Climate Centre

Country-level | Climate fact sheet

Ukraine

The following climate factsheet summarizes available information on the climate of Ukraine, climate change and impacts of these changes on humanitarian activities in country. Each of the factsheets were written as a compilation of information from peer-reviewed academic papers, government publications, and INGO documentation.

1. Climate overview

Average temperature: For most of the country, summer (May–August) annual mean temperature ranges from 18–22°C, and winter (December–March) annual mean temperatures range from -4.8–2°C (World Bank Group n.d.). Crimea enjoys mild and rainy winters (annual mean temperature of 4°C), and dry and hot summers (annual mean temperature of 24°C).

Average precipitation: Precipitation distribution decreases moving north-west to south-east, with an annual mean of 1,200 millimeters (mm) in the western mountains, 400–600mm across most of Ukraine, and less than 400mm in Crimea and the lowlands of the Black Sea (Yerofeyev and Hajda 2020).

Short overview

Most of Ukraine is located in a temperate zone derived from the moderately warm and humid air from the Atlantic Ocean, with the exception of a small subtropical Mediterranean zone on the southern coast of Crimea (Yerofeyev and Hajda 2020). Plains and steppe cover 95 per cent of the country, and the remaining areas are covered by the Polissya mixed forest in the north, the Carpathian Mountains in the west, and the Crimean Mountains in the south (Ministry of Economic Development, Trade and Agriculture of Ukraine n.d.; USAID, 2016).

2022

Ukraine experiences a summer and winter season where the west and north-west experience milder and more humid seasons, and the south and south-east experience less precipitation and greater temperature variability across seasons (Yerofeyev and Hajda, 2020).

Although not well documented, climatic annual variability in Ukraine is influenced by El Niño Southern Oscillation (ENSO), with El-Niño (warmer and dryer years) associated with droughts across the country (FAO, World Bank, 2019).

Ukraine is facing significant impacts from climate change and has been ranked 61 out of 191 countries by the 2022 Inform Risk Index (DRMKC, 2022), making Ukraine part of the medium risk class.

1.1 Climate Change in Ukraine

Historical Climate change	Projected climate change
Temperature	
▪ Annual mean temperature has increased by 0.8°C (compared to 1961–1990 averages), with the highest increase of 2°C in January (Shevchenko *et al.* 2014). ▪ Changing onset of spring and autumn up to 6 days earlier compared to 1961–1990 (Shevchenko *et al.* 2014).	▪ Projected increase in annual mean temperature of 4.7°C (Representative Concentration Pathway (RCP) 8.5) and 2.5°C (RCP 4.5) by 2100 (World Bank Group n.d.). ▪ Changes in seasonal onset with shorter winters and earlier springs (Shevchenko *et al.* 2014); it is projected that spring and summer months will become warmer and the country's subtropical zone is likely to expand (World Bank Group n.d.).
Precipitation	
▪ Little variability in total annual precipitation, but significant change in the number of extreme precipitation events and their nature; heavy snowfall events tripled in recent years (Shevchenko *et al.* 2014).	▪ Projected increase of precipitation in northern and northeastern regions, and 5–10 per cent rainfall reduction in southern and southeastern regions by 2050 (World Bank Group n.d.). Significant precipitation variability in eastern regions by 2100 (50 per cent decrease in summer and 60 per cent increase in autumn) (Gnatiuk *et al.* 2013).

