STUDY

CLIMATE CHANGE, ENERGY AND ENVIRONMENT

SOCIAL CONSEQUENCES OF CLIMATE CHANGE

Building Climate Friendly and Resilient Communities via Transition from Planned to Market Economies

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The global climate change is one of the most dangerous threats to human society in the 21st Century. The dramatic losses have already been observed, and the risks are rising over time.

CEECCA region experiences many negative impacts of global warming, which is faster and stronger than the world average. Numerous adaptation and resilience measures are required to protect people, but regional governments often underestimate and ignore the social implications of climate policies.

This paper explores what are the priority challenges for CEECCA countries and how to address them effectively.

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Contents

EXECUTIVE SUMMARY

The process of climate change is observed throughout the countries of Central and Eastern Europe, Caucasus and Central Asia (CEECCA); its impacts are significant. National and international projections show annual mean temperatures will rise there through the year 2050 and beyond. CEECCA will also experience changes in precipitation (less or more depending on the area, season and time horizon), more frequent and greater weather extremes and associated impacts on human health, physical infrastructure, water supply, food security and the natural environment. National governments generally acknowledge these problems and wish to act, but in their decisions most of them miss… people. Climate change is predominantly considered a challenge for local infrastructures, energy supplies, agriculture, forestry and other economic sectors – almost never as a social challenge. Although health impacts are probably the main social issue debated with respect to climate policies, even they are very poorly analysed and lack appropriate policies. What about the many other social challenges such as poverty and well-being, climate-change-induced migration, increased gender inequality caused by weather extremes, the impacts on life expectancy and quality of life, as well as the environmental, educational and cultural impacts? National climate-policy authorities almost never include governmental bodies responsible for social policy: Too often, social interests are missing.

Most CEECCA countries have sufficient information to formulate climate policy because they own or have access to advanced hydrometeorological monitoring systems, databases and geographic information systems that provide detailed climate, weather and environmental data. The big question is: Do they use them to identify the proper policy priorities?

Some of the countries primarily consider short- and medium-term climate change – which is when positive impacts such as increased agricultural productivity are expected. Although they have recently experienced negative impacts that are very likely to continue in the long run, these countries often do not assess the potential losses and costs associated with building a climate-change-resilient infrastructure, management systems and socio-economic development models. However, Assessment Reports by the Intergovernmental Panel on Climate Change (IPCC) and numerous national studies conclude that over time, the negative consequences of climate change will dominate and dramatically damage socio-economic and ecological life support systems. Long-term resilience strategies – not short-sighted ones – must prevail.

EU Member States in the CEECCA region have much more sound policies for resilient development and adaptation, and analytical tools and legislative programmes – largely due to EU support and mandatory reporting requirements. Other CEECCA countries would substantially benefit from more coordinated climate policies, for instance, within existing regional cooperation frameworks like the EU Eastern Partnership initiative, the Eurasian Economic Union (EAEU) and others.

The most advanced climate change strategies of EU Member States in the CEECCA region represent effective ways to build climate resilient economies, and to finance and implement specific climate-change adaptation measures. Their well-developed procedures for conducting in-depth analyses, consulting with diverse stakeholders and setting priorities could be shared with the other countries. These include considering local community leaders' views when determining social priorities.

The resilience and adaptation measures in all the CEECCA countries require substantial financial resources, technologies and capacities. The landmark 2015 Paris Agreement within the United Nations Framework Convention on Climate Change (UNFCCC) sets out the international framework for providing climate finance to the tune of USD 100 billion per year by 2020 through various foundations and mechanisms.[1] Significant financing also comes from international financial institutions, EU funds and programmes and private investors, with which CEECCA countries may continue to enhance their long cooperation on climate resilience and adaptation projects.

This paper addresses challenges, shortcomings and opportunities for including social perspectives in climate policies for the CEECA region, and presents four key recommendations:

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1 UNFCCC website: https://unfccc.int/news/developed-countries-well-placed-to-meet-usd-100-billion-goal

1) Existing climate-change resilience and adaptation programmes must be elaborated and new ones approved where needed. These must address the economic and social aspects of development and policy responses by including specific targets, quantitative indicators (damage prevention, improvement of social well-being, etc.), deadlines and authorities. Describing the problems in the strategies and plans is insufficient: The challenges are too great and too urgent.

2) Systems to monitor, assess and develop corrective actions must be introduced in CEECCA countries, and climate resilience and adaptation measures implemented, with specific focus given to their social implications.

   CEECCA countries can use the information and analytical resources of the European Climate Adaptation Platform (Climate-ADAPT) in order to accelerate and strengthen their resilience and adaptation policies and measures. EU experience and best practices can be spread through knowledge-sharing and capacity-building programmes within the EU Eastern Partnership initiative and similar frameworks.

3) The Eurasian Economic Commission must urgently begin to harmonise climate change resilience and adaptation policies and measures to help Armenia, Belarus, Kazakhstan, Kyrgyzstan and Russia enhance their legislative and institutional bases, introduce modern approaches to socially inclusive strategic planning and enhance financing capacities for climate change resilient development.

4) International climate finance is highly competitive, so national governments need to improve the quality and visibility of their projects and programmes and better promote them to international donors. A portfolio of projects for building resilient economies and specific adaptation measures should also be developed along with national strategies. Closer cooperation with international organisations is crucial for making the projects operational, well designed – and funded.

   Countries that neighbour the CEECCA region may also be interested in implementing climate projects, particularly regarding the impacts of global warming on water supplies and associated social issues. Bi- and multilateral projects are also important for Eastern European countries. Knowledge sharing and information exchange is essential for finding solutions for the CEECCA region as a whole.

INTRODUCTION

Climate change is one of humanity's most dangerous challenges of the century: It severely impacts people, economies and the environment at global, national and local levels. Especially in poor countries and regions, many communities are vulnerable to dramatic changes in temperature and precipitation, rising sea levels, and melting permafrost and glaciers. In the 21st century, annual damage caused by global warming could reach as much as 20% of global GDP[2] or around USD 20 trillion[3] according to latest estimates – with the losses very unevenly distributed across countries. Policy-makers and stakeholders must not only concern themselves with the ecological and economic consequences of losses and damages due to climate change but also their social implications. Recent estimates show that inaction (or insufficient action) could incur social costs exceeding USD 16 trillion worldwide.[4]

This paper focuses on the social consequences of climate change in the region of Central and Eastern Europe, Caucasus and Central Asia (CEECCA) and formulates recommendations for protecting local communities. It presents findings about observable and future impacts of regional climate change and the main risks for CEECCA countries. We discuss how governments and stakeholders perceive and react to these risks, and how lessons in enhancing climate change resilience and adaptation could be learnt and shared within the region. We also consider sources of climate finance available to help CEECCA countries cope with climate change impacts and how they can be accessed. More importantly, we ask how policy-makers and stakeholders can protect their citizens from the dangerous consequences of global warming.

The CEECCA region we examine includes Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Republic of Macedonia, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Tajikistan, Ukraine and Uzbekistan.

Instead of focusing on each country, we analyse *regional* trends and processes. Nonetheless we summarise how national governments perceive the risks of climate change for local societies, their priorities, and what are they can do.

We base our analysis on data from international sources, including the UNFCCC, the Intergovernmental Panel on Climate Change (IPCC), the World Meteorological Organization (WMO), the World Health Organization (WHO), international financial institutions and organisations, as well as national governments, project owners and local communities.

The main goal of this review is to ask whether we are ready to protect our citizens from the damages and losses already caused by climate change, as well as from the looming threats and disasters. We may not have any answers yet – but we must find them. We must share our knowledge and experience with our neighbours and cooperate to save our countries and the Earth for future generations. According to the recently published IPCC special report on the impacts of 1.5 °C global warming above preindustrial levels, we have at most two to three decades to prevent catastrophic impacts on ecosystems, and the health and well-being of populations.

Are we prepared to cope with these challenges? What do we know about the risk and impacts we face? What has to be prioritised in order to protect our people, communities, and societies? We must urgently find solutions. Our report discusses these challenges and presents ideas for CEECCA policy-makers.

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2 Stern, N. (2007). *The Stern Review on the Economics of Climate Change.* Cambridge University Press.

3 Measured in USD 2010, at a 3 % annual discount rate. Burke, M., Davis, W. M. & Diffenbaugh, N. S. (2018). Large potential reduction in climate damages under UN mitigation targets. *Nature*, 557, 549–553.

4 Ricke, K., Drouet, L., Caldeira, K. & Tavoni, M. (2018). Country-level social cost of carbon, *Nature Climate Change*, 8, 895–900.

1

CLIMATE CHANGE: CURRENT AND FUTURE SOCIO-ECONOMIC IMPACTS IN THE REGION

1.1 HISTORICAL TRENDS AND OBSERVATIONS

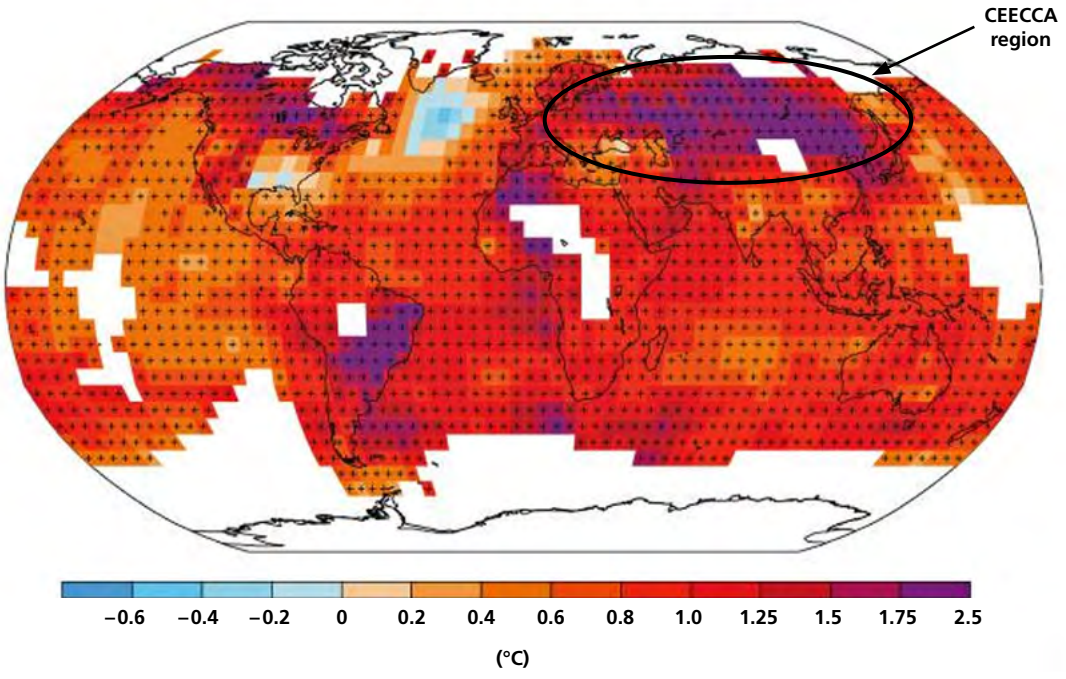
In the last few decades, national and international organisations – mostly hydrometeorological agencies and research institutes – have scientifically studied CEECCA climatic conditions. The studies present clear evidence of climate change in the 20th century. The most severe social consequences are associated with rising surface temperatures, changing precipitation patterns, dangerous hydrometeorological events (floods, droughts, extreme weather, etc.), increased environmental pollution, and the effects on health and on economic sectors such as agriculture and energy, as well as water supplies.

