CLIMATE RISK COUNTRY PROFILE

BULGARIA

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This profile is part of a series of Climate Risk Country Profiles developed by the World Bank Group (WBG). The country profile synthesizes most relevant data and information on climate change, disaster risk reduction, and adaptation actions and policies at the country level. The country profile series are designed as a quick reference source for development practitioners to better integrate climate resilience in development planning and policy making. This effort is managed and led by Veronique Morin (Senior Climate Change Specialist, WBG) and Ana E. Bucher (Senior Climate Change Specialist, WBG).

This profile was written by Andrea Cristina Ruiz (Climate Change Consultant, WBG) and MacKenzie Dove (Senior Climate Change Consultant, WBG). Additional support was provided by Jason Johnston (Operations Analyst, WBG) and Yunziyi Lang (Climate Change Analyst, WBG).

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FOREWORD

Climate change is a major risk to good development outcomes, and the World Bank Group is committed to playing an important role in helping countries integrate climate action into their core development agendas. The World Bank Group is committed to supporting client countries to invest in and build a low-carbon, climate-resilient future, helping them to be better prepared to adapt to current and future climate impacts.

The World Bank Group is investing in incorporating and systematically managing climate risks in development operations through its individual corporate commitments.

A key aspect of the World Bank Group's Action Plan on Adaptation and Resilience (2019) is to help countries shift from addressing adaptation as an incremental cost and isolated investment to systematically incorporating climate risks and opportunities at every phase of policy planning, investment design, implementation and evaluation of development outcomes. For all IDA and IBRD operations, climate and disaster risk screening is one of the mandatory corporate climate commitments. This is supported by the Bank Group's Climate and Disaster Risk Screening Tool which enables all Bank staff to assess short- and long-term climate and disaster risks in operations and national or sectoral planning processes. This screening tool draws up-to-date and relevant information from the World Bank's Climate Change Knowledge Portal, a comprehensive online 'one-stop shop' for global, regional, and country data related to climate change and development.

Recognizing the value of consistent, easy-to-use technical resources for client countries as well as to support respective internal climate risk assessment and adaptation planning processes, the World Bank Group's Climate Change Group has developed this content. Standardizing and pooling expertise facilitates the World Bank Group in conducting initial assessments of climate risks and opportunities across sectors within a country, within institutional portfolios across regions, and acts as a global resource for development practitioners.

For developing countries, the climate risk profiles are intended to serve as public goods to facilitate upstream country diagnostics, policy dialogue, and strategic planning by providing comprehensive overviews of trends and projected changes in key climate parameters, sector-specific implications, relevant policies and programs, adaptation priorities and opportunities for further actions.

It is my hope that these efforts will spur deepening of long-term risk management in developing countries and our engagement in supporting climate change adaptation planning at operational levels.

Bernice Van Bronkhorst
Global Director
Climate Change Group (CCG)
The World Bank Group (WBG)

COUNTRY OVERVIEW

Bulgaria has a total area of 111,000 square kilometers (km^2) and is located in the Eastern Balkan Peninsula in South eastern Europe. The country shares boarders with Romania, Serbia, Macedonia, Greece, and Turkey.[1] The Black Sea is a natural eastern border while the Danube river separates the country from Romania in the North. Bulgaria is characterized by diverse topography that includes 31% lowlands (0–200 m), 41% hills (200–600 m), 25% highlands (600–1,600 m) and 3% mountains (>1,600 m). 60% of the country is covered with hills and mountains that are part of the Alpine-Himalayan chain.[2] The Balkan Mountains drive differences between the northern, continental climate and the southern, Mediterranean climate.

Bulgaria is a parliamentary democracy[3] and as member of the European Union (joined in 2007) has undergone transformation from a highly centralized, planned economy to an open-market economy over the past three decades.[4] Bulgaria is classified as an upper-middle income country with a population of 6.9 million (2019), with an annual population growth rate (—0.7%), which has been decreasing since 1998; key development indicators are shown in **Table 1**. Bulgaria has a GDP of 67.9 billion USD (2019), with an annual growth rate of 3.4% (2019).[5] The country has a GDP per capita of 7,887 USD and a GINI index of 36.7, considered to be the highest in the EU. In 2019, 75% of the population lived in urban areas and this is projected to increase to 85% by 2050. Likewise, the country's population is projected to continue to decrease to 6.3 million and 5.3 million people by 2030 and 2050, respectively.[6] The service sector (67%) and industrial production (25%) represent the highest contributions to GDP in 2019.[7]

TABLE 1. Data snapshot: Key development indicators[8]

Indicator	
Life Expectancy at Birth, Total (Years) (2019)	74.9
Population Density (People per sq. km Land Area) (2018)	64.7
% of Population with Access to Electricity (2018)	100%
GDP per Capita (Current US$) (2019)	$9,828.10

1 Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

2 Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

3 Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

4 World Bank Group (2020). Country Overview – Bulgaria. URL: www.worldbank.org/en/country/bulgaria/overview

5 World Bank (2020). DataBank – World Development Indicators. URL: https://databank.worldbank.org/source/world-development-indicators

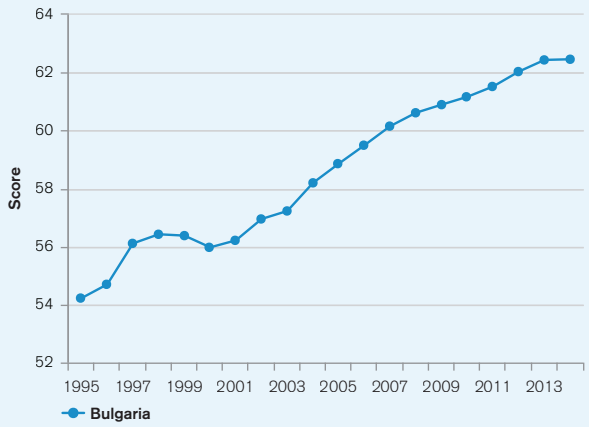
6 World Bank Open Data (2021). Data Retrieved May 2021. Data Bank: Population Estimates and Projections, Brazil. URL: https://databank.worldbank.org/data/reports.aspx?source=health-nutrition-and-population-statistics:-population-estimates-and-projections

7 World Bank Data Bank (2021). World Development Indicators: Structure of output table 4.2. URL :http://wdi.worldbank.org/table/4.2

8 World Bank (2021). DataBank – World Development Indicators. URL: https://databank.worldbank.org/source/world-development-indicators

The ND-GAIN Index[9] ranks 181 countries using a score which calculates a country's vulnerability to climate change and other global challenges as well as their readiness to improve resilience. This Index aims to help businesses and the public sector better identify vulnerability and readiness in order to better prioritize investment for more efficient responses to global challenges. Due to a combination of political, geographic, and social factors, Bulgaria is recognized as vulnerable to climate change impacts, ranked 49 out of 181 countries in the 2020 ND-GAIN Index. The more vulnerable a country is the lower their score, while the more ready a country is to improve its resilience the higher it will be. Norway has the highest score and is ranked 1st. **Figure 1** is a time-series plot of the ND-GAIN Index showing Bulgaria's progress

FIGURE 1. ND-GAIN Index for Bulgaria



Bulgaria submitted its Updated Nationally-Determined Contribution (NDC) to the UNFCCC in 2020 as part of the European Union submission and has not submitted a country specific NDC. Bulgaria finalized its Seventh National Communication (NC7) in 2018. The country developed its National Adaptation Strategy[10] and action plan which covers the period till 2030 and has identified agriculture and food security, forests, water resources, and soil as the sectors with highest vulnerability and need for adaptation actions.[11,12] Adaptation priorities accounting for different levels of vulnerability identified water, agriculture, and tourism as 'least resistant' and most important sectors in regard to needed adaptation actions.[13] The country's Climate Adaptation Plan is focused on key sectors: agriculture, forestry, biodiversity and ecosystems, water, energy, transport, infrastructure and construction, urban environment, human health, and tourism. The government has also adopted a program to measure adaptation efforts for the forestry sector that recognizes the vulnerability of forests at low elevations.[14] Soil erosion, flood risk and flood prevention management in the face of climate change are areas of major concern for the country.[15]

[9] University of Notre Dame (2020). Notre Dame Global Adaptation Initiative. URL: https://gain.nd.edu/our-work/country-index/

[10] Ministry of Environment and Water (2019). National Climate Change Adaptation Strategy and Action Plan. Strategy and Action Plan – Full Report. URL: https://www.moew.government.bg/en/climate/international-negotiations-and-adaptation/adaptation/

[11] UNFCCC (2015). Report of the technical review of the sixth national communication of Bulgaria. UNFCCC. URL: unfccc.int/resource/docs/2015/idr/bgr06.pdf

[12] This document does not provide in-depth coverage for each of these identified sectors. See the Strategy and Action Plan – Full Report for detailed sector analysis: https://www.moew.government.bg/en/climate/international-negotiations-and-adaptation/adaptation/

[13] Climate ADAPT European Climate Adaptation Platform (2018). Bulgaria Country Information. URL: https://climate-adapt.eea.europa.eu/countries-regions/countries/bulgaria

[14] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

[15] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

Green, Inclusive and Resilient Recovery

The coronavirus disease (COVID-19) pandemic has led to unprecedented adverse social and economic impacts. Further, the pandemic has demonstrated the compounding impacts of adding yet another shock on top of the multiple challenges that vulnerable populations already face in day-to-day life, with the potential to create devastating health, social, economic and environmental crises that can leave a deep, long-lasting mark. However, as governments take urgent action and lay the foundations for their financial, economic, and social recovery, they have a unique opportunity to create economies that are more sustainable, inclusive and resilient. Short and long-term recovery efforts should prioritize investments that boost jobs and economic activity; have positive impacts on human, social and natural capital; protect biodiversity and ecosystems services; boost resilience; and advance the decarbonization of economies.

