

CLIMATE LANDSCAPE ANALYSIS

and its impacts
on children
in Serbia



Republic of Serbia
MINISTRY OF ENVIRONMENTAL
PROTECTION

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for every child

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LIST OF ACRONYMS

BPA	Bisphenol A
BREEAM	Building Research Establishment Environmental Assessment Method
CCIS	Chamber of Commerce and Industry of Serbia
CE	Climate change and environmental degradation
CEE	Central and Eastern Europe
CEHAP	Children's Environment and Health Action Plan
Climate-KIC	Climate Knowledge and Innovation Community
CSO	Civil society organization
CSR	Corporate social responsibility
DRR	Disaster risk reduction
EASD	Environmental Ambassadors for Sustainable Development
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EDC	Endocrine disrupting chemical
EE	Energy efficiency
EIA	Environmental Impact Assessment
EIT	European Institute for Technology
EM-DAT	Emergency Events Database
EMS	Environmental management system
EPS	Elektroprivreda Srbije
EPR	Extended producer responsibility
EU	European Union
EUR	Euro (currency)
GCF	Green Climate Fund
GDP	Gross domestic product
GGF	Green Growth Fund
GHG	Greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GRI	Global Reporting Initiative
IFI	International Financial Institution
IPA	Instrument for Pre-Accession
ISO	International Organization for Standardization
IQ	Intelligence quotient
KfW	Kreditanstalt fuer Wiederaufbau
LEAP	Local Environmental Action Plan

LEED	Leadership in Energy and Environmental Design
NALED	National Alliance for Local Economic Development
NDRMP	National Disaster Risk Management Plan
NERP	National Emission Reduction Plan
NGO	Non-governmental organization
NPV	Net present value
OECD	Organisation for Economic Co-operation and Development
OeEB	Oesterreichische Entwicklungsbank
PM	Particulate matter
PPP	Public-private partnership
RSD	Serbian Dinar (currency)
SDC	Swiss Agency for Development and Cooperation
SDGs	Sustainable Development Goals
SEPEN	Association for Packaging and Environmental Protection (English translation)
SIDA	Swedish International Development Cooperation Agency
SME	Small and medium-sized enterprise
SOE	State-owned enterprise
UN	United Nations
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNGC	United Nations Global Compact
UNICEF	United Nations Children's Fund
USD	United States Dollar (currency)
UVR	Ultraviolet radiation
VSL	Value of a Statistical Life
WNV	West Nile Virus

Note: All currency conversions in these chapters are based on exchange rates as of October, 2020 (1 RSD = 0.0085 EUR, 1 USD = 0.8496 EUR)

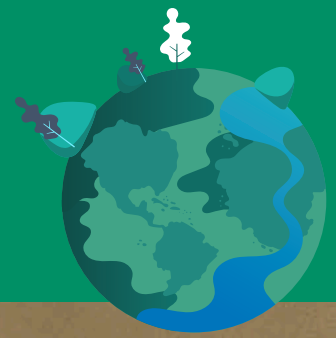
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EXECUTIVE SUMMARY

CLIMATE AND ENVIRONMENTAL SITUATION IN SERBIA AND ITS IMPACTS ON CHILDREN

Climate change and environmental degradation (CE)¹ is a context-specific issue that threatens countries' ecosystems and the well-being of populations. CE is also an equity issue; it does not manifest the same way in every region, nor does it impact every individual equally. In Serbia, greater frequency of extreme events is observed, of which flooding, wildfire, drought and extreme temperatures present the greatest risk². The country also suffers from persistent hazards such as poor air quality and a presence of hazardous chemicals. These are due in large part to industrial practices, while Serbia's lack of formal waste, wastewater and water treatment infrastructure allows for the persistence of pollutants and pathogens³ in soil and water. Climate change further exacerbates these effects, as damage from extreme weather events can allow for the release of pollutants and changing temperature and precipitation patterns can facilitate the persistence of pathogens in Serbia's environment.

Certain populations are disproportionately affected by this situation. Children are particularly vulnerable to the effects of CE. Their bodies are still growing and developing, making them more susceptible to illnesses or inadequate nutrition, and they depend on others for their well-being, reducing their ability to cope with resulting financial or emotional stressors. In Serbia, extreme weather events can increase children's risk of injury and mortality, disease contraction from exposure to pathogens, and exposure to protection risks through loss of shelter, loss of livelihood, and/or increased resource scarcity. Air pollution and hazardous chemicals due to industry and a lack of appropriate infrastructure also increase children's risk of disease contraction, chronic illnesses and impaired physical and cognitive development, all of which can have lifelong implications.

In addressing CE issues and the impacts on children in Serbia, efforts should, among other things, focus on reducing the threat of air pollution and flooding, which are, based on the analytical work behind this report, proven to have widespread impacts on children in both the short and long term. In designing solutions to address all children's vulnerability to these hazards, particular consideration should be given to children who are vulnerable due to existing inequalities related to socioeconomic status, access to healthcare and education, shelter, and/or health factors, such as disabilities and pre-existing health conditions. Similarly, demographic factors, such as geographical

¹ Climate change refers to the worsening impacts of weather conditions or events, such as floods, drought, extreme heat, etc. Environmental degradation refers to human induced environmental conditions, such as deforestation, biodiversity loss, chemical leakages, air pollution, etc. The topic of energy is a factor in both climate change and environmental degradation (i.e., through greenhouse gas emissions, pollutants, deforestation), and is therefore considered to be a cross-cutting theme included in CE.

² Djurdjević V., Vuković A., Vujadinović Mandić M., Osmotrene promene klime u Srbiji i projekcije buduće klime na osnovu različitih scenarija budućih emisija, 2018 (http://www.klimatskepromene.rs/wp-content/uploads/2019/04/Osmotrene-promene-klimeFinal_compressed.pdf)

³ Pathogens refer to any microorganism that causes a disease, including bacteria and viruses. Common pathogens include E.coli, West Nile Virus (WNV) and Salmonella

location, can influence children's exposure to CE hazards, while gender and ethnicity can amplify children's exposure to protection risks, which should also be taken into consideration in solution design. The influence of these various dimensions of inequality are elaborated upon in the spotlights on air pollution and flooding within the report. In particular, children living in Roma settlements experience heightened risks from CE hazards due to cross-cutting dimensions of inequality. The impact of these factors on these children's risk from CE hazards should be recognized and addressed in designing programs and solutions to mitigate CE risks for children in Serbia.

Air pollution — Serbia faces higher air pollution levels than surrounding European Union (EU) countries and other Balkan countries, increasing its children's exposure to a wide range of health impacts. Children in urban areas are more exposed to ambient air pollution, primarily due to coal-based energy production. On the other hand, indoor air pollution disproportionately affects poor, rural communities due to burning biofuels or waste for heating and cooking. Younger children, particularly children under five, are most vulnerable to these effects since they inhale more polluted air per weight than older children or adults; this has been observed in Serbia, for example in Bor two-thirds of children in Bor had recently visited a doctor for respiratory illness⁴. In addition to respiratory illness, such as asthma or bronchitis, air pollution is closely linked to decreased lung capacity, increased vulnerability to other chronic illnesses (e.g., diabetes, cancer, cardiovascular illness), and impaired cognitive development. Children in urban areas in Serbia have also experienced reduced growth rates in areas with high air pollution⁵. Children with pre-existing health

conditions are also most vulnerable to the respiratory and chronic illnesses linked with long-term exposure to low air quality. In order to address these issues, Serbia will need to focus on reducing pollution associated with energy production while simultaneously increasing energy access for poor and rural communities.

Flooding — The primary effects of flooding were experienced during the catastrophic floods in May 2014. Many families lost their homes and surrounding infrastructure was damaged, which can have profound implications on children. In the future, the frequency and severity of heavier rainfall during storms resulting from climate change⁶. Consequently, these changes present an increasing risk to children unless further action is taken. Children may face injury, mortality, disease from contaminated water or food, or mental health challenges following such event. Their protection may also be compromised due to family separation, the use of child labour or child marriage to recover financial losses, and neglect, abuse, violence or exploitation due to household stress. Finally, flooding compromises children's access to school (over 45,000 students were impacted by damages to schools in 2014) and healthcare services (50 healthcare facilities were closed in 2014), which can reduce their ability to recover from these impacts. Efforts to increase flood resilience should focus on the regions with higher poverty rates, as children in poorer regions are more likely to experience losses (i.e., due to inadequate housing), and have less resources to recover from, the effects of flooding, especially in the absence of special social protection measures. Similarly, children with disabilities require consideration for evacuation protocols, and girls require additional protection from violence in temporary shelters or asylum centres.

4 Zavod za javno zdravlje "Timok", Zaječar. Analiza zdravstvenog stanja stanovništva okruga Bor u periodu od 2014. Do 2018. godine. Available at: <https://www.zavodzajecar.rs/images/pdf/AnalizaokrugBor2014-2018.pdf>

5 Effects of air pollution on growth in schoolchildren, Nikolić et al. (2014). Available at: <https://pubmed.ncbi.nlm.nih.gov/25144978/>

6 Djurdjević V., Vuković A., Vujadinović Mandić M., Osmotrene promene klime u Srbiji i projekcije buduće klime na osnovu različitih scenarija budućih emisija, 2018 (http://www.klimatskepromene.rs/wp-content/uploads/2019/04/Osmotrene-promene-klimeFinal_compressed.pdf)

Children living in Roma settlements — Children living in Roma settlements face disproportionate risks associated with CE hazards due to existing inequalities and practices. Higher instances of stunting and low immunization rates leave them vulnerable to communicable diseases or chronic illness as a result of flooding and air pollution, respectively, and reduced access to nutrition, which can occur due to drought or changing temperature and precipitation patterns. They are also typically poorer, live in informal housing, and have higher rates of domestic violence and child marriage, increasing the likelihood that they will experience protection risks following an extreme event, such as flooding. Girls in these settlements are also the least likely to recover from any lost education due to extreme events over the long run, as they experience a significantly lower of school completion rates than the rest of the population due to the prevalence of child marriage. Therefore, when developing Serbia's child-sensitive CE agenda, it is critical that programming recognizes and addresses the specific vulnerabilities of children living in Roma settlements, aligning with the Serbian government's goals of promoting social inclusion of this population⁷.