The IPCC's Fifth Assessment Report consolidates the findings of these global observations to provide a comprehensive picture of the most important changes in global and regional climate. IPCC data (Figure 1) presents sound scientific evidence of the sharp rise in surface temperatures in CEECCA since 1900. The global average temperature increased by 0.8 °C over the last 160 years – but warming in the CEECCA region has reached 0.8 to 2.5 °C and more in just the last two decades.[5] According to the IPCC, the pace of warming has been increasing since 1970, with average decadal temperatures doubling in the last 40 years. Scientific evidence shows that in the 20th century, the CEECCA region was more severely hit by global warming than many other regions. This was especially true in the Arctic, where surface air temperatures have warmed at approximately twice the global rate within 40–50 recent years.[6] This is linked to planetary atmos-

5 IPCC Fifth Assessment Report (AR5), 2013–2014. Retrieved from http://www.ipcc.ch/report/ar5/

6 IPCC WGI Fifth Assessment Report (AR5).

Figure 1
Observed change in annual mean surface temperature, 1900–2012



Note: Deep red and deep blue in the CEECCA region indicate warming by 1.0 to 2.5°C in the last 112 years (much higher than the average global warming of 0.8°C in the last 160 years). Dots are used as geospatial coordinates. Source: IPCC AR5, 2014.

pheric circulation and the terrestrial ecosystem, which is warming more quickly than the oceans, as well as other climatic factors.[7] Such rapid warming imperils human lives by destroying infrastructure (sewage treatment facilities, roads and electricity networks), human health (e. g. through the explosion of insect-borne diseases) and ecosystems losing their life-support functionality (e. g. clean air and water).

Another important observation regarding climate change relates to the substantial changes in precipitation levels (Figure 2). Between 1950 and 2012, CEECCA faced large deviations of precipitation: reductions of 2.5 to 50 mm per year per decade in some areas of Southern Europe, Caucasus, Central Asia and many areas in Russia, and increases of 2.5 to 100 mm per year per decade – mostly in northern areas. While regional changes mostly involve rising levels of precipitation, national hydrometeorological studies report significant seasonal changes (both rising and declining trends) and precipitation levels changing across territories (regions, provinces, climatic zones). Overall, CEECCA has experienced much less precipitation reduction than many neighbouring areas (Southwest Europe, the Middle East, China and Africa). While farmers are currently enjoying larger harvests, if large-scale adaptation measures are not implemented, this (climate-induced) agricultural productivity will decline across the region in 20 to 30 years.

Significant changes have also been observed in melting Arctic ice, mountain glaciers, permafrost and various terrestrial ecosystems, which often negatively affect local climate in all CEECCA countries and population well-being. For example, a loss of water outflow due to glaciers melting in Central Asia substantially reduces the water supply for people and agriculture downstream, and likely stimulates migration to areas with fresh water. In other mountainous areas, the lack of snow and ice impacts winter tourism – an important economic factor for some regions.

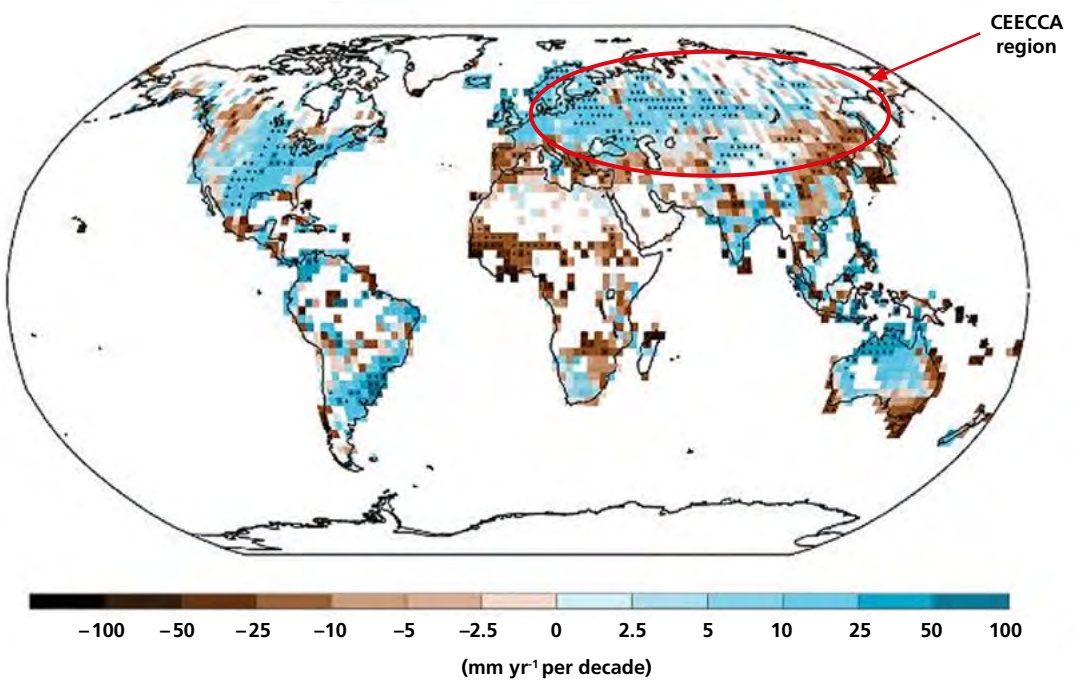
1.2 PROJECTIONS

The climatic changes observed are already affecting CEECCA countries, but the worst is yet to come. IPCC projections of future climate change are worrying: All scenarios show that warming will continue and increase by the end of the 21st century (Figure 3). RCP2.6, the most optimistic scenario, projects an increase of CO2 concentration in the atmosphere of up to 421 parts per million (ppm) by 2100[8] and temperatures rising in CEECCA from 1 to 4 °C; the most pessimistic scenario, RCP8.5, shows an increase of CO2 concentration in the atmosphere of up to 936 ppm CO2 and temperatures rising between 4 and 11 °C by 2100. Figure 4 shows significant changes in precipitation

7 Friedman, A. R. (2013). *Interhemispheric temperature asymmetry over the twentieth century and in future projections*, Berkley: University of California. Retrieved from https://doi.org/10.1175/JCLI-D-12-00525.1

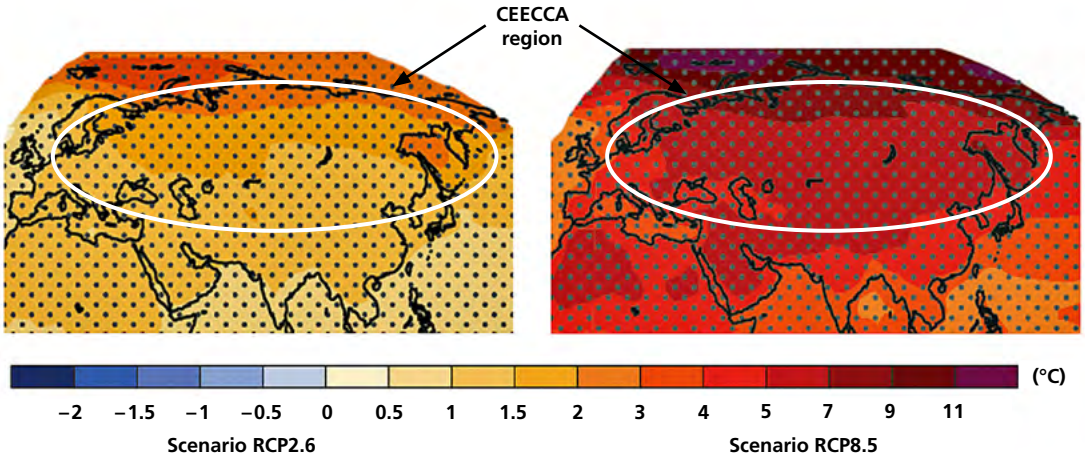
8 According to NASA and NOAA data, the dramatic rise of CO2 concentration from 285 to over 400 particles per million (ppm) between 1850 and 2018 is considered a leading factor of global warming. SeaLevel.info. Retrieved from http://www.sealevel.info/co2_and_ch4c.html

Figure 2
Observed change in annual mean precipitation, 1950–2012



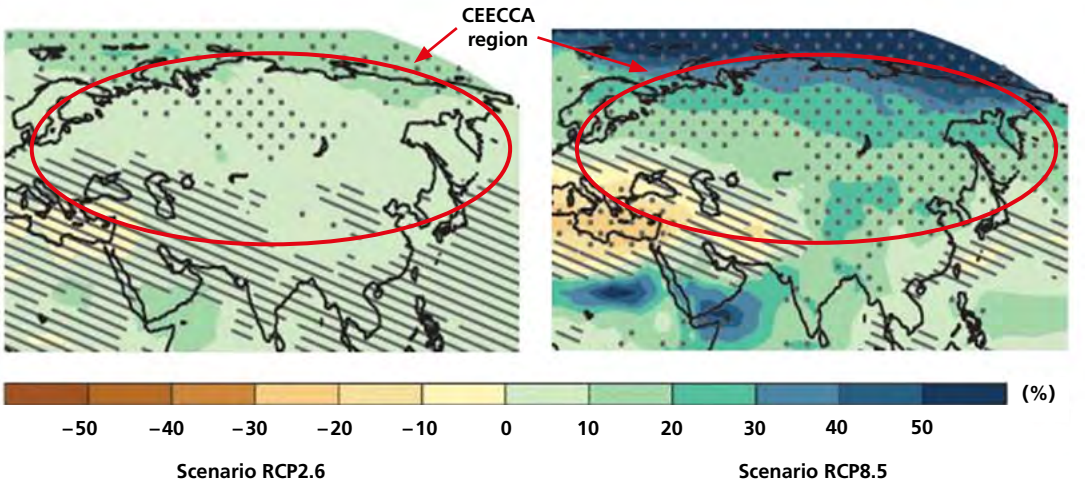
Note: A large part of CEECCA is blue, indicating increased precipitation; brown shows reduced precipitation; and white indicates there has been no change in precipitation since 1950. Dots are used as geospatial coordinates. Source: IPCC AR5, 2014.