2. Priorities of the Movement and climate change

2.1 Scale up climate-smart DRR, early action and preparedness: DRR portrait

Existing Hazard	Projected climate change
Flood	
River flood hazard is classified as high in most of country (Think Hazard, n/a), meaning that there is a potential for damaging and life-threatening river floods – the country has numerous rivers (World Bank, 2021). In 2020, summer precipitation resulted in extreme weather phenomena causing flood in Zakarpattia, Ivano-Frankivsk, Chernivtsi, Lviv and Ternopil regions with damages of UAH 6.7 billion (MENRU, 2022).	More frequent and intense precipitation days are expected in winter with an increased number of extreme rainfall events such as floods (Think Hazard, n/a). The largest precipitation increase will occur in the northern oblasts (Rivnenska and Volynska). Significant precipitation variability in eastern regions by 2100 (50 per cent decrease in summer and 60 per cent increase in autumn) (Gnatiuk *et al.* 2013). Climate change is expected to exacerbate recurring floods (World Bank, 2021). Flash floods and landslides will be more likely due to extreme events, but reduced snow coverage will lower the frequency and intensity of early spring floods (USAID 2016a).
Wildfire and drought	
An increase in forest fires has been observed in the recent year, the biodiversity loss provides contributes to conditions favourable to fire (World Bank, 2021). In 2020 damages caused by forest fires and exceeded UAH 26 bn – with a total of 2,594 forest fires recorded by the State Forestry Agency (MENRU, 2022). The entire country has a high risk of wildfire (Think Hazard, n/a). Frequency of drought doubled during the period 1989–2010 and extended to new areas not affected historically (Nikolayeva et al. 2012).	Projected changes are likely to increase wildfires and the presence of insects (World Bank, 2022). Climate change is expected to exacerbate drought (World Bank, 2021), with the southern and central oblasts expected to become drier and have high average temperature, especially in the southern steppe (with the highest average daily maximum above 34°C) (World Bank, 2022). Prolonged droughts are expected to worsen potential for forest fires and shorten agricultural seasons (World Bank, 2021). Annual severe droughts are projected to be 46 per cent more likely by 2100, compared to the period 1986–2005 (RCP 8.5) (World Bank Group n.d.).

Existing Hazard	Projected climate change
Heat waves	
Frequency and duration of summer heat periods increased between 1991–2010 (Nikolayeva *et al.* 2012).	By 2100, the number of very hot days (over 35°C) is projected to increase by 12 (under RCP 4.5) and 33 (under RCP 8.5) (World Bank Group n.d.).
Other hazard	
Frequency of extreme weather events increased by 1.5–2 times during the period of 1990–2010 (Nikolayeva et al. 2012). The IFRC also supported operations related to measles outbreak (2019), cold waves (2012, 2019 and mudflow in 2019 (IFRC, 2022).	

It is essential to note that many of these hazards are interrelated and produced compound risks to the same areas and communities. In addition, risk must be understood as the interplay between hazard risk, exposure, and vulnerability which make certain communities, individuals, and sectors more impacted by the hazards. All project design should consider the risk mentioned above and the compounding risks they represent.

2.2 Reduce health impacts of climate change

Heatwaves and rising temperatures will increase heat-related illnesses, cardiovascular and respiratory diseases and expanding ranges of vector-borne diseases (USAID, 2016). In addition, the increasing flood risks are likely to increase the risk of injuries, death and damage to medical infrastructure (Snizhko *et al.,* 2021). On the one hand, increased air temperatures, highland heat effects and frequent heat waves will increase the risk of heat-related stroke, heat fatigue and heat exhaustion (Shevchenko *et al.,* 2020; Shevchenko & Snizhko, 2015). Therefore, the number of heat-related illnesses will continue increasing significantly due to climate change (Shevchenko *et al.,* 2020). Children, the elderly and those with underlying health conditions are more susceptible to these heat-related illnesses (UNICEF, 2021; Karamuska *et al.,* 2022). On the other hand, the number of cold and very cold days in winter is decreasing and the resulting temperature rise may favour the spread of vector-borne diseases such as mosquito-borne malaria and dengue fever, which are common in tropical climates (Karamushka *et al.,* 2022;Met Office, 2021).

Increased temperature and frequent heat waves will also increase the risk of air pollution, which is already a significant health problem in Ukraine (UNICEF, 2021; Met Office, 2021). Rising temperatures and dry conditions will increase fine particles and pollutants in the air, thus, increasing the risks of death due to air pollution (Met Office, 2021; Shevchenko & Snizhko, 2015). Furthermore, according to UNICEF (2021), heatwaves and other climate change-related disasters cause mental health problems such as anxiety, depression, aggression and substance abuse, especially in children and young adults. Also, increasing risks of floods will increase the risks of drowning, injuries, and damage to infrastructure, including hospital access roads and health facilities (Shevchenko & Snizhko, 2015; Snizhko *et al.,* 2021). For example in 2020, flooding in Eastern Ukraine affected 17 health facilities and jeopardised health services (IFRC, 2021). In addition, reducing water quality due to temperature increases and flooding may also increase the risk of water-borne diseases, such as diarrhoeal diseases (Climate Change Post, 2022; Shevchenko & Snizhko, 2015).