EXISTING ENGAGEMENT AND OPPORTUNITIES FOR FURTHER ACTION

CE is slowly finding its way onto the political agenda in Serbia, although from the perspective of budget expenditure it is not yet a priority, as the government is primarily focused on economic development to recover from multiple economic recessions in the past decade. While CE is therefore relatively lower priority as compared to economic development, Serbia has in

fact created an enabling environment to address critical CE hazards in the country. This enabling environment is primarily driven by national objectives of European Union (EU) accession and alignment with international commitments, such as the Paris Agreement and the United Nations (UN) 2030 Agenda. Existing policies, strategic frameworks and funding allocation under the umbrella of CE focus on air pollution, environmental infrastructure to manage pollution (i.e., water, wastewater and waste management), and resilience to extreme events, such as flooding, through disaster risk management.

Within the public sector CE agenda, children and vulnerable groups are often not formally considered; rather, they are considered separately within specific social policies and plans. The primary reason for this is that government ministries are separated between environment (the Ministry of Environment) and children (the Ministry of Labour Employment, Veteran and Social Affairs, the Ministry of Family Care and Demography, the Ministry of Youth and Sport), which do not typically collaborate on these matters. At the local level, children have been identified as vulnerable with respect to disaster risk management, but plans have not been adapted accordingly for their needs. Further, there has been progress in incorporating gender considerations into the national CE agenda through training of public officials, but this is in the early stages and does not include considerations of children or other vulnerable groups.

Despite not being formally considered in CE policies and strategic frameworks, children and vulnerable groups could still benefit from downstream impacts of a strong CE action. However, significant funding gaps related to CE action limit these potential benefits. Standing at about Euro (EUR) 54 million in 2020, investments in environmental protection are almost ten times lower than the estimated required amount of EUR 500 million per year to addressing existing

⁷ Relevant government priorities are included in the Third National Report on Social Inclusion and Poverty Reduction in the Republic of Serbia: The Status of Social Exclusion and Poverty Trends in the Period 2014–2017 and Future priorities. Available at: https://media.srbija.gov.rs/medeng/documents/third-national-report-on-social-inclusion-and-poverty-reduction2014-17_eng.pdf

needs⁸. Public sector funds are primarily provided by international loans, which the public sector will ultimately be responsible for repaying. Revenue from the Green Fund is the second largest contributor to the national budget for environmental protection, which consists of funds collected from the private sector via environmental taxes. However, due to policy changes, these funds can now be spent on other areas outside of environmental protection, so there is no guarantee that they will benefit the CE situation in the country. Adding to these funding gaps, the COVID-19 pandemic has further limited funding as a portion of the 2020 budget for environmental protection was redirected to respond to healthcare needs and collection of Green Fund fees was disrupted. At the local level, there is also a high degree of inconsistency in spending for environmental protection based on a subset of 25 analyzed municipalities⁹. Ranging from only 1.7% of total spending in Beograd to 16% in Pančevo, this discrepancy demonstrates that expenditure on CE is up to the discretion of the municipality based on their needs or priorities. For instance, Pančevo and Novi Sad have needs to rehabilitate the environment due to spills and damage from the petrochemical industry and refineries, respectively. Other places, such as Uzice, Subotica, and Šabac are preparing for and implementing environmental infrastructure projects, which may require additional funding¹⁰.

Resulting from a lack of consideration in CE initiatives, coupled with funding gaps, children face significant costs from inaction on pressing CE hazards in the country. Focusing on air pollution and flooding, this report used available data to quantify the current costs of inaction on children and model the expected costs in future years. Assuming historical trends continue to 2025 and no additional measures are taken to reduce air pollution levels, the welfare cost¹¹ associated with air pollution for children under 15 years of age in Serbia, is estimated to reach about EUR 142 million by 2025 (calculated as the net present value of total welfare costs from 2020–2025). Past studies also outline additional costs of inaction related to air pollution, including healthcare costs, reduced school attendance, and protection risks from reduced household income due to lost working days.

With respect to flooding, based on observed impacts of the 2014 floods and projected increases in flood events, costs of inaction are calculated at over EUR 230 million (USD 279 million) and over 18,000 jobs by 2025 if no additional resilience measures are implemented. These financial implications from flooding can have significant impacts on children's protection, particularly for poorer children, due to increased household stress to cope with financial shocks. Further, children can experience reduced school attendance due to illness, injury and/or infrastructure damage caused by flooding. Considering

⁸ Required funds are estimated by the Fiscal Council of the Republic of Serbia

⁹ Provided by UNICEF Serbia

¹⁰ Interviews with health and child rights experts in Serbia

¹¹ Welfare costs represent the monetary value of health impacts caused by premature mortality in a country. More details are provided in Chapter 2.



both air pollution and flooding, these costs of inaction can impact children's future well-being and earning potential, creating implications for the country's economy in the long-term. The public sector will require additional resources, specifically alternative funding sources and increased administrative capacity, to address these costs of inaction on children. Specifically, increased efforts to improve data collection, including impact measurement and reporting, and implementation against plans, will be required.

Other actors, including international financiers and private sector, each play an important role in addressing these public sector gaps. International Financial Institutions (IFIs) provide significant loans for energy and environmental infrastructure, amounting to about EUR 300M, supplemented by an additional EUR 104 million from the EU, in 2019, which help address CE hazards in the country¹². IFIs and the EU also provide administrative and technical support (e.g., data collection, program design, public consultation) to the public sector in project planning and implementation. Additionally, Serbia's private sector is increasingly focused on reducing the environmental footprint of operations through voluntary certifications and innovation. Through Corporate Social Responsibility (CSR) initiatives, companies also support and/or work

with Civil Society Organizations (CSOs) to deliver child-targeted CE programming. This is the most notable area where children are integrated with CE action, which includes educational programming, internships and recreational programming teaching children and engaging them on CE topics. Bridging the gap between the public and private sector, business associations advocate to align CE policy with business needs and priorities while simultaneously fostering private sector compliance with CE policies. Further strengthening the connection between the public and private sectors, public-private partnerships (PPPs) could be a promising model in Serbia. Many CE hazards relate to public infrastructure needs, specifically energy, waste and wastewater, and the private sector and IFIs can help to address resource and financing constraints in the public sector to address these hazards.

Considering all of these contributions, efforts are still not sufficient to address children's needs today or in the long term. The public sector, private sector and international financiers (IFIs and the EU) do not integrate children and vulnerable groups into CE action and will require support to do so. Spanning across all sectors, there is inconsistent and limited data collection, which limits the extent to which evidence-based, child-sensitive CE initiatives can be planned. In addition, among all actors, monitoring and reporting of initiatives is limited, so benefits to society and children cannot be measured. Lastly, financing provided by international financiers toward energy and environmental infrastructure is substantial, but

¹² The total is based on available data from KfW (EUR 90.45 million), and EBRD (EUR 211 million). KfW funds are classified as commitments and EBRD as investments. Other IFIs only had project specific data available, which was not included in the total for 2019, as these commitments spanned multiple years.



is not sufficient to fully address public sector gaps, either today or in the future¹³. This is particularly evident over the long term, as the public sector will have to pay back these loans. Based on these findings, integration of children in Serbia's CE agenda is critical. It would be important to strengthen the evidence base of CE impacts on children with further data collection, analysis and transparency, above all in the areas of environmental protection, public financing, health and social protection. To achieve this, Serbia should focus in the near term on: i) active engagement of children and youth in decision making processes and their participation in CE initiatives, and ii) innovative financing mechanisms with the involvement of the private sector based on child-sensitive needs. These actions should be taken through multi-sectoral coordination between all actors, including the public and private sector, international financiers, CSOs, and children and youth, by developing appropriate mechanisms for their participation.



¹³ Authors' estimate based on: Investments in environmental protection: a social and fiscal priority, Republic of Serbia Fiscal Council (2019): Available at: <http://www.fiskalniasavet.rs/doc/eng/FC%20-%20Investments%20in%20environmental%20protection.pdf>



BACKGROUND AND OBJECTIVES

Serbia is currently in the process of aligning itself to international and European CE policies through the United Nations (UN) and EU, respectively.

Serbia is also working towards establishing a comprehensive monitoring, reporting and verification system and building local government and implementation capacity on CE topics. While Serbia is making some progress in addressing CE topics, more data is required to develop evidence-based solutions that address the impacts of CE on children in particular¹⁴.

This report consists of four chapters. The first chapter focuses on two underexplored, yet critical, areas: the impacts of CE on children, and how existing inequalities affect these impacts to children, within the Serbian context. Two subsequent chapters focus on the current state of public sector engagement, as well as private sector and international financiers engagement on these CE topics, respectively. The final chapter summarizes findings, remaining gaps, and provides evidence-based recommendations in addressing the critical CE topics in Serbia. Using the findings from chapters 1, 2 and 3, the final chapter also highlights relevant opportunities to improve

alignment with the UN's Sustainable Development Goals (SDGs)¹⁵.

This study is being conducted at a critical time, as the findings and recommendations can help to shape Serbia's current policy agenda (including the 2030 Agenda for Sustainable Development) on CE topics by informing data collection processes, national and local policies, expenditure and programming related to CE and children. The research will also be complementary to ongoing regional and global research by international organizations, such as the World Health Organization and the UN, on the topic of climate and environment impacts on children's health.

The objective of this report is primarily to generate awareness on underexplored dimensions of CE topics and the impacts on children. The report will contribute new knowledge by focusing on key CE topics that affect children in Serbia and assessing how inequalities exacerbate these impacts, both of which are currently underexplored and require further inquiry. Further, this report aggregates data related to CE engagement among multiple sectors in Serbia, allowing readers to gain a holistic perspective of the CE agenda and implications for children, which was not previously available. These findings will allow for evidence-based decisions and action to child-sensitize Serbia's CE agenda going forward.

¹⁴ Information on Serbian context from UNICEF Serbia RFP Climate landscape analysis and its impact on children (2020)

¹⁵ The SDGs are a collection of 17 global goals and indicators designed to improve global sustainability. The goals and indicators are intended to be adopted by governments and organizations. More information can be found here.



METHODOLOGY

The findings presented in this report are based on both primary and secondary research. First, a literature review was conducted to identify the major CE hazards in Serbia. The literature review consisted of a desktop review of multiple scientific studies, government reports and third-party reports. Where there was limited information on the Serbian context in particular, global and regional reports were referenced and findings in these were mapped back to the Serbian context where appropriate. For example, there were data gaps related to the impact of CE hazards and inequality on children specific to Serbia. To address these gaps, historical impacts and future projections of CE hazards in Serbia were reviewed to identify which hazards are most likely to have an impact on children. Second, inequality indicators related to these impacts were reviewed, such as rates of stunting, access to water and sanitation, and rates of exploitative practices. Disaggregated data based on various characteristics such as location, ethnicity, and economic status were also used to identify vulnerable groups of children likely to experience greater adverse impacts from CE hazards. To assess current CE engagement across the public and private sector as well as international financiers, publicly available documents such as policies, strategies and action plans, industry reports, national statistical data, and annual reports were reviewed, as well as organizations' websites.

