



# CLIMATE CHANGE RISK PROFILE UKRAINE

## COUNTRY OVERVIEW

Ukraine is a large, diverse country with high agricultural potential, rich natural resources and an established industrial base. Climate-driven changes such as higher temperatures – causing potential shifts in agricultural zones and leading to marked water deficiencies – can compromise the country’s food security and economic growth, however. Ranked fifth in the world for energy intensity, Ukraine is one of Europe’s largest energy consumers due to its inefficient energy infrastructure, historically low energy prices and high industrial and agricultural energy sector demands. Climate-related donor efforts have focused on emissions reduction, and these efforts to improve energy efficiency and management of renewable energy sources will also benefit adaptive capacity. Increased incidence of strong floods in the last 20 years has affected nearly one-third of the population, especially in the Carpathian Mountains and their foothills. Droughts now occur on average once every three years. The vulnerability of the population, which is largely urban (69.7 percent in 2015), is magnified by infrastructure deficiencies such as an aging and fragile housing stock and limited potable water supply. Since 2014, economic shocks and the humanitarian crisis in the eastern region have diverted resources from climate adaptation strategy and planning. (3, 4, 7)



## CLIMATE PROJECTIONS

- 0.5 - 1.0 °C increase in temperatures
- Changing seasonal and regional rainfall patterns
- Increased incidence of extreme weather events, including droughts and flash floods

## KEY CLIMATE IMPACTS

- Agriculture**
  - Shifting production zones
  - Increased risk from drought
  - Soil degradation
- Water**
  - Decline in surface water quality and quantity
  - Erosion and flooding of coastal areas
- Ecosystems**
  - Water stress
  - Freshwater salinization/degradation
  - Increased forest fire risk
- Energy**
  - Decreased energy efficiency
  - Power supply interruptions
  - Damage to coal/gas infrastructure
- Human Health**
  - Exacerbation of cardiovascular and respiratory disease
  - Increased waterborne disease

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This document was prepared under the Climate Change Adaptation, Thought Leadership and Assessments (ATLAS) Task Order No. AID-OAA-I-14-00013 and is meant to provide a brief overview of climate risk issues. The key resources at the end of the document provide more in-depth country and sectoral analysis. The contents of this report do not necessarily reflect the views of USAID.

## CLIMATE SUMMARY

Ukraine primarily has a temperate continental climate, with a subtropical Mediterranean climate on the southern coast of Crimea. The west and northwest are mild and moist, and the south and southeast are characterized by a lack of precipitation and slightly warmer temperatures. Average annual temperatures range from 5 – 6°C in the northeast to 9 – 11°C in the southwest. On average, up to 1200 mm of rain fall annually in the mountains, but 300 – 700 mm of rain fall in the plains, with decreasing amounts from the north/northwest to south/southeast. Ukraine has three large agro-ecological zones – the Polissya mixed forest zone in the north, a Forest-Steppe zone to the south and a Steppe zone in the south and southeast – as well as the Carpathian Mountain region in the west and the Crimean Mountains in the far south. (1, 2, 4)

### HISTORICAL CLIMATE

Observed climate trends include:

- Increase in average annual temperatures of 0.8°C from 1991 – 2010 (compared to the 1961 – 1990 average).
- No change in overall rainfall levels, but precipitation seems to be highly variable between seasons and across regions.
- Increase in the frequency and intensity of drought events over the last 15 years.
- Significant increase in frequency and intensity of heavy snowfall from 1971 – 2010.
- Increase in the number and intensity of convective weather events (e.g., rain, hail).

### FUTURE CLIMATE

The magnitude and direction of projected changes vary by region and scenario, but may include:

- Increased overall temperatures by 2050, with higher rates of increase expected in the winter.
- Increased precipitation in winter and spring and significantly decreased summer rainfall in the southeast.
- Possible shifts in the onset and duration of seasons in general.
- More frequent flash floods resulting from extreme events, but fewer early spring floods due to reduced snow coverage. (1, 4, 10, 11)

## SECTOR IMPACTS AND VULNERABILITIES

### AGRICULTURE PRODUCTION

A warmer climate may benefit crop yields in Ukraine's colder and humid north, but would negatively impact fertile regions in the south, where water availability is limited. Increases in precipitation may not be correlated with the crop cycle and higher carbon may lower grains' nutritional value, offsetting potential gains in productivity. Ukraine is a major wheat and barley exporter, and 69 percent of land area is under agriculture. The sector is dependent on rainfall, with only 6 percent of cultivated land under irrigation. Ukraine's fertile black "chernozem" soil, characteristic of the long-grass steppe, is known for its high organic matter content, which is highly efficient in its use of rain to maintain soil moisture. However, it has been degraded by intensive agricultural production since Soviet times as well as by water and wind erosion. The cost of soil loss from erosion is estimated at one-third of agricultural GDP each year; soil erosion in turn impedes the sector's resilience to climate variability and extreme events. The implications of drought events were evident in 2009, when a 30 percent reduction in Ukraine's wheat yields was a major trigger in the rise of global food prices. (1, 5, 12)