Figure 3
Projections of THE change in annual mean surface temperature in the region by the late 21st century (1986–2005 to 2081–2100)



Note: The most optimistic scenario, RCP2.6, shows a large part of the southern CEECCA region covered by yellow – meaning temperature will rise by 1 to 1.5°C. Orange indicates 1.5 to 2°C temperature rise; the dark orange area in the north shows temperatures rising by 3°C and more by 2100. In pessimistic scenario RCP8.5, most of the region is shown in scarlet, meaning a temperature rise by 5 to 7°C; areas in garnet indicate temperatures rising by 7°C and more by 2100. Source: IPCC AR5, 2014.

Figure 4
Projections of annual mean precipitation change in the CEECCA region by 2100 (1986–2005 average compared to 2081–2100 average) in scenarios RCP2.6 and RCP8.5



Source: IPCC AR5, 2014.

levels: –10 % in Southern Europe and +10 to +20 % in other areas in scenario RCP2.6, and –10 to –20 % in Southern Europe and +10 to +50 % in other areas in scenario RCP8.5. Such dramatic changes will catastrophically impact social and economic systems, and environment and life-supporting ecosystems in CEECCA countries.

In the RCP2.6 scenario, precipitation in CEECCA is likely to slightly rise (from 0 to 10 %), while in RCP8.5, the southern CEECCA region will face declining precipitation (from 0 to –30 %) and rising precipitation in all other territories (from 0 to +30–40 %) by the end of the 21st century. These changes will cause floods and extreme rain, landslides and avalanches in the areas with more precipitation, and droughts and a shortage of drinking water in areas with less.

The social consequences will be diverse and dangerous. The next section presents the main threats to the CEECCA region, which include human health, population well-being, quality of life, and increased migration, gender inequality and environmental problems.

HEALTH RISKS

Warming may affect human thermoregulation and increase morbidity and mortality: When body temperature rises above 38 °C (»heat exhaustion«), physical and cognitive functions are impaired; temperatures above 40.6 °C (»heat stroke«), sharply raise the risks of organ damage, loss of consciousness and death. Many studies report a significant increase of mortality during heatwaves. In summer 2010, a heatwave in Moscow that was accompanied by increased air pollution and the spread of infectious diseases caused over 11,000 additional deaths. Temperature-related morbidity increases are linked to cardiovascular, respira-

tory and kidney diseases. Unless we initiate urgent and effective adaptation and resilience measures, there will be significantly greater warming and more frequent and longer heatwaves. With millions of people exposed to the increasing risk of heat impacts in the region, preventive actions have to be large-scale and specific for priority populations like elderly persons and the impoverished.

Flooding and windstorms increase the risks of drowning, injury, hypothermia and infectious diseases. Floods are the most frequent type of natural disaster. The frequency and economic losses of river flood events has been increasing, with tragic evidence in the CEECCA region: In May 2014, Serbia and Bosnia and Herzegovina suffered the greatest damage caused by the heaviest flooding in 120 years. Over 1.6 million people were affected, and at least 62 died. Overall damage was estimated at EUR 3.5 billion.[9] Already in July 2012, the equivalent of five months of rain had fallen in one night in Krymsk, Russia. A 7-meter-high wave swept through the town in the early morning when most residents were asleep. It filled many houses to the ceiling: those who could not escape drowned. Regional floods caused 171 deaths, damaged nearly 13,000 houses and affected 30,000 people.[10]

Human health is also affected by dangerous infections and ecosystem-mediated impacts. Most CEECCA countries report a high risk of such health threats, including tularaemia, anthrax, Western tick-borne encephalitis, hemorrhagic fever with renal syndrome, Crimean-Congo hemorrhagic fever, West Nile fever, brucellosis and Q Fever, as well as dangerous infections such as cholera, malaria, tick typhus, leishmaniasis, leptospirosis and others. Some have already been registered in Armenia and Russia as well (see the Country Profiles). Climate change also increases pathogens that affect human health by incidental ingestion when swimming or direct contact with eyes, ears and open wounds.

Forest and peat fires are occurring more frequently due to heatwaves and droughts, releasing extremely dangerous particulate matters of 10 microns (PM10) and 2.5 microns (PM2.5), sulphur dioxide, nitrogen oxides and many other toxic substances. They also affect large numbers of local inhabitants, increasing risks of morbidity and mortality, lost years of economically active life and other negative economic consequences. Air quality studies[11] indicate a great increase in near-surface ozone concentrations induced by higher temperatures and the corresponding biogenic emissions. The frequency and intensity of extreme ozone-concentration events – the most dangerous type for human health – increased also. Regional studies of air quality changes in response to climate change in Europe project potentially large increases in near-surface summer ozone concentrations, especially in Central and Southern Europe, as a result of much warmer and drier summers.[12] In urban areas in particular, air pollution combined with heatwaves is becoming a highly hazardous risk factor for human health – affecting quality of life, property values and population well-being.

Recent studies show that climate change strengthens drought-induced dust storms in Central Asia and transports sand dust from the Aral Sea (Uzbekistan and Kazakhstan) that is contaminated by chemical fertilizers and other hazardous pollutants over long distances. This leads to increased hospital admissions, more severe asthma, skin and eye irritations and other health impacts – not only locally, but also in neighbouring countries.[13]

FOOD INSECURITY

Some countries consider that global warming positively impacts agricultural production. The governments of Belarus, Bulgaria, Estonia, Kazakhstan, Latvia and Russia report rising productivity, particularly due to the climatically induced increased harvests. However, other countries are more cautious regarding the risks associated with the impacts of warming, such as damage to the physical infrastructure in rural areas, water stress, droughts and crop losses in years of extreme weather.

The effects of climate change differ by country and time horizon. Several studies indicate that the agro-ecological potential of the Central Eurasian grain-producing zone may increase due to warmer temperatures, longer growing seasons, decreased frost frequencies and higher atmospheric concentrations of CO2 on crops; others project a decline of agricultural potential due to the increasing frequency of droughts.[14] The grain production potential in Russia, Ukraine and Kazakhstan may increase due to a combination of higher winter temperatures, extended growing seasons and the CO2 fertilization effect on crops. However, the most productive semi-arid zone could suffer a dramatic increase in drought frequency.[15]

In Russia, severe droughts in 2010 and 2012 dramatically decreased overall crop yields by 33 % and 25 % respectively,

9 Stadtherr, L., Coumou, D., Petoukhov, V. & Rahmstorf, S. (2016). Record Balkan floods of 2014 linked to planetary wave resonance. *Science Advances*, 2(4).

10 BBC. (8 July 2012). Russia flash floods: 144 killed in Krasnodar region. Retrieved from https://www.bbc.com/news/world-europe-18765305

11 Orru, H., Ebi, K. L. & Forsberg, B. (2017). The interplay of climate change and air pollution on health. *Current Environmental Health Reports* 4(4), 504–513.

12 Annesi-Maesano, I. (2017). The air of Europe: where are we going? *European Respiratory Review*, 26, 170024.

13 Sternberg, T. & Edwards, M. (November 2017). Desert dust and health: A central Asian review and steppe case study. *International Journal of Environmental Research and Public Health*, 14(11), 1342.

14 FAO. (2016). *Climate change and food security: risks and responses*. Rome: FAO.

15 Lioubimtseva, L., Dronin, N. & Kirilenko, A. (2015). Grain production trends in the Russian Federation, Ukraine and Kazakhstan in the context of climate change and international trade. In A. Elbehri (Ed.), *Climate change and food systems: global assessments and implications for food security and trade.* FAO: Rome.

causing prices to drop sharply (primarily affecting poor people) and about USD 10 billion in economic damage. That was the first strong sign that after two decades of rising climate-induced productivity, global warming has become an increasingly major risk for Russian agriculture. Without adequate climate-change adaptation measures, it is estimated that the annual economic loss of crop yields in Russia will reach USD 3.5 billion by 2020 and USD 3.9 billion by 2050.[16] The IPCC provides global estimates of such »turning points« in crop production: After 2050, climate change damage will outstrip the benefits of any productivity rise.[17]

Many places will see problems regarding water supply for their growing livestock population exacerbated by climate change. The Baltic States and all Central Asian countries report that livestock are at high risk due to the expansion of plant diseases, pests, infectious animal diseases and water shortages. In the long run, climate warming in Europe is expected to cause the massive spread of bluetongue virus in sheep and ticks in cattle.

SHORTAGE OF SAFE, SAFE DRINKING WATER

Although some 84 % of the CEECCA population has access to clean water, some countries lag far behind: Only 47 % of the population in Tajikistan, 51 % in Uzbekistan, 61 % in Armenia and 66 % in Kyrgyzstan have access to potable water.[18] Climate change impacts on the availability of fresh water and on water quality make water a top priority for these countries. The risks of droughts and insufficient surface run-off, physical damage to water- supply and water-quality control systems, which impact the well-being and health of millions of people, must be responsibly managed.

