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

General information

The information in this reporting is updated until (date: YYYY-MM-DD format)

2023-03-15

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.

Demographic situation relevant to adaptation actions

The population exceeds 5.4 million. The average population density is 110 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 2021, the average age of the Slovak population was 38.7 years.

Economic and infrastructural situation relevant to adaptation actions

The Slovak economy is a developed and high-income economy, with GDP per capita equal to 69 % of the EU average in 2021. It ranges from 188 % of the EU average in Bratislava to 54 % in eastern Slovakia. Although regional income inequality is high, up to 90 % of citizens own their own home. In 2021, according to the International Monetary Fund, Slovakia was the 46th richest country in the world (out of 187 countries) with a GDP per capita in purchasing power parity of USD 31 866. Slovakia has successfully transformed from a centrally planned economy to a market-oriented economy. Extensive privatisation has been completed, the banking sector is almost entirely in the hands of private companies, and foreign investment has increased. In 2022, more than 80 % of exports went to the EU and more than 63 % of imports came from other EU Member States. The government debt-to-GDP ratio reached 62.2 % at the end of 2021, well below the OECD average. Unemployment fell to 5.9 % in 2022, the lowest recorded rate in Slovakia's history.

If necessary, you can upload here an additional document

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Climate monitoring and modelling framework

Main activities on climate monitoring, modelling, projections and scenarios

The Slovak Hydrometeorological Institute (SHMÚ) 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 Hydrological Network and a State Meteorological Network have been established. These networks are managed by the SHMÚ. They are used for systematic monitoring of quantitative and qualitative parameters of air and water. Data from monitoring activities are stored in databases and used in research dealing with climate change impacts, vulnerability assessment and adaptation measures.

National meteorological network

Monitoring subsystems	Number of facilities
surface synoptic stations	20
surface military synoptic stations	3
surface meteorological stations with climatological measurement (manual)	6
surface automatic meteorological stations (with observer)	57
surface automatic meteorological stations (without observer)	100
surface rain gauge stations (manual)	343
surface automatic rain gauge stations (with observer)	164
surface automatic rain gauge stations (without observer)	31
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

National hydrological network

Monitoring subsystems	Number of facilities

surface water quantity	416
surface water quality	244
groundwater quantity	360 springs, 1147 wells
groundwater quality	76

Integrated drought monitoring system

The issue of 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 (MARD) 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 with SHMÚ within the "Intersucho" project is crucial. The National Forestry Centre (NLC) implemented in the period 2019 – 2021 the research project "Research and Development to Support the Competitiveness of Slovak Forestry (SLOV-LES)" (sub-project "Ecological Limits of Biomass Production in the Conditions of Climate Change") from the budget of the chapter of the Ministry of Agriculture and Rural Development of the Slovak Republic (MoARD SR), the output of which was e.g. a new online web-platform of forestry meteorological monitoring http://www.forestweather.sk/, or framework recommendations for selected risks related to climate change.

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 weekly on the SHMÚ website.

Projections and scenarios

Since 1993, climate change scenarios have been prepared for the Slovak Republic in the form of modified outputs from several Global General Circulation Models (GCMs) and Regional Circulation Models (RCMs). The method of statistical and dynamic "downscaling" was used with data from the Slovak meteorological network for the time period 1951-2010. All GCMs and RCMs offer multi-variable outputs with daily frequency for the period 1951 to 2100. The last series of climate change scenarios is mainly based on outputs from four models: GCM CGCM3.1 (Canada) and ECHAM5 (Germany), RCM RACMO (Netherlands – KNMI) and REMO (Germany – MPI). These models were used to develop climate change scenarios for the Slovak Republic. Based on the outputs and measured meteorological data for the reference periods 1961-1990 and 1981-2010, daily scenarios for about 60 meteorological and about 150 precipitation gauge stations were proposed. Scenarios were developed for the following variables: daily averages, maxima and minima of air temperature, daily averages of relative humidity, daily averages of precipitation, averages of wind speed, and sums of global radiation. Based on these baseline scenarios, several additional scenarios for snow cover, evapotranspiration, heat waves, soil moisture, runoff, etc. were proposed. In this approach, correlation/regression and simple modelling methods were used to develop scenarios for other climatic/hydrological elements.

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. New and more detailed climate change scenarios based on global (GCM) and regional (RCM) models have enabled the calculation of a series of statistical characteristics, such as complex environmental and socio-economic scenarios, as a function of a changing climate: number of summer days, tropical days, super tropical days, heat waves, ice days, freezing days, days with heavy rain, days with low or no precipitation, days with snowfall, days suitable for specific tourist activities such as skiing, swimming, summer and winter tourism, etc..
The analysis of climate change scenarios confirms the existence of extremes and risks, their interdependence and potential impacts across the whole range from ecosystems and natural resources to the economy and the social sphere. The linkages and interactions between the effects of climate change and its potential consequences form a highly complex and dynamic system.
Projections of GHG and pollutant emissions are set up to 2050 in 5-year intervals. They are used to determine projected trends in the emissions area for the correct setting of policies and measures. Emissions projections are modelled under two scenarios – the Existing Measures Scenario (WEM) and the WAM version (with additional measures). The projected GHG emissions trend to 2050 in the WEM scenario after 2020 is only slightly decreasing and the emission reductions under this scenario are insufficient. Further measures will be needed in individual sectors, which are included in the WAM scenario. The Greenhouse Gas Projections Report is available at https://oeab.shmu.sk/app/cmsSiteBoxAttachment.php?ID=8&cmsDataID=0.

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 (temperature, wind) or subjectively determined elements and characteristics of the physical state of the environment (cloud cover, phenological phases). The frequency of data storage ranges from 5 minutes (automatic weather stations) to 1 year (phenological stations).
KMIS provides batch and operational access to data describing the current state of the atmosphere as well as the current state of the climate system. For this purpose, a special set of application programs has been developed that provide data in tabular, graphical and map form.
Summary Water Register (SEoV)
The Summary Water Register 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
This system consists of meteorological, soil and hydrological drought subsystems and groundwater and occurrence of drought subsystem.
- 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. Both indices have a 30-day cumulative period. This means that the index expressed for a given day determines the deviation of the precipitation or water balance of that day and the previous 29 days, applying a so-called "sliding window" to the entire length of the data series.
The CMI calculation uses, as in the SPEI, the soil water balance, i.e. the rainfall-potential evapotranspiration difference, which is calculated according to the Thornthwaite method. This index also determines the runoff and inflow calculated over the last week, as well as the soil moisture value at the end of the penultimate week. The resulting deficit, or soil moisture surplus, is then converted from the calculated quantities into a simple dimensionless numerical value that represents a measure of the intensity of drought at a given location.
- Hydrological drought
The Drought Monitoring/Hydrological Drought website (https://www.shmu.sk/sk/?page=1&id=hydro_sucho) is used to assess the current hydrological situation at selected surface water gauging stations, particularly in terms of hydrological drought. The page 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 and provides a visualisation of the situation in the whole territory of the Slovak Republic as well as a display of regional differences with the possibility of a detailed view of the course and assessment of flows at specific gauging stations. Strong colours – red, orange, yellow – indicate the occurrence of an unfavourable hydrological condition for a given period (months).
- Groundwater and occurrence of drought
The current groundwater table with a focus on drought assessment is displayed on a map on the SHMÚ website (https://www.shmu.sk/sk/?page=1&id=pzv_kvantita). The assessment is based on operational online data of selected 111 groundwater objects of the state hydrological

monitoring network, which consists of 79 probes 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.

- 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 the 50-year long-term average (1961-2010) 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 1961-2010 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 complemented 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 only during the growing season. Information is not available in winter.

- 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.

