about the impacts of climate change on ICT and its infrastructure is becoming increasingly important. Progress and innovation processes within the ICT sector are fast and currently allow for a timely response to damage caused by climate impacts. For instance, devices are being made more robust and durable. Furthermore, an increasing need to measure several parameters can steer process or product innova-tions, respectively, leading to technological developments. In this regard, ICT can support the monitoring of climate impacts, with the increased usage of mobile infrastructure such as drones expected to enhance resilience.
Among the climate impacts rated as high priority is the increase in heat load, making cooling of ICT infrastructure and facilities such as data centres, heat pumps or solar panels necessary to prevent overheating.

Rating for the risk of potential future impacts

medium

Different rating of the risk of potential future impacts for:

Describe your assessment

One key risk has been identified for the Information and communication technology sector - the risk of damage to ICT infrastructure and widespread disruption of ICT services, e.g. due to extreme events.
Damage to ICT infrastructure and the associated risk can be a result of several factors such as extreme events and changes in the availability and quality/reliability of services (direct/indirect disruption from weather events). Relevant climate impacts for the identified key risk are all among those rated as high priority. As the urgency to act is rated mostly as low, partly as medium, the current risk is estimated to be medium and increasing throughout the next decades, resulting in a very high risk at the end of the century (pessimistic scenario).

Title of the sector

Land use Planning

Primary key affected sector

land use planning

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

high

Different rating of the observed impacts of key hazards for:

Describe your assessment

Expected consequences include an increase in the number of tropical days and heat waves, uneven rainfall distribution and more frequent extreme precipitation events leading to flash floods or mudflows, as well as more frequent droughts.

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

high

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

The current risk is already at a high level, considering the mostly high to very high ratings of exposure and sensitivity of relevant climate impacts. The exposure is expected to increase throughout the century due to ongoing urbanisation as well as increases in heat and heat extremes exacerbating the risk, especially in the far future under both scenarios.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

The primary concerns are the impacts in cities of the increase in summer and tropical days and nights, the intensification of UHI effects and the overall rise in heat stress for both people and other living organisms, increased heat loads on buildings and infrastructure (such as the electricity grid and energy supply), leading to thermal stress, structural failures due to overheating, and road and track surface failures.
Another significant issue is the rise in flood events, both pluvial and fluvial, and changes in water availability. Conflicts over land use are intensifying as different interest groups, such as building developers, have varying ideas about the use of undeveloped urban areas. This has a strong link to the preservation of wind corridors and public spaces, especially green areas, which are under increasing pressure and require more regulation.
Other impacts include the rise in landslide hazards, change in land suitability, decreased accessibility to central or critical infrastructures due to climate change-induced disruptions, such as extreme weather events.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

Describe your assessment

Three key risks are identified.
1/ Risk of extreme events related to heat, drought and floods for population and infrastructure in urban and rural areas - related to several impacts of climate change, e.g. increase in heat stress for people and living organisms, heat stress on infrastructure due to increase in summer days and tropical nights (in urban areas the impacts are higher compared to rural areas). Floods and landslides can lead to disruption of critical transport infrastructure and limit the accessibility of critical facilities such as hospitals. During dry periods and heat waves, populations can be adversely affected by changes in water availability.
2/ Risk of long-term maladaptation and dependence on a particular supplier - If maladaptation and dependence on a particular supplier is not prevented, e.g. due to the longevity of building structures, the risk is expected to increase. Land use planning must therefore be seen as a cross-sectoral issue that is key to achieving adaptation goals in other sectors.
3/ Risk of uncontrolled migration (urban/rural) - draws attention to the dynamics of migration in the context of urbanization processes, i.e. people moving from rural to urban areas and vice versa. In this context, it should be noted that involuntary migration due to climate change is one of the key risks in the World Economic Forum's Global Risk Assessment.

Title of the sector

Cultural and Natural Heritage

Primary key affected sector

other

Key affected sector

Rating of the observed impacts of key hazards, including changes in frequency and magnitude

high

Different rating of the observed impacts of key hazards for:

Describe your assessment

The cultural and natural heritage in Slovakia is rich and manifold, which presupposes the importance of addressing climate related impacts in this sector. Since natural heritage currently receives less attention than heritage sites such as buildings, accounting for this differentiated view becomes very important.
Due to climate change, flash floods, erosion caused by temperature variability, changing freeze and thaw cycles, and increasing humidity levels pose a major risk to cultural and natural heritage.
Climate impacts to nature-related cultural heritage sites are comparable to those described in the other respective sectorial chapters (e.g. Biodiversity & Ecosystems, Geological Environment & Soil).

Rating of the key hazards' likelihood of occurrence and exposure to them under future climate

high

Different rating of the likelihood of the occurrence of key hazards and exposure to them under future climate for:

Describe your assessment

With regard to natural cultural heritage, climate impacts such as indigenous pathogens/emergence of new pathogens, as well as vegetation damage and loss of biodiversity, are relevant. When assessing damage to vegetation, one must consider the health status of vegetation, especially trees. In addition, changing climatic conditions can lead to the disappearance of traditional and local varieties of fruits and herbs, with invasive plants putting additional pressure on this type of flora. Consequently, such a loss of biodiversity can influence not only the production of traditional products but also the appearance of the cultural landscape or the original woody composition of historical parks and gardens. Hence, the authenticity and historical substance of landscapes can be lost due to climate change.

Rating of the vulnerability, including adaptive capacity

high

Different rating of the vulnerability and/or adaptive capacity for:

Describe your assessment

Against the background of climate change related indices (such as increases in the number of floods), it has to be expected that also other heritage sites in Slovakia face challenges due to climate change.
Permanent maintenance, including the conduction of care and implementation of respective monitoring measures, is crucial for the appropriate prevention of climate-related threats. For instance, irreversible damage can be avoided by the timely detection and repair of malfunctions, damage to human-made or natural objects. Besides that, the necessity for conducting maintenance and evaluation work for each monument or building must be taken into account. With respect to extreme weather events such as floods, landslides or fires, a functioning infrastructure with sufficient capacity is important (e.g. water drainage, availability of rescue equipment, fire extinguishing).

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

Describe your assessment

There is one key risk for the Cultural Heritage sector, which is Risk of loss of historical, archaeological, cultural and natural sites, landscapes values, traditional practices and authenticity. The risk is associated with climate impacts such as increase in floods (pluvial, fluvial), increase in forest- & wild fires, increase in erosion (soil, surfaces/materials), increase in damage to buildings/building materials, facades & coatings (e. g. monuments), increase in vegetation damage (e. g. damage to forests, branch breakage). As it is expected that these impacts become more severe during the 21st century, the risk is rated as high for both scenarios for the far future.

Legal and policies

Legal and policy frameworks and institutional arrangements

Legal and policy frameworks and regulations

The Ministry of Environment worked on a draft law on climate change and low-carbon transformation of the Slovak Republic in 2022-2023, but work is currently suspended.The Ministry of Environment of the Slovak Republic in cooperation with Slovak environment agency (SAŽP) has implemented a project to create a wider range of methodological guidelines for better implementation of adaptation and mitigation measures. It is a set of 10 methodological guidelines mainly in the areas of planning, data collection and evaluation, risk and vulnerability assessment (available only in Slovak: https://www.klima-adapt.sk/metodicke-usmernenia).

National Adaptation Policies (2)

Adaptation Policy type

National Adaptation Strategy (NAS)

If type is 'Other', please explain

-

Adaptation policy title

Adaptation Strategy of the Slovak Republic to Climate Change

Adaptation policy status

Adopted

Year the adaptation policy was adopted

2018

Period covered by the adaptation policy

2018-2025

Link to the adaptation policy

https://www.minzp.sk/files/odbor-politiky-zmeny-klimy/strategia-adaptacie-sr-zmenu-klimy-aktualizacia.pd

Focus of the adaptation policy

Availability of the adaptation policy

YES

Adaptation Policy type

National Adaptation Plan (NAP)

If type is 'Other', please explain

-

Adaptation policy title

National Action Plan for the implementation of the Adaptation Strategy of Slovakia

Adaptation policy status

Adopted

Year the adaptation policy was adopted

2021

Period covered by the adaptation policy

2021-2027

Link to the adaptation policy

https://www.minzp.sk/files/odbor-politiky-zmeny-klimy/akcny-plan-implementaciu-nas.pdf

Focus of the adaptation policy

Availability of the adaptation policy

YES

Overview of institutional arrangements and governance at the national level

Climate vulnerability and risk assessment

Planning, implementation, monitoring, evaluation and revision of adaptation policy

Planning, implementation, monitoring, evaluation and revision of adaptation policy at national level are generally the tasks of the Government of the Slovak Republic and the responsible ministries.
Ensuring the implementation of the NAS, as well as monitoring the progress in the implementation of adaptation measures and reviewing the NAS is, in accordance with Government Resolution No. 478/2018 Coll., the task of the Deputy Prime Minister and the Minister of the Environment in cooperation with other relevant ministries. The resolution recommends that entities at the regional level, such as self-governing regions, the Association of Towns and Municipalities of Slovakia and the Union of Slovak Cities, should also participate in the implementation of the NAS objectives.
The main responsibility for the implementation, monitoring and reporting of the NAS and the NAP lies with the Ministry of Environment, which has a coordinating function within the inter-ministerial and cross-cutting tasks. Operational coordination of implementation is carried out through the Adaptation Working Group, whose members are nominated representatives of individual ministries and other central government bodies, organisations, academia, NGOs or other interested groups.
Following the approval of the NAP, a joint coordination, monitoring and evaluation mechanism was prepared as an operational document of the Adaptation Working Group to coordinate the group's work on an ongoing basis.
The Adaptation Working Group is also regularly informed of the NAP performance indicators monitored and contributes to the preparation of the next NAS and NAP.
The Council of the Government of the Slovak Republic for the European Green Deal is also adequately involved in inter-ministerial coordination. Cross-ministerial coordination is moving towards integrating climate change into sectoral policies.