CLIMATOLOGY

Climate Baseline

Overview

Bulgaria is characterized by two climatic regions: a continental climate in the north and a Mediterranean climate in the south. The country's Mediterranean climate tends to be hot and dry in the summers and cool in winters. The mountains that differentiate the northern and southern regions have a significant impact on the country's temperature.[16] The continental north tends to have higher variation in temperature and precipitation compared to the coastal regions.[17] Approximately 50% of the territory (5.2 million ha) is land used for agricultural purposes.[18] An estimated 29.5% of the area is equipped for irrigation.[19] Forests cover 34% of the total area of the country.[20]

[16] Alexandrov, V., et al. (2004). Climate variability and change in Bulgaria during the 20th century. *Theoretical and Applied Climatology* 79.3–4 (2004): 133–149. URL: https://link.springer.com/content/pdf/10.1007/s00704-004-0073-4.pdf

[17] National Institute of Meteorology and Hydrology (2018). *Seasonal analyses temperature and precipitation maps.* http://www.meteo.bg/en/node/114

[18] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

[19] FAO (2017). Country Fact Sheet. URL: http://www.fao.org/nr/water/aquastat/data/cf/readPdf.html?f=BGR-CF_eng.pdf

[20] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

The mean monthly temperature in the country ranges from –1°C to 22 °C. Coldest temperatures are experienced in the northern winter months of December and January and warmest temperatures during northern hemisphere summer months of July and August.[21] Over the past century, the region has experienced gradual warming while the intensity and length of heat waves has increased in the Mediterranean region.[22] Monthly mean precipitation ranges from 40–71 mm and varies seasonally; May and June have the highest levels of precipitation while two periods (February and March, and August and September) have the lowest levels of precipitation.[23] Precipitation has varied over the past century, with recent short-term increases in precipitation that have resulted in flooding.[24]

Analysis of data from the World Bank Group's Climate Change Knowledge Portal (CCKP) shows historical information for 1901–2020 (**Table 2**). Mean annual mean temperature for Bulgaria is 10.7°C, with average monthly temperatures ranging between 21°C (July, August) and –1°C (January) and mean annual precipitation for the country is 614.4 mm with steady rainfall occurring throughout the year;[25] the latest climatology, 1991–2020, is shown in **Figure 2**. **Figure 3** presents the spatial variation of observed average annual precipitation and temperature for 1991–2020.

TABLE 2. Data snapshot: Summary statistics

Climate Variables	1901–2020
Mean Annual Temperature (°C)	**10.7°C**
Mean Annual Precipitation (mm)	**51.43 mm**
Mean Maximum Annual Temperature (°C)	**15.8°C**
Mean Minimum Annual Temperature (°C)	**5.6°C**

[21] WBG Climate Change Knowledge Portal (CCKP, 2020). Historical Climate Data – Bulgaria URL: https://climateknowledgeportal.worldbank.org/country/bulgaria/climate-data-historical

[22] Lelieveld, J., Hadjinicolaou, P., Kostopoulou, E., Chenoweth, J., El Maayar, M., Giannakopoulos, C., Hannides, C., Lange, M.A., Tanarhte, M., Tyrlis, E. and E. Xoplaki (2012). Climate change and impacts in the Eastern Mediterranean and the Middle East. Climatic Change 114: 667–687. URL: https://link.springer.com/article/10.1007/s10584-012-0418-4

[23] WBG Climate Change Knowledge Portal (CCKP, 2020). Historical Climate Data – Bulgaria URL: https://climateknowledgeportal.worldbank.org/country/bulgaria/climate-data-historical

[24] Republic of Bulgaria (2011). Fifth National Communication on Climate Change under the United Nations Framework Convention on Climate Change, 169 pp. URL: https://unfccc.int/resource/docs/natc/bgr_nc5_2nd_submission_210112.pdf

[25] WBG Climate Change Knowledge Portal (CCKP, 2021). Historical Climate Data – Bulgaria URL: https://climateknowledgeportal.worldbank.org/country/bulgaria/climate-data-historical

FIGURE 2. Average monthly temperature and rainfall for Bulgaria, 1991–2020[26]

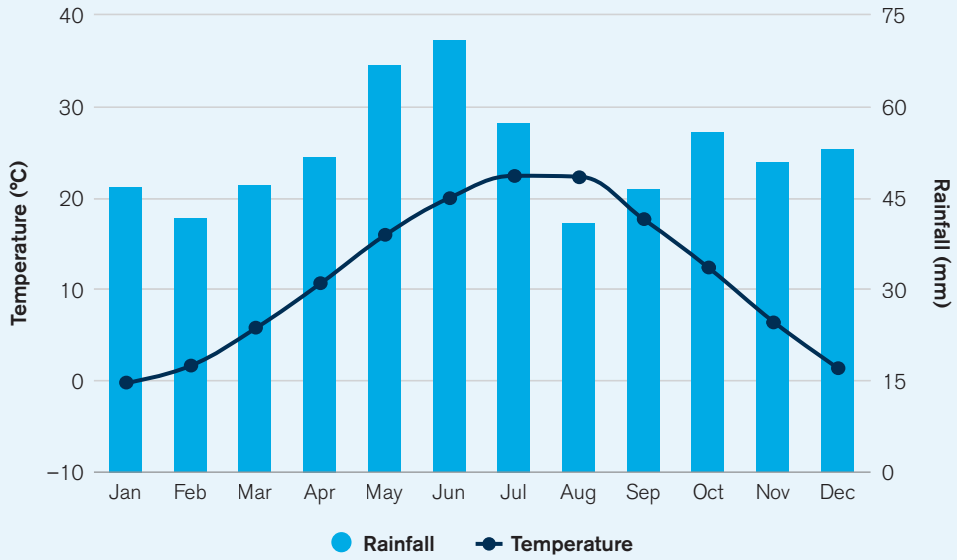
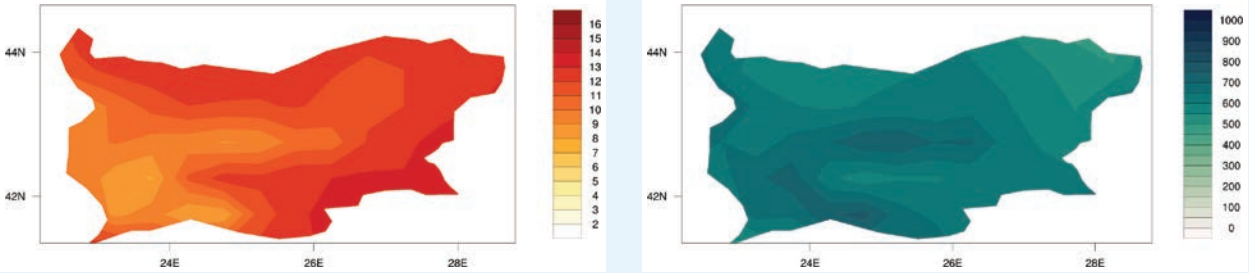


FIGURE 3. Maps of average annual temperature (°C) (left); annual precipitation (mm) (right) of Bulgaria, 1991–2020[27]



[26] WBG Climate Change Knowledge Portal (CCKP, 2021). Historical Climate Data – Bulgaria URL: https://climateknowledgeportal.worldbank.org/country/bulgaria/climate-data-historical

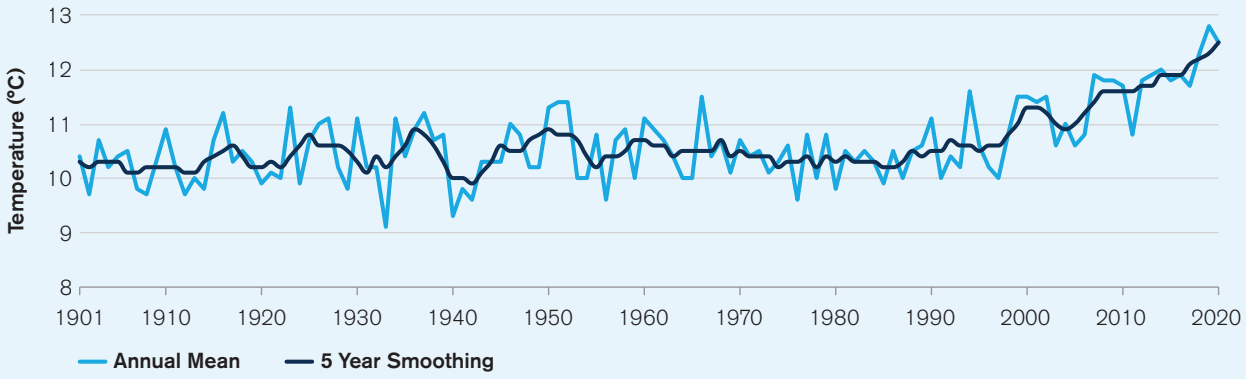
[27] WBG Climate Change Knowledge Portal (CCKP, 2021). Bulgaria. URL: https://climateknowledgeportal.worldbank.org/country/bulgaria/climate-data-historical

Key Trends

Temperature

Temperatures in Bulgaria range from 15°C to 25°C, steadily increasing from March to June. Summer typically starts in the beginning of June, with temperatures often reaching above 30°C. July and August are the hottest months and peak summer temperatures can reach above 35°C–38°C.[28] Summer usually ends in mid-September, when temperatures drop and the days become shorter. September and October are usually warm with temperatures between 10°C and 25°C. However, Bulgaria has experienced a warming tendency over the past century, with a decreasing difference between maximum and minimum temperature (**Figure 4**). Average annual temperature consistently surpassed historical records of average temperature and has continued to hit record highs. From 1988–2016, the average annual air temperature for the lower part of the country (for areas up to 800 m altitude) increased on average by 0.8°C. Since the 1970s, a tendency towards warming was observed. 2014 recorded the highest temperature since 1901, with an average annual temperature of 12°C, which was 1.45 °C above average. The observed average annual temperature for 2015 was 1.12 °C above average. Overall, winters for Bulgaria were milder in the second half of the 20th century with an increasing number of hot and dry spells.[29]

FIGURE 4. Observed temperature for Bulgaria, 1901–2020[30]



[28] Lelieveld, J., Hadjinicolaou, P., Kostopoulou, E., Chenoweth, J., El Maayar, M., Giannakopoulos, C., Hannides, C., Lange, M.A., Tanarhte, M., Tyrlis, E. and E. Xoplaki (2012). Climate change and impacts in the Eastern Mediterranean and the Middle East. Climatic Change 114: 667–687. URL: https://link.springer.com/article/10.1007/s10584-012-0418-4

[29] Republic of Bulgaria (2018). Seventh National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/0917254_Bulgaria-NC7-BR3-1-VII_NC_Bulgaria_2018.pdf

[30] WB Climate Change Knowledge Portal (CCKP, 2021). Bulgaria URL: https://climateknowledgeportal.worldbank.org/country/bulgaria/climate-data-historical

Precipitation

Dobrudzha in the northeast, the Black Sea coastal area, and parts of the Thracian Lowland usually receive less than 500 mm precipitation per year. The Thracian Lowland is often subject to summer droughts. High altitude areas, which receive the most precipitation amount in the country, can average over 1,000–1,100 mm per year.[31] Changes in precipitation have been highly variable across the country. For example, Bulgaria saw average annual precipitation of 49.7 mm in 2013, 1.7 mm below average, while experiencing 80.9 mm of rain in 2014, 29.4 mm above average. Average annual precipitation in 2015 was 60.4 mm, 8.9 mm above average. There has also been observed increase in frequency of extreme rainfall and precipitation events, particularly the number of days with high precipitation (volume above 100 mm). Snowy months have decreased, with a marked thinning in snow cover as well as changes in upper forest limit of deciduous forests and phonology.[32]

Climate Future

Overview

The main data source for the World Bank Group's Climate Change Knowledge Portal (CCKP) is the CMIP5 (Coupled Inter-comparison Project No.5) data ensemble, which builds the database for the global climate change projections presented in the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC). Four Representative Concentration Pathways (i.e. RCP2.6, RCP4.5, RCP6.0, and RCP8.5) were selected and defined by their total radiative forcing (cumulative measure of GHG emissions from all sources) pathway and level by 2100. The RCP2.6 for example represents a very strong mitigation scenario, whereas the RCP8.5 assumes business-as-usual scenario. For more information, please refer to RCP Database. For simplification, these scenarios are referred to as a low (RCP2.6); a medium (RCP4.5) and a high (RCP8.5) emission scenario in this profile. **Table 3** provides CMIP5 projections for essential climate variables under high emission scenario (RCP 8.5) over 4 different time horizons. **Figure 5** presents the multi-model (CMIP5) ensemble of 32 Global Circulation Models (GCMs) showing the projected changes in annual precipitation and temperature for the periods 2040–2059 and 2080–2099.