2.3 Sustainable water: resources management, infrastructure and access

Water, Sanitation and Hygiene

Water stress, especially in the Southern parts of the country, and reducing water quality are the two main climatic risks to the water and sanitation sector in Ukraine. Rising temperatures, precipitation decreases, and droughts will reduce river discharge and affect water availability in Ukraine (Didovets *et al.,* 2020; Ovcharuk *et al.,* 2020). Water availability will particularly reduce in the summer when there is increased consumption and high evaporation rates (Karamushka *et al.,* 2022).

Altered river flow regimes and reduced water levels in lakes and rivers due to a higher temperature will likely reduce water quality, for example through increased eutrophication (gradual increase in the concentration of phosphorus, nitrogen, and other plant nutrients and minerals throughout the water body) in lakes and rivers (UNICEF, 2021). Similarly, temperature rises will increase the mineralisation of the water sources in the country (Khilchevskyi *et al.,* 2020). According to Met Office (2021), an increase in heavy precipitation also increases the risks of flooding which reduces overall water quality. Another threat to water supplies is saltwater intrusion due to sea-level rise in the coastal areas of Ukraine (UNICEF, 2021; World Bank, 2021a). Saltwater contaminates freshwater aquifers that sustain municipal and agricultural water supplies. Furthermore, floods also cause damage to water supply infrastructure and pollute water wells (IFRC, 2021; Met Office, 2021).

Infrastructure, Power and Electricity

The ongoing conflict exacerbates climate-induced vulnerability to water shortages and floods as critical water infrastructure suffered heavy shelling damage and continues to interrupt the water supply throughout the country (OCHA 2017, REACH 2022).

Ukraine has the largest energy market in Europe due to high energy consumption (International Energy Agency (IEA) 2020). The projected impacts of climate change on Ukraine's energy sector include an increase in demand for electricity to face warmer summer months, thus increasing pressure on old power units (of which 95 per cent have reached the end of their lifespan) (Climate Change Post 2020).

The intensification of extreme cold and extreme heat events is increasing peak stress on power distribution systems, which rely heavily on non-renewable energy (Shevchenko et al. 2014). Ukraine's ambition to address energy scarcity in remote rural areas and increase its share of sustainable hydropower production will be greatly affected by the climate-induced reduction of river flows (Nikolayeva *et al.* 2012). Exacerbating the increased pressure on energy infrastructure, is the extensive damage to energy infrastructure sustained since the February 2022 escalation in hostilities. In October 2022 alone, damage to energy infrastructure was recorded in 19 out of 25 oblasts, as well as in Kyiv (REACH 2022). Such damage has been observed to both power generation plants and power distribution facilities. As a result, people are left even more vulnerable to extreme heat and extreme cold temperatures with decreased access to cooling and heating infrastructure.

2.4 Enable climate resilient livelihoods and economic security

Ukraine's livelihood vulnerabilities to climate change are primarily derived from the potential for significant agricultural losses, production disruption, and declines in coastal environments suitable for tourism and fisheries (USAID, 2016).

Agriculture in Ukraine is a major food provider for local and international markets and accounted for 11% of GDP, 20% of employment and 40% of the total exports before the Russia-Ukraine war (USAID, 2022). Warming temperatures and higher concentrations of atmospheric carbon dioxide may increase the yield of grain crops, especially in the north of the country (Tarariko *et al.,* 2017). The yield gains are partly because of the lengthened growing season as winters become warmer and favour the cultivation of crops such as winter wheat (World Bank, 2022). However, some studies indicate that yields of certain crops such as maize, wheat, barley and sorghum will be below normal and vary significantly, and there will be occasionally failed harvests as a result of climate change (Araujo-Enciso & Fellmann, 2020; World Bank, 2022). Climate-induced impacts on agriculture are projected to have severe impacts in eastern regions that are experiencing ongoing conflict and have high vulnerability to drought and precipitation decreases (Walz *et al.* 2018; Gnatiuk *et al.* 2013).