Based on findings from the literature review, preliminary conclusions were drawn and validated via interviews with key stakeholders representing a variety of sectors and areas of expertise (as shown in Annex C: Key stakeholder interviewees). Stakeholders were strategically selected based on their background. Environment experts, health experts, and child rights

experts were interviewed for Chapter 1: Climate and environment situation in Serbia and the impacts on children. For Chapter 2 and 3, representatives from government institutions, international organizations, CSOs, and business associations were interviewed to supplement publicly available data on CE engagement in these sectors. Separate interview guides were developed depending on stakeholders' areas of expertise. Stakeholders were given the opportunity to review the interview guide beforehand, and the interview guides were pre-tested with the first few interview participants and adjusted accordingly for subsequent interviews. Upon completion of interviews, the data from literature review and interviews were then combined to analyze trends and gaps, and the resulting findings are presented in the following pages.

ETHICS

Strong ethical principles were upheld during stakeholder outreach and interview proceedings. In line with the "do no harm" principle, the research team ensured the privacy and safety of all prospective and actual interview participants, designed the research study to prevent negative impacts, and provided opportunities for participants to benefit from the interview process. Due to the nature of this study, no ethical approvals from Institutional Review Boards were required.

First, to protect privacy and safety, consent and confidentiality were given utmost priority. All prospective interview participants were informed on the background of the study and their desired contribution, and were given the opportunity to decline

to participate. Consent to participate in the interview was gathered via email correspondence and acceptance of meeting invitations. To further protect stakeholders' privacy, neither names, nor direct quotations, are included in the report, limiting the extent to which participants and their contributions can be identified.

To prevent any unintended negative consequence, stakeholder requests for a preferred meeting platform (i.e., video call vs. phone call), interview format (i.e., length or structure of interview), and language for conducting the interview (i.e., Serbian vs. English), were honored. Further, interviews spanned 30 minutes to one hour, limiting the time commitment required from participants. For the child participant, the Ethical Research Involving Children (ERIC) guidance and frameworks were utilized, focusing on the principles

of respect, benefit and justice, as well as the right to be heard. For instance, the child's request to conduct the interview via phone in Serbian were honored, and questions focused on his experience and views as a child CE activist.

To allow interviewees to benefit from the study, preliminary findings and opportunities to participate in subsequent programming were shared with participants. Where requested, the research team also provided supplementary resources (e.g., links to supporting data or relevant initiatives) to participants. Lastly, in addition to professional and academic backgrounds, the diverse group of stakeholders represented different genders and age groups, allowing for a variety of perspectives to contribute to the research.







CLIMATE AND ENVIRONMENT SITUATION IN SERBIA AND ITS IMPACTS ON CHILDREN

This chapter summarizes the current and projected future climate and environment situation in Serbia, focusing on hazards and resulting impacts on children, including the effects of existing inequalities.

OVERVIEW OF CLIMATE CHANGE AND ENVIRONMENTAL DEGRADATION IN SERBIA

Climate and environment situation

Serbia's climate is classified as temperate and continental. With four distinguishable seasons, summer mean temperatures are around 21–22°C and winter temperatures do not usually fall below 0°C¹⁶. The highest monthly rainfalls occur in the summer months, while October and February have the lowest average rainfall. Snow cover is common during the winters, with the highest number of snowy days typically recorded in January¹⁷. Serbia experiences some regional variation in temperature and precipitation; for example, mountainous regions experience 5–10°C cooler temperatures and more precipitation on average¹⁸.

A number of rivers run through the country, the largest of which is the Danube River. Belonging to the Black Sea draining basin, the Danube River spans almost 600 kilometres and provides the largest source of fresh water in the country. It is joined by its main tributaries, the Sava and Tisa

Figure 1 / Map of Serbia

Retrieved from: <https://www.un.org/Depts/Cartographic/map/profile/serbia.pdf>



16 Study on the socio-economic aspects of climate change in the Republic of Serbia, UNDP (2019). Available at: <https://www.rs.undp.org/content/dam/serbia/Draft%20Study%20on%20Socio-economic%20aspects%20of%20climate%20change%20in%20Serbia.pdf>

17 Climate vulnerability assessment: Serbia, WWF (2012). Available at: http://www.seecimateforum.org/upload/document/cva_srbija_english_final.pdf

18 Study on the socio-economic aspects of climate change in the Republic of Serbia, UNDP (2019). Available at: <https://www.rs.undp.org/content/dam/serbia/Draft%20Study%20on%20Socio-economic%20aspects%20of%20climate%20change%20in%20Serbia.pdf>

Rivers¹⁹, most of which function as international transit waterways. Temperature, precipitation and snow-melt influence water levels and flow rates, with maximum water levels occurring in the spring, and minimum water levels occurring in August and September²⁰.

Serbia has a rich ecosystem and is home to a large percentage of flora and fauna in Europe, representing 16% of European fish, 66% of European birds and 43% of European mammal fauna²¹. In terms of land use, 29.1% of Serbia's land is forested and 65.5% is used for agriculture; the remainder of the land is a combination of developed and barren areas²².

Climate change has begun to, and will continue to, impact Serbia's climate and environment in two ways: i) altered temperature and precipitation patterns, and ii) increased frequency and severity of extreme weather events. Serbia has already experienced an increase in mean annual temperatures and precipitation over recent decades. In the future, Serbia's temperature will continue to rise and precipitation is expected to become more variable. In terms of extreme weather events, coastal flooding due to sea level rise and cyclones do not present a risk of occurrence²³, as Serbia is a landlocked country. On the other hand, Serbia will continue to face increased temperatures and

negative trends in the intensity of riverflows²⁴, while inland flooding²⁵ and drought, have been identified as risks to Serbia²⁶. The country has also historically experienced events of extreme temperatures (both heat and cold waves), wildfire, and extreme wind, which may increase in frequency or severity due to climate change.

Environmental degradation in Serbia is primarily caused by industrial pollution and a lack of infrastructure and is exacerbated by climate change. These effects are described below.

Serbia's industry and infrastructure

Serbia's industry and infrastructure contribute to climate change through the release of greenhouse gas (GHG) emissions²⁷. The energy and transportation sectors account for over 80% of the country's total GHG emissions²⁸, due in large part to the country's heavy reliance on coal for electricity generation. On top of releasing GHGs, industrial activities such as cement manufacturing, mining, chemical processing, and textile production release pollutants, including hazardous chemicals, into all environmental media (i.e., soil, water, air). Serbia's widespread

¹⁹ Minamata Initial Assessment for the Republic of Serbia, Ministry of Environmental Protection (2018). Available at: https://www.researchgate.net/publication/330514455_Mercury_initial_assessment_for_the_Republic_of_Serbia

²⁰ Drought Initiative — Republic of Serbia: Recommendations for development of the National Drought Plan of the Republic of Serbia, UNCCD (2020). Available at: https://knowledge.unccd.int/sites/default/files/country_profile_documents/NDP_SERBIA_2020.pdf

²¹ Institute for Nature Conservation of Serbia: <https://www.zps.rs/wp/biodiverzitet/?script=lat>

²² <http://indicator.sepa.gov.rs/pretrazivanje-indikatora/indikatorilat/allfindp/441c7b391a064132b7a1dba5f4d87a2e>

²³ <https://thinkhazard.org/en/report/2648-serbia>

²⁴ Second National Communication of the Republic of Serbia under the United Nations Framework Convention on Climate Change, Ministry for Environmental Protection (2017). Available at: https://www.klimatskepromene.rs/wp-content/uploads/2017/12/SNC-Eng_Serbia.pdf

²⁵ Inland flooding occurs when an extended period or increased intensity of rainfall, or snow or ice melt, causes a river to exceed its capacity and flood surrounding areas. Effects could be exacerbated in urban areas as a result of excessive runoff due to lack of drainage in urban areas

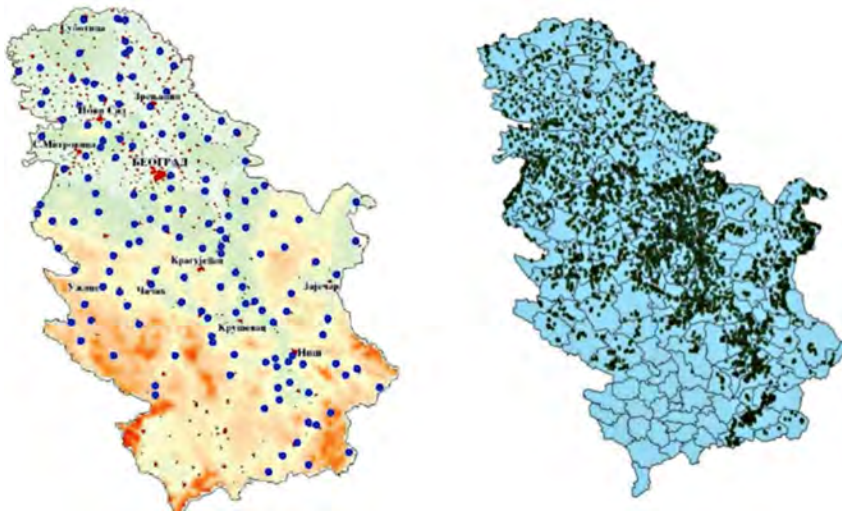
²⁶ INFORM Report 2019: Shared evidence for managing crises and disasters, INFORM Index for Risk Management (European Commission) (2019). Available at: <https://reliefweb.int/sites/reliefweb.int/files/resources/Inform%202019%20WEB%20spreads.pdf>

²⁷ GHGs prevent the Sun's heat from escaping Earth's atmosphere. This creates the greenhouse effect, which is the greatest cause of climate change. Carbon dioxide, methane, and water vapour are the most important GHGs

²⁸ Second National Communication of the Republic of Serbia under the United Nations Framework Convention on Climate Change under the United Nations Framework Convention on Climate Change, Ministry of Environmental Protection (2017). Available at: http://www.klimatskepromene.rs/wp-content/uploads/2017/09/SNC_eng.pdf

Figure 2 / Locations of identified legal (left) and illegal (right) landfills in Serbia

Retrieved from: <https://www.alda-europe.eu/public/doc/Waste%20Management%20Thiene.pdf>



use of informal landfills (see Figure 2) and lack of municipal wastewater treatment plants²⁹ also introduce pollutants into the environment. This lack of infrastructure can also lead to the presence of pathogens³⁰ in the environment, particularly nearby open landfills³¹ and water bodies where sewage is released³².