TABLE 3. Data snapshot: CMIP5 ensemble projection

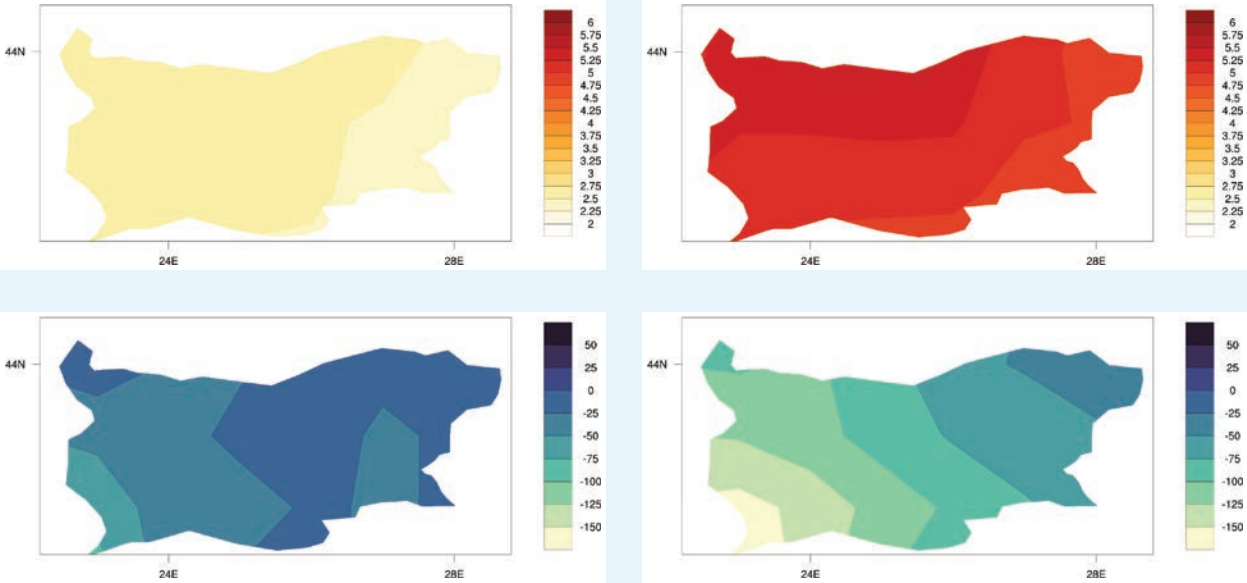
CMIP5 Ensemble Projection	2020–2039	2040–2059	2060–2079	2080–2099
Annual Temperature Anomaly (°C)	**1.1 to 1.9** (+1.2°C)	**1.8 to 3.3** (+2.2°C)	**2.7 to 4.8** (+3.2°C)	**3.7 to 6.7** (+4.4°C)
Annual Precipitation Anomaly (mm)	**–4.5 to –0.3** (–1.6 mm)	**–9.3 to –0.6** (–4.4mm)	**–14.5 to –2.0** (–5.1 mm)	**–17.6 to –7.5** (–10.2 mm)

Note: The table shows CMIP5 ensemble projection under RCP8.5. Bold value is the range (10th–90th Percentile) and values in parentheses show the median (or 50th Percentile).

[31] Republic of Bulgaria (2018). Seventh National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/0917254_Bulgaria-NC7-BR3-1-VII_NC_Bulgaria_2018.pdf

[32] Republic of Bulgaria (2012). National Action Plan on Climate Change 2013–2020. URL: www4.unfccc.int/nap/Documents%20NAP/Third%20National%20Action%20Plan%20for%20the%20Period%202013-2020.pdf

FIGURE 5. CMIP5 ensemble projected change (32 GCMs) in annual temperature (top) and precipitation (bottom) by 2040–2059 (left) and by 2080–2099 (right), relative to 1986–2005 baseline under RCP8.5[33]



Key Trends

Temperature

Projected trends show that temperatures in Bulgaria will continue to increase. Under a high-emission scenario, the regional climate model used in this profile estimates that monthly temperatures are expected to increase by 2.2°C in the 2050s, and 4.4°C by the 2090s. Monthly temperatures will continue to vary seasonally; winters will be less cold and the number of summer days above 25°C and tropical nights will increase. Average temperatures are projected to be higher in the areas of the country associated with a continental climate and increased warming will also compound impacts from increased aridity, particularly for the south-western areas. The number of consecutive hot days are also expected to increase.[34]

Across all emission scenarios, temperatures will continue to increase for Bulgaria throughout the end of the century. As seen in **Figure 6,** under a high-emission scenario, average temperatures will increase rapidly by mid-century. Across the seasonal cycle (**Figure 7**), temperature increases will be felt from April to June and again from August to October. Increased heat and extreme heat conditions will result in significant implications for human and animal health, agriculture, water resources, and ecosystems.

[33] WBG Climate Change Knowledge Portal (CCKP, 2021). Bulgaria Projected Future Climate. URL: https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=BGR&period=2080-2099

[34] Lelieveld, J., Hadjinicolaou, P., Kostopoulou, E., Chenoweth, J., El Maayar, M., Giannakopoulos, C., Hannides, C., Lange, M.A., Tanarhte, M., Tyrlis, E. and E. Xoplaki (2012). Climate change and impacts in the Eastern Mediterranean and the Middle East. Climatic Change 114: 667–687. URL: https://link.springer.com/article/10.1007/s10584-012-0418-4

FIGURE 6. Projected historical and projected average temperature for Bulgaria (Reference Period, 1986–2005)[35]

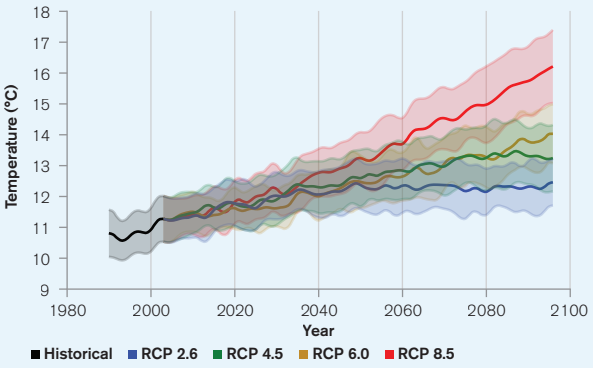
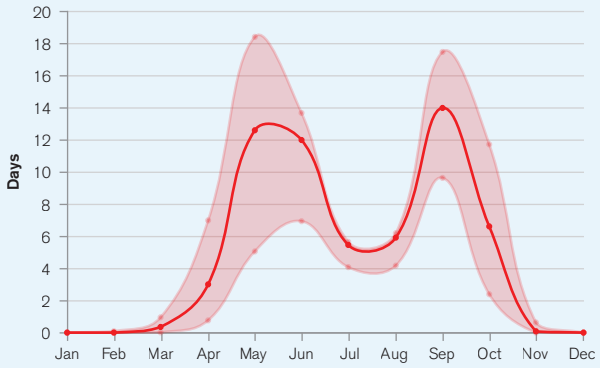


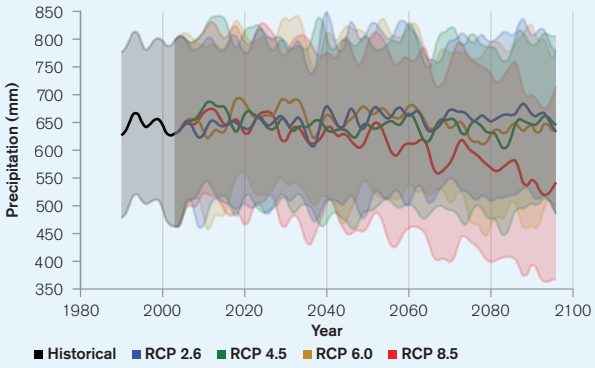
FIGURE 7. Projected change in Summer Days (Tmax >25°C) (Reference Period, 1986–2005)[36]



Precipitation

Despite significant annual variability, under a high-emission scenario, monthly precipitation is expected to decrease steadily and is projected to decrease compared to the baseline period (1986–2005) by 4.4 mm by the 2050s, and by 10.2 mm in the 2090s. Trends in precipitation variations in continental Europe are less clear; however, there is medium confidence that southern regions are expected to experience a decrease in precipitation.[37] Precipitation is projected to decrease somewhat homogeneously in the country; however, the models also project increases in precipitation in northern Europe, upstream of major river systems in Bulgaria. Winter precipitation is likely to increase while summertime precipitation will decrease.[38] As seen in **Figure 8**, annual average precipitation remains largely the same across different emissions scenarios, except for a RCP8.5, which shows a relatively significant drop in precipitation for the second half of the century.

FIGURE 8. Projected annual average precipitation in Bulgaria (Reference Period, 1986–2005)[39]



[35] WBG Climate Change Knowledge Portal (CCKP, 2021). Climate Dashboard - Agriculture. Bulgaria. URL https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=BGR&period=2080-2099

[36] WBG Climate Change Knowledge Portal (CCKP, 2021). Climate Dashboard - Agriculture. Bulgaria. URL https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=BGR&period=2080-2099

[37] Kovats, R.S., R. Valentini, L.M. Bouwer, E. Georgopoulou, D. Jacob, E. Martin, M. Rounsevell, and J.-F. Soussana (2014). Europe. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1267–1326. URL: https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap23_FINAL.pdf

[38] Republic of Bulgaria (2012). National Action Plan on Climate Change 2013–2020. URL: www4.unfccc.int/nap/Documents%20NAP/Third%20National%20Action%20Plan%20for%20the%20Period%202013-2020.pdf

[39] WBG Climate Change Knowledge Portal (CCKP, 2021). Climate Data-Projections. Bulgaria. URL: https://climateknowledgeportal.worldbank.org/country/bulgaria/climate-sector-water

Overview

Currently, Bulgaria is classified as having high risk of river flooding, urban flooding, and wildfires.[40] It has a medium risk of experiencing earthquakes, water scarcity, and extreme heat, and low to very low risk of landslides, coastal flooding, and storms. For Bulgaria, flooding is the natural hazard with highest incidence, affecting 80,000 people annually and $400 million in GDP, on average.[41] Areas along major rivers are most exposed to flooding risk, although the provinces of Jambol, Pazardzhik, and Plovdiv have the highest flood risks. Recent modeling exercises estimate that 50-year return period floods (2% probability of occurring each year, once every 50 years) could affect $2 billion of GDP, which could double or quadruple by the 2080s depending on different climate change and socioeconomic projections.[42] Significant natural hazard risk is present along the Bulgarian Black Sea coastal area, including geophysical dynamics and seismic activity and earthquakes are present. Landslides are active along most of the northern coast, exacerbated by rainfall, earthquakes and a reduction in groundwater levels.[43]

Data from the Emergency Events Database: EM-Dat, presented in **Table 4**, shows the country has endured various natural hazards, including floods, landslides, epidemic diseases, and storms.

