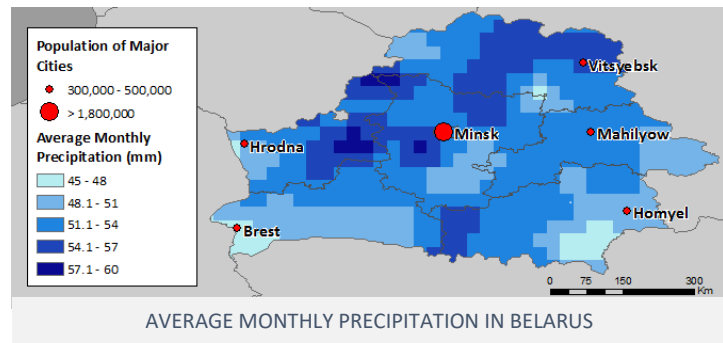




CLIMATE RISK PROFILE REPUBLIC OF BELARUS

COUNTRY OVERVIEW

A landlocked country in Eastern Europe, the Republic of Belarus is mostly flat, with vast forests, peatland, and abundant lakes, rivers, and water resources. Manufacturing accounts for about 25 percent of GDP and 23 percent of the country's 9.5 million people work in the sector. In comparison, agriculture accounts for 8.3 percent of GDP, employs almost 10 percent of the population, and covers almost 44 percent of the land. The country faces significant climate change related threats. Temperatures, floods, droughts, and precipitation patterns have begun to diverge from historical patterns, which will impact multiple sectors. For example, rising temperatures will likely increase the need for energy, placing an increased strain on the outdated electrical system as demand for cooling increases. Water, while abundant within Belarus, may deteriorate in quality due to increased flooding, extreme rain events, and changes in runoff patterns. Furthermore, changing rainfall patterns and flooding may alter the distribution of dangerous radionuclides, particularly in food and water resources, found in southern Belarus as a result of the 1986 Chernobyl accident. In a country with almost 43 percent forested land, rising temperatures are likely to change ecosystem function, forest composition, and certain species of trees, such as spruce, will suffer. Drought and increased temperatures could make forests more vulnerable to climate-related threats, such as disease outbreaks and forest fires. Climate change may also provide potential opportunities for Belarus. As temperatures warm, arable land may increase and expand northwards and forests may increase in size. However, the negative impacts of climate change appear to outweigh these potential benefits. (2,9,12,15)



CLIMATE PROJECTIONS



1.5-2°C increase in temperature by 2050



Shifting precipitation patterns
Lack of moisture in southern regions



More extreme weather, including, floods, drought, and heat waves

KEY CLIMATE IMPACTS

Human Health

Rise in number of emergency situations
Increased infectious disease
Increased heat stress

Water Resources

Decline in water quality
Increased exposure to radionuclides in the south

Energy

Increase in winter cooling demand
Disruption in energy access due to extreme weather

Forestry

Increased risk of forest fires
Increased risk of disease and invasive species

Agriculture

Reduced yields
Increased pests and disease

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CLIMATE SUMMARY

Belarus has a temperate-continental climate that is typical of central European countries. The land is mostly flat, not coastal, and relatively small, leading to a somewhat uniform climate within the country. The Belarusian Ridge, which includes the highest peak, Dzyarzhynskaya Nill, at 346 meters, runs diagonally from west-southwest to east-northeast through the country. The country has distinct seasons, with cold winters and relatively warm, moist summers. In January, temperatures average from -4.5°C to 8°C, while the average temperature in July ranges from 17°C to 18.5°C with slightly warmer temperatures in the south compared to the north. Belarus' annual rainfall is 600-700 mm, of which 70 percent falls from April to October. The country also experiences between 75 and 125 days of snow each year. Studies suggest that negative effects related to climate change will be more pronounced in the south of Belarus, which has more agricultural land and has seen reduced rainfall in the summer months, than in the north.

HISTORICAL CLIMATE

- The average annual temperature has increased by 1.1°C over the last 20 years.
- At the end of the 20th and in the early 21st century, Belarus experienced the longest warming period in recorded history, over the last 130 years.
- Of the 20 warmest years since 1945, 18 occurred between 1989 – 2013.
- From 1989 to 2012, drought conditions over two months in length occurred twice as often as in previous years.
- While total precipitation has only slightly changed over the last 20 years, rainfall patterns have become increasingly uneven, with shifting seasonal rain occurrence and more extreme rainfall events.
- Increase in average air temperature was most significant in winter and early spring.