Further, a lack of access to, or inability to afford, electricity causes households and other facilities (e.g., schools) to rely on solid fuels (such as wood or coal, or even waste, according to expert interviews) for heating and cooking, significantly degrading indoor air quality. According to a 2020 survey gathering children perspectives on climate change and environment,

Serbian children have recognized the effects of waste management and air pollution from factories and consider these to be the most significant CE-related challenges in the country³³.

These effects from industry and a lack of infrastructure are exacerbated by climate change in two ways: i) extreme weather events can damage infrastructure and accelerate the release of pollutants into the environment, and ii) changing temperature and precipitation patterns can facilitate the spread of pathogens and allow pollutants to persist in the environment. This can negatively impact Serbia's biodiversity, ecosystem health, and well-being of its population, potentially threatening Serbia's ability to achieve the SDGs. Opportunities to improve performance against relevant SDGs will be explored in the final chapter of this series.

This chapter will focus specifically on the CE hazards that present the greatest potential human impacts in Serbia, which are divided into two categories: i) event-

²⁹ Environmental and Health Performance Review: Serbia, WHO (2009). Available at: https://www.euro.who.int/_data/assets/pdf_file/0008/95345/E93534.pdf

³⁰ Pathogens refer to any microorganism that causes a disease, including bacteria and viruses. Common pathogens include E.coli, West Nile Virus (WNV) and Salmonella

³¹ Sources of microbial pathogens in municipal solid waste landfills in the United States of America, Gerba et al., 2011. Available at: https://www.researchgate.net/publication/50304016_Sources_of_microbial_pathogens_in_municipal_solid_waste_landfills_in_the_United_States_of_America

³² Environmental Performance Review: Serbia — third edition, UN Economic Commission for Europe (2015). Available at: https://www.unece.org/fileadmin/DAM/env/epr/epr_studies/ECE_CEP_174.pdf

³³ U-Report Poll on Climate Change and U-Report Poll on Environment, UNICEF (2020). Provided by UNICEF

based CE hazards and ii) persistent CE hazards. Event-based CE hazards refer to events which occur suddenly and unpredictably, such as extreme weather events or disease outbreaks, whereas persistent CE hazards are long-standing, such as the presence of pollutants.

Event-based CE hazards

Serbia has experienced a number of extreme weather events in the past, and CE will continue to increase the threat of both extreme weather events and disease outbreaks in the future. The historical and projected future trends, as well as regional variations, of each event-based CE hazard are outlined below. More information on each event-based and persistent CE hazard can be found in Annex A: Supplementary data for Chapter 1.

Flooding

Flooding is a critical CE hazard in Serbia that can have devastating impacts on communities through damage to homes and surrounding infrastructure, as was experienced in the spring of 2014. This report includes Case study 1: Flooding, which provides more information on the specific impacts to children and vulnerable groups, illustrating the importance of flood resilience.

Inland flooding presents a risk in Serbia due to the large number of rivers flowing through the country and the prevalence of urban areas, which are more susceptible to flooding from increased runoff³⁴. Serbia has experienced frequent large-scale floods in the past two decades; most notably in May 2014 and more recently in June 2020. In the future, floods are expected to increase in frequency and severity due to climate change in Serbia, particularly during the winter

season³⁵. According to climate projections, damaging and life-threatening river floods are expected to occur at least once in the next 10 years in Serbia³⁶.

Extreme temperatures

Serbia has experienced both extreme heat events, where temperatures exceed 35°C or 40°C for multiple days, and extreme cold events, with temperatures below -10°C, consecutive ice days (at least five³⁷), and high snowfall or snow cover³⁸.

Serbia is generally expected to experience increased heat due to climate change, increasing the risk of extreme heat events and decreasing the risk of extreme cold events. Extremely high summer temperatures are projected to become the norm by the latter half of the century³⁹, with central and southern parts expected to experience more pronounced temperature increases in the future⁴⁰.

Drought

Due to climate change, Serbia faced increased drought, particularly after the year 2000, after which there were seven years between 2000–2017 with instances

³⁴ Greater amounts of runoff in urban areas, due to impermeable surfaces such as concrete and asphalt, can overwhelm sewage systems and lead to flooding

³⁵ Comprehensive analysis of the disaster risk reduction and management system for the agricultural sector in Serbia, FAO (2018). Available at: <http://www.fao.org/3/I8364EN/I8364en.pdf>

³⁶ <https://thinkhazard.org/en/report/2648-serbia>

³⁷ Climate changes observed in Serbia and future climate projections based on different scenarios of future emissions, UNDP (2018). Available at: http://www.klimatskepromene.rs/wp-content/uploads/2019/11/CLIMATE-CHANGES-OBSERVED-IN-SERBIA-AND-FUTURE-CLIMATE-PROJECTIONS_compressed.pdf

³⁸ Climate change adaptation action plan and vulnerability assessment, City of Belgrade (2015). Available at: http://www.beograd.rs/images/data/c83d368b72364ac6c9f9740f9cda05ed_6180150278.pdf

³⁹ Climate changes observed in Serbia and future climate projections based on different scenarios of future emissions, UNDP (2018). Available at: http://www.klimatskepromene.rs/wp-content/uploads/2019/11/CLIMATE-CHANGES-OBSERVED-IN-SERBIA-AND-FUTURE-CLIMATE-PROJECTIONS_compressed.pdf

⁴⁰ Draft Low Carbon Development Strategy with Action Plan, Project Identification No. EuropeAid/1365966/DH/SER/RS, 2016/375-531 (2019). Available at: http://www.klimatskastrategija.eu/wp-content/uploads/2019/12/Low-Carbon-Development-Strategy-with-Action-plan_eng.pdf

of drought⁴¹. Droughts have been more prevalent in the east and north, while droughts were more severe in the south, and have a medium (20%) change of occurring in the next decade according to some climate projections⁴², while official state projections till the end of the century talk about changes in the amount of rainfall from +20% to -20%, with longer drought periods⁴³.

Wildfire

Due to a relatively dry summer climate, wildfires are frequent and prevalent during the summer in Serbia⁴⁴. In Serbia, fires are typically initially caused by agricultural burning, and then exacerbated by very low rainfall and extremely high temperatures⁴⁵. With hotter and drier summers in the years to come, wildfires are expected to increase. The central and northwestern regions of the country have been historically the most impacted by wildfires⁴⁶, although it is unclear which regions present the greatest risk in the future.

Extreme wind

Serbia's geographical position increases its exposure to the Košava wind, a squally southeastern wind that occasionally reaching speeds of 85–100 km/h or higher. Historically, extreme wind events have not been as impactful as other event-based CE hazards, such as flooding, drought and wildfire⁴⁷. While data is not conclusive, some studies indicate that annual

wind speed will decrease⁴⁸, limiting the future risks of extreme wind events.

Disease outbreaks

Changing climate conditions, namely temperature and precipitation, and an increase in extreme events, such as flooding and drought, can facilitate the spread of pathogens, including infectious and vector-borne diseases^{49,50}. Most notably, as mosquitos' life cycles are principally impacted by temperature and relative humidity, the risk of vector-borne illnesses like West Nile Virus (WNV) may increase due to climate change in Serbia.

Droughts and flooding can also facilitate the spread of pathogens due to contaminated food and water. Concerns over vector-borne diseases and contamination were experienced during the 2014 floods. In addition, *Salmonella* has been found to be affected by higher temperatures across continental Europe⁵¹.

Persistent CE hazards

Persistent CE hazards result from the ongoing presence of pollutants and changes to environmental conditions; these include air pollution, hazardous chemicals, ultraviolet radiation (UVR) and changing temperature and precipitation patterns. Below is a description of the current state and contributing factors to each persistent CE hazards in Serbia.

⁴¹ Comprehensive analysis of the disaster risk reduction and management system for the agricultural sector in Serbia, FAO (2018). Available at: <http://www.fao.org/3/I8364EN/i8364en.pdf>

⁴² <https://thinkhazard.org/en/report/2648-serbia>

⁴³ Second National Communication of the Republic of Serbia under the United Nations Framework Convention on Climate Change, Ministry for Environmental Protection (2017). Available at: https://www.klimatskepromene.rs/wp-content/uploads/2017/12/SNC-Eng_Serbia.pdf

⁴⁴ Comprehensive analysis of the disaster risk reduction and management system for the agricultural sector in Serbia, FAO (2018). Available at: <http://www.fao.org/3/I8364EN/i8364en.pdf>

⁴⁵ <http://gfmcc.online/wp-content/uploads/09-IFFN-37-Serbia-1.pdf>

⁴⁶ <https://www.desinventar.net/DesInventar/profilatab.jsp>

⁴⁷ The influence of future climate change on wind energy potential in the Republic of Serbia, Podrascanin and Djurdjevic (2020). Available at: <https://ui.adsabs.harvard.edu/abs/2020ThApC.140..209P/abstract>

⁴⁸ The influence of future climate change on wind energy potential in the Republic of Serbia, Podrascanin and Djurdjevic (2020). Available at: <https://ui.adsabs.harvard.edu/abs/2020ThApC.140..209P/abstract>

⁴⁹ Vector-borne illnesses are transferred to humans through blood-feeding insects, such as mosquitos, ticks and fleas. Common vector-borne illnesses include WNV, Malaria, Lyme disease, and Dengue fever

⁵⁰ Assessment of climate change impact on the malaria vector *Anopheles hyrcanus*, West Nile disease, and incidence of melanoma in the Vojvodina Province (Serbia) using data from a regional climate model, Mihailović DT, Petrić D, Petrović T, Hrnjaković-Cvijetković I, Djurdjevic V, Nikolić-Dorić E, et al. (2020). Available at: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0227679>

⁵¹ The challenges of climate change: Children on the front line, UNICEF Office of Research (2014). Available at: https://www.unicef-irc.org/publications/pdf/ccc_final_2014.pdf

Air pollution

Air pollution is a critical CE hazard in Serbia and is therefore given particular focus in Case study 2: Air pollution. Air pollution levels are particularly high in Serbia compared to EU countries and other Balkan countries, as coal is primarily used for energy production, which releases GHG emissions and particulate matter (PM) into the air. Other industrial sources of air pollution in Serbia include petrochemicals, mining, and increasing road traffic⁵². In poor and rural areas, households and even schools will burn biomass for heating⁵³, significantly degrading indoor air quality and releasing GHGs. According to expert interviews, children chosen not to attend school due to high levels of air pollution from these alternative heating sources. Climate change can also impact the severity of air pollution in Serbia, as heat waves, extreme cold, and wildfire will contribute to the deterioration of air quality.