Climate Stressors and Climate Risks AGRICULTURE PRODUCTION	
Stressors	Risks
Rising temperatures	Reduced losses from early spring frost
	Rise in winter wheat yields in north
	Decrease in rainfed high-input cereal yield in the south
Fewer frost days	Delayed sowing dates; overall plant length cycles substantially unchanged
	Increased moisture evaporation from the soil surface
Changes in precipitation type and amount	Intensified decomposition of humus, resulting in decreased soil fertility
	Reduced capacity of the soil to retain moisture as a result of erosion from extreme wind/water events
Shift in onset of seasons	Increased vulnerability of winter crops from reduced snow cover
Drought	Decreased grain quality resulting from higher CO <sub>2</sub> concentrations
	Increased volatility of sector and world prices

## WATER RESOURCES

Agriculture, industry and households in the south and southeast are most vulnerable to current and projected droughts. The industrial sector leads water withdrawal (48 percent), which is predominantly from surface water sources (80 percent of total). Ukraine has more than 4,100 lakes and reservoirs, but on average 25 percent of drinking water samples do not meet EU quality standards. Potable water deficits leave Ukrainians, particularly in rural areas, exposed to degraded water quality and future declines in water availability. Average flows on Ukraine's rivers – many used for transport – appear to be holding steady. Snowfall irregularities have been observed in the Carpathians, a large tourism center, with snows interrupted by winter rains. (5, 6, 8, 12)

## ECOSYSTEMS

Home to 36 percent of Europe's biodiversity, Ukraine's ecosystems are varied. Impacts of climate change are of particular concern for rare species in the Danube Delta and the Carpathian Mountains. Fire risk threatens the increasingly desiccated, non-native spruce forests in the Carpathians, forests in the Chernobyl exclusion zone and pine forests of the Dnieper region. Pollution, overfishing, alien species, destruction of habitats and river reservoirs have reduced the industrial fishing potential of the Azov and Black Seas and damaged their marine ecosystems, masking climate change effects. However, absolute sea levels rose from 1992 – 2013 by 1 to 3 mm or more, increasing vulnerability of coastal areas to erosion and flooding. (9, 11, 12)

## ENERGY

Anticipated climate impacts include disruptions to the production and transport of Ukraine's energy, specifically coal and natural gas. These comprise more than 70 percent of consumption. Ukraine is also a natural gas and petroleum liquids transit country between Russia and elsewhere in Europe, but higher ambient air temperatures lower efficiency of gas distribution systems. Renewable energy – mostly hydropower – provides about 4 percent of energy but Ukraine's National Renewable Energy Action Plan sets a target of 11 percent renewables in total energy consumption by 2020. If shale gas exploration in Ukraine's eastern regions – interrupted by conflict – expands, it may compete for water with other needs. Coastal erosion also puts stress on oil/gas infrastructure. (7, 9, 10, 14, 16)

Climate Stressors and Climate Risks WATER RESOURCES	
Stressors	Risks
Rising temperatures	Increase in surface water runoff in Crimean Mountains and Polissya; slight decrease elsewhere
	Decrease of summer river flows – may negatively impact inland shipping and navigation but also reduce flooding instances
Decreased rainfall	Decline in groundwater storage and recharge
Drought	Favorable conditions for development of pathogenic bacteria in water supply
Flash floods	Losses for snow-dependent tourism in mountain areas

Climate Stressors and Climate Risks ECOSYSTEMS	
Stressors	Risks
Changes in temperatures and precipitation	Changes in the character of forest areas; increased tree line altitude
	Water stress, provoking fires and pest outbreaks; secondary contamination from fires in radioactively contaminated areas
Drought	Increased salinization of estuaries and degradation of river deltas
Increase in sea surface temperature	Flooding of coastal lowlands
	Increase in toxic bloom events due to sea temperature rise
Sea level rise	

Climate Stressors and Climate Risks ENERGY	
Stressors	Risks
Rising temperatures	Decreased performance of gas distribution systems (e.g., decreased efficiency of cooling units)
	Increasing number of power supply emergencies (power line breaking) during extreme events
Strong winds, heavy rains and other extreme events	Drop in winter heating demand; rise in summer cooling demand
	Changes in timing and flow of water resources for hydropower
Sea level rise	Increased damage to coal mining infrastructure (e.g., corrosion, equipment failure)

## HUMAN HEALTH

Ukraine's predominantly urban population is vulnerable to heat stress, aggravated by urban heat island effects and high pollution levels.