Integration of climate change impacts and resilience into environmental assessment procedures

Incorporating climate change impacts and resilience into environmental impact assessment procedures is an ongoing task and climate change impacts should be more fully reflected in legislation. Act No. 24/2006 Coll. on EIA/SEA and its amendment No. 142/2017 Coll. dealt with mandatory integration.
Improving the climate resilience of infrastructure is also supported by a methodology for

assessing the climate vulnerability and climate resilience of new investments and projects and incorporating it into the EIA/SEA process, which has been prepared by the Ministry of Environment in cooperation with SAŽP as part of the Methodology for the Assessment of Investment Risks Associated with the Adverse Impacts of Climate Change project. The methodology aims to provide more comprehensive information on whether a proposed activity or strategy document will be significantly affected by the adverse impacts of climate change (the so-called adaptation perspective).

Collection, ownership and re-use of relevant data and access to it

Institutional management and access to relevant data shall be carried out. The ownership and sharing of data is based on the respective reports.
The Ministry of Environment of the Slovak Republic in cooperation with SAŽP within the framework of the project Methodology for the assessment of investment risks associated with the adverse effects of climate change, has prepared comprehensive methodological procedures, on the basis of which it is possible to build a comprehensive mechanism for the collection, evaluation, processing and disclosure of information in the field of adaptation. This include to create a dedicated web platform for making information available to the professional and general public www.klima-adapt.sk.

Integration of climate change impacts and adaptation planning into disaster risk management frameworks and vice versa

Incorporating climate change impacts and adaptation planning into disaster risk management frameworks and vice versa in the SR is one of the new challenges. Resolution of the Government of the SR No. 65/2022 approved the National Strategy for Security Threat Risk Management of the SR, which aims to strengthen the effective management of security risks, which is directly related to the increase of resilience and strengthening of the security system of the state. Subsequently, it´s action plan until 2025 has been approved by the Resolution of the Government of the Slovak Republic No. 28/2023. As well as improving the ability of public administration entities to respond to the risks of threats, disasters, crisis situations or emergencies.

Strategies and plans

Adaptation strategies, policies, plans and goals

Adaptation priorities

- Promote climate change adaptation as a strategic priority, integrate it into the policy and strengthen the theme of adaptation.
- Strengthen the implementation of adaptation policies and legislation, reduce bureaucratic burdens constraining the implementation of measures and improve law enforcement.
- Build an effective climate change adaptation system, based on the joint efforts of stakeholders and the public.
- Develop the knowledge base, data collection, monitoring and research. Encourage data dissemination through open data sharing.
- Promote climate change education and solutions throughout the education process and at all levels of education
- Develop a multi-source financing system for climate change adaptation.

Ref:NAP

Challenges, gaps and barriers to adaptation

According to the Environmental Strategy – "A Greener Slovakia", one of the main challenges to be addressed is adaptation to climate change.
The most significant gaps and barriers to implementation of the climate change adaptation policy in Slovakia can be summarised as follows:

- Highly fragmented sectorial approach to adaptation at all levels, within and between public bodies, hampering an integrated and well-coordinated multi-sectorial climate change policy formulation and implementation process
- Slow implementation of the NAS and NAAP owing to insufficient knowledge, experience and expertise on the impacts and effectiveness of adaptation measures, especially nature-based solutions and particularly by regional and local actors
- Lack of a methodology including indicators to monitor and evaluate implementation, measure progress, and to identify the costs, benefits and impacts of adaptation measures as a basis for priority setting
- Low overall professional and public awareness of the effects of climate change and the impacts and effectiveness of adaptation measures
- Lack of proper, context-specific finance and business models for climate change adaptation measures

Summaries of national strategies, policies, plans and efforts, with a focus on goals and objectives, foreseen actions, budget and timeline

Since the end of 2023, the Ministry of the Environment of the Slovak Republic has been implementing a project funded by the Technical Support Instrument (TSI). The project focuses on preparing outputs related to the new national adaptation strategy, capacity building, and public communication on climate change adaptation.
The revision of the NAS in 2025 considers the following:

- Maintaining the key principles of the 2018 NAS and prioritizing a proactive approach in line with the adaptation policy cycle.
- Developing a longer-term vision that extends beyond the current timeframe (2030).
- Aligning with current and upcoming EU policies and strategies to ensure coherence and synergy in adaptation efforts.
- Recognizing and consolidating existing and upcoming national policy documents on climate change adaptation developed by various ministries and external stakeholders (e.g., OECD, ICPDR) to ensure comprehensive coverage of all adaptation efforts.
- Identifying and leveraging synergies between national and subnational adaptation measures and sectoral policy objectives, clarifying the extent to which these goals and measures are interconnected.
- Improving communication in the preparation of policy documents to ensure that policies complement each other rather than merely referencing one another.
- Providing guidelines for sub-national adaptation strategies based on insights learned from analyzing key gaps in current strategies.
- Intensifying efforts to raise public awareness and expand knowledge about adaptation.
- Addressing the absence of complementary sectoral plans for sectors like tourism and finance.

Until the new NAS is developed, the same strategic documents as in 2022 remain in effect.

- Greener Slovakia – ENVIRONMENTAL POLICY STRATEGY OF SLOVAK REPUBLIC UNTIL 2030 (Envirostrategy 2030) and its Implementation Plan.

The document was approved by the Government of the Slovak Republic in February 2019. It defined the vision of a healthy environment and a sustainable economy in the Slovak Republic. Moving towards this vision is set through objectives, sub-objectives and framework actions
Implementation Plan for Envirostrategy 2030
Implementation Plan for Envirostrategy 2030 was adopted, defining more detailed steps and indicators for assessing the implementation of the measures.
An update of the Envirostrategy is expected by the end of 2025.

- Climate Change Adaptation Strategy of the Slovak Republic – Update 2018 (NAS)

The revised NAS was approved by the Government in October 2018. The aim of the NAS is to meet the requirements of the Paris Agreement, to improve the readiness of the Slovak Republic to adequately address the adverse impacts of climate change, to provide information on ongoing and future adaptation processes, to create an institutional framework and coordination

mechanism for the implementation of adaptation measures at all levels and priority sectors, and to raise awareness of adaptation to climate change.
The NAS defines six sub-objectives and framework actions on adaptation that contribute directly or indirectly to the fulfilment of its main objective. It assesses the impacts of climate change on selected areas of the economy and the environment and proposes adaptation measures. It summarises the possibilities of financing adaptation measures in the conditions of the Slovak Republic. The Government Resolution of the Slovak Republic No. 478/2018 imposes the task of submitting an update of the National Adaptation Strategy to the Government of the Slovak Republic for discussion by 31 December 2025, taking into account the latest scientific knowledge in the field of climate change.

- Action plan for the implementation of the Slovak Republic Climate Change Adaptation Strategy (NAP)

The NAP was approved by the Government of the Slovak Republic in August 2021. It is intended to contribute to a better translation of adaptation measures into the sectoral policies of the ministries concerned. It also contains a proposal for a vulnerability monitoring system, a proposal for a system of mid-term evaluation of the adaptation process in Slovakia, including tracking the links between costs and benefits. It identifies approaches that help adaptation to ongoing or expected changes, increasing the resilience of systems. At its core are 7 specific areas such as water conservation, management and use, sustainable agriculture, adapted forestry, natural environment and biodiversity, health and healthy populations, adapted human settlements, and technical, economic and social measures. It identifies 45 specific measures and 169 tasks within them for the period of validity of the document until 2027.

- Law on climate change

The first ever law on climate change and low-carbon transformation was being prepared. The law will also address the issue of adaptation in the relevant sections. The draft law was prepared in 2022, but the legislative process has not been completed.