Hazardous chemicals

Serbia's lack of waste, wastewater and water treatment infrastructure, concentration of heavily polluting industry, and use of certain consumer products all play a role in increasing the population's overall exposure to hazardous chemicals, such as heavy metals, pesticides, and endocrine disrupting chemicals (EDCs)⁵⁴.

For instance, one study found that the majority of children living near a secondary lead smelter had blood lead levels in the range and higher than those of children living in other developing nations⁵⁵.

The agricultural sector also increases exposure to

pesticides, of which prenatal exposure was observed in the Vojvodina province⁵⁶.

One particular category of hazardous chemicals that are of increasing interest globally are EDCs. In the Danube River basin, a source of drinking water in Serbia, a study found that the population is likely exposed to EDCs, even if their drinking water is treated, and that the risk of exposure is much higher for populations without access to improved drinking water sources⁵⁷. People in Serbia can also be exposed to EDCs through contact with consumer products, such as toys, textiles, furniture and detergents⁵⁸.

Ultraviolet radiation (UVR)

UVR is influenced by the release of ozone-depleting chemicals and the long-term increase of air temperatures. Coupled with increasing temperatures, these ozone-depleting chemicals can lead to prolonged exposure to UVR among the Serbian population. While Serbia's ozone levels have not decreased significantly compared to the global average, the health risks of UVR in Serbia⁵⁹ are relatively high, as discussed in Impacts on children, below.

Changing temperature and precipitation patterns

Serbia has already experienced changing temperature and precipitation patterns due to climate change. Since the 1960s, Serbia has experienced steadily increasing

⁵² Health impact of ambient air pollution in Serbia, WHO (2019). Available at: https://serbia.un.org/sites/default/files/2019-10/Health-impact-pollution-Serbia_0.pdf

⁵³ Interviews with health and child rights experts in Serbia

⁵⁴ EDCs are chemical substances in the environment, food, and consumer products that interfere with the body's endocrine system, which is responsible for hormone regulation among other functions

⁵⁵ Environmental and take-home lead exposure in children living in the vicinity of a lead battery smelter in Serbia, Mandić-Rajčević et al. (2018). Available at: <https://pubmed.ncbi.nlm.nih.gov/30236521/>

⁵⁶ Prenatal Exposure to Organophosphate Pesticides in Vojvodina, Živković et al. (2019). Available at: <http://journaljammmr.com/index.php/JAMMMR/article/view/29025>

⁵⁷ Occurrence and assessment of environmental risks of endocrine disrupting compounds in drinking, surface and wastewaters in Serbia, Celic et al. (2020). Available at: <https://www.sciencedirect.com/science/article/abs/pii/S0269749119362645>

⁵⁸ Non-communicable diseases and environmental determinants, WECEF, IPEN, HEAL, Sustainlabour (2013). Available at: https://www.env-health.org/wp-content/uploads/2018/06/non-communicable_diseases_and_environmental_determinants_final.pdf

⁵⁹ Stratospheric ozone fluctuation and ultraviolet radiation over Serbia, Martić-Bursac (2011). Available at: https://www.researchgate.net/publication/273866689_Stratospheric_ozone_fluctuation_and_ultraviolet_radiation_over_Serbia



temperature averages⁶⁰, with a higher temperature rise in the north and central parts of Serbia, as well as urban areas⁶¹. Similarly, annual and seasonal precipitation across the country has increased up to 10% since the 1980s⁶².

Temperatures are expected to continue to rise in Serbia, while precipitation will become more variable. Serbia is generally expected to become drier while also experiencing greater precipitation during extreme rainfall events.

⁶⁰ Climate changes observed in Serbia and future climate projections based on different scenarios of future emissions, UNDP (2018). Available at: http://www.klimatskepromene.rs/wp-content/uploads/2019/11/CLIMATE-CHANGES-OBSERVED-IN-SERBIA-AND-FUTURE-CLIMATE-PROJECTIONS_compressed.pdf

⁶¹ <https://www.climatechangepost.com/serbia/climate-change/>

⁶² Climate changes observed in Serbia and future climate projections based on different scenarios of future emissions, UNDP (2018). Available at: http://www.klimatskepromene.rs/wp-content/uploads/2019/11/CLIMATE-CHANGES-OBSERVED-IN-SERBIA-AND-FUTURE-CLIMATE-PROJECTIONS_compressed.pdf

IMPACTS ON CHILDREN

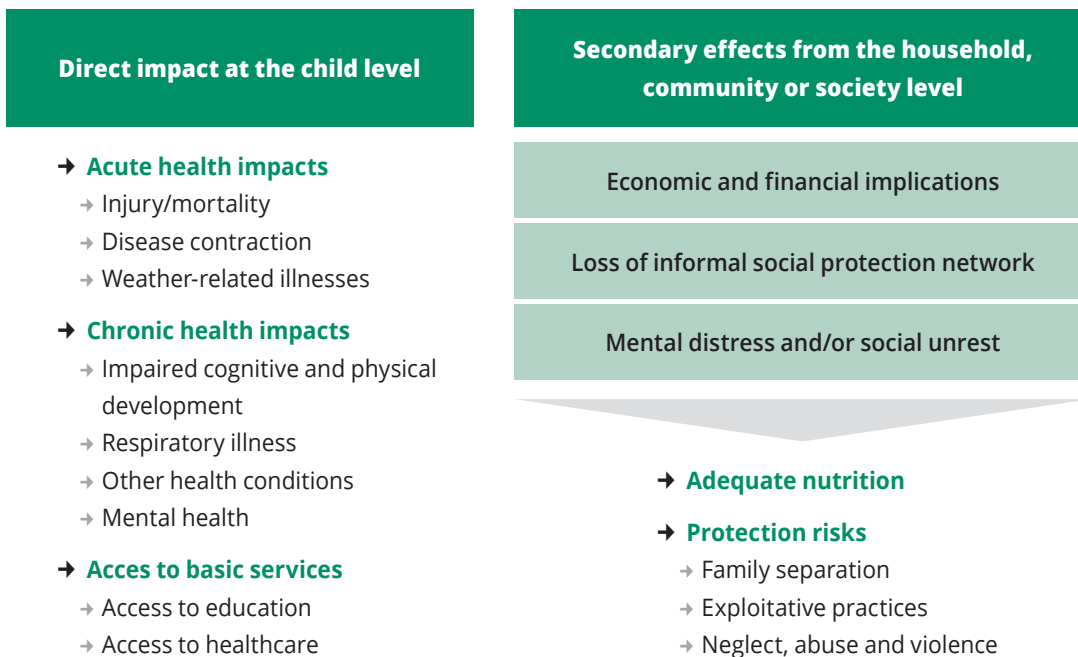
Serbia's population, including children, have already begun to experience the impacts of the CE hazards described above, most of which are expected to worsen in the coming years. Children in Serbia realize the severity of the situation. When surveyed, almost 90% expect CE to be a significant problem in their lifetime, with over one quarter believing it is the biggest problem facing humanity⁶³.

Children are expected to be disproportionately impacted by CE hazards, as they are more sensitive to environmental and climate conditions and extreme events. Their bodies are still growing and developing, making them more susceptible to illnesses or inadequate nutrition resulting from CE hazards. Children are also dependent on others for their well-being, such as their

parents, guardians and/or other caregivers. If their household and/or support network experiences physical, financial or emotional stresses as a result of CE hazards, children will become more exposed to protection risks.

As such, the impacts of CE hazards on children can be divided into two types: i) direct impacts at the child level, such as health and access to services, and ii) secondary effects from the household, community, or society level, through which children's health and protective environment is impacted as a result of effects on the individuals and support networks that children depend on. Figure 3 provides an illustration and examples of these impacts, which are also discussed below.

Figure 3 / Illustration of direct and secondary impacts of CE hazards on children



⁶³ U-Report Poll on Climate Change and U-Report Poll on Environment, UNICEF (2020). Provided by UNICEF

Direct impacts at the child level

CE hazards can impact children directly through acute or chronic health impacts resulting from event-based hazards, pathogens and weather conditions, and long-term exposure to pollutants. These health implications can negatively affect school attendance, while extreme weather events can obstruct access to healthcare facilities and schools.

Acute health impacts

Acute health impacts manifest shortly after exposure to a CE hazard, such as injury and mortality, disease contraction and weather-related illnesses.

Disease contraction

As a result of a lack of environmental infrastructure, including water treatment, sanitation, and waste management infrastructure, children in Serbia are more likely to be exposed to pollutants or pathogens that can cause disease. This can be exacerbated by extreme events, such as flooding, where damage to existing infrastructure can cause the proliferation of pollutants and pathogens. Children in Serbia are particularly concerned about an increase in infectious disease epidemics, with one third identifying it as the most significant effect of CE⁶⁴. Children are more susceptible to these diseases because their immune systems⁶⁵ are relatively immature, and they have higher exposure due to the fact that they spend more time outside and on the ground and put their hands in their mouths more often than adults do. Unsanitary conditions also exist in schools, particularly urban schools, where over 60% of children in Serbia state that they do not use the washroom or handwashing facilities because they are unsatisfied with the sanitary conditions (e.g., low

cleanliness, toilet paper not available)⁶⁶. In particular, schools in less developed and remote areas do not have access to proper drinking water, toilets or handwashing facilities⁶⁷, and primary schools have the lowest rates of water, sanitation and hygiene services among the different school levels in Serbia⁶⁸. Similarly, as of 2017, 27% of all homes in the south of the country are not connected to the water supply system⁶⁹, reducing their access to improved drinking water sources and increasing exposure to potential communicable diseases. Furthermore, even homes that are connected to drinking water supplies can be exposed to water-borne illness. When tested, 18% of a sample of drinking water supplies did not meet physiochemical standards (i.e., contained higher levels of iron, ammonia and nitrates) and about six percent did not meet microbiological safety standards. The highest percentage of urban public water non-compliance occurred in Vojvodina and Belgrade. In addition, one outbreak from rural public water supplies caused 24 cases of water-borne diseases in 2019, though this has decreased significantly from 100 cases due to three outbreaks in 2015⁷⁰. However, it is unclear to what extent children were impacted by this event.