Cardiovascular disease is the leading cause of death in Ukraine – 48 percent of deaths are attributable to heart failure alone – and heat waves add stress to cardiovascular systems. Warmer temperatures could increase incidence of diarrhea and other bacterial diseases and may also increase the range of vector-borne diseases. At least 10 percent of Ukraine's housing stock is beyond its usable life span and ill-prepared to withstand extreme events. (4, 8, 12, 13, 15)

Climate Stressors and Climate Risks HUMAN HEALTH	
Stressors	Risks
Heat waves	Increased stress on cardiovascular systems, added risk of heart disease/failure
Rising temperatures	Increased risk of heat stroke, respiratory illness and death, esp. among the elderly and infants
Flooding and other extreme events	Reduced risk of cold exposure
	Expanding vector- and waterborne disease incidence
	Injuries, mortality or exposure from housing damages

## POLICY CONTEXT

Since 2014, Ukraine has faced a security crisis catalyzed by the Russian annexation of Crimea and the rise of an armed insurgency. The crisis compelled Ukraine to reorient its development agenda toward conflict response and recovery. As a result, recent developments on climate policy have been modest. Ukraine ratified the UN Framework Convention on Climate Change (UNFCCC) Paris Agreement in August 2016.

## INSTITUTIONAL FRAMEWORK

The Ministry of Ecology and Natural Resources is the UNFCCC focal point and guides development and implementation of the National Climate Policy. The Ministry of Fuel and Energy guides climate change strategy and policy for the energy sector. As of 2013, priority measures included expansion of the knowledge base to support adaptation activities, national planning and economic analysis of measures, and plans for health and economic sectoral adaptation programming.

## NATIONAL STRATEGIES AND PLANS

- [First National Communication](#) (1998)
  - [Second National Communication](#) (2006)
  - [Third, Fourth, and Fifth National Communication](#) (2009)
  - [Sixth National Communication](#) (2013)
  - [Climate Change Adaptation Strategy and Action Plan for Danube Delta Region](#) (2014)
  - [Intended National Contribution of Ukraine](#) (2015)
- (7, 10)

## KEY RESOURCES

1. Bernoux, M. et al. 2014. [Ukraine – Soil fertility to strengthen climate resilience](#). World Bank.
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  5. FAO. 2015. [Ukraine](#). Aquastat.
  6. International Commission for the Protection of the Danube River. 2013. [ICPDR Strategy on Adaptation to Climate Change](#).
  7. London School of Economics. 2015. [Ukraine Country Profile](#). The Global Climate Change Legislation Study.
  8. Massey, E. 2012. [Experience of the European Union in Adaptation to Climate Change and its Application to Ukraine](#). OSCE.
  9. Met Office Hadley Centre. 2010. [Impacts of Climate Change: Ukraine](#).
  10. Ministry of Environment and Natural Resources. 2013. [Sixth National Communication of Ukraine on Climate Change](#).
  11. Nesterenko, M., et al. 2014. [Climate Change Adaptation Strategy and Action Plan for Danube Delta Region](#).
  12. Nikolayeva, L., et al. 2012. [Climate Change in Eastern Europe: Belarus, Moldova, Ukraine](#). ENVSEC, Zoï environment network.
  13. UNECE. 2013. [Country Profiles on Housing and Land Management: Ukraine](#).
  14. U.S. Energy Information Administration. 2015. [Ukraine](#).
  15. WHO. 2015. [Ukraine: WHO Statistical Profile](#).
  16. World Bank. 2009. [Adapting to Climate Change in Europe and Central Asia](#).
- Map Source: Adapted from MAPFU. 2010. "On the state of soil fertility in Ukraine." In [Ukraine – Soil fertility to strengthen climate resilience](#).

## SELECTED ONGOING EXPERIENCES

Many donor efforts are focused on climate change mitigation efforts – in particular, improving energy efficiency – that may indirectly support climate change adaptation.

Selected Program	Amount	Donor	Year	Implementer
Eastern Europe Energy Efficiency and Environment Partnership	€168 million (fund)	Multiple donors including USAID	2009–present	N/A
Municipal Energy Reform Project	\$16.5 million	USAID	2013–2017	International Resource Group
Hydropower Rehabilitation Project	\$440.5 million	World Bank	2006–2016	Ministry of Energy and Coal, and others
Capacity Building for Low Carbon Growth in Ukraine	€2.5 million	UNDP	2012–2015	State Environmental Investment Agency of Ukraine, Point Carbon, a Thomson Reuters company and DIW econ GmbH
Integrating Rio Conventions Provisions into Ukraine’s National Policy Framework	\$900,000	UNDP, GEF	2014–2016	Multiple
Removing Barriers to Increase Investment in Energy-Efficiency in Public Buildings in Ukraine through the ESCO Modality in Small and Medium Sized Cities	\$62 million	UNDP, GEF	2016–2021	Ministry of Regional Development, Construction, Housing and Communal Services of Ukraine, State Agency on Energy Efficiency and Energy Saving, and Ministry of Ecology and Natural Resources
Finance and Technology Transfer Center for Climate Change in Ukraine	\$52.35 million	GEF	TBD	European Bank for Reconstruction and Development
Energy Efficiency in Municipalities	€4 million	German Federal Ministry for Economic Cooperation and Development	2013–2016	GIZ, Ministry of Regional Development, Construction, Housing and Communal Services of Ukraine
Establishment of Energy Agencies in Ukraine	€3 million	German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety	2014–2017	GIZ, Ministry of Regional Development, Construction, Housing and Communal Services of Ukraine