FUTURE CLIMATE

- Increase in average annual temperature of 1.5 - 2°C by 2050.
- Most warming is projected to occur in the winter, with a likely 2-3°C increase in the winter period.
- Precipitation projections are less clear. It is likely that there will be an increase in the intensity, if not total amount, of precipitation, with more extreme rainfall and flooding expected.
- Winter runoff is expected to increase due to increased snowmelt. Potential increase in runoff in spring and summer during heavy rains, with decreased runoff during heat waves due to increased evapotranspiration.
- Increase in the frequency and duration of heat waves, with an increase of up to 6 days over 35°C by 2060. (2,3,4,5,16)

SECTOR IMPACTS AND VULNERABILITIES

AGRICULTURE PRODUCTION

Though heavily reliant on government subsidies, agriculture is one of Belarus' largest economic sectors, accounting for 8.3 percent of GDP and employing 9.9 percent of the population. Agriculture comprises 44 percent of total land area with arable land, permanent crops, and permanent pasture making up 27 percent, 0.6 percent, and 16 percent of land respectively. Due to vast above and below ground water resources, most places in Belarus need drainage rather than irrigation. In some areas where excessive drainage of groundwater has occurred, irrigation is used. The main agricultural and pastoral products from Belarus are milk, cattle, poultry, grain, potatoes, vegetables, sugar beet, and flax. Belarus is a global leader in production of potatoes and flax, which are two particularly

Climate Stressors and Climate Risks	
AGRICULTURE	
Stressors	Risks
Floods	Erosion and subsequent loss of farmland.
Rising temperatures	Desertification and loss of arable land for agricultural production, decreased soil fertility, and increased risk of poor harvest yields.
Change in rainfall patterns	Increased livestock mortality.
Droughts	Increased prevalence of waterlogged soils.
Heat waves	Increased incidence of pests and crop diseases, such as possibility of parasite propagation and increased fungal diseases.
Powerful winds	Damage to agricultural buildings.

important crops for the country. Changing climatic conditions may lead to both beneficial and harmful impacts in the agriculture sector. Increased temperatures are expected to extend the length of the growing seasons in the northern part of the country, with crops only suitable for the south potentially becoming viable in the north. At the same time, projections suggest a slight increase in precipitation in summer and winter, yet a likely decrease in the water supply in the spring, which could negatively affect crop productivity. The biggest threat to agricultural production may be changes in the frequency and intensity of drought and heat-waves, both of which are expected to increase throughout the country resulting in increasing stress to agricultural production. In dry years, the yield of cereals and legumes can drop by 10 to 20 percent and in years of severe drought, yields may decrease by as much as 30 to 40 percent. Adverse effects on agriculture from warming temperatures are also associated with the increase in frequency and duration of winter thaws and the associated increase in the probability of damage to winter crops. Additional threats include an increased likelihood of pest outbreaks and increased likelihood of fire. Rapeseed and barley yields are most likely to be impacted across the country. (2,3,4,11,18)

FORESTRY

The Government of Belarus has exclusive ownership of all forests in the country, which total 43 percent of total land area, or 9.4 million hectares. The effects of climate change on the forestry sector are uncertain, but negative impacts likely outweigh positive impacts. While there may be increased growth due to longer growing seasons, forests will likely be threatened with an increase in pests and pathogens due to warmer weather, increase risk of fire due to drier and hotter conditions, and increased stress due to drought. Belarusian forests are mostly coniferous, with pine trees constituting 50 percent and spruce 10 percent. Prior to a massive draining of peatlands beginning in the 1950s, Belarus was also home to about 2.5 million hectares of peatland. Every year 2,000 – 3,000 forest fires occur in the country, in both coniferous forests and drained peatland. The number and intensity of fires may increase due to hotter temperatures, drought, and extended fire seasons. Dry peatlands are particularly susceptible to fire. In 1999 and 2002, massive peat fires occurred in drained peatlands, causing ecological and economic damage. Today, there are widespread efforts to restore peatlands and forests. In recent decades, forest rehabilitation and restoration has been successful. However, these efforts have sometimes led to forests with uniform species composition and contain trees that are relatively young and lack genetic diversity. Young, low diversity forests, which also lack genetic diversity, are less resistant to pests and diseases, which are likely to become more problematic as the climate changes. Forest dieback from heat and drought is also a concern. Spruce forests, which are not drought tolerant and consist of 10 percent of the country's forests, will be threatened if the frequency and intensity of drought increases as expected. In the past 15 to 30 years, mass spruce forest dying has been observed and such declines are expected to continue; in the southern part of the country, spruce forests are expected to decline by 8 to 10 percent by 2025 and by 20 percent by 2050. Furthermore, increased evapotranspiration rates and lower rainfall may combine to lower growth rates in some regions. While a warmer climate with a longer growing season may increase spread and growth of forests in some parts of the country, overall projections are unfavorable for the long term, suggesting decreasing growth and a reduction in primary