- Forestry sector

The Ministry of Agriculture and Rural Development is 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.

If necessary, you can upload here an additional document

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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

Time horizon for the future climate 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. In rural areas, significant impacts on water availability and supply, food security, infrastructure and agricultural incomes are expected. 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, 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, 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.

-

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 (14)

Title of the sector

Biodiversity

Key affected sector

biodiversity (including ecosystembased approaches)

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 of the 21st century. There is ample evidence that climate change is affecting biodiversity, and it is clear that changes in biodiversity and ecosystem functioning affect climate processes. For example, peatland degradation is a significant source of greenhouse gases. Direct effects of climate change on biodiversity include drought, increased risk of wildfires and limited snow cover. Indirect impacts include, for example, the spread of invasive species. Biodiversity will also be affected by associated socio-economic changes, in particular land-use change.
The expected impacts of climate change on ecosystems and plant and animal species are associated with increased annual air temperature, drought, extreme weather events, changes in CO2 concentration, etc. This in turn will affect physiological and phenological changes, changes in the geographic distribution of species, such as the transformation of population structures

and the extinction of vulnerable species.

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

Air temperature is expected to increase, annual precipitation is expected to decrease, but at the same time local precipitation is expected to increase, relative humidity is expected to decrease, snow cover is expected to decrease, and the negative impacts of climate change on the biodiversity of ecosystems and plant and animal species are expected to persist. An increase in the temporal and spatial variability of rainfall will result in an increase in localised flooding in different parts of the country prone to flash flooding. On the other hand, the occurrence of long periods of deficit rainfall will result in localised or widespread drought. Weakened forest vegetation will be susceptible to damage caused by strong winds.

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 is complex.
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. With changes in CO2 concentration, increased air temperature and water demand, increased levels of photosynthesis and respiration, changes in growth, body structure or biological productivity of species are expected. In an extreme case, a shift towards shorter winter seasons and more frequent late spring frosts could cause the

extinction of cold-sensitive populations.
Changes in the geographic distribution of species will affect the most vulnerable species, endemics and relicts. Changes in the interdependence of predator-prey, plant-pollinator species are expected. Changes in symbiotic dependence, isolation, declining migratory opportunities, the extinction of vulnerable species and the spread of resistant species are also expected.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

-

Describe your assessment

The same impacts as those identified today are expected to persist in the future.

Title of the sector

Energy

Key affected sector

energy

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

The energy sector is expected to be affected by these key climate risks:
Temperature change, windy conditions, precipitation, heat or cold waves, storms, drought, floods, snow and ice, as well as landslides.
As a result of warming, a reduction in energy intensity in the winter months can be expected due to a reduction in heating requirements. This will lead to a deterioration in energy efficiency due to oversized district heating systems. At the same time, warming would lead to an increase

in energy intensity in the summer months due to an increase in the energy needed for air conditioning and cooling. Cold waves/freezes can episodically lead to increased loads on the heat distribution system. Changing weather events can threaten the generated output of existing wind farms. Flow volume fluctuations on watercourses can have a negative impact on the operation of hydro-power plants. Drought can lead to increased demands for process water within the energy infrastructure. The need to pump water for irrigation will lead to increased demands on electricity generation and distribution capacity. Windstorms, snow loads, floods or landslides can cause equipment failures and damage, power outages, increased repair complications, increased damages caused by power outages to customers.

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

When it comes to adapting to temperature changes, the energy sector/mainly its infrastructure/distribution systems need to be more resilient and adapted to both warmer and colder conditions.
In preparation for the cold wave, there is a growing demand for underground natural gas storage capacity.

Rating of the vulnerability, including adaptive capacity

high

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

-

Describe your assessment

Energy production from fossil fuels is less affected by the negative impacts of climate change than energy production from renewable energy sources. The vulnerability of renewable energy technologies (wind turbines, solar panels, hydropower) is much higher compared to the vulnerability of technologies used to generate energy from non-renewable sources (power plants, incinerators). A special category is nuclear power plants, where the availability of water

resources needed for cooling water remains a risk factor.
Energy infrastructure, which includes the supply of electricity, heat, gas, oil and other forms of energy, is part of the so-called critical infrastructure and its disruption has a serious impact on the protected interests of the state (security, life and health, economy and public administration).

Rating for the risk of potential future impacts

medium

Different rating of the risk of potential future impacts for:

-

Describe your assessment

The same impacts as those identified today are expected to persist in the future.
In the energy sector, potential environmental and operational risks arise from the nature of individual plants, facilities and processes, where the manifestations and consequences of climate change may pose a potential threat to business continuity (and hence continuity of production or energy supply), major industrial accidents or threats to human health and safety.
It is in the general interest of society as a whole to ensure that climate change adaptation measures and mechanisms are taken into account in the preparation of initial plans that represent large and long-term investment projects. In existing plants, they are in fact mainly applied in the context of the expansion of production capacities, the introduction of major technological changes or the renewal of larger technological units.
Adaptation of the energy system is seen as the process of adapting all components of the energy system to actual or expected climate change and its consequences.

Title of the sector

Forestry

Key affected sector

forestry

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

As a result of climate change, there is already an increase in extreme weather events, droughts, floods, extreme high and low temperatures and storms. These phenomena are associated with acute damage, especially to less resistant tree species.
Forest tree communities, especially those with lower resilience (conifers, especially spruce), are declining locally and are being replaced by successional communities (trees and herbaceous plants) that are well suited to the change in conditions
Recurrent dry and warm periods cause physiological weakening of the trees and make them more susceptible to pest infestation or infection.
Changes in the population dynamics of several pests due to a changing climate have an impact on forest integrity. In particular, an increase in the number of generations of the Spruce bark beetle (Ips typographus) per growing season has been shown to contribute to the accelerated decay of spruce forests.

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 addition to the increased likelihood of direct damage to forests (wind calamities, drought), 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, the spread of host trees, etc. In particular, an increase in air temperature may affect the success of populations of tree pests. Particularly in the case of bark beetles, a third generation of pests may develop and the two-generation regime may shift to mountainous areas over large areas.
A separate risk is the potential emergence of new pests and diseases that can significantly affect the condition and development of forests composed of tree species ecologically suitable for the given soil and climatic conditions.
Forest fires, which are not yet as frequent and widespread in our latitudes as, for example, in the Mediterranean, will become more and more likely. This risk will be associated with a higher frequency of significantly dry periods but locally probably also with an increase in available

combustible material in dieback-affected coniferous forests. Increased risk of forest destruction in conjunction with forest fires can also lead to soil degradation (loss of humus, erosion, reduced water retention) as well as reduced water quality (surface and groundwater).
From a forestry perspective, a decline in timber production can be expected at lower and middle altitudes for spruce and beech. In general, a shift of the timber production optimum to higher altitudes can be expected, but where the forest area is limited. This will result in an overall decline in forest production in Slovakia. Reduced production, deterioration of forest health and increased forest damage also have negative impacts on the non-productive functions of forests, especially carbon sequestration, regulation of the water regime of stands and watersheds.

Rating of the vulnerability, including adaptive capacity

high

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

-

Describe your assessment

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, the importance of all forest ecosystem services, especially non-productive ones, in a relatively diverse geomorphology and mountainous landscape type.
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

The same impacts as those identified today are expected to persist in the future.

Title of the sector

Transport

Key affected sector

transport

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

There are several areas in the transport sector that are directly affected by weather events. These include high and low temperatures, extreme weather events such as heavy rainfall, intense storms, snow calamities and ice, which are increasing in frequency and intensity as a result of climate change.
Extreme weather events cause serious complications for almost all modes of transport. They are immediate, intense and have significant negative consequences: they lead to longer transport times for goods, longer travel times and an increased likelihood of accidents and damage to transport infrastructure.