However, some climate-induced risks, such as the risk of water shortages due to glacier melting, are hard to control. Central Asia will face the most severe damage because 38 % of the volume of the Tian Shan glaciers has been lost in the last 25 years. If temperatures and precipitation continue to rise substantially, the rest may disappear.[19] The population in arid Central Asia depends on snow and glaciers melting for irrigation and drinking water. A continuation of the current retreat will eventually deplete glacial ice and substantially reduce or eliminate run-off. It will also affect the availability of fresh water for mountain recreation, and animals and plants that depend on melting glaciers – impacting the economies and local communities in Tajikistan, Kyrgyzstan and Uzbekistan. Lack of water can be a strong driver of migration for millions of people in the region and neighbouring countries, such as Russia and Kazakhstan, as well as in Eastern and Western Europe.[20]

Climate change also affects water quality through a complex set of natural and anthropogenic mechanisms that work in parallel and in series. While contaminated drinking water increases human morbidity and mortality, projecting such health impacts is difficult because it requires lots of specific data on local conditions, climatic and environmental assumptions and current pollution.

DAMAGE TO PHYSICAL INFRASTRUCTURE

In the second half of the 20th century, annual economic losses from large extreme events including floods and droughts increased tenfold. In recent decades, floods have been responsible for about one third of the economic losses due to natural hazards worldwide – mostly related to wellbeing of population and infrastructure. In Europe, between 1980 and 2009, 416 flood events affected 8.9 million citizens, causing 2,546 human fatalities and economic damage amounting to EUR 75 billion. By 2100, river flooding in EU Member States (Eastern Europe is one of the highest-risk regions) could cause annual economic damage of EUR 14 to 21.5 billion.[21] To avoid that, the European Flood Alert System has been introduced (but not yet fully integrated) into EU flood risk management programmes. Increased temperatures and heavy precipitation will change flood frequency and intensity in the region. The projected long-run flood risks in CEECCA vary significantly and must examined at the regional and local levels (Figure 5).

Another factor of climate change involves melting permafrost that puts three quarters of the Arctic population at risk.[22] The permafrost area is projected to continue to decline throughout the first half of the 21st century. This is especially significant for Russia, where permafrost covers two thirds of the territory, and where damage to infrastructure (roads, oil and gas pipelines, heat-supply networks, buildings, electricity transmission lines, etc.) will increase in the near future.[23] There is yet another impact on human health and environmental quality due to permafrost melting: Anthrax spores can survive in the soil for centuries.[24] As old cattle graves and human cemeteries (for those who died of

16 Safonov, G. & Safonova, Y. (2013). *Economic Analysis of the Impact of Climate Change in Agriculture in Russia.* Oxford: OXFAM.

17 IPCC Fifth Assessment Report 2014.

18 Based on OECD Green Growth Indicators. Retrieved from https://stats.oecd.org

19 Fu, B. H. et al., Glacier retreat of the Tian Shan and its impact on the urban growth and environment evaluated from satellite remote sensing data. *IOP Conference Series: Earth and Environmental Science*, 74, Conference 1.

20 FAO. (2018). *Water stress and human migration: a global, georeferenced review of empirical research.* Rome: FAO; Qobil, R. (25 October 2016) Will Central Asia fight over water? BBC Uzbek. Retrieved from https://www.bbc.com/news/magazine-37755985

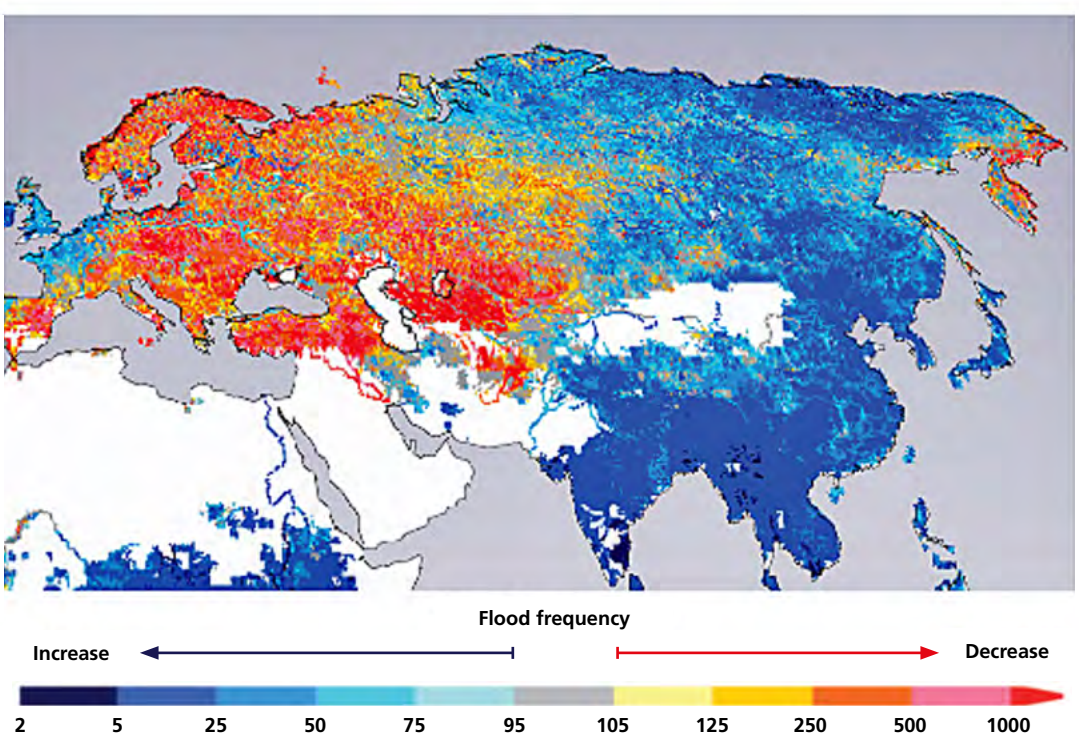
21 European Commission. (June 2013). *Science for Environment Policy: Flooding*, Issue 40.

22 Hjort, et al. (2018). Degrading permafrost puts Arctic infrastructure at risk by mid-century. *Nature Communications*, 9, Article number: 5147.

23 Anisimov, O. A. (2016). *Impacts of changing climate in permafrost regions: The Russian perspective, Summary Report*. Foreign & Commonwealth Office UK-Russia Project.

24 RIA Novosti (2016). Retrieved 11. Nov. 2018 from https://ria.ru/science/20180312/1516150221.html

Figure 5
Projections of flood frequencies in the CEECCA region



Source: IPCC AR5, 2014.

anthrax and other deadly diseases) degrade, hazardous infections leak into rivers and other bodies of water. The risks for local populations are extremely high, as shown in Yakutia in 2016. Russia is peppered with over 100,000 gravesites of cattle that died from anthrax in the last few decades.

ENERGY

Climate change and extreme weather events will affect energy supplies through the impacts of higher mean temperatures, changing patterns of rainfall and wind, cloud cover and insolation, high winds and hail, sand storms and dust, extreme cold and heat, floods, drought and wildfires on electricity generation and transmission systems, fuel infrastructure and transportation systems, and energy demand.[25]

Global energy demand for residential air conditioning in summer is projected to increase rapidly in the 21st century: from nearly 300 terawatt hours (TWh) in 2000 to about 4,000 TWh in 2050 and more than 10,000 TWh in 2100. The main drivers for that will be greater population well-being in developing countries and more population (75 % of the impact) and climate change (25 %).[26] Meanwhile, energy demand for heating is not expected to decline, mostly due to the growing population and its well-being in colder regions and continued reliance on relatively inefficient heating technologies. Thus, rising energy consumption (based on fossil fuels) can be blamed for accelerating climate change and creating a vicious circle: increasing carbon emissions → growing concentration of CO2 → rising temperature → increased demand for energy → more emissions.

25 Ebinger, J., Vergara, W. & Leino, I. (2011). *Climate Impacts on Energy Systems. Key Issues for Energy Sector Adaptation*. World Bank Studies. Washington, DC: World Bank.

26 IPCC Fifth Assessment Report, WGII AR5 (2014), 665.

2

POLICY RESPONSE TO THE CLIMATE CHALLENGE

2.1 STRATEGIES AND POLICIES

CEECCA countries have been reporting vulnerability assessments of their socio-economic systems and adaptation needs since the 1990s, particularly in line with their commitments under the UNFCCC, but also under national climate change regulations. However, many countries have not yet succeeded in developing national strategies and action plans to mitigate the risks to society and population well-being that are associated with climate change. The declarations and reports do not appear to be supported by practical measures. This can be explained by a lack of finance, the low priority of climate issues compared to traditionally perceived development needs (although climate change impacts must be considered with regard to poverty and economic growth), as well as poor capacity regarding analysis, planning, implementation and many other important steps.

In most CEECCA countries, the worrying threats of climate change led to the development of climate strategies, policies and action plans. National Communications, Biennial Reports and (the intended) Nationally Determined Contributions of the Parties to the UNFCCC indicate how the countries view their climate change vulnerabilities, potential resilience and adaptation measures, and funding needed to cope with the negative impacts of global warming.

A good information base is essential for developing policy responses and implementing and monitoring their effectiveness. CEECCA countries have demonstrated very diverse capacities in that regard: Moldova, for instance, uses a detailed geographic information system that is suitable for analysing climate change impacts in depth, setting policy priorities and measuring the effects. Russia's hydrometeorological system provides huge amounts of data about its territory and neighbouring areas that is adequate but could be improved through modern technologies. Some case countries are generally ignoring climate change and its social implications. For instance, in 2010 the government of Montenegro admitted that it sees no strategic interest in adaptation measures. Slovenia, too, is rather unambitious regarding strategic planning and practical measures for resilience and climate change adaptation. In a recent interview, a prominent climate expert from Slovenia explained that its geographical location means that the country is not strongly impacted by global warming and may even become a »climate paradise« for refugees. Hungary also believes it could become a global climate migration target. However, most of the CEECCA governments have developed national strategies, plans and programmes to respond to problems posed by climate change. These are very different and country-specific, and address issues identified as high priority by policy-makers – which may or may not be scientifically justified, long-term or account for all the social challenges.

Analysing national reports reveals, however, that *responding* to climate change is a rather low priority for CEECCA governments. While they acknowledge some climate change impacts and have developed some responses, they are not seriously pursuing them (Table 1). All the countries have identified the observed and projected rising temperatures as a risk factor for socio-economic development. Changes in precipitation are estimated to rise in some areas and decline in others. At the same time, over half of the countries expect flood impacts to increase and about one quarter of them foresee droughts causing increasing damage. Just a few countries (Albania, Slovenia and Russia) are concerned by coastal erosion and sea-level rise, while the risks of landslides, rock falls and avalanches are highly relevant for mountainous countries in Caucasus and Central Asia. All Central Asian countries, Moldova and Macedonia expect more water stress and reduced access to water.