TABLE 4. Natural disasters in Bulgaria, 1900–2020[44]

Natural Hazard 1900–2020	Subtype	Events Count	Total Deaths	Total Affected ('000)	Total Damage (Million USD)
Drought	Drought	2	0	0	0
Flood	Riverine Flood	18	81	60,017	854,200
Storm	Convective Storm	5	1	5,890	545,000
Wildfire	Forest Fire	3	f8	176	20,054
Extreme Temperature	Cold Wave	6	49	323	0
	Heat Wave	2	9	50	50
	Severe Winter Conditions	1	18	20	0
Earthquake	Ground Movement	6	131	3962	0

[40] Think Hazard! (2018). Bulgaria Country Profile. URL: http://thinkhazard.org/en/report/41-bulgaria

[41] World Bank Group (2015). GFDRR Bulgaria Country Profile. URL: http://documents.worldbank.org/curated/en/688381493716849492/pdf/114725-WP-PUBLIC-drp-bulgaria.pdf

[42] Republic of Bulgaria (2018). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan. *Assessment of the Disaster Risk Management Sector* (Draft). URL: http://www.moew.government.bg/static/media/ups/tiny/%D0%9F%D0%98%D0%9A/%D0%9C%D0%9F%D0%90/DRM%20-%20Full%20Report%20-%20First%20Draft%20(2018-04-27)%20-%20EN%20-%20for%20printing%20v2.pdf/

[43] Dimitrov, O. and Ranguelov, B. (2018). Natural Hazards and Natural Resources of the Bulgarian Black Sea Coastal Area. SES 2018, 15th International Scientific Conference. URL: http://www.space.bas.bg/SES/archive/SES%202018%20DOKLADI/4_Ecology/2_Dimitrov.pdf

[44] EM-DAT: The Emergency Events Database – Universite Catholique de Louvain (UCL) - CRED, D. Guha-Sapir – www.emdat.be, Brussels, Belgium. URL:http://emdat.be/emdat_db/

Key Trends

Climate change is expected to increase the frequency and magnitude to extreme weather events in the area, namely, extreme precipitation and temperature, storms, floods, wildfires, landslides, and drought.[45] The primary hazards Bulgaria is exposed to include floods, drought, extreme heat, wildfire, storms, as well as earthquakes and landslides. Projected increases in temperatures are likely to exacerbate the existing risks of temperature related hazards such as heat waves, droughts, and fire. Projections estimate an increased risk of wildfire and a longer fire season as a result of higher temperature and variation in rainfall. Changes in temperature and precipitation could also affect soil fertility, further affecting food systems. Although mortality from cold temperatures is expected to decrease, higher temperatures, increased risk of heat waves, and droughts are likely to have impacts on temperature related mortality.

Climate change is expected to affect water availability with decreases in river flows for the country's major rivers. In addition to changes in precipitation, changes in regional hydrology can be associated with risk of extreme events such as drought and flooding.[46] The changes in regional precipitation is expected to impact existing patterns of river flow by increasing peak discharge rates for major catchments such as the Danube in Bulgaria's northern border.[47] Bulgaria is renowned for diverse and fertile soils which are susceptible to erosion from changes in precipitation patterns, such impacts have caused concern for the government which values agricultural production. Tourism, an important contributor to GDP, is also sensitive to changes in climate and tourism infrastructure along coastal areas.[48] This impact can be especially severe in urban areas.[49] **Figure 9** presents the risk of urban flooding and wildfires for Bulgaria.[50]

[45] Ministry of Water and Environment (2018). Strategy and Action Plan Full Report. URL: http://www.moew.government.bg/en/climate/international-negotiations-and-adaptation/adaptation/

[46] Republic of Bulgaria (2012). National Action Plan on Climate Change 2013–2020. URL: www4.unfccc.int/nap/Documents%20NAP/Third%20National%20Action%20Plan%20for%20the%20Period%202013-2020.pdf

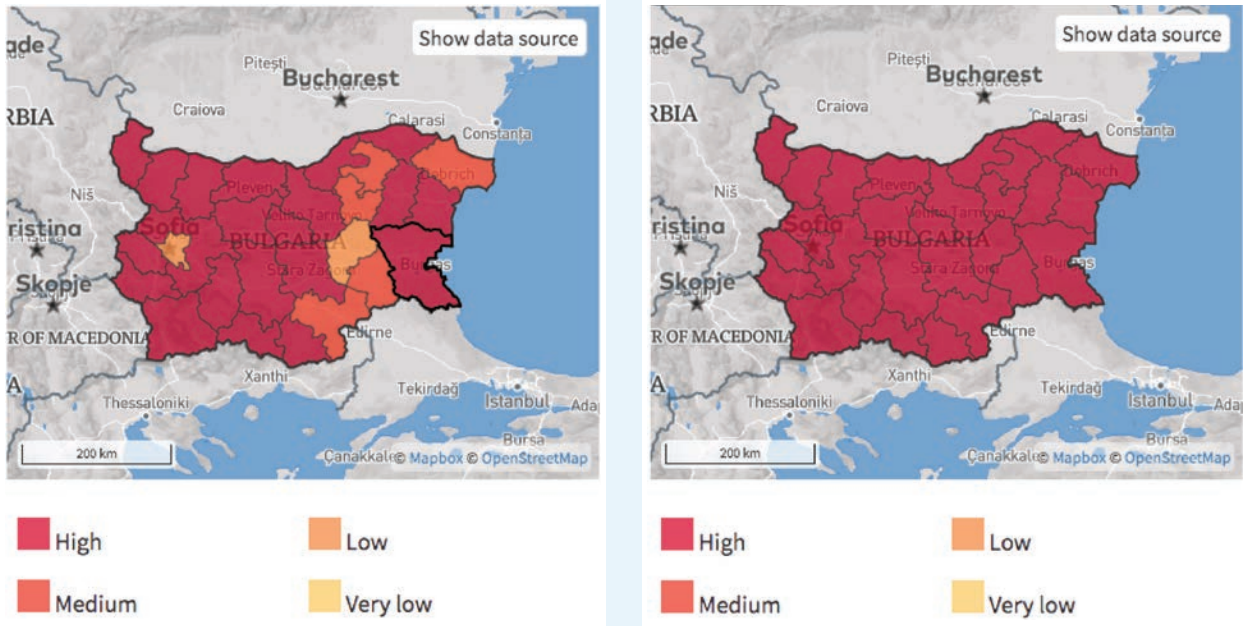
[47] Kovats, R.S., R. Valentini, L.M. Bouwer, E. Georgopoulou, D. Jacob, E. Martin, M. Rounsevell, and J.-F. Soussana (2014). Europe. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1267–1326. URL: https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap23_FINAL.pdf

[48] Republic of Bulgaria (2018). Seventh National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/0917254_Bulgaria-NC7-BR3-1-VII_NC_Bulgaria_2018.pdf

[49] Republic of Bulgaria (2018). Seventh National Communication on Climate Change to the UNFCCC. URL: https://unfccc.int/sites/default/files/resource/0917254_Bulgaria-NC7-BR3-1-VII_NC_Bulgaria_2018.pdf

[50] FAO (2018). Drought Characteristics and management in North African and the Near East. URL: http://www.fao.org/3/CA0034EN/ca0034en.pdf

FIGURE 9. Current risk of urban flood (left);[51] Current risks of wildfire (right)[52]



Implications for DRM

Bulgaria's National Disaster Risk Reduction (DRR) Strategy 2014–2020 leads the country's strategy with the Disaster Protection Act and the alignment with related EU policies. It identifies the strategic priorities for DRR Disaster Risk Management (DRM) and support their implementation on national, district, municipal and specific subject levels. It prioritizes concrete areas for trans-boundary and trans-regional cooperation as well as long-term coordination of disaster risk reduction.[53] As part of its approach to reduce its disaster risk and improve climate resilience, it is important for Bulgaria to build on existing strengths while increasing attention paid to mitigation and adaptation efforts. Investing in early warning systems and capacity building while also promoting inter-agency knowledge could support a more holistic approach to addressing exposure and vulnerabilities to projected hazards caused or intensified by climate change. In addition to risk identification, investing in financial protection or risk reduction strategies could also provide important opportunities.[54]

[51] ThinkHazard! (2020). Bulgaria – Urban Flooding. URL: http://thinkhazard.org/en/report/41-bulgaria/UF
[52] ThinkHazard! (2020). Bulgaria – Wildfire. URL: http://thinkhazard.org/en/report/41-bulgaria/WF
[53] Bulgaria (2018). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan – Assessment of the Disaster Risk Management Sector. URL: https://www.moew.government.bg/static/media/ups/articles/attachments/DRM%20-%20Full%20Report%20-%20First%20Draft%20(2018-04-27)%20-%20EN%20-%20for%20printing%20v2675c5b0db190d4aa5dae48daf147c909.pdf
[54] World Bank (2014). Insurance Against Climate Change: Financial Disaster Risk Management and Insurance Options for Climate Change Adaptation in Bulgaria. URL: http://www.moew.government.bg/static/media/ups/tiny/file/Climate/Insurance_Against_Climate_Change.pdf

DRM strategies should be considered at both national and local levels and adapted to the unique needs of each region and population. In the case of water related hazards such as flooding and drought, it is important to invest in early warning, infrastructure to mitigate expected risks, integrated water management systems. Special attention should be placed on land use changes, particularly in highly vulnerable areas. Temperature related hazards could have negative impacts to human health if the option for behavioral adaptation through air conditioning is not available. As the percentage of urban populations increase, special attention should be taken to urban challenges such as heat island effects. The potential for increased fire hazards would require increased awareness, investment in early warning systems and the development of comprehensive emergency response strategies as well as recovery plans.[55]

CLIMATE CHANGE IMPACTS TO KEY SECTORS

Bulgaria remains highly vulnerable to climate variability and change, particularly for the country's water resources, agriculture, public health, energy, and forestry sectors. Heavy rains, flooding, and soil erosion puts both urban and rural infrastructure at risk, particularly for poor and vulnerable groups. Increased risk and vulnerability to soil droughts are expected to increase in the occurrence, intensity, and level of impact of the soil droughts in Bulgaria through the end of the century. Soils with existing low capacity of moisture preservation such as the regions in southeastern areas of the country, which are most vulnerable to those changes. Furthermore, increased occurrences of aridity and drought conditions will impact agriculture, food security, energy generation, and human health.[56]