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

Natural hazards that potentially threaten the operation or integrity of transport infrastructure (including roads and buildings) are expected to be more likely to occur. The following can be hazardous to traffic: high winds, heavy rain, snow and ice, flash and flash floods, landslides, drought, fires and fog.

Rating of the vulnerability, including adaptive capacity

high

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

-

Describe your assessment

Transport significantly determines economic growth, contributes significantly to the functioning of the Slovak economy and is extremely important for regional development. Vulnerability of transport is associated with extreme weather events that lead to threats to the safety and continuity of transport (prolongation of transport time for people and goods, increase in traffic density, increase in the incidence of accidents), damage to transport infrastructure and its functionality and performance (delay of works, delay of deliveries, loss of carriers, depreciation of goods), and other associated secondary economic consequences. In Slovakia, the negative effects of climate change are mainly manifested on road transport infrastructure (less so on rail transport), especially in connection with intense storms and the consequent occurrence of flood situations. Drainage and sewerage systems, culverts, bridges and road sections in the immediate vicinity of watercourses should be considered as risky elements of transport infrastructure. In urbanised areas, inadequate capacity of sewerage systems and the consequent rapid flooding of roads cause significant problems. Transport adaptation measures therefore focus on reducing transport safety risks due to extreme weather conditions and on improving transport infrastructure in at-risk locations.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

-

Describe your assessment

The same impacts as those identified today are expected to persist in the future.

Title of the sector

Water management

Key affected sector

water management

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

Prolonged periods of drought in summer and autumn, associated with water scarcity, can be an important manifestation of climate change. These dry periods may be interrupted by several days of high rainfall, or by heavy storm activity with intense rainfall leading to flooding.
Climate change impacts cause: Increase in winter runoff and loss of naturally snow-accumulated winter precipitation, increase in potential evapotranspiration and hence evapotranspiration during the summer half of the year, decrease in soil moisture and loss of hypodermal runoff during the summer half of the year, an increase in surface runoff in the summer half of the year during episodic rainfall events, an increase in the frequency and magnitude of floods (especially flash floods), an increase and prolongation of droughts.
Sustainable water management also includes ensuring that the required quantity of water of adequate quality is available at all times. As there has been a trend of increasingly uneven water availability over time in the Slovak Republic, building appropriate water storage capacities may be a solution. The occurrence of torrential rainfall requires a reassessment of the capacity of public sewerage systems or soil erosion control measures. Changes in catchment runoff patterns – and associated flooding, erosion and water scarcity – can be positively influenced by linked measures in forestry, agriculture, spatial planning.

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 Slovakia, total precipitation is projected to be about 10 % lower in the period from 2075 to 2100, and usable water resources are projected to decrease by 30-50 %.
A more uneven distribution of rainfall is likely to occur. The development of runoff ratios will correspond to this. According to the climate scenarios, a change in the long-term average annual runoff can be expected over most of the area, with a more pronounced decrease expected in the lowlands. Changes in long-term monthly flows are expected, with an increase in winter and spring runoff and a decrease in summer and autumn runoff, especially during the growing season.
Prolonged periods of drought in summer and autumn, associated with water scarcity, can be a manifestation of climate change. This phenomenon can occur as a result of significant snow loss in winter and earlier melting in spring, an earlier onset of the growing season, and thus more pronounced evapotranspiration in spring.
Drought can also occur as a result of lower rainfall and higher temperatures in summer. The result is a significant lack of soil moisture in the second half of summer and early autumn. It is also important to take into account the possibility of a permanent decline in the abundance of groundwater resources and the need to compensate for this decline in abundance, especially in the lowlands of central and eastern Slovakia and in summer. Dry periods may be interrupted by several days of high rainfall or thunderstorms.
The number of storm days should remain unchanged from today (15/30 per summer), but the number of severe storms is likely to be up to 50 % higher. Furthermore, tornadoes are expected to occur during severe storms. More frequent occurrence of local flash floods can be expected in different parts of Slovakia.

Rating of the vulnerability, including adaptive capacity

high

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

-

Describe your assessment

The water sector provides water for all other sectors and for society as a whole according to its needs. Water has been considered a strategic raw material for several years. In addition, water management has another role – to protect society from the adverse effects of hydrological extremes such as droughts and floods. Water management practically addresses the relationship between water demands and water resources. Therefore, influencing the conditions under which water management operates, whether on the side of available water

resources or on the side of demands, means transferring impacts to all other spheres of life and socio-economic sectors.
For a long time, water resources have been considered as a stationary renewable resource, where the mean and variance do not change over time. However, when considering climate change, this process turns out to be non-stationary. That is, in both climate and hydrological time series we identify trends – water resources decrease or increase depending on the evolution of climatic elements.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

-

Describe your assessment

The same impacts as those identified today are expected to persist into the future.
Prolonged periods of drought can cause significant water scarcity. According to the development so far, it is likely that climate change may have a more significant negative impact on local, scarce water resources, especially in the southern regions of Slovakia.Changes in rainfall and runoff patterns, increasing number and intensity of extreme meteorological and hydrological events due to climate change can have a significant impact on the health and lives of the population, both as a result of floods and droughts. In addition to the direct threat to life and health from the flood wave, there is a risk to the population from deterioration in the quality of water sources, epidemiological risk from food contamination,etc.
Climate change can also negatively affect the quality of water resources. Torrential rainfall and flood events can lead to significant short-term deterioration of surface water bodies as well as the chemical status of groundwater sources used for drinking water supply.
Water scarcity can also have an impact on the activities of economic sectors (meeting the needs of industrial enterprises, impaired conditions for the development of tourism, etc.).
Climate change risks are also associated with the risk of water scarcity for biota and landscapes during extreme drought events. The balancing of water resources and needs, which today only includes permitted abstractions and registered water resources, will also need to take into account the water actually used in a comprehensive way for agriculture and the water needed for biota and ecosystems.
In the urbanised area, the lack of compliance with efficient water management practices in construction as well as inadequate planning for drought and flood risk reduction in land-use planning processes contributes to the exacerbation of the effects of climate change, indicating the need to improve integrated landscape management.

Title of the sector

Tourism

Key affected sector

tourism

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 climate determines the length and quality of the tourist season, determines the range of tourist activities and has a significant impact on operating prices (heating, cooling, snowmaking, irrigation, insurance prices, water and food supply, operation of natural swimming pools). Most tourism activities are based on a certain stability of weather and all infrastructure, marketing and local socio-economic activities are adapted to these conditions. The tourism industry is highly dependent on seasonality, but climate change is causing tourists to seek different destinations and travel at different times of the year.
Changes in the length and quality of the tourist season due to climatic conditions (winter and summer holidays) have significant implications for competitiveness within similar destinations and significantly determine the profitability of tourism operators. At the same time, climate change and its effects on the natural environment and socio-economic conditions can significantly affect the tourism potential of individual regions, tourism businesses and tourists themselves.

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 tourism sector is expected to be most affected by these climate change impacts:

- Landscape change: A reduction in the aesthetic value of the environment due to climate change may mean that tourists are less interested in a tourist destination.
- Extraordinary events: They pose a risk to tourist facilities, increase insurance costs and have a negative impact on the safety of tourists.
- Erosion, pH and soil moisture changes: In extreme cases, they can mean the gradual destruction of archaeological sites and natural resources.
- Invasive species and new diseases (diseases not commonly found in Slovakia): Warming causes the spread of invasive plant and animal species that are atypical for our climate zone. Increased incidence of new allergens (from pollen of invasive and non-native plants), infectious diseases, mite-borne diseases and an extended pollen season must also be taken into account.