Warmer temperatures and drier conditions, especially in the southern region, will likely increase evaporation rates and irrigation water demands (Kovalenko *et al.,* 2019; Met Office, 2021; Skrypnyk *et al.,* 2021). In addition, dry and warmer periods as well as floods will increase the risks of erosion, with subsequent damage to soil quality and its attendant effects on agricultural production (Met Office, 2021). Other risks to agricultural production due to warmer temperatures include a sudden return of ground frost, pests, and diseases (Tarariko *et al.,* 2017).

Climate-induced stressors on agricultural production pose a significant threat to local food security, with particular concerns about food availability in conflict zones where 1.2 million Ukrainians already face food insecurity (Thomson Reuters Foundation 2017). Additionally, grain nutritional value is projected to decrease due to changes in meteorological conditions (Boychenko *et al.* 2016).

In the fisheries subsector, higher temperatures will increase the number of pathogenic organisms affecting and often decreasing fish stock in natural water bodies and aquaculture (Levchenko & Danchuk, 2020).

The Black Sea fisheries are an important source of employment, income and food for the coastal population (Gücü *et al.,* 2021). However, warming will also affect fisheries migration, overwintering and schooling behaviour, negatively impacting the sector (Hidalgo *et al.,* 2018). In addition, warmer conditions will cause non-native Indo-Pacific species to expand and survive in the Black Sea (topicalization) (Gücü *et al.,* 2021). Topicalization may alter the biodiversity of the black sea with consequences for the fisheries sub-sector. Furthermore, sea-level rise could harm coastal ecosystems and damage port infrastructures, affecting fisheries and other livelihood sources (UNICEF, 2021).

2.5 Address climate displacement and protection

Current and future displacement challenges

Ukraine is currently the world's largest internal displacement crisis, with 7.1 million IDPs (UNHCR, 2022). Approximately 5 million Ukrainian refugees have fled to neighbouring countries (BBC, 2022). Prior to the invasion of Ukraine by Russia, there has been ongoing armed conflict triggered by Russia's annexation of Crimea and the Donetsk and Luhansk regions' proclamation of independence. This triggered an internal displacement crisis of over 2 million IDPs, from which only 800,000 are located in the government-controlled territory (Cazabat & Tucci 2019), which has compromised people's ability to adapt to climate change impacts and caused significant disruption to the accessibility of essential services (Cazabat & Tucci 2019, OSCE, 2017). Ukraine has also experienced climate disasters in 2021, such as record-breaking rains in Crimea and the regions of Zaporizhzhia and Odesa which led to flooding which led to the displacement of 2,000 people (IDMC; 2022).

Active conflict may prevent evacuation and lead to immobility during extreme weather events, further endangering lives. Currently the war in Ukraine shows no sign of stopping, increasing the likelihood that people will become caught in or between extreme weather events such as flooding or wildfires and active conflict. This situation is already common for those living around the Line of Contact in Donetsk and Luhansk, with one study finding that extreme cold increased protection risks due to people needing to fetch firewood in areas with land mines and decreased the ability to travel long distances as roads became impassable due to poor weather conditions (REACH, 2018).

Populations in the Eastern regions of Ukraine are particularly vulnerable to climate-induced drought and disruption of precipitation patterns in addition to exposure to the armed conflict and lacking access to governmental services and aid (Gnatiuk *et al.,* 2013; Waltz *et al.,* 2018). Alongside environmental stressors, farmers in conflict zones face increased income insecurity as they have lost access to their traditional markets along the conflict line and non-government-controlled areas (Rozwadowski *et al.* 2018). As many fields are currently unable to be cultivated due to mining around the LoC, economic security is further threatened.

Extreme temperatures and increases in the number of both extremely hot and cold days pose a particular threat for displaced people, particularly those in transit or living in housing affected by the conflict. There is a risk that many IDPs will be unable to adequately stay cool or warm in their homes due to damages from the conflict, and a risk that people displaced by conflict and in transit become caught in a heat- or cold-wave, as occurred in March 2022 for thousands of Ukrainian refugees on the move (Lada, 2022).