Climate Stressors and Climate Risks FORESTRY	
Stressors	Risks
Drought	Boreal components of cover crop weaken and/or perish.
	Reduction in size of taiga and sub-taiga zones.
Rising Temperatures	Aggravated wintering conditions increasing likelihood for vegetation provoking thaws.
Shift in onset of seasons	Change in timing of maturity of tree fruits and seeds, and forest berries.
	Inhibited growth of deciduous species.
Changes in precipitation patterns	Changing composition of forests.
	Crop failures of berries and other agro-forestry commodities that lead to decreases in forestry revenues.
	Increased likelihood of forest fires.

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productivity as temperatures warm, CO₂ saturation is reached for synthetic enhancement, and summer precipitation is reduced. (1,2,4,7,13,18,19)

WATER RESOURCES

With approximately 20,800 rivers, 10,800 lakes, 153 water reservoirs, and 1,500 ponds, water is one of the most abundant resources throughout Belarus and should be sufficient to meet both current and future demands. Ground water resources are prevalent and the yearly volume of fresh water withdrawal is less than 3 percent of the total volume of available fresh water. Water use falls into three main categories: agriculture (31 percent), industry (20 percent) and household (49 percent). While water supply and sewerage coverage are high across the country, at 86 percent and 74 percent respectively, there is an unequal distribution and quality of the water supply. In urban areas, 95 to 100 percent of the population is served by a centralized water distribution system, whereas 1 in 5 Belarusians living in rural areas lack access to centralized water systems. While the likelihood of a change in precipitation amount is unclear, it is likely that there will be changes in runoff driven by shifts in river flow volumes due to increased winter temperatures. River runoff is likely to increase during winter months country-wide as a result of increased snowmelt. In summer, runoff may decrease due to increased evapotranspiration resulting from hotter temperatures, particularly in the warmer southern region. Also, as a result of evapotranspiration and decreased overall precipitation, river flows may decrease in summer months. Changes in runoff patterns can introduce pollutants from farmlands and other areas to water resources. Precipitation, while likely to stay consistent in total amount, is expected to change in intensity and frequency, which could lead to an increase in flood frequency and a potential decrease in water quality. In the southern region, close to the Chernobyl accident that occurred in 1986, increased flooding could result in increases in radionuclides in water resources and entering the food web. (3,8,13,19,21)

Climate Stressors and Climate Risks WATER RESOURCES	
Stressors	Risks
Rising temperatures	Prevalence of persistent organic pollutants in water resources.
	Reduction of water supply to economic sectors that use surface waters.
Drought-like conditions	Deterioration of water quality.
Reduction of runoff	Increased frequency of large flood events.
Changes in precipitation patterns	Increased concentration of radionuclides in watersheds.

ENERGY

Ninety-nine percent of total installed capacity of electricity in Belarus comes from fossil fuels, largely natural gas, utilizing thermal power plants installed during the Soviet period. As most of Belarus' thermal power plants were installed in the 1960s and 1970s, they are at the end of their planned lives and are badly in need of repairs or replacement. While warmer winters are likely to reduce heating costs of buildings, increased temperatures, as well as increased frequency and intensity of droughts and heat waves, could result in greater cooling demands in warmer months and place additional strain on the aging system. Furthermore, increased frequency of flooding events could damage infrastructure already in need of maintenance or repair. Belarus saw a sharp decline in its energy consumption in the 1990s after the fall of the Soviet Union; Belarus was one of the USSR's major industrial republics, specializing in agriculture and the production of machinery.¹ There has been a very gradual rise in energy consumption since 2000. The country produces 32 billion kWh annually and all Belarussians have access to electricity. Currently, renewable sources make up less than one percent of total energy and the institutional and technical capacity to develop these sources has yet

Climate Stressors and Climate Risks ENERGY	
Stressors	Risks
Rising temperatures	Drop in winter heating demand; rise in summer cooling demand.
	Damaged power lines.
Extreme weather events such as strong winds and heavy rains	Disruptions in heat, power, and gas.
	Power transmission and communication lines broken.
	Settlements left without power.