Rating of the vulnerability, including adaptive capacity

high

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

-

Describe your assessment

Climate significantly determines the range of tourist activities, is a fundamental determinant of the global seasonality of tourist demands, and has an important influence on operating prices such as heating-cooling, snowmaking, irrigation, water and food supply, and insurance prices. Changes in the length and quality of the climate-dependent tourist season (summer holidays, winter ski holidays) therefore have a significant impact on the competitiveness of similar destinations and significantly determine the profitability of tourism operators.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

-

Describe your assessment

The same impacts as those identified today are expected to persist in the future.

Title of the sector

Soil environment

Key affected sector

biodiversity (including ecosystembased approaches); land use planning; other; water management

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 context of the European Union Thematic Strategy for Soil Protection (2006), several threats to soil have been identified, a significant part of which are also related to the effects of climate change: impacts on soil biogeochemical cycles affecting soil fertility, changes in soil nutrient balances, soil nutrient inputs, soil water availability, and changes in the moisture regime due to extreme weather events.
Forest soils are generally in a more favourable state both in terms of resilience to a changing climate and in terms of mitigation potential (carbon stocks), with the changes identified so far being related to the water regime. Soil organic mass stocks, and hence carbon stocks, are so far stable, with no degradation trends.

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

A changing climate is likely to have regionally different effects on forest land. In areas of increased production, there is likely to be a temporary increase in the input of organic matter to the soil and an improvement in some soil properties, but in general a gradual increase in the likelihood of a deterioration in the water regime of soils can be expected, as well as a slight deterioration in some other soil properties.

Rating of the vulnerability, including adaptive capacity

high

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

-

Describe your assessment

Soil conservation and sustainable land management in the new (current) climate conditions are an essential part of adapting rural landscapes to the adverse effects of climate change.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

-

Describe your assessment

Climate change impacts on soils can lead to an overall reduction in soil fertility and agricultural production, loss of biodiversity, increased erosion, destruction of soil structure (disturbance and compaction of aggregates), induction and intensification of desertification processes, and disruption of the overall hydropedological cycle. The consequences will be difficult to identify in an environment of anthropogenically intensively used or anthropogenically altered and damaged soils. The expected anthropogenic changes will occur much earlier and on a larger scale and will affect not only the nature of soil properties but also the overall morphology of soil profiles.

Title of the sector

Agriculture and food

Key affected sector

agriculture and food

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

Agriculture is highly exposed to the adverse impacts of climate change as it is directly dependent on climatic conditions. Increases in air temperature, changes in annual rainfall patterns and intensity, and the frequency of extreme weather events affect water resources, soils, pests and diseases, affect the quantity, quality and stability of food production, and lead to changes in crop and livestock production. There have been recent shortfalls in fodder production due to the effects of extreme drought. This unfavourable situation has been continuously remedied by extraordinary financial aid to livestock farmers, which has been accompanied by a commitment to maintain their stocks. Also, the 2021 forage harvest season was marked by periods of tropical temperatures, which increased the technological and organisational demands of producing forage of the required quality.

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

Negative impacts of climate change are expected: Changes in species composition, number and occurrence of harmful organisms (diseases, pests, weeds), changes in the thermal security of crop production, changes in phenological conditions and agro-climatic production potential, changes in the distribution and amount of precipitation and humidity, changes in conditions for winter crops (absence of snow cover), changes in soil diversity and soil physical and chemical properties, increased wind erosion, as well as a complete change or loss of crop production, especially due to drought.
Increased demand for irrigation in crop and livestock production is expected. Climate change is already causing prolonged droughts during the beekeeping season, which shorten the flowering

period of plants and thus the lack of nectar for bees. In contrast, higher elevations are exposed to increased rainfall during the flowering period, which prevents bees from collecting pollen. These factors impair the quality of bee foraging and consequently limit honey production. Inadequate bee nutrition and warm winters, during which warm spells are frequent, weaken both the immune system and the vitality of the bees, which consequently cannot withstand the increasing pressure of viruses and pests, which is reflected in an increase in unexpected colony deaths.
Electricity consumption and cost is another limiting factor for livestock farming. The need for active animal cooling and forced ventilation in buildings is essential not only for animal welfare reasons, but also for the sustainability of production.

Rating of the vulnerability, including adaptive capacity

high

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

-

Describe your assessment

Agriculture is one of the sectors most vulnerable to climate change as it is highly dependent on climate and weather conditions.
As a result of the problematic drought, measures will need to be taken regarding the development of new crop varieties and selection of crop species, cropping systems, irrigation systems and the adjustment of livestock nutrition and feeding systems (precision, balanced feeding).
There remains a high exposure to hazards in terms of sustainable and efficient production due to the lack of elaboration of the task of technological adaptation of animal feeding. A basic prerequisite for sustainable "climate-friendly" livestock production is the design of rations that cover the needs of the organism at each physiological stage, while minimising negative impacts on the environment. Due to current climate change and the occurrence of drought, there is a need to focus on determining the nutritional value of drought-tolerant crops. Determination of the quality of silage from drought tolerant crops and also the quality of maize silage, as one of the most important feedstuffs in cattle nutrition, in relation to rainfall and temperature during the growing season of the maize plant. Existing information on the consumption of process water and drinking water for different species, breeds and categories of animals will need to be reviewed and analysed.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

-

Describe your assessment

However, these impacts will increase their contribution to the sustainability of the quality and quantity of both crop and livestock production, where, for example, reduced grazing or forage quality due to drought may result in increased greenhouse gas production from ruminant livestock.

Title of the sector

Civil protection and emergency management

Key affected sector

civil protection and emergency management

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

The likelihood of major hazards will persist in the future.

Rating of the vulnerability, including adaptive capacity

high

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

-

Describe your assessment

Intensifying manifestations of climate change and weather extremes increase the risks of short-term emergencies associated with threats to the health and lives of the population. In the field of civil protection, it is therefore necessary to continuously improve and streamline the procedures and means to prevent, mitigate and eliminate the consequences of risks. Considering the adaptation measures implemented so far, it is necessary to continue similarly focused projects with an emphasis on increasing adaptation to climate change and protecting life, health, property and the environment. In the area of risk management, further priority adaptation actions should be implemented in the following areas: Threat and risk monitoring, civil protection system, crisis management system, critical infrastructure protection.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

-

Describe your assessment

The risk of potential future impacts of climate change on the occurrence of emergencies and security is high. A proactive approach to dealing with emergencies requires an effective strategy, a comprehensive risk assessment, ongoing monitoring and analysis of crisis factors, as well as the establishment of governing bodies, forces and the necessary resources to minimise the consequences of such threats. In the field of civil protection and crisis planning in the Slovak Republic, due attention is paid to the provision and continuous streamlining of early warning systems as one of the basic elements of the civil protection information system. Measures in this area are based on the need to increase the preparedness of the civil protection system for risks and disasters arising from climate change. The systematic involvement of civil society

organisations and volunteers in civil protection mechanisms also appears to be a strong element of Slovakia's adaptation measures.

Title of the sector

Finance and insurance

Key affected sector

finance and insurance

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

low

Different rating of the observed impacts of key hazards for:

-

Describe your assessment

The insurance industry, as a specific non-manufacturing sector of monetary services, forms an integral part of the financial market in which a specific type of services – insurance and reinsurance – is traded. The main objective of an insurance company is to assume the contractually defined risks of its clients. Despite many studies, only limited qualitative descriptions and estimates of the magnitude and consequences of future climate change are yet possible. The options that climate change presents for the insurance industry today are diverse, complex and uncertain.