It is evident that many CEECCA countries have no capacity to integrate climate change-related health-risk assessment and management into their policies and measures. High-income countries in the region (e. g. Russia and the Baltic states) demonstrate more advanced approaches in this area, while lower-medium-income ones (e. g. Kyrgyzstan and Tajikistan) lack qualified specialists and scientific foundations. A third of the CEECCA countries acknowledge the positive impacts that climate change has on agricultural production, greatly benefiting their economies; they expect these benefits to continue. Half the countries foresee dangerous impacts on food production, such as the loss of agricultural land, livestock, grapes and wine products. Human health impacts, including vector-borne diseases and extreme weather events (most often heatwaves), concern many countries. However, besides making note of these risks in reports, there is little evidence of practical efforts to

reduce them. Several countries highlight negative impacts on tourism as a major problem. About one third of the countries are highly concerned about the physical impact of climate change on urban and rural infrastructure due to permafrost melting and floods, etc., as well as damage to forests by wildfires, forest diseases and insects.

Figure 6 illustrates CEECCA government perceptions of the top challenges associated with climate change. The situation differs substantially by region, although some similarities can be observed. For instance, climate-change induced increased agricultural productivity is often perceived as helping GDP growth, rather than potentially threatening food security. The temporary benefits prevail. Many countries have no plans for long-term resilience or sustainably produced food (through developing modern irrigation systems, introducing different climate-resilient agricultural species or changing agro-business models and practices).

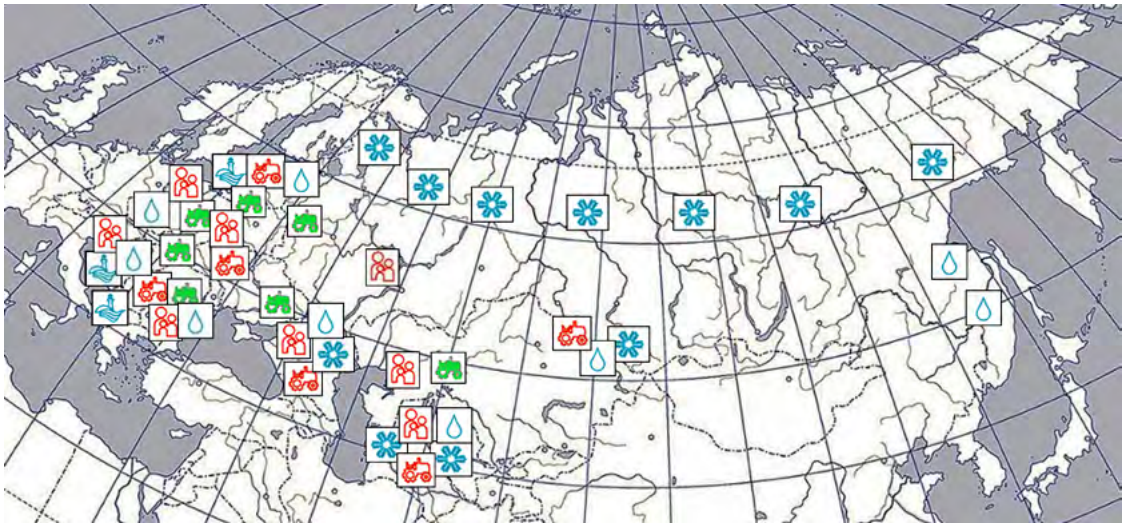
We note that the countries receiving support from EU policy frameworks, funds and programmes demonstrate significant progress in the strategic planning, monitoring and reporting of resilience and adaptation measures. For instance, the National Strategy for Climate Change in Romania provides sound scientific bases for resilience and adaptation measures, including the socially important issues of water resources and flood protection, construction and infrastructure, tourism, energy, industry, transport and public health. In 2017, Poland integrated all the EU climate regulations into its Strategy for Responsible Development, which sets specific climate policy targets. Albania has introduced the principles of integrated coastal zone and disaster risk management for identifying necessary adaptation measures, while working on adopting the EU »acquis communautaire« in the environmental and climate change sectors. Other CEECCA countries are considering and adopting national climate strategies: Russia adopted the Climate Doctrine in 2009 and the governmental plan for its implementation in 2011. But it still has no coordinated policy on climate change resilience and adaptation. The measures are »reactive« rather than »preventive« in many vulnerable areas, such as compensating crop losses, flood impacts, fighting forest wildfires and treating heatwave emergencies. Nonetheless, the region has successfully developed and implemented several climate policies. The next section presents lessons learnt in some CEECCA countries that could be shared with the others.

2.2 LESSONS LEARNT

EU MEMBER STATES IN CEECCA

In 2015, the European Commission and the European Environment Agency established Climate-ADAPT, a partnership for sharing adaptation resources across Europe. EU Member States (including those from the CEECCA region) are to regularly report their progress in developing national adaptation strategies, action plans, impact assessments, vulnerability and adaptation needs, relevant research programmes, climate services, monitoring systems, online resources for climate issues, adaptation/resilience platforms, training and education resources and UNFCCC reporting. The Climate-ADAPT database provides legal, analytical and

Figure 6
Climate change impacts in CEECCA: government perceptions and priorities



Source: Authors.

Table 1
Climate change issues: priorities for CEECCA governments

	Warming	Precipitation change	Impacts of floods	Impacts of droughts	Coastal erosion / sea-level rise	Damage from landslides, rock falls, avalanches	Access to water	Food production	Vector-borne diseases	Health impacts of extreme weather events	Impact on tourism	Damage to infrastructure, forests
Albania	↗↗	↘↘	↗		↗							
Armenia	↗↗	↘↘	↗↗			↗↗		↘↘	↗↗	↗↗		
Azerbaijan	↗↗	↘↘	↗↗	↗↗				↘↘			↘↘	
Belarus	↗↗	↘ | ↗						↗↗	↗	↗		
Bosnia and Herzegovina	↗↗	↗ | ↘↘						↗↗ | ↘	↗	↗	↘	
Bulgaria	↗↗	↘ | ↗	↗	↗				↗↗				↗
Croatia	↗↗	↘↘	↗									
Estonia	↗↗	↗						↗↗ | ↘	↗	↗		↗
Georgia	↗↗	↘ | ↗	↗			↗↗		↘	↗	↗↗		↗
Hungary	↗↗	↘↘		↗				↘↘		↗↗	↘	↗
Kazakhstan	↗↗	↘↘					↘↘	↗↗	↗	↗		
Kyrgyzstan	↗↗	↘					↘↘	↘↘	↗↗	↗		
Latvia	↗↗	↘ | ↗	↗					↘ | ↗		↗		↗↗
Lithuania	↗↗	↘↘		↗				↘↘	↗	↗		↗
Macedonia	↗↗	↘↘					↘↘	↘↘	↗	↗		
Moldova	↗↗	↘					↘↘	↘↘	↗	↗		
Montenegro	↗↗		↗					↗				↗
Poland	↗↗	↗	↗	↗					↗	↗		
Romania	↗↗	↘↘	↗					↗		↗		
Russia	↗↗	↘ | ↗	↗	↗	↗			↗	↗	↗		↗↗
Serbia	↗↗	↗	↗↗					↘↘	↗			↗
Slovakia	↗↗	↗	↗	↗				↗↗	↗	↗		
Slovenia	↗			↗	↗							↗
Tajikistan	↗	↗	↗			↗↗	↘↘	↘			↘	↗
Ukraine	↗↗	↘ | ↗						↘↘				
Uzbekistan	↗↗	↘ | ↗	↗			↗	↘	↘	↗	↗		

Source: Authors, based on the latest National Communications and Biennial Country Reports to the UNFCCC. Retrieved from https://unfccc.int

↗ – increasing impact ↗↗ – strongly increasing ↘ – decreasing impact ↘↘ – strongly decreasing ↘|↗ – both decreasing and increasing impacts expected or observed

practical information (case studies, adaptation options and adaptation planning tools) for national climate-change-policy developers in CEECCA. Many countries have been receiving financial, methodological and analytical support as well as funding for practical measures from various EU sources. This greatly helps them make progress in strategic planning and resilience and adaptation actions. The user-friendly platform is found at: https://climate-adapt.eea.europa.eu/.

CROATIA'S LONG-TERM STRATEGIC AND FINANCIAL PLANNING

Croatia has developed a Strategy on Adaptation to Climate Change to 2040, with a corresponding Action Plan (until 2040, with some longer-term considerations up to 2070). The Strategy provides the vision and guidelines for developing climate change adaptation measures, while the Action Plan identifies priority measures for five-year periods. The government applied a multi-criteria approach for selecting the priority measures and involved numerous stakeholders from relevant sectors. Of the 155 activities proposed, 81 were selected for implementation for water and sea resources management, fisheries, agriculture, forestry, biodiversity, energy, tourism, health, coastal area spatial planning and management, risk management and supra-sectoral measures. A system of indicators was adopted to monitor implementation and the effectiveness of measures for reducing vulnerability and strengthening the resistance of social and natural systems. The government appointed the Inter-Sectoral Coordination Commission for climate-change policy, mitigation and adaptation measures to control implementation of the Action Plan, review reports and propose measures to remove obstacles and improve implementation. In the short run, the Adaptation Strategy is estimated to cost EUR 3.6 billion (99 % from EU funds).

Any CEECCA country can apply such a comprehensive approach, which features:

- a long-term planning horizon with 5-year milestones;
- a broad range of activity options to be prioritised;
- various sectors representing diverse socio-economic challenges;
- many stakeholders setting the priorities and helping ensure representation of different social groups;
- an inter-sectoral coordination body facilitating implementation; and
- correctly identified and estimated funding resources.