On the topic of waste, unregulated dumpsites can also lead to disease contraction for children living

⁶⁴ Ibid.

⁶⁵ The challenges of climate change: Children on the front line, UNICEF Office of Research (2014). Available at: https://www.unicef-irc.org/publications/pdf/ccc_final_2014.pdf

⁶⁶ The situation of water, sanitation and hygiene in schools in the pan-European region, WHO and UNECE (2016). Available at: https://www.euro.who.int/_data/assets/pdf_file/0020/322454/Situation-water-sanitation-hygiene-schools.pdf

⁶⁷ Voluntary national review of the Republic of Serbia on the implementation of the 2030 agenda for sustainable development, Republic of Serbia (2019). Available at: https://sustainabledevelopment.un.org/content/documents/23471Serbia_VNR_Report_2019_final.pdf

⁶⁸ Drinking water, sanitation and hygiene in schools: Global baseline report 2018, UNICEF (2018). Available at: <https://www.unicef.org/media/47671/file/JMP-WASH-in-Schools-ENG.pdf>

⁶⁹ Statistical Office of the Republic of Serbia. Available at: <https://data.stat.gov.rs/Home/Result/25010206?languageCode=en-US&displayMode=table&guid=a3326a67-bf21-40ed-bfe4-86d76a8ca7b1>

⁷⁰ Health statistical yearbook of Republic of Serbia, Institute of Public Health of Serbia (2019). Available at: <http://www.batut.org.rs/download/publikacije/pub2019a.pdf>

nearby⁷¹, particularly among Roma children who use landfills as sources of income; waste collection begins at an early age as a way of life, resulting from generations of exclusion in education and employment⁷².

Floods in particular can increase the transmission of water-borne and vector-borne illnesses, some of which can lead to diarrheal disease⁷³. Children are particularly vulnerable to pathogens that cause diarrhea, as this deprives them of necessary nutrition for growth and development, and can lead to mortality. Children under five are particularly vulnerable to diarrhea, as it is the leading cause of disease in this age group globally⁷⁴. The rate of morbidity from diarrheal disease for children under five in Serbia is low and has decreased from 2.4 per 100,000 in 1998 to 0.3 per 100,000 in 2015⁷⁵, followed by an increase to 1.2 per 100,000 in 2016⁷⁶, though estimates vary between sources. Expert interviews indicate that a lack of data on infectious disease is a challenge in Serbia, so these numbers may not reflect the reality of the situation. This lack of data limits the extent to which these outbreaks can be linked directly with CE hazards⁷⁷.



Weather-related illnesses

Children's risk of heat stress or heat stroke will likely increase with increasing temperatures. Heat stress can exacerbate existing medical conditions (i.e., diabetics, patients with kidney, nervous system or respiratory diseases), while extreme cold temperatures can cause hypothermia. Over 50% of the population does not have access to air conditioning in the home⁷⁸ and over 20% of the poorest populations in Serbia cite difficulty keeping the house warm⁷⁹, leaving these children at greater risk of weather-related illnesses. Extreme heat and cold also influence other CE hazards which have

⁷¹ Environmental and Health Performance Review: Serbia, WHO (2009). Available at: https://www.euro.who.int/_data/assets/pdf_file/0008/95345/E93534.pdf and Analysis of the main problems and obstacles in access of Roma to the rights to work and employment, Praxis, Belgrade (2013). Available at: https://www.praxis.org.rs/images/praxis_downloads/Analysis_of_the_Main_Problems_and_Obstacles_in_Access_of_Roma_to_the_Rights_to_Work_and_Employment.pdf

⁷² A paper life: Belgrade's Roma in the underworld of waste scavenging and recycling, Petrovic (2018). Available at: https://repository.lboro.ac.uk/articles/A_paper_life_Belgrade_s_Roma_in_the_underworld_of_waste_scavenging_and_recycling/9585008

⁷³ https://www.who.int/hac/techguidance/ems/flood_cds/en/#:~:text=Floods%20can%20potentially%20increase%20the,fever%2C%20and%20West%20Nile%20Fever

⁷⁴ <https://data.unicef.org/topic/child-health/diarrhoeal-disease/#:~:text=Diarrhoea%20remains%20a%20leading%20killer,age%205%20worldwide%20in%202017>

⁷⁵ <https://gateway.euro.who.int/en/hfa-explorer/>

⁷⁶ Estimates of the global, regional, and national morbidity, mortality, and aetiologies of diarrhoea in 195 countries: a systematic analysis for the Global Burden of Disease Study 2016, The Lancet (2016). Available at: [https://www.thelancet.com/journals/laninf/article/PIIS1473-3099\(18\)30362-1/fulltext](https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(18)30362-1/fulltext)

⁷⁷ Interviews with health and child rights experts in Serbia

⁷⁸ Statistical Office of the Republic of Serbia. Available at: <https://www.stat.gov.rs/en-US/>

⁷⁹ Environmental health inequalities in Europe. Second assessment report, WHO (2019). Available at: <https://www.euro.who.int/en/publications/abstracts/environmental-health-inequalities-in-europe.-second-assessment-report-2019>



an impact on children, such as respiratory illness, which is discussed below.

Injury and mortality

Children are at greater risk during extreme events, as they lack the resources, physical strength, and judgement to remove themselves from hazardous situations. They also have greater risks associated with blood loss⁸⁰ and are more likely to drown in shallow water during floods⁸¹.

⁸⁰ <https://www.cdc.gov/childrenindisasters/differences.html>

⁸¹ Floods in the WHO European Region: Health effects and their prevention, WHO (2013). Available at: https://www.euro.who.int/__data/assets/pdf_file/0020/189020/e96853.pdf

Historically, flooding, wildfire and extreme cold have caused mortality, as well as damage and destruction of homes, in Serbia. The severe flood in May 2014 resulted in 50 deaths⁸² and damaged or destroyed over 20,000 homes⁸³. While there is no data on the number of child mortalities due to flooding in Serbia, during flooding in the Ukraine in 2009 children represented over 20% of total people reported dead or missing (16 children) and 8% of total hospitalizations (8 children)⁸⁴. In Serbia, wildfires account for over two-thirds of reported mortalities due to extreme events in the country⁸⁵. Lastly, extreme cold in Serbia took 23 lives⁸⁶ and led to the death of six people in 2012 and 2017, respectively. Migrant children are particularly at risk; during the 2017 cold in Serbia, up to 300 child refugees risked freezing to death in refugee camps, as they did not have proper clothing or shelter, and many were left unattended⁸⁷.

Chronic health impacts

Chronic health impacts are those which manifest after long-term exposure to a CE hazard, such as impaired cognitive or physical development, respiratory illness, other health conditions, and mental health challenges.

Impaired cognitive and physical development

Exposure to air pollution and hazardous chemicals has been linked with impaired cognitive and physical development in children, as their nervous systems are still developing and particularly vulnerable to these

⁸² Climate change adaptation action plan and vulnerability assessment, City of Belgrade (2015). Available at: http://www.beograd.rs/images/data/c83d368b72364ac6c9f9740f9cda05ed_6180150278.pdf

⁸³ <https://www.desinventar.net/Desinventar/profiletab.jsp>

⁸⁴ Floods in the WHO European Region: Health effects and their prevention, WHO (2013). Available at: https://www.euro.who.int/__data/assets/pdf_file/0020/189020/e96853.pdf

⁸⁵ Comprehensive analysis of the disaster risk reduction and management system for the agricultural sector in Serbia, FAO (2018). Available at: <http://www.fao.org/3/i18364EN/i18364en.pdf>

⁸⁶ Climate vulnerability assessment: Serbia, WWF (2012). Available at: http://www.seecclimateforum.org/upload/document/cva_srbija_english_final.pdf

⁸⁷ <https://www.independent.co.uk/news/world/europe/child-refugees-crisis-serbia-freezing-to-death-temperatures-plummet-drop-sub-zero-minus16-celcius-a7530201.html>

substances⁸⁸. Long-term exposure to these substances can have broad and varied impacts on children.

Most notably, air pollution can impact both children's cognitive performance, behavior, and growth and development, starting during fetal development, with potential lifelong effects⁸⁹. Recent studies have found associations between exposure to outdoor air pollution during pregnancy and lower birth weight⁹⁰, and even infant mortality⁹¹. Young children's growth can also be impaired due to air pollution; in Serbia specifically, a study of schoolchildren in Niš found that air pollution may negatively impact growth rate in urban children⁹². Further, there are associations between air pollution exposure and cognitive outcomes, including verbal and nonverbal intelligence quotient (IQ) and memory, reduced test scores, grade-point averages, as well as other neurological and behavioral problems⁹³.

Hazardous chemicals, such as lead, mercury and pesticides, can have similar effects. Exposure to mercury, as well as lead, can impair children's neurological and cognitive⁹⁴ development, especially during fetal development, even at low levels of exposure. EDCs can also cause mental retardation, congenital malformations, loss of vision and hearing, language disorders and developmental delays⁹⁵.

Lastly, prenatal and childhood exposure to pesticides are linked to challenges with memory and attention⁹⁶.

Respiratory illness

Children can experience respiratory illness primarily due to exposure to air pollution, as well as a lack of sanitation, extreme weather events, and changing temperature and precipitation patterns. Children under five are most vulnerable, as they take in more air proportionally to their weight than adults. There is evidence that prenatal exposure to air pollution (i.e., high PM concentrations) is associated with impairment of lung development and lung function in childhood⁹⁷, and acute lower respiratory tract diseases in children aged 0–4⁹⁸. Studies have shown that the lung capacity of children living in polluted environments can be reduced by 20%, similar to the effect of growing up in a home with secondhand cigarette smoke⁹⁹, and that this exposure increases children's risk of developing lung diseases later in life¹⁰⁰.