Selection of actions and (programmes of) measures (2)

Title of the measure or action

Programme Slovakia

Key Type Measure (KTM)

A: Governance and Institutional

sub-KTM

A1: Policy instruments

Specification

-

Short description of the measure or action

The amount of financial resources earmarked for adaptation is EUR 360 million.
Actions examples:

- Water retention measures for adaptation to climate change in settlements and landscapes and/or flood protection
- Supporting the prevention and management of landslide risks associated with excessive rainfall
- Preventive measures for flood protection linked to a watercourse
- Developing a conceptual basis for the implementation of adaptation measures at national, regional and local level

Climate threat

Sectors affected

Status

-

Administrative level the measure is implemented

National

If 'other', please explain

-

The cost of implementing the measure

EUR 56 million

Weblink

https://www.eurofondy.gov.sk/program-slovensko/index.html

Title of the measure or action

Recovery and Resilience Plan of the Slovak Republic

Key Type Measure (KTM)

A: Governance and Institutional

sub-KTM

A1: Policy instruments

Specification

Creation / revision of policies

Short description of the measure or action

The main objective of the Slovak Recovery and Resilience Plan is to transform Slovakia into a modern state with an innovative economy, which will also be a healthy and green country. It is divided into five key areas:

- Better education for everyone
- Competitive and innovative Slovakia
- Green Slovakia
- Healthy living for everyone
- Efficient state and digitalisation.

The Green Slovakia area includes a Climate Change Adaptation component.
The approval process was completed on 13.7.2021.

Climate threat

Sectors affected

Status

being implemented

Administrative level the measure is implemented

-

If 'other', please explain

-

The cost of implementing the measure

EUR 9,5 mil.

Weblink

https://www.planobnovy.sk/realizacia/

Overview of efforts to integrate climate change adaptation into sectoral policies, plans and programs, including disaster risk management strategies and action plans

A fundamental principle in developing strategies and policies across all economic sectors is that the first step begins with an analysis and subsequent implementation of the requirements of existing cross-cutting strategic, political, and planning documents at both national and international levels. This approach ensures that the objectives and measures within these strategies align, complement, and support one another. It also guarantees that the goals and measures defined in the national adaptation strategy are effectively integrated into the relevant sectoral policies.
The objectives of the NAS are most closely linked to the goals and measures of policies in sectors most severely impacted by climate change, such as agriculture, forestry, water management, healthcare, disaster risk management, urban and spatial planning, tourism, and others.
NAS2018 also served as a key non-legislative basis for the National Strategy for Managing Security Threat Risks, adopted in Slovakia in 2022. The vision of this strategy is to consolidate the civil protection and crisis management system as a framework for an integrated approach to risk management and multisectoral cooperation. It prioritizes the protection of human life and health, property, the environment, natural heritage, and societal values, highlighting the urgent need for societal adaptation to climate change's adverse effects.
Whether a given strategic document takes climate change impacts into account is also assessed during the evaluation process of the document as part of the strategic environmental impact assessmen.
In 2023, Slovakia adopted the Action Plan for the National Strategy for Risk Management of Security Threats of the Slovak Republic until 2025. The aim of the Action Plan is to establish a set of tasks and activities that are feasible within the specified period, as well as tasks that need to be implemented by 2030. The funding for these tasks will be secured primarily from EU sources, in addition to the state budget. These sources include the Recovery Plan, the Internal Security Fund (ISF), programs under DG ECHO, DG HOME, Horizon Europe, DG CLIMA, Operational Programs of European Territorial Cooperation, and the Slovakia 2021–2027 Program, Priority: 2P2. Environment, Specific Objective: RSO2.4. Supporting climate change adaptation, disaster

risk prevention, and resilience, considering ecosystem-based approaches (ERDF), among others. The activities in three out of the four areas defined in the strategic plan are linked to NAP2021.
In the forestry sector, adaptation measures for forests threatened by climate change are included in the Action Plan of the National Forestry Program of the Slovak Republic for the period 2025–2030, titled "Forests for Society" (NLP), which was approved by the Government of the Slovak Republic in December 2024. The NLP Action Plan translates 17 strategic and 31 specific objectives into concrete measures.
Like the NLP itself, its Action Plan was developed by the National Forestry Center in Zvolen through a broad participatory process, with the support of PDCS, a non-governmental organization specializing in education and communication. PDCS facilitated collaboration among various groups and institutions in the preparation of these strategic documents.
Strategic Objective I of the NLP focuses on adapting forests threatened by climate change. It is reflected in three specific objectives and eight measures.
In the water management sector, the integration and implementation of NAS measures are supported by the Flood Risk Management Plan for the Sub-basins of the Slovak Republic – 2021 Update, which was approved in January 2025. The plan proposes the implementation of flood prevention measures, including both nature-based "green" measures and technical "gray" measures.
These measures include: Actions in forests, agricultural land, and urban areas that enhance the retention capacity of catchments, promote natural water accumulation in suitable locations, and slow down water runoff; Measures that reduce peak flood flows, such as reservoirs, weirs, and flood detention basins; Measures that protect areas from flooding caused by watercourses, including river regulation, protective dikes, and flood barriers; Measures that safeguard areas from flooding due to internal waters, such as drainage canal systems and pumping stations.
The plan also focuses on identifying and utilizing areas suitable for natural or artificial flood wave transformation. An essential part of designing and preparing preventive measures against extreme weather events and subsequent natural disasters was the assessment of projected climate change developments in the coming years. To support this planning, studies were conducted to forecast short-term rainfall intensity, estimate its recurrence probabilities, and assess the impact of climate change on projected 100-year flood flows, using data from the Copernicus Climate Change Service.

Overview of measures in adaptation policy at the national level to engage with stakeholders particularly vulnerable to climate change impacts

During the preparation of NAP2018, a participatory process was applied to define priority adaptation measures and tasks. More than 200 experts from various fields, including central state administration bodies dealing with adaptation issues, participated, and the process was conducted using expert decision-making techniques. As part of the strategic environmental

assessment process, the public was also able to engage in the work.
In the autumn of 2023, the project Revision and Update of the National Strategy on Adaptation to Climate Change in Slovakia was launched. The aim of the project is to prepare analyses for the new national adaptation strategy, support communication, and build capacity. During the phase of climate risk and vulnerability assessment, it was necessary to gather insights from experts and stakeholders. Therefore, in June 2024, 15 meetings were organized to discuss the impacts on selected sectors and areas, such as forestry, energy, and human health. These discussions contributed to the analysis of climate risks, the identification of key risks, and the development of strategic guidance proposals. The draft was discussed in a workshop in September 2024, and in its revised form, it will serve as an important input for the new adaptation strategy.
A crucial foundation of the entire assessment was cooperation with experts from the Slovak Hydrometeorological Institute (SHMÚ), who prepared climate scenarios for the near (up to 2050) and distant future (2071–2100).
Both the current NAS and NAP support activities aimed at raising awareness among stakeholders and the public about the expected negative impacts of climate change and the potential adaptation measures in Slovakia.
In October 2024, within the framework of the Clim4Cast (Interreg CE) project, an expert consultation was held with practitioners on the topic of wildfire risk management in Slovakia. A new wildfire risk index (FWI) was introduced, designed to better reflect on-the-ground conditions and extend the fire risk forecast from the current 2 to 10 days.
Since 2024, the Scientific and Technical Information Center of the Slovak Republic has been organizing a series of online events called the Climate Change Adaptation Mission Forum. The goal of these events is to bring together experts, policymakers, and stakeholders for discussions and collaboration. The events presented EU partnership opportunities and their contributions to the Adaptation to Climate Change Mission, examples of best practices highlighting key technologies in EU partnerships, an evaluation of Slovak involvement in the Horizon Europe missions, and experiences and challenges encountered.
A best practice example is the DELIVER project: Developing resilient, low-carbon, and more livable urban residential areas, which aims to increase the resilience of neighborhoods to the impacts of climate change through a balanced range of adaptation and mitigation measures. The Bratislava-Karlova Ves district, together with its partners, carried out several activities from June 2018 to December 2023 that have inspired numerous municipalities in Slovakia and abroad. By implementing these measures, they contributed to reducing the district's carbon footprint, improving the quality of life for residents through green measures and biodiversity support, and, through deep renovations of two public buildings, reducing the financial costs of managing and maintaining municipal property.
Another example of good practice is the KLIMASKEN project, a tool for assessing cities, city districts, and buildings in terms of their contribution to climate change and adaptation. The tool is made up of several dozen indicators that the user fills with the required data, from which the main index and its subcomponents are calculated through simple computations. The results are already helping some cities in Slovakia and the Czech Republic. The project results also allow the city’s climate readiness to be communicated to the public in an understandable way through the

so-called climate label. In 2023, the Union of Towns of Slovakia, in cooperation with expert partners and the member city of Veľký Krtíš, conducted a pilot project of KLIMASKEN for Veľký Krtíš.
In 2024, the new Green Portal Zelené.Michalovce.SK was launched. The portal provides information and education on how to combat the climate crisis. Its primary goal, however, is to engage residents in the decision-making process in the city. The public is also informed about completed projects, including revitalized green public spaces, promoted electromobility and photovoltaics, and newly constructed cycling paths. The Green Portal is funded by EU resources under the Interreg Slovakia-Hungary cross-border cooperation project Green Water (HUSK/2302/1.2/033).
Each year, numerous projects are also implemented to raise environmental awareness about adaptation through educational and informational activities, school programs, campaigns, and more.