Gender

An increasing body of research has shown that climate-related disasters have impacted human populations in many areas including agricultural production, food security, water management and public health. The level of impacts and coping strategies of populations depends heavily on their socio-economic status, socio-cultural norms, access to resources, poverty as well as gender. Research has also provided more evidence that the effects are not gender neutral, as women and children are among the highest risk groups. Key factors that account for the differences between women's and men's vulnerability to climate change risks include: gender-based differences in time use; access to assets and credit, treatment by formal institutions, which can constrain women's opportunities, limited access to policy discussions and decision making, and a lack of sex-disaggregated data for policy change.[57]

[55] GFDRR (2017). Disaster Risk Profile: Bulgaria. URL: https://www.gfdrr.org/en/publication/disaster-risk-profile-bulgaria

[56] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

[57] World Bank Group (2016). Gender Equality, Poverty Reduction, and Inclusive Growth. URL: http://documents1.worldbank.org/curated/en/820851467992505410/pdf/102114-REVISED-PUBLIC-WBG-Gender-Strategy.pdf

Agriculture

Overview

Agriculture plays a key role in Bulgaria's socioeconomic fabric and is considered to be a major part of the Bulgarian economic landscape,[58] even though most of the population resides in urban areas and agriculture represents a relatively small fraction of GDP. Bulgaria produces wheat, barley, corn, sunflower, tobacco, rapeseed, fresh vegetables, fruits and grapes, exports cereals, tobacco, and oil seeds. The country also imports meat, vegetables, fruits, sugar, fish, and coffee.[59] Bulgaria engages in aquaculture in the Black Sea, though it continues to be a net seafood importer.[60] The country has rich endowments in soil biodiversity and meteorological conditions that have developed into centuries-long traditions of plant growing and livestock breeding.[61] Approximately 50% of the territory (5.2 million ha) is land for agricultural purposes, which contributed 5.45% of GDP value added in 2015; however, food processing represents 20% of industrial production.[62] An estimated 29.5% of the area is equipped for irrigation[63] and 86% of the water demand for agriculture in 2016 and forestry was used for irrigation. The depth of calorie deficits have decreased by 50% from 48 kcal/capita/day in 2003–2005 to 24 kcal/capita/day in 2015–2017; the number of undernourished has decreased and is currently at 3.4%.[64] Cereal yields and crop production has increased by 57% and 34% between 1995 to 2016, respectively, while the area harvested has decreased by 15%. Similarly, the value of food production has increased since 2005, however, the costs of food imports has also been increasing.

Climate Change Impacts

Climate change is already impacting agriculture through increases in extreme events in the last decades, namely droughts, flooding, and temperature increase.[65] Climate change is also expected to affect fisheries in the Black Sea[66] as sea surface temperatures increase and put pressure on organisms, changing migratory patterns, inducing adaptation behavior, and potentially reducing fish stocks.[67] These events can change productivity, growing season, agro-phenology, crop yields, spread of pests and diseases, livestock at risk of heat stress, soil aridity and salinization.[68] Impacts of climate changes will be different across regions, existing socioeconomic conditions, and

[58] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

[59] USDA (2017). Exporter Guide to Bulgaria. URL: https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Exporter%20Guide_Sofia_Bulgaria_12-15-2017.pdf

[60] FAO (2018). Fish Stat – Bulgaria. URL: http://www.fao.org/fishery/facp/BGR/en

[61] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

[62] USDA (2017). Exporter Guide to Bulgaria. URL: https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Exporter%20Guide_Sofia_Bulgaria_12-15-2017.pdf

[63] FAO (2017). Country Fact Sheet – Bulgaria. URL: http://www.fao.org/nr/water/aquastat/data/cf/readPdf.html?f=BGR-CF_eng.pdf

[64] FAO (2018). Country Indicators Dashboard. URL: http://www.fao.org/faostat/en/#country/27

[65] Ministry of Water and Environment (2018). Strategy and Action Plan Full Report. URL: http://www.moew.government.bg/en/climate/international-negotiations-and-adaptation/adaptation

[66] Kovats, R.S., R. Valentini, L.M. Bouwer, E. Georgopoulou, D. Jacob, E. Martin, M. Rounsevell, and J.-F. Soussana (2014). Europe. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1267–1326.

[67] Erdogan, Naciye, et al. (2009). Black Sea Fisheries and Climate Change. CIESM Workshop Monographs. No.39 CIESM, Monaco, 2009. URL: https://www.researchgate.net/publication/261709237_Black_Sea_fisheries_and_climate_change

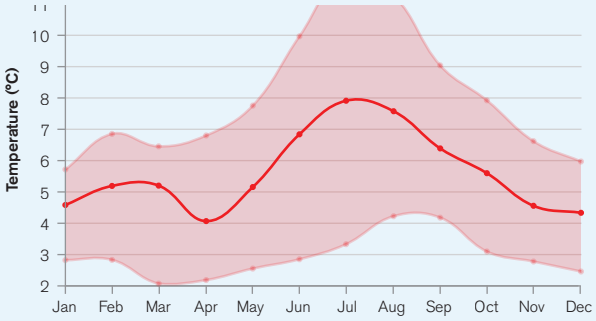
[68] Ministry of Water and Environment (2018). Strategy and Action Plan Full Report. URL: http://www.moew.government.bg/en/climate/international-negotiations-and-adaptation/adaptation

the structure of each farm. Regional impacts will depend on changes in precipitation, temperature, and exposure to extreme events such as flooding, drought, or wildfire. Projections estimate that the annual growing season length will increase, as will rainfall seasonality and number of days with consecutive dry spells.[69] The projected days with consecutive dry spells are predicted to increase by 12 days by the 2090s with a higher concentration around September, primarily in south eastern regions. Land is distributed unevenly between two farming structures: large-scale commercial farms and small holder farming.[70] Approximately 80% of land holdings are smaller than 2 ha while 82% of commercialized agricultural areas are larger than 100 ha.[71] Large scale farming is highly economically vulnerable and more capable to invest in adaptation measures, while smallholders are socially and economically vulnerable with lower adaptation capacities. Food security could be affected if the majority of food imports depends on the productivity of neighboring countries experiencing similar impacts. Currently, 70% of Bulgaria's agricultural trade takes place with neighboring countries and European Union members.[72]

Increased temperatures and the threat of waterlogging of fields due to intense rainfall and flooding may also result in an increased presence of pests and diseases harmful to yield production and quality. The projected increased heat will increase stress on crops and is also likely to alter the length of the growing season. Decreased water availability is likely to reduce yields and the reduction in soil moisture may alter suitable areas for agriculture or the production of specific crops. Increased heat and water scarcity conditions are likely to increase evapotranspiration, expected to contribute to crop failures and overall yield reductions. Increased temperatures, are also likely to increase the presence of pests and increase risks of fires. Increased frequency and intensity of extreme events may change or impact species composition and alter 'regulating services' such as soil water maintenance, base flows, and filtration.[73]

Figure 10 shows the average daily max-temperature across seasonal cycles. These higher temperatures have implications for impacts to soil moisture and crop growth and as seen in the graph below. Throughout the year, max temperatures will increase in Bulgaria, with additional spikes in max temperature from June to September, by as much as 8°C under RCP8.5.

FIGURE 10. Projected average daily max temperature for Bulgaria (Reference Period, 1986–2005)[74]



[69] WBG Climate Change Knowledge Portal (CCKP, 2021). Bulgaria. URL: https://climateknowledgeportal.worldbank.org/country/bulgaria/climate-data-projections

[70] Ministry of Water and Environment (2018). Strategy and Action Plan Full Report. URL: http://www.moew.government.bg/en/climate/international-negotiations-and-adaptation/adaptation

[71] Eurostat (2018). Agricultural census in Bulgaria. URL: http://ec.europa.eu/eurostat/statistics-explained/index.php/Agricultural_census_in_Bulgaria

[72] USDA (2017). Exporter Guide to Bulgaria. URL: https://gain.fas.usda.gov/Recent%20GAIN%20Publications/Exporter%20Guide_Sofia_Bulgaria_12-15-2017.pdf

[73] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

[74] WBG Climate Change Knowledge Portal (CCKP, 2021). Bulgaria Agriculture. Dashboard URL: https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=BGR&period=2080-2099

Adaptation Options

Adaptation options for Bulgaria's agriculture sector should be undertaken by the MAFF in collaboration with all other relevant ministries, government organizations, and main stakeholders. At the same time, the policy should be consistent with EU and international policies and commitments. Efforts can be undertaken to improve agricultural productivity such and adjusting timing of farm operations, planting and sowing dates to better adjust to projected changing seasonality. Crop yields and productivity could be improved by developing sustainable irrigation technologies and improved management of existing woodlots, hedgerows and woody buffer strips around agricultural land. Improved water management and water rationalization practices can be used for livestock as well as improvements to livestock cooling and ventilation systems. Adaptive capacity could be built in the agricultural community regarding identifying and evaluating climate risks; identifying climate change methods for preventing and reducing its negative consequences for the residents of communities. Related knowledge dissemination with stakeholders could be increased in regards to training and technological advice taking into account aspects of adapting agricultural production to the increased climate risks and preventing climate change.[75]

Water

Overview

Bulgaria is endowed with abundant freshwater resources and more favorable soil and climatic conditions compared to other European countries. These are concentrated along major waterways, river basins, and snow although only 2% of the territory is covered in freshwater bodies and vary by season.[76] Water provides important services to the economy as an input for agriculture, habitat for aquaculture, and involvement for domestic consumption, and energy production. In 2015, the main economic sectors used 4,735 million m^3 of which 86% is used by industry, 8% is used by agriculture, 5% is used for private household consumption, and 1% is used in the service industry.[77] The country has up to 21.3 km^3 in long-term annual renewable water resources, most of which is from surface water compared to groundwater resources.[78] Despite high water availability, in 2016, 10.7% of the population did not have basic sanitary facilities, compared to 1.9% in Europe.[79] Waste water management quality has increased substantially; however, the biochemical oxygen demand in rivers continues to be higher than the European average (2.86 mg O_2 per liter in Bulgaria vs 2.19 mg O_2 per liter in Europe). An estimated 86% of the population has improved sanitation facilities although 14% share sanitation facilities.[80]

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[75] Republic of Bulgaria (2019). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan. Assessment of the Agriculture Sector. URL: https://www.moew.government.bg/en/climate/international-negotiations-and-adaptation/adaptation/

[76] Republic of Bulgaria (2019). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan. *Assessment of the Disaster Risk Management Sector* (Draft). https://www.moew.government.bg/static/media/ups/tiny/%D0%E2%80%A6