Potential needs for migrants and displaced people

A significant number of people requiring humanitarian assistance in Eastern Ukraine are over 60 years old and pensioners (Bacchi, 2017), reducing their mobility and increasing their risk of heat-related illnesses and vulnerability to extreme weather events such as flooding (BMJ, 2019). Furthermore, many are required to cross the conflict line to the government side to withdraw pension and assistance, waiting in a queue at checkpoints exposed to seasonal environmental conditions including extreme heat or cold (Bacchi, 2017).

Migration Law and Policies

- EU Temporary Protection Directive, 2022. This EU policy allows all Ukrainian refugees to receive temporary protection in the EU, including the right to stay and work.
- Strategy of State Migration Policy Until 2025, 2017. This policy by the Government of Ukraine centres around migration goals such as increasing the freedom of movement for Ukrainians and reducing the negative effects of emigration from Ukraine.

Weapons Contamination

Even prior to the February 2022 escalation, Ukraine was ranked as being one of the most weapons contaminated countries in the world (OCHA 2019). Weapons contamination in Ukraine includes explosive remnants of war (ERW) and the remains of military tanks and equipment (DRC 2022). As climate change adds pressure to agricultural yields, so too does weapons contamination, creating compound risks. The remains of military tanks and equipment leach toxic substances into the soil affecting soil quality and potentially decreasing agricultural yields. ERW prevent agricultural workers from accessing their fields, limiting their ability to plant and harvest their crops, negatively affecting livelihoods (DRC 2022). At the same time, international research warns for potential displacement of mines during severe flooding, moving them to other areas. Light anti-personnel mines can sometimes float and travel long distances in flood waters (Hagen & Teufert, 2009). Further, as heat becomes more extreme in summer months, this may also increase the likelihood of spontaneous explosion of ERWs (Schwartzstein 2019).

2.6 Policy

Relevant information from the National Determined Contribution (NDC) (2021)

Emission target: Commit to 65% reduction below 1990 levels by 2030. It focuses on energy. This is a significant increase of ambitions; however, this goal is still not compatible with 1.5C target (Climate Analytics, 2021).

Area of focus on Adaptation: None. 'By 2030 Ukraine plans to create a baseline for adaptation to climate change in order to increase resilience and reduce vulnerability to climate change, as foresee in Article 7 of the Paris Agreement'.

Inclusion of DRR: No

National Designated Entity: Ministry of Ecology and Natural Resources of Ukraine, Climate Change and Ozone Layer Protection Department

Stakeholders: Sweden, European Union, European Bank, Low Carbon Ukraine, Berlin Economics, UNDP (MENRU, 2021)

Other National Policies on Climate

- Climate Analytics highlights that 'once peace is restored, in addition to very large reconstruction and humanitarian needs, Ukraine will need international support to build a climate-resilient society and economy in line with the Paris Agreement' (Climate Analytics, 2021). The impacts of the conflict in crisis will impact the achievement of climate objectives nationally and worldwide, although the possible impacts are not defined yet (Avis, 2022).
- Ukraine officially supported the European Green Deal, aiming for climate-neutral continent by 2050. This commitment was integrated in 2021 into the Nation Economic Strategy with a flexible timeline of 2060 to implement this objective (MENRU, 2021).
- Local action at the city level have been widely adopted with 257 signatories of the Covenant of Mayors in Ukraine, including set targets GHG emissions reduction targets through Sustainable Energy and Climate Action Plan (SECAP) in 184 communities (MENRU, 2021).

Climate finance

National societies cannot directly apply for climate finance from the GCF, but they can be an implementing partner for an accredited entity, engaging in the early stage of the project development. National Societies can explore options for accessing climate funds through smaller funds, such as the GEF's Small Grants Programme or the FFEM's Small Scale Initiatives Program, or National Climate Funds. These funds are not accessible in every country. Other funding from bilateral donors, national climate funds, or multilateral climate funds like Adaptation Fund, CREWS, or GCCA+ could be explored (Climate centre, 2022a).

Engaging in national climate adaptation planning is vital for accessing climate finance.

Additional Resources

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