In Serbia, respiratory illnesses account for the most commonly reported morbidities for children and youth, accounting for 17% and 37% of all morbidities for children aged from 0–6 and 7–19, respectively¹⁰¹. Rates of acute respiratory tract infections are particularly high among children, followed by bronchitis and asthma. Rates of bronchitis among children have decreased since

⁸⁸ The challenges of climate change: Children on the front line, UNICEF Office of Research (2014). Available at: https://www.unicef-irc.org/publications/pdf/ccc_final_2014.pdf

⁸⁹ Danger in the air, UNICEF (2017). Available at: https://www.unicef.org/environment/files/Danger_in_the_Air.pdf

⁹⁰ Ibid.

⁹¹ Air pollution and child health, WHO (2018). Available at: https://www.who.int/ceh/publications/Advance-copy-Oct24_18150_Air-Pollution-and-Child-Health-merged-compressed.pdf?ua=1

⁹² Effects of air pollution on growth in schoolchildren, Nikolić et al. (2014). Available at: <https://pubmed.ncbi.nlm.nih.gov/25144978/>

⁹³ Danger in the air, UNICEF (2017). Available at: https://www.unicef.org/environment/files/Danger_in_the_Air.pdf

⁹⁴ <https://www.who.int/news-room/fact-sheets/detail/mercury-and-health>

⁹⁵ Identification of risks from exposure to Endocrine-Disrupting Chemicals at the country level, WHO (2014). Available at: https://www.euro.who.int/__data/assets/pdf_file/0008/245744/Identification-of-risks-from-exposure-to-ENDOCRINE-DISRUPTING-CHEMICALS-at-the-country-level.pdf

⁹⁶ Neurodevelopmental effects in children associated with exposure to organophosphate pesticides: A systematic review, Munoz-Quezada et al. (2013). Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3899350/>

⁹⁷ Air pollution and child health, WHO (2018). Available at: https://www.who.int/ceh/publications/Advance-copy-Oct24_18150_Air-Pollution-and-Child-Health-merged-compressed.pdf?ua=1

⁹⁸ Health impact of ambient air pollution in Serbia, WHO (2019). Available at: https://serbia.un.org/sites/default/files/2019-10/Health-impact-pollution-Serbia_0.pdf

⁹⁹ Clear the air for children, UNICEF (2016). Available at: https://www.unicef.org/publications/files/Clear_the_Air_for_Children_Executive_summary_ENG.pdf

¹⁰⁰ Air pollution and health in Serbia, HEAL (2014). Available at: https://www.env-health.org/IMG/pdf/heal_briefing_air_serbia_eng.pdf

¹⁰¹ Health statistical yearbook of Republic of Serbia, Institute of Public Health of Serbia (2019). Available at: <http://www.batut.org.rs/download/publikacije/pub2019a.pdf>

2010, while acute respiratory tract infections and asthma have remained relatively stable¹⁰². While the data on respiratory illness and resulting morbidity on children does not explicitly link these conditions to air pollution, a number of studies have explored this linkage. For instance, exposure to indoor air pollution is linked with bronchopneumonia in children under five, while pollution from coal power plants is linked primarily to bronchitis and asthma¹⁰³. Studies of preschool children in the city of Niš have concluded that there is a directly proportional relationship between ambient air quality and respiratory diseases in preschool children¹⁰⁴. In Bor, a city in eastern Serbia with a history of high levels of air pollution, about two-thirds of pre-school children and half of those under 18 years of age visited a doctor for respiratory issues¹⁰⁵.

A lack of sanitation is also linked with acute respiratory infections, including pneumonia¹⁰⁶. Extreme heat can increase the concentration of pollutants and allergens in the air, while extreme cold can facilitate the spread of respiratory diseases due to narrowing of blood vessels¹⁰⁷. Furthermore, moisture-damage in buildings as a result of flooding can cause increased exposure to microbes, which can cause asthma symptoms in

young children¹⁰⁸. Lastly, changes in temperature and precipitation can cause fluctuations in pollen allergens, causing bronchitis¹⁰⁹.

Children are particularly vulnerable to the impacts of air pollution, as their immune system and lungs are still developing and when children breathe in polluted air, they take in more pollutants per unit of body weight than adults¹¹⁰. Furthermore, children's respiratory airways are smaller than those of adults, so infections are more likely to cause blockages. During early childhood, children are highly susceptible to viruses, bacteria and other infections as their immune system is still developing, increasing their risk of respiratory infection and reducing their ability to combat it¹¹¹.

Other health conditions

CE hazards have been linked to other chronic health conditions, such as cardiovascular conditions, diabetes, and cancers, as a result of long-term exposure. Children are more vulnerable to these effects, as they will be exposed to these hazards over a longer period of time.

Air pollution is a predominant chronic health hazard, as early-life exposure to air pollutants has also been shown to contribute to higher risks of developing chronic diseases later in life, including obesity, diabetes, and hormone related cancers (e.g., breast and prostate cancer)¹¹², and cardiovascular diseases¹¹³.

¹⁰² Health statistical yearbook of Republic of Serbia, Institute of Public Health of Serbia (2010). Available at: <http://www.batut.org.rs/download/publikacije/pub2010.pdf>

¹⁰³ Chronic coal pollution, Europe Beyond Coal Campaign (2019). Available at: <https://www.env-health.org/wp-content/uploads/2019/02/Chronic-Coal-Pollution-report.pdf>

¹⁰⁴ Respiratory diseases in preschool children in the city of Niš exposed to suspended particulates and carbon monoxide from ambient air, Djordjevic et al. (2016). Available at: https://www.researchgate.net/publication/295246816_Respiratory_diseases_in_preschool_children_in_the_city_of_Nis_exposed_to_suspended_particulates_and_carbon_monoxide_from_ambient_air

¹⁰⁵ Analiza zdravstvenog stanja stanovništva okruga Bor u periodu od 2014. Do 2018. godine Zavod za javno zdravlje "Timok", Zaječar. Available at: <https://www.zavodzajecar.rs/images/pdf/AnalizaokrugBor2014-2018.pdf>

¹⁰⁶ Clear the air for children, UNICEF (2016). Available at: https://www.unicef.org/publications/files/Clear_the_Air_for_Children_Executive_summary_ENG.pdf

¹⁰⁷ Climate change adaptation action plan and vulnerability assessment, City of Belgrade (2015). Available at: http://www.beograd.rs/images/data/c83d368b72364ac6c9f9740f9cda05ed_6180150278.pdf

¹⁰⁸ Environmental health inequalities in Europe. Second assessment report, WHO (2019). Available at: <https://www.euro.who.int/en/publications/abstracts/environmental-health-inequalities-in-europe.-second-assessment-report-2019>

¹⁰⁹ Environment in Serbia: 2004–2009 Extended Summary, Republic of Serbia. Available at: http://www.sepa.gov.rs/download/ENG_FIN_JubilarnaPublikacija.pdf

¹¹⁰ Danger in the air, UNICEF (2017). Available at: https://www.unicef.org/environment/files/Danger_in_the_Air.pdf

¹¹¹ Clear the air for children, UNICEF (2016). Available at: https://www.unicef.org/publications/files/Clear_the_Air_for_Children_Executive_summary_ENG.pdf

¹¹² Air pollution and health in Serbia, HEAL (2014). Available at: https://www.env-health.org/IMG/pdf/heal_briefing_air_serbia_eng.pdf

¹¹³ The challenges of climate change: Children on the front line, UNICEF Office of Research (2014). Available at: https://www.unicef-irc.org/publications/pdf/ccf_final_2014.pdf

Hazardous chemicals, such as lead, can also result in health conditions, as long-term exposure to lead has been linked to reduced red blood cell count in children aged 11–14, which is an indicator for iron deficiency anemia¹¹⁴. Fluctuations in allergenic pollens due to changing temperature and precipitation patterns can also cause conjunctivitis and dermatitis¹¹⁵.

Melanoma¹¹⁶, which is a result of higher doses of UVR, is an increasing problem in Serbia. Mortality in the Vojvodina province (northern Serbia) within the period 1985–2004 shows an evident increase, placing it amongst the most vulnerable regions in the world. While melanoma occurs at much higher rates in adults (age 30 and above); there were over 30 reported cases in children (<19 years old) in Serbia in 2014¹¹⁷. While children have lower instances of melanoma than adults, a study in Belgrade found that the majority of children were not aware of the risk of melanoma many did not use sun protection, increasing their exposure to UVR¹¹⁸ and overall risk.

Mental health

The most significant mental health risks will likely arise as children are exposed to post-traumatic stress and depressive reactions following extreme events¹¹⁹, such as floods or wildfires. A significant number of adolescents report symptoms of anxiety

and depression; as of 2019, 10% of adolescents have experienced high anxiety, more than 20% experience frequent negative moods, 45% have a feeling of constant worry, and 7% have suicidal intentions¹²⁰. On the other hand, children, particularly those under 8 years old, are at increased risk for mental health issues associated with extreme weather events¹²¹, as they have less understanding and sense of control of the situation and have not yet developed the ability to cope and adapt¹²². After the 2014 floods in Serbia, children experienced mental illnesses, such as depression, as a result of losing their homes, which expert interviewees observed in Obrenovac, Vojvodina province, Krusevac. Studies in other countries also indicate that the mental health effects on children persist long-term. In the UK, children still showed significant signs of distress during rainfall 18 months after a flood event¹²³; similar effects were noted in Iceland and China, where children experienced distress and anxiety for three to four years following extreme events¹²⁴.

Research also shows an association between prenatal exposure to high levels of air pollution and psychological and behavioral problems later in childhood, including symptoms of anxiety and depression¹²⁵. Likewise, higher temperatures have been correlated to more emergency department visits due to high distress¹²⁶.

¹¹⁴ Effects of air pollution on red blood cells in children, Nikolić et al. (2008). Available at: <http://www.pjoes.com/Effects-of-Air-Pollution-on-Red-Blood-Cells-in-r-nChildren,88104,0,2.html>

¹¹⁵ Environment in Serbia: 2004–2009 Extended Summary, Republic of Serbia. Available at: http://www.sepa.gov.rs/download/ENG_FIN_JubilarnaPublikacija.pdf

¹¹⁶ Melanoma is the most serious type of skin cancer; the risk of developing this cancer increases with exposure to UV radiation

¹¹⁷ Trends in incidence of non-melanoma and melanoma skin cancers in central Serbia, Antonijević et al. (2018). Available at: <https://pdfs.semanticscholar.org/edd7/c7d4e2f00cb155e00902c022cd28b6734773.pdf>

¹¹⁸ Ultraviolet radiation exposure among Belgrade high school students: analysis of knowledge, attitudes and behavior, Skiljević and Srecković (2019). Available at: <https://pubmed.ncbi.nlm.nih.gov/30811695/>

¹¹⁹ The impact of climate change on youth depression and mental health, The Lancet (2017). Available at: [https://www.thelancet.com/pdfs/journals/lanplh/PIIS2542-5196\(17\)30045-1.pdf](https://www.thelancet.com/pdfs/journals/lanplh/PIIS2542-5196(17)30045-1.pdf)

¹²⁰ Voluntary national review of the Republic of Serbia on the implementation of the 2030 agenda for sustainable development, Republic of Serbia (2019). Available at: https://sustainabledevelopment.un.org/content/documents/23471Serbia_VNR_Report_2019_final.pdf

¹²¹ <https://www.cdc.gov/childrenindisasters/differences.html>

¹²² Ibid.