GREEN CLIMATE FUND (GCF) PROJECTS IN CENTRAL ASIA

In March 2018, the GCF approved a large-scale project, »Building climate resilience of vulnerable and food insecure communities through capacity strengthening and livelihood diversification in mountainous regions of Tajikistan«. Mountain communities have very weak adaptive capacities for coping with the severe impacts of increasing temperature and rainfall variability and recurrent natural disasters, particularly droughts and floods. This USD 10 million project will introduce adaption measures to address climate change effects that decrease agricultural yields, increase food prices and reduce incomes in the most vulnerable rural communities. A joint Tajik-Uzbek initiative was approved in June 2016: The GCF provided USD 68.8 million for a climate adaptation and mitigation programme for the most vulnerable communities in the Aral Sea Basin. Various loans and grants focused on climate resilient measures for priority areas, including the poorest populations in risk-prone areas and marginalised groups, such as women. Low-income CEECCA countries with limited experience in resilience building initiatives can build on this programme to develop and implement GCF-funded projects. All the project documentation is available at the GCF portal and can be used as templates for new projects.

HUNGARY'S ADAPTATION FINANCE

Hungary has very successfully tapped various sources to finance its adaptation activities. The New Hungary Development Plan includes policies and operational programmes aimed at environmental and climate protection and agricultural and rural development. Overall adaptation support for Hungarian programmes from 2014 to 2020 cost EUR 893 million, mostly funded by the EU. Priorities include water management, drinking water and air quality protection; developing biodiversity and green infrastructure; and specific measures regarding climate change adaptation and risk management. Hungary uses multiple instruments to raise funds for climate finance, such as the EU Strategy for the Danube, the European Regional Development Fund, the European Neighbourhood Instrument and Norwegian Financial Mechanisms. Hungary is also participating in regional initiatives to enhance climate change resilience and adaptation, for instance by launching The Balkan Regional Trust Fund to implement Nationally Determined Contributions by Balkan countries, financial contributions to the GCF, and other bi- and multilateral funds (approximately EUR 30 million annually between 2016 and 2018). Hungary's impressive success in attracting massive finance for development and adaptation and resilience activities comes from its ability to propose a wide range of projects and programmes to donors. Other CEECCA countries could benefit from Hungary's example and create portfolios of project proposals for potential donors instead of implementing numerous small projects that require just as much paperwork.

RUSSIA'S HEALTH IMPACT ASSESSMENT

In 2004, the first high-level workshop on climate change and human health in Russia was organised by the Russian Academy of Medical Sciences and WHO. Since then, analysis of health impacts associated with climate change has

increased, including extreme weather events, heat and cold waves, air quality, the expansion of infectious diseases, and other subjects. A disastrous heatwave in the Central European part of Russia and, specifically in Moscow in summer 2010 created a turning point in scientific research and policy-making on climate-change-induced health issues. Excessively high temperatures and air pollution lasting six weeks in a territory counting 100 million inhabitants caused the additional mortality of 54,000 people more than in 2009. The government has since adopted a broad range of measures to protect human health from heatwave impacts, amongst them installing air conditioning systems and water coolers in public facilities such as hospitals and schools, free blood pressure measuring devices for individuals, better and faster ambulance services and early hazardous weather warnings. Russian citizens have also undertaken multiple self-protective steps, among them, installing home air conditioners and air purifiers – which could, however, lead to increased carbon emissions due to increased electricity consumption (mostly generated from burning fossil fuels). The 2011 Climate Doctrine of the Russian Federation considers human health protection as a top priority in its national climate policy.

CZECH REPUBLIC: OPTIONS FOR FINANCING ADAPTATION USING EU EMISSION-TRADING-SCHEME (EU ETS) REVENUES

EU carbon regulation[27] obliges Member States to use at least 50 % of revenues generated from EU ETS auctions for pre-defined purposes – primarily involving GHG reduction and adapting to the negative effects of climate change. The Czech Republic anticipates earning EUR 1 billion by 2020 by auctioning its GHG allowances, and much more between 2021 and 2030.[28] While most of these revenues are to be invested in energy efficiency and renewable energy sources, other national priorities include agriculture and forestry, and improving air quality and waste management. The EU Effort Sharing Decision allows countries more flexibility in transferring a limited amount of credits from the land-use sector – which could stimulate resilience measures in agriculture and forestry between 2021 and 2030. Carbon credits generated in this sector can provide rural communities with additional finance for adaptation. All EU Member States in the CEECCA region, as well as Kazakhstan and other countries with ETS or other carbon-pricing mechanisms, could apply such carbon-credit-revenue instruments to finance resilience and adaptation problems, preferably those focused on social challenges and needs.

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27 Directive 2009/29/EC. (23 April 2009). Official Journal of the European Union.

28 Analysts assess the role of EU ETS in climate policy both positively and negatively. See, for example: Branger, F., Lecuyer, O. & Quirion, P. (2014). The European Union Emissions Trading Scheme: Should we throw the flagship out with the bathwater? *Wiley Interdisciplinary Reviews: Climate Change*, 6(1), 9–16 and Ellerman, A. D., Marcantonini, C. & Zaklan, A. (Winter 2016). The European Union Emissions Trading System: Ten years and counting. *Review of Environmental Economics and Policy*, 10 (1), 89–107.

3

CLIMATE FINANCE AND COOPERATION OPPORTUNITIES

CEECCA countries must have ambitious strategies for climate-change resilience and adaptation. The urgency of the problem may be recognised but government officials say they lack the substantial financial resources needed for the relevant activities, most of which require upfront investments. In 2016, the UNDP estimated that by 2030, developing countries will need as much as USD 140–300 billion per annum – six to 13 times more than the international public finance currently available for development and climate issues. Most CEECCA countries are already able to tap into massive sums of international finance.

Besides national financing, numerous types of international support can be used for CEECCA regional investments addressing climate change. Interestingly, about 30 % of the climate finance granted by multilateral development banks (MDBs) has been provided to EU transition economies and non-EU Europe and Central Asia: CEECCA countries have a lot of experience working with MDBs, know their requirements for project development, implementation and reporting, and are aware of the complicated financial instruments.

Since 1996, the UNFCCC has had a Financial Mechanism to facilitate funding from developed to developing countries, specifically for climate resilience and adaptation projects via the Global Environment Facility (GEF). The Parties later established four special funds: the Special Climate Change Fund and the Least Developed Countries Fund, both managed by the GEF; the Convention's GCF; and the Adaptation Fund under the Kyoto Protocol. Especially low-income CEECCA countries have access to these sources.

Apart from these »classic« sources, international sources of climate project finance have grown substantially in recent years. The World Bank Group (WBG) has committed over USD 100 billion (an average of USD 12.6 billion per year) for climate finance for the period from 2011 to 2019. The WBG set the new high target of USD 20.5 billion for climate-related finance by 2020. The largest multilateral provider of climate finance, the European Investment Bank (EIB), committed over 25 % of its total financing to climate change adaptation and mitigation, earmarking USD 100 billion for climate projects from 2016 to 2020. The European Bank for Reconstruction and Development (EBRD) is one of the leaders in climate finance funding in CEECCA. In 2017, the African Development Bank (ADB) mobilised over USD 5 billion for future climate finance projects. The Islamic Development Bank (IsDB) provides USD 19.3 billion to Europe and Central Asian countries and USD 2.2 billion to non-member countries, regional projects and special programmes.

Climate finance flows are facilitated by a mix of instruments: 53 % of multilateral climate funding is provided as grants and 47 % as concessional loans; bilateral, regional and other funding comes in grants (32 %), concessional loans (20 %), non-concessional loans (11 %), and equity and other instruments (37 %).

Public and private collaboration on climate finance between developing countries is also increasing. »South–South« climate financing reached USD 12 billion, from 12 national funds, the South-South Climate Cooperation Assistance Fund and the IsDB, which also funds CEECCA countries that are already implementing projects. Recently established funds include the Environmental Transformation Fund of the United States, United Kingdom and Japan, in cooperation with the World Bank. Such national funds are expected to be significant over the long term.

Because private businesses have many more resources and, according to many economists, are more efficient than public investors, they must play a big role in climate finance. The Organization for Economic Co-operation and Development (OECD) and the Climate Policy Initiative (CPI) have estimated private climate finance mobilised by developed countries at around USD 71 billion by 2017. It is difficult to quantify total amounts because not all private investments are publicly reported.

Private finance often participates in MDB projects. In 2015, the reported ratio of MDB adaptation finance to the total project value reached 3.5, that is, for each USD of MDB investment, private and other sources provided USD 2.50.

The Climate Investment Fund (CIF) recently launched the USD 1.2-billion Pilot Program for Climate Resilience (PPCR) to engage the private sector in helping governments integrate climate resilience into strategic development planning across all sectors. The PPCR provides concessional and grant funding to implement the plans, along with pilots of

innovative public and private sector solutions. PPCR funds are currently available only for some CEECCA countries, including Armenia, Kazakhstan, Kyrgyzstan, Tajikistan and Ukraine, but the list may be expanded. The EBRD also plays a prominent role in raising private sector finance for adaptation. In 2013–2015, the EBRD attracted USD 267.1 million in private financing, most of which was invested in the non-EU region of Europe and Central Asia (USD 220 million for 24 projects).

Overall, the financial resources available to CEECCA countries are significant and expected to increase. For many states they can represent large-scale investment for resilience building and adaptation. Local stakeholders have worked with international donors and partners and are capable of initiating high quality projects and raising climate funds. That said, capacity has to be strengthened – especially in low-income countries.

4

CONCLUSIONS

CEECCA countries recognise that climate change has significantly impacted their economies and may affect them even more. However, the social challenges of climate change are very poorly reflected in their climate strategies. The governments seem to be very concerned about the economic impacts, such as the loss (or gain) of agricultural production, and physical damage caused by floods, droughts and extreme weather events, which usually are well analysed and quantitatively assessed. However, the impacts on human health, poverty and population well-being, as well as the quality of life, migration, environment, and other social impacts are almost totally neglected in national climate action plans. The lack of focus, metrics and prioritising of these social issues result in the poor performance, slow progress and exclusiveness of the socio-economic development pathways. Much more must be done in this respect throughout the CEECCA.

Another issue: Climate policies and strategies are often not linked to social problems, mostly because there is poor or no communication between the relevant authorities and civil society groups. For instance, socially and environmentally oriented non-governmental organisations (NGOs) often fail to communicate or compete for funding and media attention. Instead, they should seek to understand how social and climate change problems are interconnected and join forces to achieve stronger results and outcomes.

Most CEECCA countries have quite reliable primary data and information from hydrometeorological monitoring, although some low-income countries lack the expertise, technical capacity and qualified labour to supply up-to-date information and analytical support to national decision-makers. International support is needed.