Overview of measures in adaptation policy at the national level to engage with the private sector

In accordance with the National Adaptation Strategy (NAS) and National Adaptation Plan (NAP), entrepreneurs within their respective business sectors, particularly in agriculture, food processing, forestry, water management, and industrial production, are required to adapt their activities to sound economic practices with regard to climate change and the sustainable use of natural resources, in line with applicable legislation and established best practices (e.g., water resource protection, land management, cultivation of appropriate crops, storage of pollutants, efficient wastewater discharge, and the use of wastewater).
In the private sector, the selection and prioritization of adaptation measures is the direct responsibility of businesses. The state and public authorities are expected to continuously provide all available, up-to-date, and objective information in this area. Given the intensity, frequency, scope, and negative impacts of extreme weather events in recent years, climate change adaptation has become an integral part of the analysis and decision-making process, particularly in the banking sector, especially regarding the provision of loans to businesses.
Both the NAS and NAP support the creation of formalized public-private partnerships for preparing and implementing adaptation measures at the regional and local levels.
The international project TRANSCEND responds to the socio-economic transformation in Slovakia related to the cessation of coal mining in 2023, which affects the private sector, as well as the uncertainty posed by climate change for future water resource management. The project's aim is to identify and accelerate the adoption of transformational adaptation policies (TAPs) to address water scarcity, policies that are robust and adaptable to future uncertainties. The proposed models and TAPs will be implemented in seven pilot areas—so-called living labs. These are river basins facing increasing water scarcity in European countries (including Slovakia), South America, and India. In Slovakia, the living lab is situated in the Nitra River basin, which has a long history of coal mining, resulting in environmental consequences and impacts on the

region's hydrological regime. In 2025, Slovakia will host the second national stakeholder workshop, where the prototype of a hydrological model for the Nitra River basin will be presented. Stakeholders will have the opportunity to provide feedback, identify their needs, and propose initial measures and TAPs.

Monitoring and evaluation

Monitoring, reporting and evaluation of adaptation actions and processes

Monitoring, reporting and evaluation (MRE) methodology related to reducing climate impacts, vulnerabilities, risks, and increasing adaptive capacity

The following 10 methodological guidelines have been prepared in the framework of the project Methodology for the assessment of investment risks associated with the adverse effects of climate change in 2023.

1. Methodological guidance for the development of a Climate Change Adaptation Strategy/Action Plan, including an assessment of climate resilience at the local and regional level
2. Methodological guidelines for business climate resilience assessments based on climate vulnerability assessments of economic sectors
3. Methodological guidance to support the deployment of green infrastructure solutions: analysis of barriers, support for the implementation of good practice and recommendations for public policies
4. Development of methodological procedures for obtaining, collecting and evaluating data and information in the field of climate change adaptation in order to fulfil reporting obligations at national and European level
5. Methodological guidance for assessing climate vulnerability and climate resilience of new investments and projects and integration into the EIA/SEA process
6. Methodology for assessing and taking into account the risks associated with the adverse effects of climate change in the preparation of spatial planning documentation at regional and local level
7. Methodology of prioritization of brownfield sites for their effective revitalization through future land use scenarios
8. Assessment of the risk and vulnerability of industrial sites and environmental burdens in terms of their preparedness and security against risks related to the adverse effects of climate change
9. Methodology for considering and assessing landscape/ecosystem/biodiversity value
10. Methodological guide "Risk and vulnerability assessments of linear structures and pipelines in terms of their preparedness and security against risks related to the adverse effects of climate change".

A sector-specific methodology for reducing climate change impacts, vulnerability and risks to major infrastructure plans and projects has been adopted by the Ministry of Transport of the Slovak Republic (Climate Change Assessment – Developing a Methodology and Embedding Climate Change Impact Assessment of Infrastructure Plans/Projects into Existing National Level Processes (2018).

MRE methodology related to the implementation of adaptation actions

The approved NAP defines the principles of monitoring and implementation of individual adaptation measures/tasks. For each task, an indicator(s) is/are assigned and evaluated on an ongoing basis. At the same time, on the basis of the evaluation of these indicators and on the basis of the assessment of the situation in the given area, the situation in the implementation of the strategic priorities and specific objectives is qualitatively assessed. Individual tasks are evaluated, in accordance with set deadlines for their implementation, on an annual basis through the Adaptation Working Group, whose members are nominated representatives of individual ministries and other CSOs, other public administration organizations, academia, NGOs, or other interested groups. Reporting of adaptation measures at EU and national level is planned under this regulation (Government Resolution 478/2018, No. 476/2021). At the national level, Information on the progress achieved in the implementation of adaptation measures in the Slovak Republic by 28 February 2023 has been submitted to the Government of the Slovak Republic. Information on the progress made in meeting the short-term objectives of the NAP has been submitted to the Government of the Slovak Republic in 21 June 2024, as stipulated in Government Resolution of the Slovak Republic No. 476/2021.

State of play of the implementation of measures planned under 'Strategies and Plans' and the disbursement of funding to increase climate resilience

The Ministry of Environment of the Slovak Republic (MŽP SR) contacts the authorities responsible for implementing adaptation measures under the National Adaptation Strategy (NAS) every year and coordinates the assessment of the implementation of tasks under the National Adaptation Plan (NAP).
In 2024, the Climate Change Adaptation web platform (https://www.klima-adapt.sk/) was designed and launched to provide information on climate change adaptation for both the general and professional public. The platform focuses on national, regional, and local levels, with the potential to expand its content in the future and become part of the planned information system for climate-related data.
National legislation was addressed to adjust the conditions for supporting measures under the Strategic Plan of the Common Agricultural Policy 2023–2027 (SP CAP). This includes a proposed amendment to the Act on the Protection and Use of Agricultural Land, which strengthens legal protection for the most fertile agricultural soils with the highest water retention potential by introducing their comprehensive protection.
Under the CAP agroforestry systems were supported (e.g., through Interventions 73.01 “Establishment of an Agroforestry System” and 70.01 “Protection and Maintenance of Trees within an Established Agroforestry System”). Research projects were also implemented, such as TRANSAGROLES—a project focused on transforming tree-covered non-forest land into productive agroforestry systems.

Forest management programs are continuously being implemented to meet NAP requirements, particularly under Specific Measure 2.1 of the action plan, which aims to enhance flood protection for the safety of residents, critical infrastructure, and landscapes.
As part of the Slovakia Programme, calls for projects were announced to support biodiversity and ecosystem services through the maintenance and development of green and blue infrastructure, as well as the implementation of water retention measures for climate change adaptation in settlements and landscapes and/or flood protection.
A Methodological Guide on Adaptive Drainage Channel Management was developed, providing guidelines for applying sustainable and climate-smart management practices to drainage channels, considering the projected impacts of climate change. The guide outlines measures that utilize drainage channels to slow water runoff and enhance soil water retention.
In the field of public administration education and awareness-raising, a large number of events were organized, including public engagement activities, school programs, competitions, an environmental education fair, the “KlimaTyzuj sa” educational campaign, and information portals focused on climate change adaptation.
During the assessed period (2023–2024), the disbursement of funds from various operational programs continued—primarily in relation to adaptation through the Operational Programme Quality of the Environment, the Integrated Regional Operational Programme, and the Common Agricultural Policy. At the same time, new financial mechanisms were introduced. Currently, adaptation measures are primarily funded through European Union funds, with a focus on the Slovakia Programme, the SP CAP, and cross-border cooperation programs. Additional resources, particularly for urban adaptation, have been provided by the Recovery and Resilience Plan of the Slovak Republic. Programs such as LIFE, as well as grants from the EEA and Norway, also play a crucial role. In terms of national funding, significant sources include the Environmental Fund, the state budget, and municipal budgets. Complementary funding sources consist of science and research funds, such as the VEGA and APVV schemes, as well as private financial contributions from business entities.