[77] National Statistical Institute Republic of Bulgaria (2018). Water used by economic activity – total for the country. Table Ecology_9.3. URL: http://www.nsi.bg/en/content/5142/water-used-economic-activity-total-country

[78] Republic of Bulgaria (2018). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan. *Assessment of the Disaster Risk Management Sector* (Draft). https://www.moew.government.bg/static/media/ups/tiny/%D0%E2%80%A6

[79] Eurostat (2018). SDG 6-Clean Water and Sanitation Country Progress. URL: http://ec.europa.eu/eurostat/web/sdi/clean-water-and-sanitation

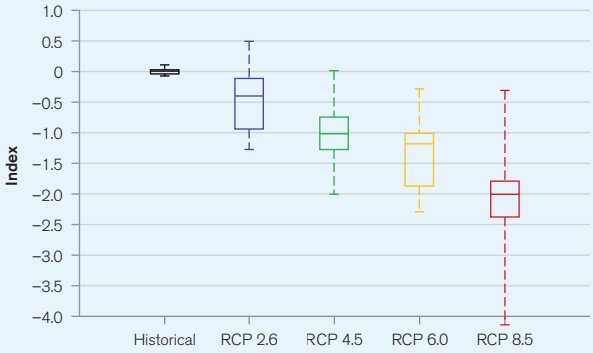
[80] UNICEF (2018). Monitoring Water and Sanitation Indicator Cluster Surveys – Bulgaria. URL: https://data.unicef.org/country/bgr/

Climate Change Impacts

Climate change will have an impact not only on precipitation but also on river hydrology and soil moisture levels. Changes in seasonality and discharge could lead to hydro-meteorological hazards like floods as well as drought hazards; in some river basins, discharge rates are estimated to decrease by 10% in the next 30 years compared to 1976–2005 levels.[81] Evidence from natural disasters in recent years show significant exposure to river flooding as well as the occurrence of drought. Areas that have high dependency on surface water will be more exposed to drought conditions compared to those that use ground water as illustrated in the maps below. Some projections expect that the risk for long-term water scarcity will be highest in the south east and north western regions of the country.[82] The projected change in annual severe drought likelihood is expected to change from less than 21% to 40%–90% by the 2090s, under a high emission scenario.[83] In the short run, vulnerabilities can arise in areas near rivers that may see increased fluctuations in discharge. Challenges to natural systems can also occur through lacking waste water management, which can be exacerbated during extreme events, and increased demand for agricultural inputs (fertilizers and pesticides) that can cause pollution through runoff. Freshwater abstraction used in energy production represents 65.3% of the demand for abstracted water (5,629 million m^3 in 2015), and is the main contributor to increase demands on water.[84] Critical infrastructure such as hydroelectric power plants, nuclear plants, and sanitation facilities that currently demand high amounts of water depend on reliable water flow could also be affected if water becomes scarce or highly variable.

Temperature increases have the potential to also increase soil moisture deficits, even under conditions of increasing rainfall. **Figure 11** shows the projected annual Standardized Precipitation Evapotranspiration Index (SPEI). SPEI is an index which represents the measure of the given water deficit in a specific location, accounting for contributions of temperature-dependent evapotranspiration and providing insight into increasing or decreasing pressure on water resources. Negative values for SPEI represent dry conditions, with values below –2 indicating severe drought conditions, likewise positive values indicate increased wet conditions. This is an important understanding for the water sector in regards to quantity and quality of supply for human consumption and agriculture use as well as for the energy sector as reductions in water availability impacts river flow and the hydropower generating capabilities. As seen in **Figure 11**, at a nationally aggregated scale, Bulgaria is projected to experience heightened dry conditions and with potential for increased drought severity, which will likely increase pressure on water resources for the country and region by mid-century and by end of the century.

FIGURE 11. Projected annual SPEI Drought Index in Bulgaria (Reference Period, 1986–2005)[85]



[81] Republic of Bulgaria (2018). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan. *Assessment of the Disaster Risk Management Sector* (Draft). https://www.moew.government.bg/static/media/ups/tiny/%D0%E2%80%A6

[82] Think Hazard! (2020). Bulgaria Country Profile. URL: http://thinkhazard.org/en/report/41-bulgaria

[83] WBG Climate Change Knowledge Portal (CCKP, 2020). Bulgaria Future Climate Projections. URL: https://climateknowledgeportal.worldbank.org/country/bulgaria/climate-data-projections

[84] National Statistical Institute (2015). National Statistical Institute of Bulgaria. URL: http://www.nsi.bg/sites/default/files/files/publications/Okolna_sreda_2015.pdf

[85] WBG Climate Change Knowledge Portal (CCKP, 2021). Bulgaria Water Sector Dashboard. URL: https://climatedata.worldbank.org/CRMePortal/web/water/land-use-/-watershed-management?country=BGR&period=2080-2099

Adaptation Options

Sustainable use of surface water, groundwater, and river systems are effective efforts to limit the impacts from human actions such as pollution from runoff and waste water management, and are required for long-term availability of water resources. Bulgaria's water sector can undertake adaptation options in support of more adaptive governance by strengthening adaptive water management techniques, including scenario planning, learning-based approaches, and flexible and low-regret solutions in the face of projected climate risk trends. Financial tools can be developed for more sustainable management of water considering poverty eradication and equity. Engineering plans can be supported to develop and integrate eco-efficient climate adaptive and risk mitigation water infrastructure. Water can be relocated to water-scare areas in the country. Vertical adaptation strategies in Bulgaria need to include national level policies that support adaptive governance of water resources both through legislation and cooperation, in the case of shared resources such as river basins.[86]

Energy

Overview

Bulgaria has a total primary energy supply of 18.6 Mtoe, of which 12.1 Mtoe are produced locally and 6.9 Mtoe are imported.[87] The country consumes approximately 34.87 TWh annually with a per capita consumption of 4.86 MWh/capita. Compared to Europe, Bulgaria has a lower energy dependence, importing 37.2% of its energy, compared to the European average of 53.6%. Although a significant majority of the population has access to electricity, an estimated 36.5% of the population is unable to keep their homes adequately warm in winters.[88] Fossil fuels provide the majority of energy for Bulgaria,[89] particularly coal (33.8%), oil (21.7%), and natural gas (13.3%), however, energy is also produced from nuclear (2.5%), biofuel/waste (6.3%), hydrological (2.5%), and other renewable (1.7%) sources.[90] A majority of renewable energy comes from hydroelectric resources,[91] which is susceptible to impacts from climate change.

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[86] Republic of Bulgaria (2019). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan. Assessment of the Water Sector. URL: https://www.moew.government.bg/en/climate/international-negotiations-and-adaptation/adaptation/

[87] International Energy Agency Statistics (2015). Bulgaria Indicators URL: http://www.iea.org/statistics/statisticssearch/report/?product=Indicators&country=BULGARIA

[88] Eurostat (2018). SDG 7-Affordable and Clean Energy, country progress statistics. Bulgaria. URL: http://ec.europa.eu/eurostat/web/sdi/affordable-and-clean-energy

[89] European Commission (2014). Energy Bulgaria Country Report. URL: https://ec.europa.eu/energy/sites/ener/files/documents/2014_countryreports_bulgaria.pdf

[90] International Energy Agency (2015). Statistics- Share of total primary energy supply in 2015- Bulgaria. URL: http://www.iea.org/stats/WebGraphs/BULGARIA4.pdf

[91] Ministry of Environment and Water (2019). National Climate Change Adaptation Strategy and Action Plan. Strategy and Action Plan – Full Report. URL: https://www.moew.government.bg/en/climate/international-negotiations-and-adaptation/adaptation/

Climate Change Impacts

The projected climate changes are expected to increase pressure on existing energy infrastructure. Most methods of power generation require significant amounts of water for cooling, this effect is particularly strong for nuclear energy generation. Changes in hydrology could result in water scarcity and variability, which could in turn affect energy production. Energy generation can also be at risk to flooding and stress from increased temperature depending on their location in the country. Rising temperatures will increase energy demand while also placing pressure on energy generating infrastructure. Climate projections predict that the number of days that require cooling will increase primarily in the summer months between June and September[92] as a result of behavioral adaptations to increased temperatures (i.e. air conditioning and fan use). As temperatures increase, it is also likely that demand for winter heating fuel will decrease as the number of heating degree days also decrease. The future of renewable energy through hydroelectric power is uncertain given the projected changes and high level of variation in inter-annual river discharge.

Cooling Degree Days presents the relationship between daily heat and cooling demand, typically sourced through a form of active cooling or an evaporative process. The change in cooling degree days provides insight into the potential for extended seasons of power demand or periods in which cooling demand (power demands) might increase. As seen in **Figure 12**, seasonal increases for cooling demands are expected to increase over an extended summer period (June to September). The Warm Spell Duration Index represents the number of days in a sequence of at least six days in which the daily maximum temperature is greater than the 90th percentile of daily maximum temperature. Shown in **Figure 13**, warm spells are expected to sharply increase in the second half of the century.

FIGURE 12. Projected change in Cooling Degree Days (65°F) in Bulgaria for the period 2040–2059, (Reference Period, 1986–2005)[93]

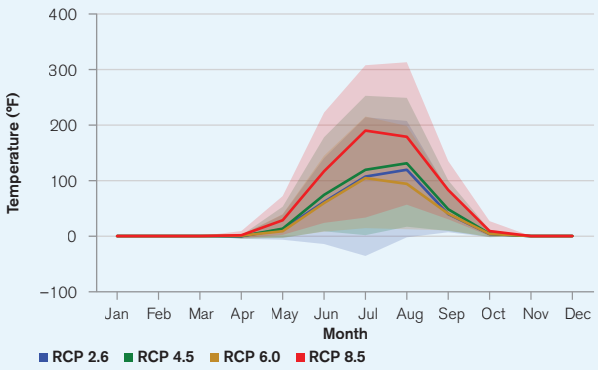
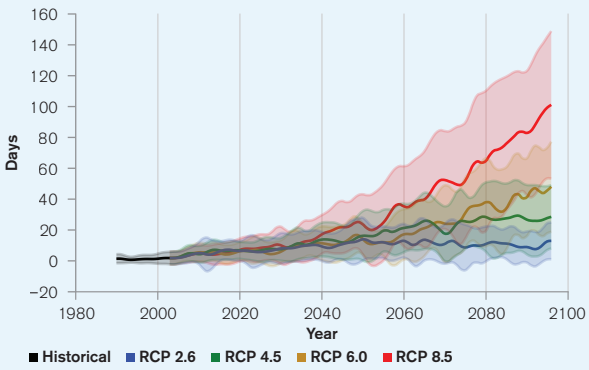


FIGURE 13. Projected Warm Spell Duration Index in Bulgaria (Reference Period, 1986–2005) [94]



[92] WBG Climate Change Knowledge Portal (CCKP, 2021). Bulgaria Future Climate Projections. URL: https://climateknowledgeportal.worldbank.org/country/bulgaria/climate-data-projections