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

low

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

-

Describe your assessment

Despite the current uncertainty in describing and estimating the magnitude of the implications of future climate change for the insurance industry, international experience suggests three key

risk factors that should be proactively addressed by the insurance industry as soon as possible and to an appropriate extent:

a) Physical risks: arise from events related to extreme weather events, such as floods or extreme storms, and similarly include impacts such as property damage or damage that may arise indirectly from downstream events (disruption to global supply chains or resource scarcity).

b) Transition risks: financial risks that could arise for insurers as a result of the transition to a low-carbon, climate-resilient economy, related to the potential re-pricing of carbon-intensive assets and the speed at which such re-pricing may occur.

c) Liability risks: the risks that insurers could incur from parties that have suffered losses or damages caused by climate change and subsequently seek to recover losses from other entities that they believe may be liable.

Rating of the vulnerability, including adaptive capacity

low

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

-

Describe your assessment

The insurance sector's vulnerability to the negative impacts of climate change can be assessed as low compared to other sectors.

However, based on an analysis of risk factors, climate change may pose a problem for insurers' business models as it may reduce the insurance industry's interest in providing cover for specific classes of business, assets or clients. It can also be assumed that the public will refer to the disclosure of information on the financial implications of climate change risks.

Rating for the risk of potential future impacts

low

Different rating of the risk of potential future impacts for:

-

Describe your assessment

Insurance will never be able to cover all risks and, despite efforts to maximise the insurance capacity of the market, there will still be limitations. Nevertheless, it remains an appropriate form of providing targeted coverage for potential climate change risks. It is also a fact that

opportunities for new business models are being created. This includes scope to develop new risk-related products for clients who foresee the impact of climate change on their business activities (in particular oil and gas transportation and processing, electricity generation, transmission and distribution). The types of insurance required are likely to include a variety of innovative types of business liability insurance. The results of scientific studies and forecasts will increasingly need to be used to adequately capture and assess future risks.

Title of the sector

Health

Key affected sector

health

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 risk of food contamination, the emergence of new vectors for the transmission of infectious diseases, and the prolongation of the pollen 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

There may be a change in the distribution of infectious diseases in Slovakia, with an increase in water-related diseases, especially where sanitation and personal hygiene are low (especially during floods or in segregated areas). There is a risk of an increase in respiratory diseases due to air pollution, especially in cities and inversion sites, or from increased pollen distribution. Health depends on the stability and resilience of ecosystems. However, the health consequences of climate change also depend on non-environmental factors, in particular the level of socio-economic development.

Rating of the vulnerability, including adaptive capacity

high

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

-

Describe your assessment

Vulnerable groups are mainly the elderly, children, chronically ill and socially isolated people. The elderly suffer from many chronic diseases and poverty. They are more isolated, have physical disabilities and lack access to transport and health facilities. Children are particularly vulnerable because of their immature physiological and cognitive abilities. The entire period of fetal and infant development should be taken into account, when the mother may be exposed to extreme weather conditions, lack of a varied diet, poor water quality or infectious diseases. Employed persons are particularly at risk at their place of employment. Heat exhaustion, stress and dehydration are the biggest health risks for workers in both open and indoor environments. The risk to health increases with the level of physical exertion. Agricultural and construction workers are most vulnerable, but heat stress also affects people working indoors. Emergency responders (police, firefighters, medical personnel) of critical infrastructure could be particularly at risk in their work (risk to life during disasters, caused by the effects of climate change).

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

-

Describe your assessment

The same impacts as those identified today are expected to persist in the future.

Title of the sector

Urban environment

Key affected sector

urban

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

Manifestations of climate change in urban environments include an increase in the number of tropical days and the occurrence of heat waves in summer, uneven spatial and temporal distribution of precipitation, more frequent occurrence of extreme precipitation totals causing rain, snow and flash floods or mud-flows, more frequent occurrence of droughts causing a reduction in the capacity of water resources, and the occurrence of extreme weather events (storms, hurricanes, tornadoes).

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

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, commerce, industry and tourism. Impacts in the urban environment will vary depending on the geographic location, size and type of city.

Currently, half of Slovakia's population lives in cities (approximately 54 % of the total population). Climate change impacts are most pronounced in urban areas, which are characterised by high population densities, 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 to the fore the issue of buildings and their management in terms of adaptation and mitigation. The quality of life of building users, especially in cities, will be further deteriorated by the heat island effect, the lack of greenery 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

Adaptation aims to reduce the vulnerability of the urban environment to the adverse effects of climate change and to increase the capacity of cities to adapt to new, often extreme, conditions. The horizontal and vertical structure of the city significantly influences its micro-climatic conditions. Built-up area, proportion of paved and unpaved areas, spatial distribution of green space, shading and morphological attributes of landscaping and airflow play an important role in creating the micro-climatic conditions of cities and a key role in adaptation. Water and green spaces and features that can influence micro-climatic conditions in cities will play an important role in meeting this objective.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

-

Describe your assessment

The same impacts as those identified today are expected to persist in the future.

Title of the sector

Business and Industry

Key affected sector

business; industry

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

Businesses are increasingly exposed (directly or indirectly) to the negative impacts of climate change, as business activities are directly dependent on all other sectors (energy, agriculture, biodiversity, etc.). Thus, the impacts of climate change are not only felt directly by actors, but also indirectly through impacts on individual actors in the supply chain, as well as impacts on energy/critical infrastructure. In the overall context, the industry is energy and resource intensive; on the other hand, it plays a significant role in the country's economic growth. Consequences and risks arise from the nature of individual operations, facilities and processes, the effects and consequences can pose a potential threat to the continuity of industrial operations, major industrial accidents, instability in the supply of supplies, raw materials and electricity, increases in commodity prices, as well as to the safety and health of people. It is therefore in the interest of businesses to take measures to identify and anticipate risks, tools to change production systems and other action that climate change presents.

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

Businesses are becoming increasingly aware of the risks of climate change on their operations, with the aim of building resilient operations to the impacts of climate change. So far, business activities 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 progressively introduced.

Rating of the vulnerability, including adaptive capacity

medium

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

-

Describe your assessment

Climate change creates business risk for all businesses, depending on the business segment, but in the long term, manufacturing is key. The main challenge will be to reduce greenhouse gas emissions from production, focus on minimising product waste, as well as introducing circular economy principles, particularly in relation to reducing dependence on critical raw materials, as well as reducing resource intensity and overall adaptation to the transition to a clean economy. Industry's resilience to the adverse impacts of climate change inevitably requires the gradual development and implementation of appropriate, timely and effective adaptation measures. It is in the general interest to ensure that measures and mechanisms are in place to adapt to climate change. Measures are consistently taken into account in the development of the initial plans, which are large, long-term investment packages. In the case of existing plants and enterprises, they apply in particular in connection with the expansion of production capacity, the introduction of major technological changes or the renewal of larger technological units.

Rating for the risk of potential future impacts

medium

Different rating of the risk of potential future impacts for:

-

Describe your assessment

In a broader sense, different types of risks can be identified in the business sector. Risks can be divided into interlinked groups, which are risks in the value chain and risks from external stakeholders, and to these is added the risk to human health and safety from climate change.

Title of the sector

Rock environment and geology

Key affected sector

other; water management

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

When combining the diverse geological structure of an area with a changing climate, the rock environment is activated and responds to these conditions with various manifestations according to its structure, hardness of rocks, their porosity, chemical properties, susceptibility to weathering or water storage capacity. The rock environment is most influenced by the intensity and sum of rainwater, the intensity of solar radiation, the air temperature, rapid temperature changes and human activity.
We see the risks associated with the erosion of the rock material of heaps and sludge ponds, with natural waters in the rock environment, with water and wind erosion and with landslides.