A few CEECCA countries appreciate the short-term benefits of climate change, specifically for agriculture, but underestimate its long-term negative socio-economic and environmental impacts. Thus their development strategies do not address the climate change resilience and adaptation aspects of development and the corresponding technological and investment priorities, or the solutions to existing and future social climate-change challenges at the national and local levels.

The EU requirements and standards for adaptation policy-making and strategic planning are highly relevant and useful for the CEECCA countries that belong to the EU or have association agreements. Croatia, Czech Republic and Hungary can help other CEECCA governments develop strategies and programmes to build climate resilient economies, secure financing and implement specific adaptation measures. Priority-setting procedures based on in-depth analysis and consultations with the diverse stakeholders are well developed in some countries: They could be shared with others. Similar approaches could be used with other international associations, such as the EAEU, to help harmonise policies and measures for resilience building and adaptation.

Many CEECCA countries have already attracted international climate finance for climate programmes and projects. Various UNFCCC funds, international financial organisations, and bi- and multilateral sources plan to make more such resources available. Private financing can be facilitated through institutions like the OECD CPI, the CIF Pilot Program for Climate Resilience and the EBRD.

5

RECOMMENDATIONS

CEECCA countries must engage various governmental bodies (including those responsible for social issues), think tanks, academics and NGOs to develop and adopt strong, sound climate-change resilience and adaptation strategies and plans of action as soon as possible. Besides economic and policy issues, their strategies must cover the social aspects of climate-change resilient development. Policies should aim at specific social targets, such preventing and reducing negative health impacts, supporting gender equality and quality of life, addressing the loss of well-being and increasing poverty, environmental degradation, and the cultural and educational challenges. It is not enough to merely outline these issues in programmes and plans: These serious challenges require urgent action.

Most CEECCA countries have access to up-to-date monitoring systems and databases for developing and implementing climate resilience and adaptation policies and measures. But national governments often fail to address the *social* challenges in »climate work« and do not assign officials from social development ministries to make climate change policies.

Resilience and adaptation policies and measures in CEECCA countries can make use of the information and analytical resources of Climate-ADAPT, which describes EU experience and best practices in detail. Knowledge sharing and capacity building can be facilitated through the EU Eastern Partnership and other international organisations such as the EAEU and the Shanghai Cooperation Organisation.

Access to international climate finance is provided through different channels including UN funds, international financial organisations, bi- and multilateral agreements and private business initiatives. By 2020, more than USD 100 billion is envisaged for annual climate financing. CEECCA countries can also use innovative domestic instruments to raise funds for resilience and adaptation needs, such as auctioning carbon allowances, introducing carbon taxes and many others. Worldwide, climate finance is highly competitive: National governments must improve the quality and visibility of their projects and programmes to better promote them to international donors through cooperating with international organisations like the United Nations Development Programme (UNDP), the United Nations Environment Programme (UNEP) and its Food and Agriculture Organization (FAO).

Countries around CEECCA have common interests in implementing climate projects. In Central Asia, joint projects, such as how global warming impacts water supply and related social issues, are both possible and needed. Bi- and multilateral projects are plausible in many Central and Eastern European countries. Knowledge sharing and information exchange is a prerequisite for finding solutions for the CEECCA region.

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Global Environment Facility: http://www.thegef.org/

Green Climate Fund: https://www.greenclimate.fund

Islamic Development Bank: https://www.isdb.org/what-we-do/sustainable-development-goals

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ANNEX: CLIMATE CHALLENGES AND RESPONSE MEASURES IN CENTRAL AND EASTERN EUROPE, CAUCASUS AND CENTRAL ASIA

Albania has assessed its vulnerability in the key sectors of water, agriculture, livestock, forests, crops, biodiversity, tourism, population and health. It is planning to apply the principles of integrated coastal zone management and disaster risk management to identify priority adaptation measures for densely populated northern coastal areas, particularly those caused by rising sea levels, and changes in the frequency and intensity of flooding. Albania has also been working on adopting the EU acquis communautaire regarding the environment and climate change.

Armenia has been experiencing climate change through severe landslides, floods, rock falls and flash floods. Of 960 local communities, 233 have suffered substantial damage due to landslides. A number of causative agents, carriers and transmitters, and natural foci of extremely dangerous infections have been registered in Armenia, including plague, tularaemia, anthrax, Western tick-borne encephalitis, haemorrhagic fever with renal syndrome, Crimean-Congo haemorrhagic fever, West Nile fever, brucellosis and Q Fever, along with cholera, malaria, tick typhus, leishmaniosis and leptospirosis. However, national climate change policy includes no specific response measures or strategic planning to cope with such strong impacts.

Azerbaijan has faced substantially rising temperatures that quintupled the duration and number of heatwaves in Baku between 1961 and 1990. The most vulnerable economic sectors include agriculture, hydropower and water supply. Large areas along the east coast of the Caspian Sea risk flooding that will affect local communities and tourism. The country still lacks a comprehensive climate-change strategy with clear social goals and implementation mechanisms.

Belarus has not yet registered a meaningful rise of hazardous hydrometeorological events – although economic damage from such events has increased in the last decade. Over 40 % of the national economy is weather dependent. The north of the country is experiencing increases between 43 % and 72 % in the productivity of the main agro-cultures. Warming has slowly raised crop production by 9.5 million tons per year so the national government considers climate change a benefit rather than a threat for coming decades. Although health impacts, floods and heatwaves are expected to increase, Belarus has developed no specific policy responses yet.

Bosnia and Herzegovina's agriculture has been experiencing the positive effect of climate change on the yield and quality of crops due to longer vegetation periods, as well as negative impacts on the yield and quality of pasture, feed (particularly spring crops), and the depletion of pastures by heavy rains and strong winds. Expansion of diseases and pests, water shortages, and tourism and health impacts are recognised but not yet analysed for proper strategic planning and policy-making.

Bulgaria has observed a significant increase in extreme weather events in the last decades, including heavy rains, thunderstorms, wildfires, floods, wind throw, disturbances by insects and heavy hail that injure people and seriously damage agricultural production, infrastructure and buildings. However, annual crop yields have increased by 11 to 23%. No well-articulated national strategy (including a quantified assessment of social impacts) exists to prioritise response.

Croatia is faced by a very strong negative trend in river run-off, which is affecting the fresh water balance and hydrological regime of many open watercourses intensively used by communities and businesses. Climate change policy primarily considers the water, hydropower and forestry sectors; there is no strategic vision about how to enhance resilience and adaptation capacities and prevent the negative social impacts of global warming.

Estonia's main policy conclusion is: »Despite the hazards, Estonian agriculture will most likely be initially more productive and competitive as a result of climate change.« However, the country also expects increased energy consumption for cooling; more frequent wildfires, diseases and other forest damage; rising health impacts due to the higher risks of cardiovascular, cerebrovascular and respiratory diseases induced by heatwaves; and changes in infectious diseases, insect-borne transmission of Lyme fever, malaria and other diseases – along with food- and waterborne diseases. The negative impacts have not been quantitatively determined because they are not perceived as challenges and have not been prioritised. Apparently, the government's view is that there is »no priority, no problem«: It has introduced no preventive actions for Estonians.

Georgia faces both the positive and negative impacts of climate change on agriculture. The latter include the intensification of droughts and yield losses; increased salinisation, rapid mineralisation and exhaustion of soil organic matter; expansion of crop pests and diseases; erosion and increased risks of high water and hail. Since the 1980s, disasters due to excessive rainfall, landslides, mudflows, avalanches, falling glaciers and transformed glacier flows in mountainous areas have dramatically increased – stimulating emigration from highland villages. Climate-change-related health risks include diarrhoea, mental disorders, trauma and infectious and cardiovascular diseases. Aside from a health risk analysis, there is no comprehensive strategic planning for climate change that addresses the social dimension.

Hungary's agriculture is one of its most vulnerable sectors, with growing risks of droughts and damage to plantations, livestock, food and water supplies. The population is threatened by the increased strength and frequency of heatwaves and storms; greater wind speeds; and impacts on the significant waste containment areas, landfills, slurry and sludge reservoirs that could be the sites of ecological catastrophes. The government has identified many other dramatic impacts but not yet articulated its policy regarding social issues. Climate change could make Hungary a target for global migration, as national government believes.

Kazakhstan expects crop productivity to continue to increase until 2050 as a result of global warming. However, communities will be negatively affected by the decline in traditional pasture-yielding capacity. Long-term and catastrophic water stress is also envisaged by 2050. While rural areas will suffer damage to agriculture, in urban areas the negative impacts on human health are expected to increase. National climate policy is not focused on resilience and adaptation needs so far. Nor are social challenges comprehensively integrated into the agenda.

Kyrgyzstan has 6,771 large glaciers that provide fresh water to the nearby regions and communities – and are affected by global warming. The damage to agriculture from climate change is likely to increase, with health impacts including increased cardiovascular disease, the high incidence of recurrent malaria and more tick-borne infections. The country has weak capacity for resilience and adaptation planning and action, and needs international support.

Latvia has correctly determined its vulnerability to climate change impacts, including damage to agriculture (although positive impacts on crop production are also expected), hydropower generation, water supply and sewage systems, the urban infrastructure and coastal erosion, as well as multiple health impacts. Although a lot of information has been collected, there is no explanation about how to respond to the social challenges of climate change or the social targets and indicators to integrate into decision-making.

Lithuania expects a longer vegetation period in the near future – accompanied by soil degradation and weather extremes that are expected to damage traditional agriculture in rural communities. Climate change will most severely impact the elderly, children, people with health issues and socially isolated people. Health impacts are expected to increase. Despite a sophisticated review of the vulnerabilities, government plans for resolving the social development issues remain unclear. The impacts include morbidity and mortality due to cold and heatwaves; increased ultraviolet radiation; the spread of infectious diseases due to the expansion of disease carriers and chemical and biological materials, including allergens, in the air; the spread of bloodsucking insects that cause tick-borne encephalitis and Lime disease; and extreme weather phenomena. Risks for recreational areas will also increase.