[93] WBG Climate Change Knowledge Portal (CCKP, 2020). Bulgaria – Energy. URL: https://climateknowledgeportal.worldbank.org/country/bulgaria/climate-sector-energy

[94] WBG Climate Change Knowledge Portal (CCKP, 2020). Bulgaria Energy Sector Dashboard. URL: https://climatedata.worldbank.org/CRMePortal/web/energy/oil-gas-and-coal-mining?country=BGR&period=2080-2099

Adaptation Options

Adaptation options in the energy sector would need to include a transition away from fossil fuels to renewable sources in a scenario of deep uncertainty, especially in regard to hydrological changes. Adaptation options should focus on strategies for energy security and energy investment which include climate change components both in terms of preparing for future energy needs and incorporating risk mitigation for critical infrastructure in vulnerable locations. Adaptation measures for Bulgaria's energy sector include:

- Translate monitoring, forecasting and weather data for the energy sector
- Mainstream climate change considerations within energy sector policies and plans
- Incorporate climate resilience into design and engineering of new power plants and into operations and contingency planning for existing power plants and coal mines
- Incorporate climate resilience into design and engineering of new T&D infrastructure and into operations and contingency planning for existing T&D infrastructure
- Diversify supply, including regional energy trade, district heating/cooling, gasification of households, and small-scale renewables to increase overall energy system resilience
- Improve energy efficiency in public and private sector buildings to ensure that the existing supply and demand balance is maintained
- Build institutional capacity and knowledge networks
- Develop financial mechanisms to build resilience

The development of knowledge tools to inform a consolidated energy strategy that incorporates climate change would require knowledge products such as maps and regional projection estimates. It is worth noting that there is also need for financial mechanisms for large scale investments required in energy production and distribution. Incorporating resilience planning into components of current energy plans is necessary to ensure energy resilience in the long term.[95]

Health

Overview

Bulgaria has experienced noticeable improvements in public health over the past decades; however, the country continues to face many health challenges. Life expectancy increased by 3.1 years between 2000 and 2015 and has improved in most of the 19 core indicators monitored by the World Health Organization. Some of the unfavorable trends relate to tobacco smoking, alcohol consumption, prevalence of overweight and obesity, inequality, and out of pocked expenditures. The public-sector health expenditure represented 54.6% of total health expenditure in 2014, significantly less than expenditures in 2000 and lower than the regional average. Private out-of-pocket expenditure was 44.2%, significantly higher than the region and twice the average of the EU13, this is expected to represent significant barriers to accessing public health. Health is closely connected to the environment, in fact, environmental issues such as air pollution are among the top 10 risk factors associated with burden of disease

[95] Republic of Bulgaria (2019). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan. Assessment of the Energy Sector. URL: https://www.moew.government.bg/en/climate/international-negotiations-and-adaptation/adaptation/

measured in disability adjusted life years. In Bulgaria's NC7, human health is considered in relation to sectors that create externalities affecting health such as transportation, waste management. Health is also considered in connection to natural hazards and disaster risk management.[96]

Climate Change Impacts

In Bulgaria, predicted increases in air and water temperatures, changing precipitation patterns and increased likelihood of extreme events will have impacts on human health both directly and indirectly. Primary effects are most likely to be connected with increased temperature and heat waves and impacts from flooding. The number of heating degree days is also expected to decrease, reducing pressure on winter heating. Under a high emission scenario, projections estimate that by the 2050s there will be at least six additional heat days, days with temperatures over 30°C and an increase in 41–88 tropical nights.[97] As seen in **Figure 13**, the warm spell duration index is also expected to increase by 16–39 days compared to the historical 1–2 days between 1986–2005.[98] The magnitude of impacts is highly connected to the duration as well as the severity of impacts. Health impacts can also be exacerbated by social vulnerability which can compromise access to adaptive technology such as cooling as well as limited access to health systems. Secondary effects could be connected to changes in phenology that could affect allergen production, vector-borne diseases, fires, and challenges in food security.[99]

Heat waves have already caused significant numbers of deaths and morbidity in South East Europe during the past twenty years, particularly for the most vulnerable groups: elderly, chronically ill and disabled. Higher temperatures are also likely to lead to an increase in the number of water and food-borne diseases (i.e. salmonellosis and gastro-intestinal infections), to which children are especially vulnerable, and water quality may also suffer from algal contamination and concentration of pollutants.[100]

Rising temperatures are of increasing concern for Bulgaria. For the country, the annual distribution of days with a high-heat index provides insight into the health hazard of heat. **Figure 14** shows the expected Number of Days with a Heat Index >35°C for the 2090s; showing a sharp increase in days with a heat index over 35°C. This accelerates sharply under a high-emission scenario by end of the century. It also shows night temperatures (>20°C), which are expected to rapidly increase in a high-emission scenario. Increased health threats can be projected and monitored through the frequency of tropical nights. Tropical Nights (**Figure 15**) represents the projected increase in high night-time temperatures for different emission scenarios to demonstrate the difference in expected numbers of tropical nights across different scenarios.

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[96] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

[97] WBG Climate Change Knowledge Portal (CCKP, 2020). Bulgaria – Health Sector. URL: https://climateknowledgeportal.worldbank.org/country/bulgaria/climate-sector-health

[98] WBG Climate Change Knowledge Portal (CCKP, 2020). Bulgaria – Health Sector. URL: https://climateknowledgeportal.worldbank.org/country/bulgaria/climate-sector-health

[99] Republic of Bulgaria (2018). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan. Assessment of the Health Sector. URL: http://www.moew.government.bg/static/media/ups/tiny/%D0%9F%D0%98%D0%9A/%D0%9C%D0%9F%D0%90/Strategy%20and%20Action%20Plan%20-%20Full%20Report%20-%20Draft%20(2018-05-03)%20-%20EN%20V4.EM.pdf

[100] World Bank Group (2015). Turn Down the Heat – Confronting the new climate normal. The Climate Challenge for the Western Balkans. URL: http://documents.worldbank.org/curated/en/494741468189532505/pdf/98220-WP-P148173-PUBLIC-Box393168B-pdf.pdf

FIGURE 14. Projected days with a Heat Index >35°C (Reference Period, 1986–2005)[101]

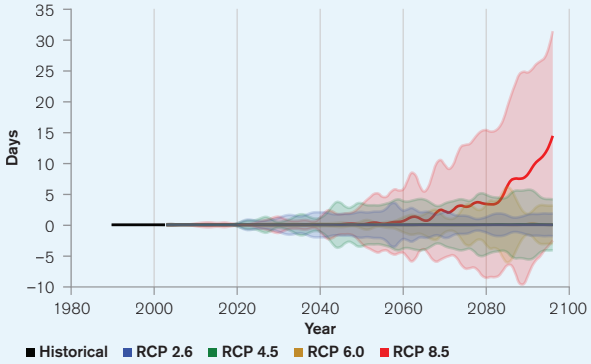
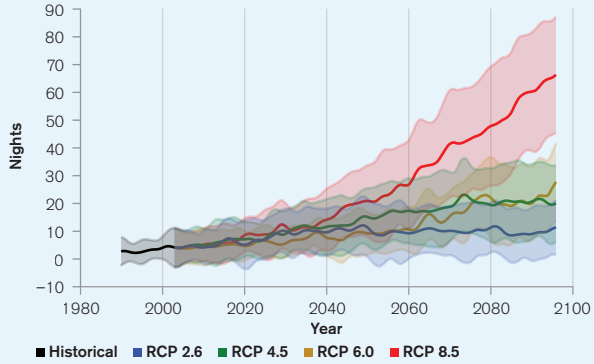


FIGURE 15. Projected number of Tropical Nights (Tmin >20°C) (Reference Period, 1986–2005)[102]



Adaptation Options

Bulgaria can undertake specific steps to improve its healthcare services and specifically to improve its ability to assess health impacts and health system adaptation. This includes the development of a national health adaptation strategy, as part of Bulgaria's National Climate Change Adaptation and Action Strategy, which prioritizes the needed capacity building and training in early identification of potential infectious disease risks and outbreaks to improve disease surveillance systems.[103] Adaptation efforts should build on existing national efforts towards adaptation to climate change, including assessments, and development and implementation of policies and programs at local to national levels. Climate and health adaptation efforts should be integrated into national health planning strategies, processes, and monitoring systems. A flexible and context-specific approach to health adaptation to climate change should be undertake, which accounts for specific national circumstances and available information and experience, institutional arrangements, and resources required. Relevant health indicators should be developed for the health sector, which can work within the adaptation monitoring systems of other key sectors such as, the food, water, energy and housing sectors, ensuring that health considerations are integrated into their adaptation planning to avoid maladaptation.[104]

[101] WBG Climate Change Knowledge Portal (CCKP, 2020). Bulgaria Health Sector Dashboard. URL: https://climatedata.worldbank.org/CRMePortal/web/health/systems-and-service?country=BGR&period=2080-2099

[102] WBG Climate Change Knowledge Portal (CCKP, 2021). Bulgaria Health Sector. URL: https://climateknowledgeportal.worldbank.org/country/bulgaria/climate-sector-health

[103] Republic of Bulgaria (2018). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan. Assessment of the Health Sector. URL: http://www.moew.government.bg/static/media/ups/tiny/%D0%9F%D0%98%D0%9A/%D0%9C%D0%9F%D0%90/Strategy%20and%20Action%20Plan%20-%20Full%20Report%20-%20Draft%20(2018-05-03)%20-%20EN%20V4.EM.pdf

[104] Republic of Bulgaria (2018). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan. Assessment of the Health Sector. URL: http://www.moew.government.bg/static/media/ups/tiny/%D0%9F%D0%98%D0%9A/%D0%9C%D0%9F%D0%90/Strategy%20and%20Action%20Plan%20-%20Full%20Report%20-%20Draft%20(2018-05-03)%20-%20EN%20V4.EM.pdf

Bulgaria's health-care infrastructure needs to be upgraded to support more systemic climate change resilience, and capacity also needs to be built to support the adaptation to extreme weather events and support the necessary response capacities. This is particularly important for the country's rural and poorer areas. Individuals with pre-existing diseases, especially cardiovascular and respiratory diseases, have a high risk of increased morbidity during heat-waves and special awareness and preparation should take place during the summer months. Health care system personnel may not be fully aware of the relationship between climate change, seasonal variability and health impacts. Increases in training and capacity can improve the level of knowledge and skills to prevent diseases connected with climatic factors, however this knowledge remains relatively limited among the general population.[105] Across policies, there is need to intensify intersectoral cooperation and provide a coordinated approach and functional cooperation in terms of effective and efficient carrying out of the activities.