State of play of the implementation of measures planned under 'Strategies and Plans': spending earmarked for climate adaptation including in disaster risk management

Finance allocated for climate change adaptation activities:
Operational Programme Quality of the Environment 2014–2020 (as of 12/2024)

- Activities: Enhancing biodiversity, reducing flood risks and impacts, eliminating environmental hazards, efficient emergency management
- Expenditure: €490 million

Environmental Fund (EF) (2023–2024)

- Activities: Use of renewable and low-emission energy sources, green infrastructure in urban areas, water retention measures, protection of ecosystems and habitats, environmental education and awareness

- Expenditure: €8.1 million

LIFE Programme 2014–2020 and 2021–2027 (as of 12/2024)

- Activities: Climate change mitigation and adaptation
- Contracted contributions from EU funds and the state budget for Slovak beneficiaries: €7.1 million

SK-Climate Programme / EEA and Norway Grants (as of 12/2024)

- Activities: Climate change mitigation and vulnerability reduction
- Expenditure: €18.2 million

Integrated Regional Operational Programme (IROP) (as of 12/2024)

- Activities: Green infrastructure and adaptation of urban environments
- Expenditure: €93.6 million

Slovakia Programme (as of 12/2024)

- Activities: Disaster risk management, sustainable water management, nature protection
- Expenditure: €55.9 million

Strategic Plan of the Common Agricultural Policy (2023–2027) (2023–2024 period)

- Activities: Adaptation measures related to climate change adaptation in agriculture and improving forest health
- Expenditure: €631.9 million

To the extent possible, state of play of the implementation of measures planned under 'Strategies and Plans': the share of spending used to support climate adaptation in each sector

Based on the financial sources mentioned above, along with co-financing from the state budget, the approximate allocation to selected sectors is as follows:

- Agriculture and Forestry: By 2024, within the Strategic Plan of the Common Agricultural Policy (2023–2027) measures under Specific Objective 4 (SO 4: Contribute to climate change mitigation and adaptation, including reducing greenhouse gas emissions and increasing carbon sequestration, as well as supporting sustainable energy), addressing needs 4.1 to 4.7 were financed with €291 million. Additionally, €341 million was allocated under Specific Objective 6 (SO 6: Contribute to halting and reversing biodiversity loss, improving ecosystem services, and preserving habitats and landscapes), covering needs 6.1 to 6.4.
- Urban and Rural Development: By 2024, €75 million was spent under the Integrated Regional Operational Programme (IROP) for Specific Objective 4.3.1 (SO 4.3.1: Improving environmental aspects in cities and urban areas by developing green infrastructure, adapting urbanized environments to climate change, and implementing systemic measures to reduce air pollution and noise). Additionally, €19 million was provided under Specific Objective 7.3 (SO 7.3: Improving environmental aspects in cities and urban areas). The Environmental Fund provided €3.6 million in grants in 2023 and 2024 for green infrastructure, urban and rural landscape management, green roofs, urban greenery, and environmental education.

- Biodiversity: By December 2024, €116 million was spent from the Operational Programme Quality of the Environment (OP QoE) to strengthen biodiversity. The Environmental Fund provided €3.4 million in grants in 2023 and 2024 for species protection, achieving a favorable conservation status of habitats, managing protected areas, and raising awareness. Additionally, €8.6 million was allocated under the Slovakia Programme for Specific Objective RSO 2.7 (Strengthening nature protection, biodiversity conservation, and green infrastructure, including in urban areas, and reducing all forms of pollution).
- Water Management: By December 2024, €129 million was spent from OP QoE to reduce flood risks. The Environmental Fund provided approximately €0.4 million in grants in 2023 and 2024 for water retention measures in landscapes and settlements. Additionally, €44.4 million was provided under the Slovakia Programme for Specific Objective RSO 2.5 (Supporting access to water and sustainable water management).
- Civil Protection and Emergency Management: By December 2024, approximately €244 million was spent from the OP QoE on managing climate change-related emergencies and enhancing the effectiveness of adaptation measures. Additionally, around €3 million was allocated under the Slovakia Programme for Specific Objective RSO 2.4 (Supporting climate change adaptation, disaster risk prevention, and resilience, considering ecosystem-based approaches).

Progress towards reducing climate impacts, vulnerabilities and risks

The SHMÚ project "Development of comprehensive (2030/2050) climate change scenarios with a focus on the vulnerability of selected sectors in relation to adaptation measures" has started in 2022 and aims to improve the linkage of climate change scenarios with the development of policies and strategies in selected sectors at the national to local level, and also to provide a basis for future risk management. Scenario analysis within the project will focus on scenarios that integrate climate change into the broader context of environmental change. Climate resilient development pathways will then generalise the concept of adaptation processes and focus on future development models that make societies more resilient to climate change.

Progress towards increasing adaptive capacity

However, there is no comprehensive and up-to-date assessment of vulnerability and risks due to climate change in the territory of the Slovak Republic. Building on the SHMÚ project and in the context of the preparation of the new NAS, the MoE is also focusing on climate change vulnerability and risk assessment as part of the TSI "flagship" project on climate change adaptation, which provides the basis for planning, implementation, monitoring and evaluation of climate change adaptation. The Report on the Climate Risk and Vulnerability Assessment Slovakia as part of the project Revision and update of the national strategy on adaptation to climate change in Cyprus and Slovakia funded by the European Union via the Technical Support Instrument, managed by the European Commission Directorate-General for Structural Reform Support has been delivered to MoE in February 2025, under the EC Contract No

REFORM/2021/OP/0006 Lot 1 - TSIC-RoC-20036. Increasing adaptive capacity
The issue of adaptation to climate change is part of several strategic documents adopted in the Slovak Republic. Adaptation measures are also becoming part of the implementation documents of other ministries and organisations. In the context of climate change adaptation, projects that increase adaptive capacity are supported through various financial mechanisms.
At present, the Slovak Republic lacks an information system that would comprehensively assess how measures and implemented projects contribute to increasing adaptive capacity. Progress in this area should be brought by the implementation of methodological procedures for obtaining, collecting and evaluating data and information in the field of climate change adaptation for the purpose of fulfilling reporting obligations at the national and European level, which will propose a mechanism for cooperation between the relevant responsible ministries, a proposal for the creation of a functional network of cooperating institutions and the professional strengthening of the provision of information support. Setting up cooperation with local authorities in order to systematically obtain information on activities implemented at the local government level (level of policies, plans, implementation of specific measures). The new web platform for adaptation to climate change Klima-adapt https://www.klima-adapt.sk/ has been established by Slovak environmental agency in 2024 and is still being worked on.

Progress towards meeting adaptation priorities

At the core of the NAP are 7 specific areas: water protection, management and use, sustainable agriculture, adapted forestry, natural environment and biodiversity, health and healthy populations, the built environment, and technical, economic and social measures. Progress on priorities by area has been made as follows:
1. In the field of water protection - Resolution of the Gov. approved the Water Policy Concept until 2030 with a view to 2050 and Water Plan of Slovakia for the years 2022 – 2027
2. In the field of sustainable agriculture - Resolution of the Gov. approved the Strategic Plan of the Common Agricultural Policy for 2023-2027 (CAP). It is the basic programming document of the EU's Common Agricultural Policy to support the sustainable development of agriculture, food, forestry and rural areas.
3. In the field of adapted forest management -Resolution of the Gov. approved the National Forestry Programme for 2025 – 2030 „Forests for Society“. In the context of respecting the verified knowledge in the field of adaptation of forests to climate change
4. In the field of natural environment and biodiversity - Currently, the Ministry of Environment of the Slovak Republic is working on the update of the Biodiversity Conservation Strategy 2030.
Update of the Slovak Wetland Care Programme until 2024 and the Wetland Action Plan for 2019-2021: The Slovak Wetlands Management Programme is the basic strategic document for the implementation of the Ramsar Convention obligations and is primarily based on the Ramsar Strategic Plan.
5. In the area of health and healthy populations - Gov. Resolution approved the National

Environment and Human Health Action Plan V (NEHAP V).

6. In the field of the built environment - the new Act No. 200/2022 Coll. on spatial planning, as amended, remembers the protected interests of the state in the process of creating spatial planning documentation. A new feature is that the landscape plan, the flood risk map or the principles of protection of conservation areas will also become binding for the creation of spatial plans.

The new Construction Act No. 201/2022 Coll. on Construction, as amended, provides for the participation of the affected public if the construction project also concerns a protected part of nature. It also facilitates the permitting and implementation of water retention measures. The process of removing black buildings is simplified.

7. In the field of technical, economic and social measures - the importance of the insurance sector's role in protecting against climate and environmental risks is underlined by the new EU Climate Change Adaptation Strategy, which also implies the need to involve the insurance sector in the collection of data on climate change claims. This issue was reflected in the NAP and in 2022 the first discussions of the Ministry of the Environment of the Slovak Republic with the Slovak Association of Insurance Companies and the National Bank of Slovakia started.

Progress towards addressing barriers to adaptation

The NAP details the steps needed to achieve the objectives set out in the NAS. It defines procedures for solving existing problems and obstacles to adaptation in the conditions of the Slovak Republic.

One of the problems in the area of adaptation is the cross-cutting nature of most of the proposed measures. There are problems related to the competences of ministries and also to the division of competences between state and local government. The desired state of play is to be able to improve systemic approaches to adaptation at least in the following areas:

- Improving the implementation of adaptation policies and legislation and better enforcement, increasing competences and strengthening control and sanction mechanisms.
- Increased transparency, public participation in the preparation and implementation of specific projects
- An efficient and functional system for the collection, processing and dissemination of data and information
- Better educating, informing and raising public awareness of climate change adaptation issues and adaptation needs
- A functioning system of multi-source funding for climate change adaptation projects.