Republic of Macedonia. Since 1960, the annual mean temperature has increased by 0.5 °C, with an unprecedented extreme high of 45.7 °C recorded in 2007. A further rise of 2 °C is projected by 2050 and 3.9 °C by 2100. Throughout most of the country, precipitation has decreased, and will continue to decline – by 10 % by 2050 and 19 % by 2100. Also by the year 2100, water availability is expected to decline by 18 %, affecting local rivers, lakes and aquifers. Increased negative agriculture impacts in half of the country will bring crop damage to EUR 30 million in 2025. The most dramatic reduction in maize yields will reach 86 % by 2050, while viticulture and wine production (17 % of agricultural GDP) will suffer a 20 % loss of grapes and wine products. Moderate to high health effects due to more than 20 causes have been identified, analysed and ranked.

Moldova. Since 1887, the average temperature has increased by over 1.0 °C but there has been no significant change in precipitation. By 2100, temperatures could rise by 6.3 °C to 6.7 °C, with precipitation mostly declining in summer and autumn. If no adaptation measures are implemented, by 2100 winter wheat production in Moldova's most vulnerable areas could drop by 19 to 63 % with grain corn yields declining by 28 to 91 % and milk production decreasing by 30 to 60 %. By 2100, mean annual water run-off is projected to drop by 45 % in the north, 55 % in the centre and 65 % in the south. Health effects have been identified for all major impact factors. The analysis of vulnerability in Moldova is deep and detailed; resilience and adaptation policies and measures have sound scientific foundations.

Montenegro. The annual mean temperature has increased by 1.4 °C since 1958, and while seasonal changes in annual precipitation have been observed, there has been no significant change in the amount. Montenegro's geomorphology means that climate-change-induced floods could jeopardise settlements, agricultural areas, forests and other land and transport routes in river plains and valleys. Despite the frequently fatal consequences, flood protection has not been prioritised. The water sector is highly vulnerable to climate change impacts. Livestock is considered vulnerable to climate change but not crops. Estimates of climate change impacts on socio-economic systems are largely missing. In 2010, the government admitted the critical lack of national readiness and ability to adapt: »At this point there are no national strategies or adaptation measures and analysis of the mechanisms of self-adaptation.«

Poland has recorded its warmest temperatures in the last 30 years. In the past decade, the temperature rose by 0.12 °C (twice as fast as the earlier two). Precipitation has mostly increased in southern Poland. In the 21st century, precipitation is projected to in-

crease in winter and fall in summer. The frequency of very dangerous flash floods that cause substantial damage is increasing. Floods of this type are particularly dangerous in mountainous and submontane areas, where slope erosion and landslides substantially damage tree stands, and in urban areas. Drought frequency doubled in the last 60 years, causing crop losses. Greater risks of agricultural drought are forecast for the periods between 2021 and 2050 and 2071 and 2100, specifically in the centre and southwest. Heatwaves, too, are becoming more frequent in the southwest. The most dangerous diseases transmitted by infected ticks are tick-borne encephalitis, Lyme disease and babesiosis, with cases expected to increase by 20 to 50 %. Heatwaves combining high air temperatures, intense solar radiation and high air humidity impact human health; by the end of the century, deaths in Poland caused by dysfunctions of the circulatory system are expected to increase by 20 to 30 %.

Romania. Since 1961, significant changes in temperature regimes have been observed yearround: Precipitation in summer, spring and winter has been declining in mountainous areas, the south and east, and rising in northern and central Romania in autumn. Long-term projections (for 2041 to 2070 and 2071 to 2100) show temperatures continuing to rise and mean precipitation dropping for most of the country. The National Strategy for Climate Change in Romania, approved in July 2013, provides a sound, scientific basis for resilience and adaptation measures, including critical social issues concerning water resources and flood protection, construction and infrastructure, tourism, energy, industry, transport and public health. Climate change is expected to increase negative social impacts in the near future (by 2040) and exacerbate demographic problems (declining and aging population), economic problems (the lack of irrigation infrastructure, small farmers' low productivity) and social problems (property fragmentation and rural depopulation as a result of the exodus of young people). Multiple consequences of climate change are expected for the water sector, including river- flow decreases of 10 to 20 %, and lower water quality in rivers, reservoirs and piped water. While health impacts still need to be studied comprehensively, heatwave impacts have been identified as a top priority.

Russia. The very diverse impacts of climate change in Russia must be considered for each geographic region. Winter temperatures are expected to rise in 60 % of the country. Annual river flows are expected to increase this century, continuing the trend of the last 50 years. Although agriculture has thus far benefited from warming and higher precipitation, more risks and damages are expected for this sector in a few decades: The rural population and poor provinces will suffer from yield losses caused by drought, floods, the expansion of pests and plant diseases, and so on. The already worrying human health impacts will increase – specifically heatwaves, lowered water quality and the expansion of infectious and parasitic diseases (malaria, encephalitis, Lime disease and many others). Dangerous consequences of climate change will appear very unevenly across Russia which means that resilience and adaptation measures require regional approaches, as stated in the Russian Climate Doctrine of 2009. The Doctrine goals are very far from realization yet.

Serbia. Since 1960, average decadal warming has been 0.3 °C. According to a pessimistic scenario, temperatures could rise another 4 °C by 2100. Much of the country faces rising precipitation; 99 areas risk inundations. A recent disastrous flood (May 2014) hit 42 areas in the west and centre of Serbia, seriously affecting 1.6 million inhabitants and causing EUR 1.5 billion in property damage in 24 municipalities. More similar events are anticipated due to the rising frequency of prolonged, heavy rainfalls. The winter wheat yield will decline by 16 % in the northwest and north by 2030 but rise by 21 % in the southeast. All crops in all regions will be impacted by the expansion of pests and diseases due to warming and precipitation changes. Climate change will change the distribution and increase the incidence of vector-borne diseases (malaria, dengue, West Nile virus, etc.), as well as the spread of waterborne diseases such as cholera and diarrhoea.

Slovakia. In the last 132 years, annual mean air temperature increased by 1.8 °C throughout the country – while annual precipitation scarcely changed. This century, climate change will increase air temperature by 1.5 to 4.7 °C, with little or no decrease in relative humidity. Although increased temperature and precipitation benefit agriculture in Slovakia, the positive impact will be diminished by heavy rains and prolonged droughts. The main human health impacts are associated with floods (deaths, injuries and infectious diseases); temperature extremes combined with polluted air (cardiovascular and respiratory diseases, asthma, dehydration and premature deaths); infectious diseases (malaria, yellow fever, Lyme disease, encephalitis, West Nile fever, waterborne diseases like hepatitis and diarrhoea); skin diseases caused by UV radiation; and pollen allergies. A set of policies and measures to reduce such negative impacts has been adopted.

Slovenia. Agriculture and forestry, the most vulnerable sectors in Slovenia, have been the focus of national climate change policies, while research is still needed regarding water, energy, health, natural disaster response and so forth. In 2008, the Government adopted the Strategy for the Adaptation of Slovenian Agriculture and Forestry to Climate Change, followed by an action plan and practical measures. Although the Governmental Office on Climate Change was done away with in 2012, some important plans had been developed and approved, such as the Water Management Plan for the Danube and Adriatic See Basins for 2009 to 2015; The National Action Plan for Drought Management; The Plan of Adaptation to Climate Change with Spatial Planning Tools under the Strategy for Spatial Planning in Slovenia; and risk assessment reviews for specific natural disasters. Slovenia's national climate change policy is still rather weak in terms of practice.

Tajikistan. The last 15 years were the warmest on record. Between 1940 and 2012, annual precipitation increased on average by 5 to 10 %. Since Tajikistan's glaciers and snow reserves are the main sources of river flow, their melting poses extremely high risks for Tajikistan's population and industry. However, no systematic monitoring of glaciers has been carried out since 1991. Sustainable, conflict-free use of water resources is a challenge in Tajikistan and Central Asia. Warming will affect the main river regimes and reduce water availability by 10 to 20 % by the end of the century. Other priority impacts are associated with extreme temperatures (above 40 °C – which are already frequent), heavy fog, dust storms and haze, strong winds and precipitation, mudflows and avalanches, dry weather and droughts. These risks are exacerbated by Tajikistan's heavy reliance on agriculture, food insecurity, high under-five mortality rates, unprotected water sources and bad drinking water quality for much of the population, low education levels, poverty and the lack of diverse sources of income.

Ukraine. Projections show that by the end of this century, temperatures will rise by 3.2 °C in summer and 4.1 °C in winter. Precipitation change will vary by territory and season (rising in autumn, winter and spring and falling in summer). High risks of climate change impacts are identified for the energy sector (affecting the reliability and quality of supplies) and agriculture (causing crop yields to drop by 40 to 60 % in the most extreme years). Water resources and supply systems are not expected to suffer substantially in most regions. The health impacts have not yet been properly studied.

Uzbekistan. Since 1950, the annual mean temperature has risen 0.27 °C per decade – or 1.62 °C. Precipitation has been declining slightly, mostly in the southern provinces. By 2100, annual temperatures are expected to further rise by 3.6 °C to 4.1 °C. Overall annual precipitation will decline, but intra-annual regimes will alter substantially, with potentially dangerous impacts. Warming air, shrinking glaciers and snow cover, decreasing precipitation, and increased climate variability will affect the formation and volume of water resources. Decreases in river run-off and intensive population growth will increase demand for water, throwing water supply and demand out of balance. Uzbekistan has been struggling with water availability for many years: Greater water stress is expected to affect its population, agriculture, pastures and cattle breeding. The priority health impacts are associated with mudflows, floods, avalanches and frosts, as well as heatwaves and the expansion of leishmaniosis and malaria.

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CLIMATE CHANGE AND SOCIETY

Building Climate Friendly and Resilient Communities via Transition from Planned to Market Economies

Climate change is an observable threat for human beings, which affect local communities, infrastructure, economies, and ecosystems. There are no positive scenarios of global warming till 2100, all climate models project dramatic impacts if governments, industries and civil society would not act urgently and effectively to avoid dangerous consequences.

CEECCA is affected by global climate change, sometimes much stronger than other regions. The risks are rising, but countries often ignore or underestimate them, hoping for the good. Such myopic approach is unacceptable, especially in highly vulnerable areas. Governments must implement active measures in adaptation and resilience building, with specific focus on social implications of climate change. Local communities, civil society, people's wellbeing must be address by the decision makers, but it rarely happens in CEECCA countries.

This paper presents the priority challenges of climate change for CEECCA region, the lessons learnt in developing and implementing strategies, policies, best practices, and financial mechanisms to effectively tackle climate change.

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