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

Most heaps and sludge ponds are currently stabilized, at least at the level of their natural geological environment. In the new environment that climate change will bring in the long term (several decades), the rocks become unstable compared to the current state, which will be reflected especially in faster and more intensive erosion. Erosion will be aided by abruption and frequent weather changes, in which the chemical influence of precipitation is accompanied by a physical influence, rock disruption at alternating low and high temperatures. As a result of intensive erosion, heavy metals will be doped in the rock environment (when sulphidic heaps erode), acidification due to the formation of weak sulfuric acid in flat areas with longer periods of drought, and there will also be gradual salinization of soils. When the pH drops below 4, alkalis (Na, K, Li, Cs, ...), alkaline earth elements (Ca, Ba, Sr, ...) and also aluminum get into motion. Another impact will be an increase in the susceptibility to slope movements in the form of more frequently occurring rock falls of weakened rock blocks. The largest changes in the erosion process can be expected on the heaps and tailings ponds of sulphide ores.

Rating of the vulnerability, including adaptive capacity

high

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

-

Describe your assessment

Climate change in relation to the rock environment has impacts for the balance of natural waters (groundwater, surface water, precipitation). Under certain conditions, the accompanying phenomena are also the intensification of erosion (increased by the effects of CO2 content in the air), landslides, sediment transfer and changes in the morphology of the area. The intensity of these manifestations is relatively much influenced by the vegetation present.

Rating for the risk of potential future impacts

high

Different rating of the risk of potential future impacts for:

-

Describe your assessment

The same impacts are expected to persist in the future as those already identified today.

In connection with the implementation of adaptation measures aimed at removing the environmental burden or mining waste repository, resp. to eliminate their adverse effects on the environment and health, it will be necessary to preferentially use such remediation

technologies and remediation procedures that will not have negative impacts on the environment and health, respectively their negative impact will be minimal or minimized compared to the negative impact of the environmental burden or the extractive waste repository. It is essential to give priority to the use of environmentally friendly technologies and to ensure the sustainability of remediation.

Legal and policies

Legal and policy frameworks and institutional arrangements

Legal and policy frameworks and regulations

The Ministry of Environment is working on a draft law on climate change and low-carbon transformation of the Slovak Republic. The draft law reflects the EU climate goals, the binding nature of climate plans, the obligation to develop strategies and action plans at the regional and local level, and the way adaptation strategies, implementation plans and other adaptation documents are developed at the national level.
The Ministry of Environment of the Slovak Republic in cooperation with SAŽP is implementing 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.

National Adaptation Policies (2)

Adaptation Policy type

B: 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

c-actual adaptation policy (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

Sectors covered by the adaptation policy

-

If sector is 'Other', please explain

-

Focus of the adaptation policy

-

Adaptation Policy type

C: 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

c-actual adaptation policy (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

Sectors covered by the adaptation policy

-

If sector is 'Other', please explain

-

Focus of the adaptation policy

-

Overview of institutional arrangements and governance at the national level

Climate vulnerability and risk assessment

Climate-related vulnerability and risk assessment is the subject of Act No. 24/2006 Coll. on EIA/SEA. Climate vulnerability (impact) has been addressed therein since its amendment No. 142/2017 Coll.
The expected impacts of the proposed activity on the environment, including health, and an estimate of their significance (expected impacts direct, indirect, secondary, cumulative, synergistic, short-term, temporary, long-term and permanent, caused during construction and implementation), including impacts on climatic conditions and the vulnerability of the proposed activity to climate change, shall be assessed.

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 will also be 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 is being 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 arrangements and management of the collection, ownership, reuse and access to relevant data shall be carried out in accordance with laws, government resolutions and adopted action plans.The collection, ownership and sharing of data is based on the respective reports.The reports are public.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, prepares comprehensive methodological procedures,on the basis of which it will be possible to build a comprehensive mechanism for the collection, evaluation, processing and disclosure of information in the field of adaptation.

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 Slovak Republic is one of the new challenges. The Ministry of the Interior of the Slovak Republic is working on disaster risk management tasks at both national (adoption of a strategy, action plan and disaster risk assessment) and international level – reporting to the EC. Resolution of the Government of the Slovak Republic No. 65/2022 approved the National Strategy for Security Threat Risk Management of the Slovak Republic, 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.

Strategies and plans

Adaptation strategies, policies, plans and goals

Adaptation priorities

- Promote climate change adaptation as a strategic priority, integrate climate change adaptation into the policy and legal framework and strengthen the theme of adaptation in plans and programmes.
- Strengthen the implementation of adaptation policies and legislation
- Build and develop an effective and functioning climate change adaptation system, based on the principle of subsidiarity and the joint efforts of stakeholders and the public.
- Develop the knowledge base, data collection, monitoring and research associated with the dissemination of data and information.
- Promote climate change education and solutions throughout the education process
- Promote and develop a multi-source financing system for climate change adaptation.

Challenges, gaps and barriers to adaptation

The main barriers to successful adaptation are, funding sources and poor information. Both the Slovakia Programme and the Recovery and Resilience Plan provide us with a framework within which we can implement a spectrum of adaptation measures, but the priority focus is on landscape planning reform and the reform of nature conservation and water management in the countryside

Proper and efficient financing of adaptation measures and tasks is a prerequisite for their implementation and will be guided by the principle of multi-source financing. The key will be the use of the resources of the state budget, municipalities in combination with allocated resources from EU funds, CAP measures and the aforementioned Recovery and Resilience Plan, including their national co-financing.

Achievement of the main objective of adaptation of the NAS and NAP should contribute to the fulfilment of the sub-objectives, which are: ensuring active development of national adaptation policy, implementation of adaptation measures and monitoring of their effectiveness, strengthening the reflection of the objectives and recommendations of the NAS in the framework of multilevel governance and business support, raising public awareness of climate change issues, promoting synergies between adaptation and mitigation measures and the use of the ecosystem approach in the implementation of adaptation measures, and promoting the reflection of the objectives and recommendations of the 2030 Agenda, the Convention and the PA. In these activities, however, we must also not forget the open discussion of all possible solutions and the importance of raising public awareness on the subject. Also, the implementation of the individual NAP targets by 2027 and subsequently the new NAS can

contribute substantially to increasing adaptive capacity and reducing climate vulnerability to the adverse impacts of climate change.

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

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.
In the framework of the adopted resolution on the Implementation Plan, the task was defined to allocate adequate financial resources for the implementation of the measures of the Envirostrategy 2030 within the available resources of the chapter of the Ministry of the Environment of the Slovak Republic, according to the possibilities.
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.

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. It also contains a matrix of measures and their financing options, including the amount of planned financial resources (where it has been possible to quantify this amount).

Law on climate change
The first ever law on climate change and low-carbon transformation of the Slovak Republic (the so-called Climate Act) is being prepared in the Slovak Republic. The law will also address the issue of adaptation in the relevant sections. It stresses the need and necessity to adapt to climate change and to take appropriate measures to anticipate the adverse effects of climate change and to avoid or minimise these adverse effects of climate change. Adaptation strategies and related measures need to be taken at the national level, but also at the local level, i.e. on the territory of higher territorial units, as well as at the local level. The draft law defines the various strategic and planning documents, the institutional framework and coordination mechanism for their development, updating and evaluation.

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

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

-

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

studies ongoing

Administrative level the measure is implemented

-

If 'other', please explain

-

The cost of implementing the measure

The total planned allocation is EUR 6 575 million, of which the Climate Change Adaptation component is EUR 159 million.

Weblink

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

Title of the measure or action

Operational 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

-

If 'other', please explain

-

The cost of implementing the measure

EUR 360 million

Weblink

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

If necessary, you can upload here an additional document on the actions and (programmes of) measures reported in the optional table above

Annex_2_EN.docx

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

Efforts to integrate climate change adaptation into sectoral policies, plans and programmes, including disaster management strategies and action plans.
An overview of relevant sectoral documents is provided in the Annex 2.