A systematic approach to increasing the adaptive capacity of the Slovak Republic is based on the principle of transparency. The impacts of climate change and the measures implemented and planned should be widely communicated to the public. The public must have a voice in the decision-making process and be part of the solution. Approaches and solutions should be based

on expert analysis of data and information.
Approaches to implementing measures and tasks should be based on a symbiosis between addressing economic, social and environmental challenges. Adaptation measures require investment and create jobs, reduce energy costs, affect public health and improve quality of life.
The principle of complementarity in the climate change adaptation process means that information, expertise and financial resources are brought together to produce a common effect.
The principle of "efficiency and effectiveness" says that it is necessary to consider how much money will be spent on a given measure (especially "cheap" solutions). The measures also aim to assess whether the measure will be effective enough to help reduce the risk from climate change.
The principle of "new issues require new approaches", based on the phenomenon of climate change and its impact on social, economic and environmental systems, especially in the residential environment (but not only there), will require innovative approaches, a combination of resources and the testing of alternatives.
The implementation of actions and tasks should support the principle of "partnership". This means involving stakeholders such as government organisations, academia, civil society and the private sector.

Steps taken to review and update vulnerability and risk assessments

The review and updating of vulnerability and risk assessments are dictated by resolutions passed when specific documents are adopted. Specific steps are described elsewhere in this report.

Steps taken to review and update national adaptation policies, strategies, plans, and measures

The revision and updating of national adaptation policies, strategies, plans and measures are determined by the resolutions adopted when these specific documents are adopted. Specific steps are described elsewhere in this report. An evaluation of progress achieved by the NAS implementation had been carried out and submitted as an agenda item of a Government meeting, which was held on 15 March 2023 and during which the Government adopted the Resolution no. 110/2023. It states that the main barriers to a successful implementation are financial resources and low awareness; in addition, the document highlights a need for inter-ministerial cooperation, especially for climate adaptation mainstreaming in sectoral policies and plans. Subsequently, Information on the progress made in meeting the short-term objectives of the NAP has been submitted to the Government of the Slovak Republic in 21 June 2024, as stipulated in Government Resolution of the Slovak Republic No. 476/2021. Besides these, it is important to underline that the Resolution of the Government no. 478/2018 states that the new strategy shall be based on the latest scientific evidence. Within this context, it is necessary to stress that Slovakia needs a comprehensive and up-to-date climate risks and vulnerability assessment to be able to fulfil the Resolution no. 110/2023.

Cooperation and experience

Cooperation, good practices, synergies, experience and lessons learned in the field of adaptation

Good practices and lessons learnt (3)

Area of good practices

disaster risk reduction and management, innovative adaptation solutions and innovative financing mechanisms

Good practices and lessons learnt

Green Economy Information Platform – enables the presentation and sharing of solutions in the areas of climate change adaptation, energy efficiency and sustainable use of resources, waste management, water management, green buildings and housing, etc. It is intended for businesses, municipalities, NGOs and the public. The platform provides general information, a database of companies and their environmental solutions in line with the principles of the green economy.

Area of good practices

disaster risk reduction and management, innovative adaptation solutions and innovative financing mechanisms

Good practices and lessons learnt

Carpathian Development Institute – is an independent non-governmental organization that seeks to support and promote a systemic approach to innovative and sustainable development of regions and municipalities, especially projects related to climate change adaptation. The Institute has collaborated/co-operated with a number of municipalities in the preparation of local climate plans.

Area of good practices

integration of indigenous, traditional and local knowledge into climate adaptation

Good practices and lessons learnt

The "Enviromesto" competition, organized by the Ministry of the Environment, annually rewards active municipalities. One of the categories assessed is adaptation to the adverse effects of climate change.

Synergies of adaptation actions with other international frameworks and/or conventions

The adaptation measures defined by the NAS and the NAP have been drawn up taking into account the frameworks set out in a number of international documents, including the UNFCCC, the Paris Agreement, the 2030 Agenda for Sustainable Development, the Sendai Framework for Disaster Risk Reduction 2015-2030, and the EU Strategy for Adaptation to Climate Change (2013).
The NAS also takes into account the recommendations of the Intergovernmental Panel on Climate Change.
Slovakia has adopted the "Draft Vision and Strategy for the Development of Slovakia until 2030 – Long-term Strategy for the Sustainable Development of the Slovak Republic – Slovakia 2030" (2021). It fulfils the role of the National Strategy for Regional Development of the Slovak Republic. Its content is in line with Slovakia's international commitments in the field of sustainable development and with the European Green Deal.
The objectives of the Sendai Framework for Disaster Risk Reduction 2015 – 2030 have been reflected in the National Strategy for Disaster Risk Management of the Slovak Republic (2016), the National Strategy for Security Threat Risk Management of the Slovak Republic (2022) and the Action Plan of National Strategy for Security Threat Risk Management of the Slovak Republic until 2025 (2023).
The Slovak Republic is a member of various international initiatives on climate change adaptation and is involved in the Danube Strategy and the Carpathian Convention. Transnational cooperation is currently underway between the European countries that share the Danube River to tackle flood risks, prepare flood management plans and build flood defences. In 2014, the Strategic Programme for Climate Change Adaptation in the Carpathian Region was adopted, which is mainly implemented through the activities of the Climate Change Adaptation Working Group of the Convention. In October 2017, a new Article 12 on climate change was adopted.

Cooperation with Union Member States, international cooperation, and with regional and international organisations to share information and to strengthen science, institutions and adaptation knowledge

An example of LIFE projects is the LIFE17 project GIC/CZ/000107 "Green Infrastructure Minimising the Urban Heat Island Effect". The main objective is to reduce adverse climate impacts – in particular the urban heat island effect – in European cities by increasing the efficiency and effectiveness of planning and decision-making processes related to the use of green infrastructure. The Slovak partner of the project is the Carpathian Development Institute.
Through the Danube Transnational Programme INTERREG, the Slovak Republic participates in the project "Enhanced Cooperation on Flood Forecasting in the Danube River Basin" (DAREFFORT). The aim of the project is to create a standardised international platform for the exchange of hydro-meteorological data that will help to improve the quality and efficiency of forecasting systems in individual countries. An important element of the project design is the principle of solidarity and exchange of experience. The project partners are the Slovak Hydrometeorological Institute and the Slovak Water Management Company.
Another INTERREG project "Central European Alliance for Increasing Climate Change Resilience to Combined Consequences of Drought, Heatwave, and Fire Weather through Regionally-Tuned Forecasting" (Clim4Cast) establishes a new weather forecast tool, which will be integrated into existing national monitoring platforms of seven countries. Concrete action plans to set up regional response mechanisms are also developed. The project partner is the Slovak Hydrometeorological Institute.

Cooperation with Union Member States, international cooperation, and with regional and international organisations to enhance adaptation action at national, macro-regional and international level

An example of cooperation is the LIFE17 CCA/SK/000126 project "Developing a resilient, low-carbon and more liveable urban residential area". The main objective is to balance adaptation and mitigation efforts in residential zones consisting of predominantly prefabricated buildings in order to increase their resilience to climate change, reducing their carbon footprint. Slovak coordinating beneficiary: Bratislava – Karlova Ves. The associated beneficiaries of the project are: Regional Association for Nature Conservation and Sustainable Development CI2, o.p.s (CZ); Passive House Institute (SK); Carpathian Development Institute (SK) and Bratislava Regional Conservation Association (SK).
In the framework of the INTERREG Central Europe Financial Mechanism, Slovakia participates in the project "Framework for improving water balance and nutrient balancing through the application of small-scale water retention measures". The project aims to raise public awareness of natural small-scale water retention measures and their benefits, and in particular to develop methods to assess the cumulative effect of these measures, to test them in pilot international river basins, and to provide tools and guidelines to facilitate public governance in strategy documents. The project partner is the Slovak Water Management Company.
Another example of a project from the INTERREG Central Europe Financial Mechanism is the DEEPWATER-CE project. Activities are focused on the possibilities of using managed

groundwater recharge. It is the retention of water in the ground, which allows its subsequent infiltration into the underground horizons. The project partner is the Research Institute of Water Management.

Slovakia has also joined the international project "Climate Resilient Cities and Infrastructures – RESIN". The project addressed the development of practical tools to support cities in designing and implementing climate change adaptation strategies in their local contexts. One of the outputs of the project was the "Vulnerability Atlas and Risk Assessment of Adverse Impacts of Climate Change on the Territory of the Capital City of the Slovak Republic, Bratislava". The Atlas provides a detailed assessment of the sensitivity and vulnerability of individual districts of Bratislava to selected climate change impacts, including the adverse impacts of extreme heat waves and intense torrential rainfall on the population, road infrastructure and buildings. The project was supported by the European Union's Horizon 2020 framework programme. The project partner was the Capital City of the Slovak Republic Bratislava. Several other Slovak organisations collaborated in the compilation of the atlas.