Forestry

Climate Change Impacts

The Government of Bulgaria has recognized forestry as a priority sector for climate change not only because forested areas cover over one third of the country, but also because forests contribute to economic growth, provide ecosystem services, and support disaster risk management. Bulgaria has a total forested area of 4.2 million hectares[106] that contribute approximately €500 million to the economy annually, including 43,000 jobs in the forest sector. In highly forested regions, the forestry sector is the most important economic activity.[107] Forest area has increased by 0.5 million ha and standing wood area has tripled in the last 50 years, primarily due to afforestation efforts and land use change from farmland to forest. The average age of forests in Bulgaria is 57 years. Forest health is also important to consider in the context of erosion control as forests support land conservation and soil health, approximately 39.8% are considered to serve a protective or rehabilitation role.[108] The state manages 74.5% of forests and municipalities, private persons, and religious communities manage the remaining 25.5%.[109] The majority of forests are deciduous (69.5%) and coniferous (30.5%) with a growing stock of about 680 million m^3, which is mostly deciduous (55.4%) and an average annual harvest of 14 million m^3 of wood.[110] The government

[105] World Bank Group (2020). Turn Down the Heat – Confronting the new climate normal. The Climate Challenge for the Western Balkans. URL: http://documents.worldbank.org/curated/en/494741468189532505/pdf/98220-WP-P148173-PUBLIC-Box393168B-pdf.pdf

[106] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

[107] Republic of Bulgaria (2017). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan Sector Assessment for Forestry. Annex 2. Forest sector climate adaptation modelling in Bulgaria to date. URL: http://www.moew.government.bg/static/media/ups/articles/attachments/Forestry%20-%20Full%20report%20-%20draft%20-%20(2017-12-01)%20-%20EN%20-%20for%20printing282093a834310d7ff33ca899bcb1b5ad.docx

[108] Republic of Bulgaria (2018). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan. *Proposal for a National Climate Change Adaptation Strategy and Action Plan.* Draft URL: http://www.moew.government.bg/static/media/ups/tiny/%D0%9F%D0%98%D0%9A/%D0%9C%D0%9F%D0%90/Strategy%20and%20Action%20Plan%20-%20Full%20Report%20-%20Draft%20(2018-05-03)%20-%20EN%20V4.EM.pdf

[109] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

[110] Republic of Bulgaria (2017). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan Sector Assessment for Forestry. Annex 2. Forest sector climate adaptation modelling in Bulgaria to date. URL: http://www.moew.government.bg/static/media/ups/articles/attachments/Forestry%20-%20Full%20report%20-%20draft%20-%20(2017-12-01)%20-%20EN%20-%20for%20printing282093a834310d7ff33ca899bcb1b5ad.docx

strategy for forests has been focused on ensuring sustainable use of forest resources, strengthening the role of forests to support economic growth and socio-economic development, and increasing forest contribution to the green economy.[111]

Climate Change Impacts

Changes in precipitation and incidence of more extreme weather events could have lasting impacts on forest health. Attempts to calculate degradation estimates that Bulgaria lost 25.2% of the value of ecosystem due to degradation in 2015.[112] Forests help preserve soil health and prevent erosion but are also affected by the effects of degradation. Trends toward increasing temperatures are already changing the phenological composition of forests, which are showing 7–15 days of earlier onset of development phases, resulting in an increase in the length of the growing season but also a high risk of damage from late frost or susceptibility to prolonged heat exposure.[113] Increased risk of drought could also add stress and result in high mortality for forests. Mortality outbreaks in forest health has often been associated with health deterioration which makes certain forests more vulnerable to insect outbreaks and other diseases. Changes in water availability or distribution of precipitation increase the probability of forest fires. The last decades have experienced a significant increase in forest fires which is closely associated to years with dry summers.[114] Most forest fires have been located in lowlands, however there have also been forests in mountainous coniferous forests during dry years.[115] Most forests in Bulgaria are below 800 meters above sea level and are thus at higher risk of heat stress. Reduced forest health can also affect other sectors like agriculture, health, and energy by increasing the risk of natural disasters such as forest fires.

Adaptation Options

In Bulgaria, forests provide important inputs to the economy through timber and non-timber forest products, including ecosystem services. The importance of the forestry sector is recognized by the Bulgarian government both in their National Communications as well as national strategies for the development of the forest sector. Adaptation efforts can be undertaken in face of stress from temperature and hydrological changes, which can increase forest health and safeguarding biodiversity in the short term.[116] Increasing research and extension to promote sustainable forest use is critical for effective forest management. In areas where forests have experienced stress or areas that are

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[111] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

[112] Sutton, Paul C., et al. (2016). The ecological economics of land degradation: Impacts on ecosystem service values. *Ecological Economics* 129 (2016): 182–192.

[113] Republic of Bulgaria (2017). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan Sector Assessment for Forestry. Annex 2. Forest sector climate adaptation modelling in Bulgaria to date. URL: http://www.moew.government.bg/static/media/ups/articles/attachments/Forestry%20-%20Full%20report%20-%20draft%20-%20(2017-12-01)%20-%20EN%20-%20for%20printing282093a834310d7ff33ca899bcb1b5ad.docx

[114] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

[115] Panayotov, M., et al. (2011). Wind disturbances shape old Norway spruce-dominated forest in Bulgaria. *Forest Ecology and Management* 262.3 (2011): 470–481. https://s3.amazonaws.com/academia.edu.documents/45683157/j.foreco.2011.04.01320160516-21702-fg1m6f.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A& . . .

[116] Republic of Bulgaria (2018). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan. Assessment of the Forestry Sector. URL: http://www.moew.government.bg/static/media/ups/tiny/%D0%9F%D0%98%D0%9A/%D0%9C%D0%9F%D0%90/Strategy%20and%20Action%20Plan%20-%20Full%20Report%20-%20Draft%20(2018-05-03)%20-%20EN%20V4.EM.pdf

prone to flooding, investing in reforestation could not only improve forest health but also provide flood mitigation. Supporting biodiversity and genetic diversity in forests through lodging, conservation, and restoration practices are also important approaches that can be taken. Changing current approaches to forest management are necessary to ensure long term availability of the resource.[117]

ADAPTATION

Institutional Framework for Adaptation

Bulgaria is subject to both international and European union frameworks for climate change. At an international level, it is subscribed to international frameworks as a member of UNFCCC, signatory to Kyoto and Paris agreements. Bulgaria submitted its Updated NDC as a European member state in 2020. Bulgaria has outlined and enacted several policies through their Kyoto commitments and has worked to improve its adaptation through the formation of a National Adaptation Strategy. Bulgaria is also a signatory to other relevant international and regional conventions on biodiversity, architectural heritage, trade of endangered species, and cooperation for sustainable use of the Danube River. At a regional level, Bulgaria follows the framework set forth by Europe 2020 strategy, EU strategy on adaptation, 7th Environmental action program, other regulations. At a country level, the national Ministry of Environment and Water (MOEW) is the central body that coordinates adaptation policy making.[118]

Policy Framework for Adaptation

Bulgaria submitted its Seventh National Communication to the UNFCCC in 2018 and its Nationally-Determined Contributions to the UNFCCC in 2016. Climate change is recognized in the national development program and plan for Bulgaria 2020 and likewise, the country's development agenda forms an important component of the Third National Action Plan on Climate Change 2013–2020. The MOEW began their adaptation planning though a vulnerability assessment in 2014. Adaptation is included in the Third National Action Plan on Climate Change 2013–2020; however, the country has developed a National Climate Change Adaptation Strategy and Action Plan in 2019. The strategy comprises a period through 2030, with a perspective by 2050. The implementation of the Strategy is supported by National Climate Change Adaptation Council and Expert Working group, comprised by wide range of stakeholders from institutions, academia, businesses and NGOs. In addition to the ministry of the environment, climate change is mainstreamed in 25% of all investments from the EU and are thus reflected in sectoral strategies.

[117] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

[118] Climate ADAPT (2018). European Climate Adaptation Platform: Bulgaria. URL: https://climate-adapt.eea.europa.eu/countries-regions/countries/bulgaria

National Frameworks and Plans

- Updated Nationally Determined Contribution (2020)
- Fourth Biennial Report (2020)
- National Climate Change Adaptation Strategy and Action Plan (2019)
- Assessment of the Disaster Risk Management Sector (2018)
- Seventh National Communication (2018)
- Nationally Determined Contribution (2016)
- Sixth National Communication (2013)
- Fifth National Communication (2011)

Recommendations

Research Gaps

- Improve regional projections of hydrological hazards, storms and wildfires to improve preparation and early warning systems
- Increase participation of the public, scientific institutions, women and local communities in planning and management, accounting for approaches and methods of gender equity, and increase urban resilience
- Strengthen environmental monitoring capabilities for strengthened and more effective environmental management
- Increase research and extension efforts on adapted crop and livestock development and farming practices as well as infrastructure and other technology options for irrigation
- Strengthen the technical capacity to integrate climate-smart agriculture and climate change risk management into farmer's and the wider agricultural sector
- Improve knowledge, skills and technologies for improving water use efficiency in agriculture
- Undertake research on the economic diversification due to climate change impacts for key sectors such as tourism and agriculture

Data and Information Gaps

- Develop early warning systems about dangerous hydrometeorological phenomena and climate risk management, specifically for sea level rise, water resources and health impacts
- Improve regional climate change projections specifically pertaining to hydrological changes
- Increase local capacity to implement adaptive opportunities in agriculture
- Create a comprehensive accounting framework for emissions and removals from land-use change and forestry, as proposed by ongoing EU legislation
- Improve monitoring of chemical and nutrient pollution in the water surface and ground water bodies through increased collection of data on waste water management and pollution
- Ensure that nation-wide climate change and atmosphere monitoring systems are maintained and enhanced where necessary, including through monitoring networks at appropriate spatial density and frequency[119]

[119] Republic of Bulgaria (2018). Advisory Services on a National Climate Change Adaptation Strategy and Action Plan. URL:URL: http://www.moew.government.bg/static/media/ups/tiny/%D0%9F%D0%98%D0%9A/%D0%9C%D0%9F%D0%90/DRM%20-%20Full%20Report%20-%20First%20Draft%20(2018-04-27)%20-%20EN%20-%20for%20printing%20v2.pdf/

Institutional Gaps

- Climate change adaptation strategies should continue to be developed within sectoral and regional plans and are in alignment with EU policies
- Develop a national monitoring, reporting and verification system to improve coordination between the authorities and various institutions working on climate change adaptation[120]
- Address training gaps to increase number of training for experts and occupations relevant to climate change adaptation across all sectors
- Increase capacity to create expert resources in all departments and institutions bearing responsibilities for the implementation[121]

[120] Ministry of Water and Environment (2019). Strategy and Action Plan Full Report. URL: http://www.moew.government.bg/en/climate/international-negotiations-and-adaptation/adaptation /

[121] Republic of Bulgaria (2018). Seventh National Communication on Climate Change. United Nations Framework Convention on Climate Change. URL: http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/0917254_bulgaria-nc7-br3-1-vii_nc_bulgaria_2018.pdf

CLIMATE RISK COUNTRY PROFILE

BULGARIA

WORLD BANK GROUP