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

A participatory process of defining priority adaptation measures and tasks was applied in the preparation of the NAP. It was attended by more than 200 experts from various fields, including central government bodies concerned with adaptation issues, and was conducted using expert decision-making techniques. As part of the strategic environmental assessment process, the public was also able to participate in the work.
The NAS as well as the NAP support activities aimed at strengthening the awareness of stakeholders and the public about the expected negative consequences of climate change and the possibilities of adaptation measures in Slovakia. A number of projects are being implemented to reach/engage different stakeholder groups. The projects are mainly financed by the Operational Programme on Environmental Quality, the EU Horizon 2020 Framework Programme and grants from the European Economic Area and Norway.
Within the framework of the support of educational and information activities, a project financed from the OP Environment Improvement of information and provision of advice in the field of improving the quality of the environment in Slovakia (SAŽP) is being implemented. Within the framework of the project, information materials are prepared for various target groups, as well as educational and awareness-raising events are carried out.
Many projects involving mainly pupils and students are implemented through NGOs. The Green School Project (Živica Centre for Environmental and Ethical Education) is an environmental education programme for kindergartens, primary, secondary and special schools. It aims to contribute to preventing and solving environmental problems and to bring about real changes in the way schools operate and teach. The topics addressed also include those related to adaptation to climate change.

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

In accordance with the NAS and the NAP, entrepreneurs in their field of business, but especially in agriculture, food processing, forestry and water management, and industrial production, are obliged to adapt their activities to good economic practice with regard to climate change and the sustainable use of natural resources, in accordance with applicable legislation and best practices (in the protection of water resources, land management, cultivation of suitable crops, storage of pollutants, discharge of wastewater, use of efficient technologies in production processes, etc.).

In the case of the private business sector, the selection and prioritisation of adaptation measures is its direct responsibility. It should be provided with all available, up-to-date and objective information in this area on an ongoing basis by the state and public authorities. Given the intensity, frequency, magnitude and negative impacts of extreme weather events in recent years, adaptation to climate change is becoming a direct part of the analysis and decision-making of the banking sector as well, particularly in the context of lending to businesses.

The NAS and the NAP also support the establishment of formalised public-private partnerships for the preparation and implementation of adaptation measures at regional and local level.

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 are being prepared in the framework of the project Methodology for the assessment of investment risks associated with the adverse effects of climate change, which is expected to be completed by the end of 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)).

An overview of existing monitoring and information systems in the Slovak Republic that are

relevant for gathering information on climate change mitigation, vulnerability, risks and enhancing adaptive capacity is provided in Annex 3.

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 and the next task is to submit to the Government of the Slovak Republic Information on the progress achieved in the implementation of the short-term objectives of the Action Plan in the Slovak Republic by 30 June 2024.

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

The measures are set out in the revised NAS – 2018. The objectives and specific tasks are elaborated in the NAP – 2021.
Significant finances for adaptation have so far been disbursed mainly through these financial mechanisms: Operational Programme Quality of the Environment (OP EQE), Environment Fund, LIFE Environment and Climate Protection Programme and others (INTERREG, HORIZONT2020, EEA and Norwegian financial mechanism). Within the Ministry of Investments, Regional Development and Informatization of the Slovak Republic, the Integrated Regional Operational Programme (IROP) and the Rural Development Programme within the Ministry of Agriculture and Rural Development of the Slovak Republic are mainly used.
There is currently no comprehensive database of financial resources and the amount of financial resources spent to support adaptation projects and activities An Environmental Goals Information System is under preparation, which, in addition to informing the public about the current goals in the field of environmental care, including the topic of climate change, will also serve to track the implementation of these goals and the measures taken, with the ambition of evaluating the amount of financial resources spent as well.
Below is an overview of selected financial sources in the structure of currently available information.
Operational Programme Environmental Quality 2014 – 2020

In the 2014-2020 programming period, the Operational Programme Quality of the Environment (https://www.op-kzp.sk/en/) supports activities aimed at adaptation to climate change as well as disaster risk management through three priority axes. The funds can be used until 2023.
Priority Axis 1 (PO 1) Sustainable use of natural resources through environmental infrastructure with an allocation of EUR 131,946,524 supports measures related to the improvement of the conservation status of species and habitats and the enhancement of biodiversity, in particular in the framework of the Natura 2000 network.
As of 31 December 2022, the contracting rate for PO 1 was EUR 85,741,043 and the uptake was at EUR 43,462,562 (EU source) and EUR 7,669,864 (state budget source).
Under Priority Axis 2 (PO 2) Adaptation to the adverse effects of climate change with a focus on flood protection, with an allocation of EUR 221,251,525, flood protection measures related to watercourses as well as off-watercourses, watercourses, water retention measures in urban areas, as well as the updating of flood risk management plans (including the updating of flood hazard maps and flood risk maps), the development of methodologies and information activities in this area are supported.
As of 31 December 2022, the contracting rate of funds for PO 2 was EUR 141,711,142 and the uptake was at the level of EUR 64,338,342 (EU source) and EUR 10,354,292 (state budget source).
Under Priority Axis 3 (PO 3) Support for risk management, emergency management and resilience to climate change-influenced emergencies with an allocation of EUR 286,936,725, specific objectives support e.g. Modelling of emergency developments, monitoring and assessment of risks related to climate change and its impacts, building risk assessment and early warning and preparedness systems for climate change-induced emergencies, prevention, research and rehabilitation of climate change-induced landslides, hydrological and hydrological research, optimisation of its systems, services and strengthening of intervention capacities for emergency management at local and regional level, and building technical and institutional support for specialised rescue modules.
As of 31 December 2022, the contracting rate for PO 3 is EUR 219,445,962 and the uptake is at EUR 149,754,181 (EU source) and EUR 26,411,309 (state budget source).

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

Environment Fund (EF)
In the years 2021-2022, 17 projects aimed at improving air quality through adaptation measures were supported with a total amount of EUR 2,382,406,89.
Under the Watercourse Measures activity, 2 projects were supported for a total of EUR 251,192 and under the Non-Watercourse Measures activity, 2 projects for a total of EUR 136,318.

Village Renewal Programme (POD)

Under the Rural Environmental Quality activity, 11 projects were supported in 2021 with a total amount of EUR 43,543. In 2022, 17 projects were supported. The approved amount was EUR 98,016. The drawing will be completed by 06/2023.
Under the Green Infrastructure and Adaptation Measures to Mitigate Climate Change activity, 128 projects were supported in 2021 with a total amount of EUR 578,009.

LIFE Programme 2014-2020
Financial contribution to Slovak LIFE projects/international projects with Slovak partner organisations for the period 2014-2020 (total of 4 LIFE projects – until 31 December 2022):
EC contribution: EUR 3,008,798

LIFE Programme 2021-2027
Financial contribution to Slovak LIFE projects/international projects with Slovak partner organisations for the period 2021-2027 (1 LIFE project financed – until 31 December 2022):
EUR 418,127.54

SK-Climate Programme
The allocation for the SK-Climate Programme is EUR 21,430,588, while the contribution is as follows:

- the EEA grants are at the level of EUR 5,000,000,
- Norwegian Grants of EUR 13,216,000 and
- State budget of EUR 3,214,588

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

Integrated Regional Operational Programme (IROP)
Under the specific objective Improving environmental aspects in cities and urban areas by building green infrastructure and adapting the urban environment to climate change, as well as introducing systemic elements to reduce air and noise pollution, the following calls have been launched:

- Improving environmental aspects in cities and urban areas – building green infrastructure elements and adapting the urban environment to climate change, as well as introducing systemic elements to reduce air and noise pollution

Contracted: 121 projects for a total of EUR 40,030,953 Total eligible costs (EUR 34,026,310 ERDF source, EUR 4,003,095 state budget source)
Draw-down until 31 December 2022: EUR 28,560,659 (source European Regional Development Fund).