Sub-National Adaptation

LEGAL AND POLICY FRAMEWORKS AND INSTITUTIONAL ARRANGEMENTS

Overview of institutional arrangements and governance at the sub-national level

Legal requirements and strategic documents

The structure of the state environmental administration bodies is defined by Act No. 525/2003 Coll. on the state administration of environmental protection in the current wording.
Act No. 200/2022 Coll. on Spatial Planning stipulates in the spatial planning documentation at the level of regions, micro-regions, municipalities and zones the obligation to incorporate, among other things, protection against undesirable geological phenomena, floods, fires, environmental burdens, prevention of serious industrial accidents and limitation of their consequences on people's health, the environment and property, measures to mitigate climate change and to adapt to its adverse consequences.

Networks or other collaborations on adaptation across national authorities

Convention of Mayors for Climate and Energy (Covenant) and the National Platform.
The National Platform was established in 2011. CITENERGO is the initiator, founder and permanent coordinator of the National Platform. The Union of Towns of the SR (UMS) is a national supporter.
It has 40 signatories from among towns.
Representatives of the Association of Towns and Municipalities of Slovakia and the IMS are members of the Adaptation Working Group.
Within the Horizon Europe programme Mission: Adaptation to climate change, the Slovak signatories to the Mission Charter stands self-governing regions Banskobystrický, Košický, Žilinský and Trnavský and to the Friends of the Mission is Envirocentrum Banská Štiavnica.

Good practice examples of networks or other collaborations on adaptation across local and regional authorities

Cities and municipalities that are active in climate change adaptation include: Bratislava, Banská Bystrica, Košice, Trenčín, Trnava, Bardejov, Brezno, Gbely, Holíč, Hurbanovo, Ilava, Kremnica, Kežmarok, Leopoldov, Liptovský Mikuláš, Malacky, Martin, Modra, Moldava nad Bodvou, Nová Dubnica, Nové Zámky, Prešov, Prievidza, Púchov, Senica, Snina, Šaľa, Zlaté Moravce, Zvolen,

Želiezovce and Žilina.

ADAPTATION STRATEGIES, POLICIES, PLANS AND GOALS

Overview of the content of sub-national strategies, policies, plans and efforts

From the perspective of the legislative framework, adaptation to the adverse effects of climate change at the subnational level is supported by Act No. 200/2022 Coll. on Spatial Planning. The spatial planning authority, in order to achieve sustainable territorial development, aligns national, regional, municipal, and local interests through spatial organization and the functional use of neighboring areas. The law requires that spatial planning documentation at the regional, municipal, or zonal level should comprehensively define the urban and landscape concepts of the designated area, while reconciling the interests and activities that impact sustainable spatial development, including adaptation to the adverse effects of climate change.
In Slovakia, various adaptation plans and strategies are being implemented at subnational levels. From 2015 to May 2024, 17 cities (Zvolen, Trnava, Prešov, Nitra, Trenčín, Hlohovec, Prievidza, Snina, Košice, Žilina, Brezno, Banská Bystrica, Bratislava, Martin, Spišská Nová Ves, Bardejov, Šaľa) and three self-governing regions (Košice, Prešov, and Bratislava) had developed strategies or action programs for climate change adaptation. Analysis of the strategies/plans developed within the Ministry of the Environment of the Slovak Republic's project (Preparation of the New National Adaptation Strategy – TSI project) shows that the documents are prepared at varying levels of quality. Of the 20 strategies/plans assessed, 7 demonstrate overall comprehensiveness in addressing climate change impacts across all sectors, 4 show potential for improvement, and 9 strategies/plans would require further enhancement.
Despite the progress made in implementing adaptation plans, fragmentation of plans at the municipal level remains a general issue, indicating the need for better data collection and coordination.
From the detailed evaluation of regional and local strategies, the following points emerged:

- Geographical coverage – Three self-governing regions, all 8 regional capitals, and 9 other cities with populations over 20,000 have developed an adaptation strategy.
- Time horizont – Most of the analyzed adaptation strategies at subnational levels lack a clear time horizont for implementation.
- Budget and funding allocation – A significant challenge is the allocation of budgetary and financial resources for adaptation efforts at subnational levels.
- Spatial climate risks – While many sub-national adaptation strategies address relevant climate threats, some fall short in adequately assessing spatial climate risks.
- Sector-specific risk assessment – Sub-national adaptation strategies that assess risks within specific sectors are more prevalent, indicating a robust understanding of sectoral vulnerabilities in certain cities/regions.

- Multi-dimensional risk assessment – Eight of the reviewed strategies showed a multidimensional risk assessment. While many subnational strategies assess risks from various perspectives, some lack a holistic approach.
- Adaptation capacity assessment – The assessment of adaptation capacity varies across strategies, with most failing to evaluate the readiness of the city or region to react or prevent negative climate change effects from a process and institutional standpoint.
- Evaluation mechanism – Of the reviewed strategies, 5 include an evaluation mechanism for objectives.
- Methodological clarity – Methodological clarity remains a challenge, with around half of the strategies showing adequate methodological logic in presenting information.
- Applicability as a management tool – In terms of applicability as a management tool for city/region development, several strategies show high applicability.

In 2023, as part of the project "Methodologies for Assessing Investment Risks Associated with the Adverse Effects of Climate Change" (ITMS 2014+ code: 310021BSY), a methodology for assessing and considering risks related to the adverse effects of climate change in the preparation of spatial planning documentation at the regional and local levels was developed. Next year the methodology was tested on a pilot area in the city of Puchov. By the end of 2024, the Climate Change Adaptation Strategy for the city of Púchov was developed as a result of testing.

Stakeholder engagement

Overview of good practice examples from the sub-national levels to engage with stakeholders particularly vulnerable to climate change impacts

A similar participatory approach used in the development of NAP2018 is also applied in the development of adaptation strategies at the level of self-governing regions, and even at lower levels. Cooperation mainly takes place through working groups with the participation of relevant stakeholders, and standard procedures include involving the public in the process (e.g., public hearings and others).

From 2015 until May 2024, 17 cities in Slovakia (Zvolen, Trnava, Prešov, Nitra, Trenčín, Hlohovec, Prievidza, Snina, Košice, Žilina, Brezno, Banská Bystrica, Bratislava, Martin, Spišská Nová Ves, Bardejov, Šaľa) and three self-governing regions (Košice, Prešov, and Bratislava) had developed climate change adaptation strategies or action programs.

Overview of good practice examples from the sub-national levels to engage with the private sector

A similar participatory approach used in the development of NAP2018 is also applied in the development of adaptation strategies at the level of self-governing regions, and even at lower

levels. Cooperation with private sector representatives takes place mainly through working groups with the participation of relevant stakeholders.
City's actions have been intensified by implemented activities and projects. Some of the projects were funded by international grants, including EU funded projects.
Examples:

- the project ACC05P01 „CLIMA BEST – Better CLIMA based on the BEST experiences" - Bioclimatic Park Drienova (link: https://bioklimapark.com/) funded under the Norwegian Financial Mechanism Programme ACC Climate change mitigation and adaptation
- the project ACC05P03 „Living smart with climate change" (link: https://sccd-sk.org/projekty/zit-zodpovedne-so-zmenou-klimy-2/) funded under the Norwegian Financial Mechanism Programme ACC Climate change mitigation and adaptation

MONITORING AND EVALUATION OF ADAPTATION ACTIONS AND PROCESSES

State of play of the implementation of measures planned under sub-national strategies, policies, plans and efforts and stakeholder engagement

- Banská Bystrica Self-Governing Region
BBSK Economic and Social development program 2022 – 2030
In priority 2 - Green region for future generations, the topic of climate change is the subject of the main strategic goal: 2.1 To ensure effective protection and restoration of all components of the environment with an emphasis on mitigating climate change and increasing the region's resistance to its adverse effects, and further specific goals: 2.1. 6 Transform forest management closer to nature and society and increase the resistance of forests to the adverse effects of climate change. 2.1.11 Increase the region's resistance to the adverse effects of climate change.
Strategic document The concept of applying SMART principles in the development of public policies - the area of Resilience to climate change
A separate part of the document is devoted to the environment, sustainability and climate change resistance. According to this concept, adaptation to adverse manifestations and integration of adaptation policy into all sectoral policies and development projects is a key prerequisite for increasing the region's resilience to climate change.
Zelený kraj - Environmental policy strategy "Envirostrategy BBSK" (in preparation)
A separate part of the document will be devoted to the topic of adaptation to climate change and will be incorporated into all strategic areas as a cross-cutting topic. It details the national Green Slovakia strategy at the regional level.The plan is to develop a complex adaptation strategy for both the residential environment and the free landscape, consisting of a vulnerability study and the adaptation strategy itself, which will serve as a decision-making tool.