¹ From 1990-2011, total primary energy consumption of Belarus decreased from 46 to 30 Million tonnes of oil equivalent (Mtoe)

to be built. Belarus is heavily dependent on imported oil and gas, which it receives mostly from Russia at prices substantially lower than world market prices. However, beginning in 2006, Russia began rolling back subsidies on oil and gas exports to Belarus, placing an increased strain on energy security and independence. Shifts in climatic conditions that could increase energy demand or result in damage to aging energy infrastructure could thus result in greater strain on Belarus' energy security. Belarus plans to open its first nuclear power plant in 2019, which will produce 2,400 megawatts. There are also plans to develop coal, hydropower, and wind energy in the country. (2,6,10,12,14,19)

HEALTH

Despite recent gains in life expectancy for both men (64.8 years in 2009) and women (76.6 years), both remain lower than the average of the WHO European Region (72 for men and 79 for women). Changing climate conditions may place an increased burden on the Belarusian health sector through an increase in the number of emergency situations, deterioration of living conditions, and spread of infectious diseases, including encephalitis and other infections. Changing conditions are most likely to affect those with chronic diseases, such as diabetes, asthma, malnutrition, and cardiovascular diseases. The negative health impacts of climate change are most acute for vulnerable groups, particularly the elderly, disabled, children, people with low incomes, and the homeless. For example, heat stress due to heat waves can increase mortality of those with chronic illness. Additionally, higher temperatures and potential flooding may lead to more exposure to water- and vector-borne diseases. There is evidence that those living in rural areas suffer from a higher mortality rate from extreme weather events due to a lower level of population literacy and information support for extreme weather phenomena and advisable response actions. (4,9,17)

Climate Stressors and Climate Risks	
HEALTH	
Stressors	Risks
Flooding	Quality deterioration of food and water.
Rising temperatures and increased heat waves	Increased number of pests and pathogenic organisms.
Changes in precipitation	Increased number of emergency situations.
Drought-like conditions	Deterioration of living conditions.
Increased humidity	Heat stress.
	Desertification and loss of arable land for agricultural production.

POLICY CONTEXT

INSTITUTIONAL FRAMEWORK

The Belarus Government works closely with donors and international organizations to understand and address climate risks. The right of Belarusians to a healthy environment and compensation for damages caused by the violation of these rights is enshrined in the Constitution of the Republic of Belarus. In its Nationally Determined Contribution to the UN Framework Convention on Climate Change (UNFCCC), Belarus pledged to reduce greenhouse gas emissions by at least 28 percent of the 1990 level by 2030, excluding emissions and removals in the land use, land-use change, and forestry sector. The Ministry of Natural Resources and Environmental Protection is the responsible authority for implementing provisions of the UNFCCC and the obligations of Belarus in accordance with the Kyoto Protocol. Additionally, Belarus is a signatory to the Aarhus Convention. The State Commission on Climate Change has been established to

NATIONAL STRATEGIES AND PLANS

- [Intended Nationally Determined Contributions of the Republic of Belarus](#) (2015)
- [First National Communication](#) (2003)
- [Second, Third, and Fourth National Communication](#) (2006)
- [Fifth National Communication](#) (2009)
- [Sixth National Communication](#) (2015) (Russian)
- [Second Biennial Report](#) (2015)
- [Strategy for Adaptation of Agriculture to Climate Change in the Republic of Belarus](#) (2017)

coordinate the work of the implementation of policy to mitigate climate change in Belarus, which is responsible for developing strategy in climate change negotiations. The Republic of Belarus is party to more than 20 international conventions and agreements on environmental protection issues. The Ministry of Natural Resources and Environmental Protection currently chairs an interagency committee to implement Global Environment Facility (GEF) projects focused on climate change, which are expected to increase in the future. (3,19)

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SELECTED ONGOING EXPERIENCES³

Selected Program	Amount	Donor	Year	Implementer
Forestry Development Project	\$40.71 million	World Bank	2015-present	N/A
Biomass District Heating Project	\$90 million	World Bank	2014-2019	Energy Efficiency Department
Water Supply and Sanitation Project	\$60 million	World Bank	2008-2019	Ministry of Housing and Utilities
Conservation-oriented Management of Forests and Wetlands to Achieve Multiple Benefits	\$14,230,000	GEF, UNDP	2016-present	Ministry of Environment and Natural Resources, Ministry of Forestry
Landscape Approach to Management of Peatlands Aiming at Multiple Ecological Benefits	\$13,185,300	GEF, UNDP	2011-present	Ministry of Environment and Natural Resources, Ministry of agriculture, National Academy of Sciences, Ministry of Forestry
Strengthening Air Quality and Environmental Management in Belarus (SAQEM)	€14.5 million	European Union	2015-present	N/A

²This “Key Resources” section lists works cited in preparing the Climate Risk Profile.

³ This “Selected Ongoing Projects” section lists a selection of ongoing development projects and interventions directly or indirectly relevant to climate risk management and adaptation in Belarus. Projects were identified primarily via desk review of USAID, multi-lateral development bank, and other international donor programming. Projects listed are not meant to be comprehensive.