- Improving environmental aspects in cities and urban areas

Contracted: 77 projects for a total amount of EUR 47,238,168 Total eligible costs (EUR 40,152,442 ERDF source, EUR 4,723,816 state budget source)
Draw-down until 31 December 2022: EUR 4,526,175 (source European Regional Development Fund).

- Improving environmental aspects in cities and urban areas

Contracted: 38 projects for a total amount of EUR 17,488,834 Total eligible costs (EUR 17,488,834 ERDF source, EUR 0 state budget source)
Draw-down until 31 December 2022: EUR 0 (source European Regional Development Fund).
Rural Development Programme (RDP) SR 2014 – 2020:
Sub-measure 8.3 Support for the prevention of damage to forests caused by forest fires and natural disasters and catastrophic events:

- Allocation EUR 86,000,000
- Draw-down until 31 December 2022: EUR 803,477

Sub-measure 8.4 – Aid for the restoration of forests damaged by forest fires and natural disasters and catastrophic events:

- Allocation EUR 69,533,365
- Draw-down until 31 December 2022: EUR 49,741

Measure M10 – Agri-environmental-climatic measure:

- Allocation EUR 151,863,208
- Draw-down at 31 December 2022: EUR 20,843,434

Measure M15 – Forestry, environmental and climate services and forest protection:

- Allocation EUR 7,313,700
- Draw-down at 31 December 2022: EUR 945,160

The Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences (VEGA) supported 15 active research projects in the period 2021-2022 with a total amount of EUR 178,454.
In the period 2021-2022, the Agency for the Promotion of Research and Development (APVV) supported 68 active research projects with a total subsidy of EUR 2,820,222.

If necessary, you can upload here an additional document

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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" 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.
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 MoEW will also focus 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.

Progress towards 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 structure of the web platform for the public will also be proposed, including the methodology for its implementation and operation.

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, management and use

Resolution of the Government of the Slovak Republic No. 372/2022 approved the Water Policy Concept until 2030 with a view to 2050. Resolution of the Government of the Slovak Republic No. 319/2022 approved the document Water Plan of Slovakia for the years 2022 – 2027.

2. In the field of sustainable agriculture

Resolution of the Government of the Slovak Republic No. 94/2022 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

The Ministry of Agriculture and Rural Development of the Slovak Republic has prepared the document "National Forestry Programme for 2022 – 2030".

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

Government Resolution No. 3/2019 of 9 January 2019 approved the National Environment and Human Health Action Plan V (NEHAP V). The primary objective of NEHAP V is to minimize risks from the environment that may harm and endanger human health through the proposed activities of each priority area, which includes climate change.

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.

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. The conditions for the creation of a new National Climate Change Adaptation Strategy are currently being prepared in the Slovak Republic.

Cooperation and experience

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

Good practices and lessons learnt (2)

Title

Green Economy Information Platform

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.

Title

Village Renewal Grant Programme

Area of good practices

Integration of indigenous, traditional and local knowledge into climate adaptation; Stakeholder engagement

Good practices and lessons learnt

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.

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).
Among the international conventions, the NAS promotes synergies with the Convention on Biological Diversity, the Convention to Combat Desertification and the Framework Convention on the Conservation and Sustainable Development of the Carpathians. 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.
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) and the National Strategy for Security Threat Risk Management of the Slovak Republic (2022).
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.

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. The activities of local government bodies is regulated by Act No. 369/1990 Coll. on Municipal Establishment. These regulations also include the setting of targets for selected areas related to climate change adaptation.
Act No. 200/2022 Coll. on Spatial Planning stipulates in the spatial planning documentation at the level of regions, It contents measures to mitigate climate change and to adapt to its adverse consequences.
A new climate law is being drafted that will oblige municipalities and municipalities with more than 2,000 inhabitants to develop an adaptation strategy.

Networks or other collaborations on adaptation across national authorities

The National Platform of the Convention of Mayors for Climate and Energywas established in 2011 thanks to the NET-COM (NETworking of Covenant of Mayors, Energy Cities) project, which created a cooperation between the different European networks. CITENERGO is the founder and coordinator of the National Platform. The Union of Towns of the Slovak Republic (UMS) is a supporter of the Convention.
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, the Slovak cities of Banská Bystrica, Košice, Žilina and the municipal district of Rača have joined the research and innovation initiative Mission: Adaptation to climate change.

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 (Bratislava self-governing region - Program of Economic development and Social development of BSK for the years 2021-2027 with a view to 2030, Catalog of adaptation measures of BSK cities and municipalities to the adverse consequences of climate change), Banská Bystrica (Banská

Bystrica self-governing region - Economic and Social development program 2022 – 2030) Košice (Košice self-governing region - Košice region's Landscape Restoration Program "POK"), Trenčín, Trnava, Ilava, Nitra (Environmental study of Territorial Impacts of Climate Change), Kremnica, Kežmarok, Liptovský Mikuláš, Martin, Nová Dubnica, Nové Zámky, Prešov and Žilina

ADAPTATION STRATEGIES, POLICIES, PLANS AND GOALS

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

At the regional level, individual self-governing regions have developed Economic and Social Development Plans up to 2030. The topic of adaptation to climate change is also addressed. Some regions are also preparing specific climate change adaptation documents for their territories:

- Adaptation Plan of the Bratislava Self-Governing Region to the Adverse Impacts of Climate Change (planned for adoption in 2023)
- Climate Change Adaptation Strategy of the Prešov Self-Governing Region (plan for adoption in 2023)
- Concept of application of SMART principles in the development of public policies of the Banská Bystrica Self-Governing Region – the area of RESILIENCE TO CLIMATE CHANGE (approved in 2022)
- ADAPTATION STRATEGY for the consequences of climate change in the Košice Region – Strategy, 2020 (plan for adoption in 2023)

Stakeholder engagement

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

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 „DELIVER: DEveloping resilient, low-carbon and more LIVablE urban Residential area – Sídliská ako živé miesta odolné voči zmene klímy" (link: https://odolnesidliska.sk/home/) funded by the European Commission, by the financial Instrument for the Environment: Program LIFE for the period 2014 – 2020.

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

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), Its approval is expected in May 2023.

- 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
Draft Adaptation Strategy for Climate change (in preparation)
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

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.

ANY OTHER INFORMATION RELATED TO CLIMATE CHANGE IMPACTS AND ADAPTATION

Key reports and publications at sub-national level (1)

Title

Economic and Social Development Programme of the Bratislava Region for years 2021 – 2027

Year of publication

2021

Publisher

Bratislava self-governing region

WebLink

https://bratislavskykraj.sk/wp-content/uploads/2022/09/pshr-bsk-jun-2021-aj-final.pdf

Contact

Any other information related to climate change impacts and adaptation

Key contact details of national coordinator and organisation (3)

Organisation

Ministry of Environment of the Slovak Republic

Department within the organisation

-

Role of the organisation

-

Contact person

-

Role of the contact person

-

Email address

jozef.skultety@enviro.gov.sk

Website

https://www.minzp.sk/

Organisation

Ministry of Environment of the Slovak Republic

Department within the organisation

Climate Change Policy Department

Role of the organisation

-

Contact person

-

Role of the contact person

-

Email address

miroslava.dancova@enviro.gov.sk

Website

https://www.minzp.sk/

Organisation

Ministry of Environment of the Slovak Republic

Department within the organisation

-

Role of the organisation

-

Contact person

-

Role of the contact person

-

Email address

anna.hinerova@enviro.gov.sk

Website

https://www.minzp.sk/

If necessary, you can upload here an additional document

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