- Bratislava Self-Governing Region
Program of Economic development and Social development of BSK for the years 2021-2027 with a view to 2030

Its goal is to ensure the continuous development of the region after taking into account the problems and expectations of municipalities, cities, the private sector and other socioeconomic partners of BSK.
Catalog of adaptation measures of BSK cities and municipalities to the adverse consequences of climate change
In addition to the development of adaptation measures, the publication also provides information on climate change itself, the relevant legislative-strategic framework, the process of preparing an adaptation strategy for municipalities and cities, examples of good practice and the possibility of financing adaptation processes.
BSK's Adaptation plan for the adverse consequences of climate change
The main goal of the document is to evaluate the vulnerability of the territory to the impacts of climate change at the level of the cadastral territories of individual cities and municipalities of BSK with a primary focus on the inner city (residential environment).

- Košice Self-Governing Region
Košice region's Landscape Restoration Program "POK"
The goal of the Program is to change the approach to the management of forest and agricultural land, as well as urban land.
The Concept of the Adaptation strategy for the Consequences of Climate change (in preparation)
Program of Economic development and Social development of KSK for the years 2023-2027 (in preparation)

- Nitra Self-Governing Region
Environmental study of Territorial Impacts of Climate Change
The study analyzes the current state of climatic conditions in the Nitra Self-Governing Region, defines measures aimed at mitigating the impacts of climate change and proposes adaptation measures
Parks as adaptation potential to climate change
An urban study, the aim of which is to use the parks of the Nitra Self-Governing Region as areas of first aid in extreme heat and at the same time as the rescue and use of natural and cultural heritage

- Prešov Self-Governing Region
Adaptation Strategy for Climate change
The outputs of the proposal of AS PSK were implemented in the Economic development and Social development Program of PSK 2021-2030. The adaptation strategy will also be implemented in the Territorial Plan of the Prešov Self-Governing Region

- Trenčín self-governing region
Program of Economic development and Social development until 2030
The topic of adaptation is addressed by Priority Green Region in Specific Objective 2.3.

Adaptation to climate change, ecosystem services and biodiversity protection and 2.4. Landscape management and flood protection.

- Trnava Self-Governing Region
Program of Economic development and Social development of the Trnava Self-Governing Region 2016-2023 in the consolidated version of the update - strategy, 2015, 2020
Territorial plan of the Trnava Self-Governing Region, 2014

- Žilina Self-Governing Region
Economic development and Social development Program ŽSK 2021+
The development document of the region, as part of its goals and priorities in the area of the environment, also addresses the issue of supporting adaptation to climate change.

Overview of good practice with regard to steps taken to review and update subnational adaptation plans, policies, strategies and measures

An overview of good practices regarding the steps taken to review and update adaptation plans, policies, strategies and actions at sub-national level is provided in the resolutions adopted when these specific documents were adopted. Specific steps are described elsewhere in this report.

COOPERATION, GOOD PRACTICES, SYNERGIES, EXPERIENCE AND LESSONS LEARNED IN THE FIELD OF ADAPTATION

Good practices and lessons learnt at sub-national level (3)

Area of good practices

integration of indigenous, traditional and local knowledge into climate adaptation

Good practices and lessons learnt at sub-national level

Village Renewal Grant Programme – creates the economic, organisational and professional prerequisites to support rural communities in their harmonious development. The programme supports specific activities aimed at addressing the acute problems of rural municipalities in the care of the rural environment, in particular green infrastructure and adaptation measures to mitigate the effects of climate change and care for the countryside.

Area of good practices

strengthening scientific research and knowledge

Good practices and lessons learnt at sub-national level

The research activities of the project "Supporting data and knowledge for decision-making and strategic planning systems for farmland adaptation to climate change and minimizing farmland degradation" (URANOS) were focused on the development of new approaches and data for early drought assessment, monitoring and forecasting; climate change prediction and comprehensive impact assessment of agricultural landscapes; and proposals for optimal land use. In June 2023 the project was completed.

Area of good practices

assessment of climate impacts, vulnerability and risks to climate change, including adaptive capacity

Good practices and lessons learnt at sub-national level

Project LIFE12 NAT/SK/000488 "Integrated management of river ecosystems in southern Slovakia" – the main objective of the project is to address the lack of water management in the target sites and to reduce the negative impacts of changes in land use on the conservation status and habitats of populations of target bird species. The project envisages the improvement of the water regime through the repair of sluice gates and the restoration of formerly drained wetlands.

Cooperation with Union Member States, international cooperation, and with regional and international organisations to enhance adaptation action at the sub-national level

Examples:

- the project CLIMADAM - Adaptation strategy for climate change and mitigation activities for the Slovak-Ukrainian border region (link: https://www.arr.sk/en/climadam/) - benefits from an grant from Iceland, Liechtenstein and Norway through the EHP Grants.

The project CLIMADAM benefits from an (amount – 462 243 €) grant from Iceland, Liechtenstein and Norway through the EHP Grants. The project has been co-financed from the State Budget of the Slovak Republic in the amount of 15%.

The aim of the project is: to better prepare the border regions of Ukraine and Slovakia for the expected climate change by developing an adaptation strategy for climate change for the

Transcarpathian region of Ukraine and applying it (an adaptation strategy for KSK was created) within the pilot activities;
increase readiness for the introduction of effective measures in public transport for the city of Uzhhorod by developing a model of sustainable transport, using the experience of the Košice and Prešov regions;
increase the availability of information on climate change, the need for measures to mitigate the negative impact of climate change and adaptation measures to expected climate change.

Leading partner: Agency for Regional Development Support Košice (SK)
Partner 1: Department of Urban Development and Architecture (UA)
Partner 2: Košice self-governing region (SK)
Partner 3: Transcarpathian Regional State Administration (UA)
Partner 4: Institute of Carpathian Region Development (UA)

ANY OTHER INFORMATION RELATED TO CLIMATE CHANGE IMPACTS AND ADAPTATION

General information

Any other information related to climate change impacts and adaptation

Key contact details of national coordinator and organisation (1)

Organisation

Ministry of Environment of the Slovak Republic

Department within the organisation

Department of global air protection, climate change and adaptation

Website

https://www.minzp.sk/

Relevant websites and social media sources used at national level (as appropriate) (4)

Title

Adaptation to climate change

level

National level

Type

Website

Weblink

https://www.klima-adapt.sk/

available

YES

Title

Green infrastructure

level

National level

Type

Website

Weblink

https://www.sazp.sk/zivotne-prostredie/starostlivost-o-krajinu/zelena-infrastruktura/

available

YES

Title

Climate change (Slovak Environmental Agency website)

level

National level

Type

Website

Weblink

https://www.sazp.sk/zivotne-prostredie/starostlivost-o-zivotne-prostredie-3976/zmena-klimy/zmena-klimy.html

available

YES

Title

Climate change (Slovak Hydrometeorological Institute website)

level

National level

Type

Website

Weblink

https://www.shmu.sk/sk/?page=1790

available

YES

Key reports and publications at national level (6)

Title

10 methodologies as a part of the project Methodology for the assessment of investment risks associated with the adverse effects of climate change

Year of publication

2024

FPublisher

Slovak Environment Agency, Ministry of Environment of the Slovak Republic

WebLink

https://www.klima-adapt.sk/metodicke-usmernenia

Title

The Report on the state of play of the climate adaptation policies and governance framework - Final Report - Technical Support Instrument

Year of publication

2024

FPublisher

Slovak Environment Agency, Ministry of Environment of the Slovak Republic

WebLink

https://www.klima-adapt.sk/narodna-adaptacna-strategia (EN and SK language)

Title

Green infrastructure and its importance in flood protection

Year of publication

2021

FPublisher

Slovak Environment Agency

WebLink

https://www.sazp.sk/projekty-eu/infoaktivity/kalendar-udalosti-hap6-zmena-klimy/6-2-8-zelena- infrastruktura-a-jej-vyznam-v-protipovodnovej-ochrane-publikacia.html

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Title

State of the Environment Report of the Slovak Republic in 2023

Year of publication

2024

FPublisher

Ministry of the Environment of the Slovak Republic, Slovak Environment Agency

WebLink

https://www.enviroportal.sk/sprava/11941

Title

Development of selected manifestations of climate change and threats resulting from climate change in the conditions of the Slovak Republic

Year of publication

2023

FPublisher

Slovak Environment Agency, Slovak Hydrometeorological Institute

WebLink

https://www.klima-adapt.sk/files/ZK-Prejavy%20a%20ohrozenia_final.pdf

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Title

Financial instruments related to sustainable tourism and climate change adaptation measures

Year of publication

2024

FPublisher

Slovak Environment Agency, Ministry of the Environment of the SR

WebLink

https://www.klima-adapt.sk/files/Financne-nastroje-UCR-wp_sazp_2024.pdf

If necessary, you can upload here an additional document

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