¹²³ Floods in the WHO European Region: Health effects and their prevention, WHO (2013). Available at: https://www.euro.who.int/_data/assets/pdf_file/0020/189020/e96853.pdf

¹²⁴ Children and natural disasters, Dyregrov et al. (2018). Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6095022/>

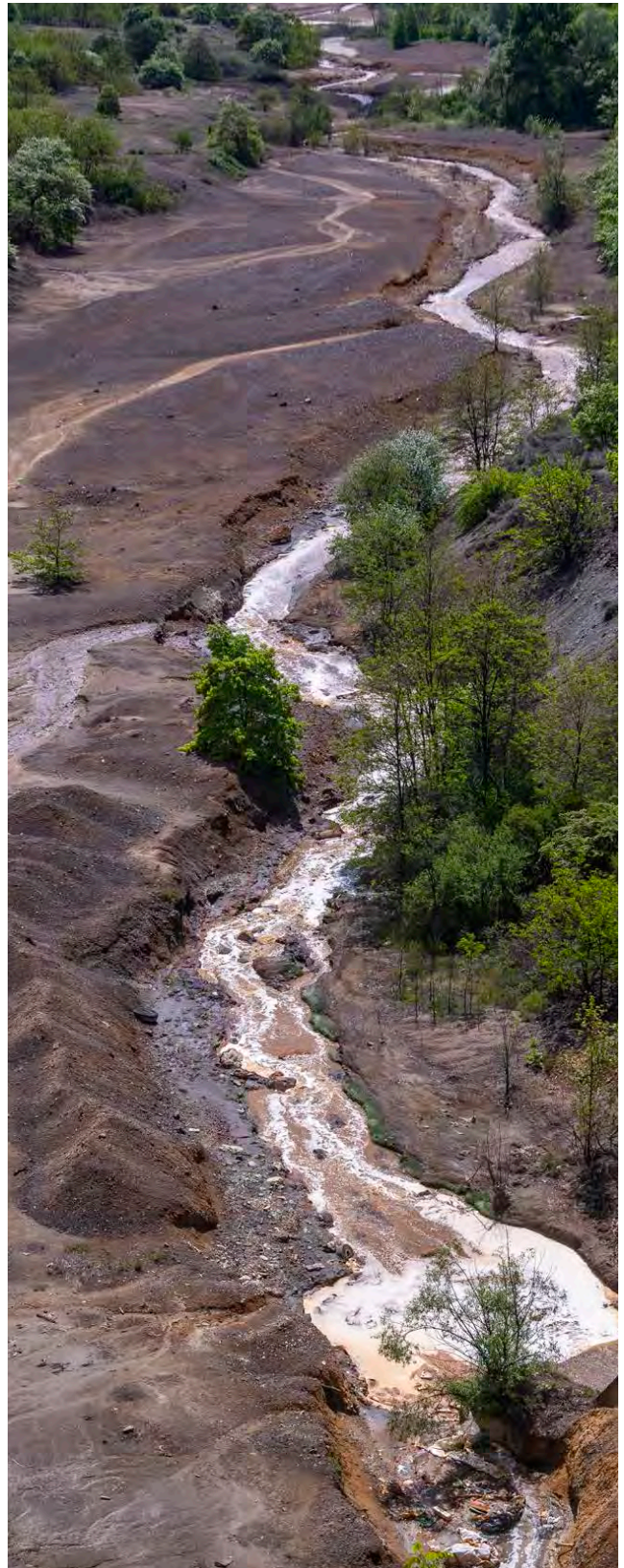
¹²⁵ Danger in the air, UNICEF (2017). Available at: https://www.unicef.org/environment/files/Danger_in_the_Air.pdf

¹²⁶ The impact of climate change on youth depression and mental health, The Lancet (2017). Available at: [https://www.thelancet.com/pdfs/journals/lanplh/PIIS2542-5196\(17\)30045-1.pdf](https://www.thelancet.com/pdfs/journals/lanplh/PIIS2542-5196(17)30045-1.pdf)

Access to basic services

Children's access to education and healthcare can be compromised by both event-based and persistent CE hazards. Infrastructure damage due to extreme weather events have resulted in closures of schools and medical facilities. During the 2014 floods, many health care and educational institutions suffered material damages. Seven hospitals incurred significant damages and 50 health facilities (centres, pharmacies, etc.) had to be temporarily closed, resulting in suspended health care. During extreme events, critical services (e.g. ambulance, fire, police response) are also suspended¹²⁷, which can prevent timely healthcare interventions and therefore increase the potential severity and long-term impacts of a child's injury or condition¹²⁸.

The educational sector is similarly impacted by extreme events, as the 2014 floods in Serbia damaged over 35 schools across seven municipalities (Figure 4 below). Schools were also used as temporary shelters and the school year closed approximately one month early¹²⁹ in 150 schools¹³⁰, impacting about 45,300 children/students. Most of the children impacted were of elementary school age; about 14% were preschool children, 62% were elementary school students and 25% were secondary school students¹³¹. Further, children who become sick due to CE hazards, such as air pollution, hazardous chemicals, pathogens, or weather-related illnesses may be required to miss school, impacting their ability to keep up with peers and complete their education. Expert interviews also revealed that children sometimes refrain from attending school due to poor air quality from alternative heating (e.g., burning biofuels) during winter months.



¹²⁷ <https://www.osac.gov/Country/Serbia/Content/Detail/Report/452bd4dc-9d15-491b-b271-15f4aeb34077>

¹²⁸ https://resourcecentre.savethechildren.net/node/9496/pdf/what_is_child_protection.pdf

¹²⁹ Serbia floods 2014, UN, World Bank Group (2014). Available at: <http://www.obnova.gov.rs/uploads/useruploads/Documents/RNA-REPORT-140714.pdf>

¹³⁰ https://www.unicef.org/appeals/files/UNICEF_Consolidated_SitRep_Bosnia_and_Herzegovina_and_Serbia_21_May_2014.pdf

¹³¹ Ibid.

Figure 4 / Educational institutions impacted by the 2014 floods in Serbia

Retrieved from: https://www.ilo.org/wcmsp5/groups/public/---ed_emp/documents/publication/wcms_397685.pdf

Municipality	Pre-primary education		Primary education		Secondary education		Tertiary education		TOTAL	
	Total # of buildings	Affected by flooding	Total # of buildings	Affected by flooding	Total # of buildings	Affected by flooding	Total # of buildings	Affected by flooding	Total # of buildings	Affected by flooding
Bajina Bašta	5		20		2				27	
Lazarevac	32		33		3				68	
Obrenovac	27	5	28	5	3	3			58	13
Valjevo	11	3	53	2	6		3		73	5
Varvarin	11		17		1				29	
Velika Plana	17		21		3				41	
Kosjerić	4		14		1				19	
Koceljeva	1		16		1				18	
Kragujevac	48		63		9		7		127	
Kraljevo	52		61		9		1		123	
Krupanj	1		19		1				21	
Loznica	9		43		4				56	
Ljubovija	1		22		1				24	
Mali Zvornik	1		10		1				12	
Osečina	1		13		1				15	
Jagodina	12		21		2				35	
Svilajnac	1	1	13		1	1			15	2
Smederevska Palanka	1		22		1				24	
Trstenik	35		43	1	2	2			80	3
Paraćin	28	2	33	2	4	3			65	7
Ub	1	1	5		1				7	1
Čačak	54		61		9		3		127	
Šabac	1		3	3	1	1			5	4
Šid	18		19		2				39	
Total	372	12	653	13	69	10	14		1108	35

Extreme weather can also disrupt children’s access to food, particularly if they are located in remote areas. In Serbia, extreme cold and snow cover have required distribution of food supplies via helicopters in remote mountain villages¹³². Further, CE hazards have led

to decreased agricultural yields. The implications of decreased food availability will be covered in the next section, as it is exacerbated by effects on household finances and the broader economy.

¹³² <https://reliefweb.int/report/serbia/emergency-situation-serbia-due-heavy-snowfalls-and-extreme-cold-situation-report-no15>

Secondary effects

Children experience secondary effects from CE hazards via financial and logistical challenges, and/or emotional stressors at the household and community level. These factors inhibit the ability of households to protect and support their children, threatening their access to adequate nutrition and exposing them to protection risks.

Adequate nutrition

CE hazards in Serbia, such as drought, flooding, extreme heat and wildfire, as well as fungal diseases and pests due to changing temperature and precipitation patterns¹³³, can result in reduced agricultural yield and increased food prices¹³⁴. In recent decades, both maize and soybean¹³⁵ have seen reduced yield in Serbia food prices have risen 10 times in a single decade (1999–2012) due to drought¹³⁶. Further, flooding in Serbia has led to the contamination of food supplies with heavy metals¹³⁷ and heavy snowfall has interrupted food supply¹³⁸.

Reduced agricultural yields and decreased availability of food can reduce children's access to adequate nutrition, particularly if their families cannot afford higher food prices or alternative sources of nutrition. Children are more vulnerable to nutritional deprivation. They require up three to four times the amount of

food than adults relative to their body weight¹³⁹ as they experience more rapid growth processes and nutrient absorption. A chronic lack of nutrition leading to stunting and wasting can also make children more susceptible to diseases and result in impaired brain and physical development over the long term¹⁴⁰.

Protection risks

CE hazards can expose children to increased protection risks, which result from exposure to violent, abusive and/or exploitative situations. This effect is two-fold: i) hazards such as flooding and wildfire can create emergency situations whereby children are separated from their families and/or lose their shelter, and ii) these hazards can have financial and psychological implications on families, reducing their ability to recover and inducing emotional stress. Families may place children in exploitative situations to recover financial losses, while emotional stresses at the household and community level can expose children to neglect, abuse, and/or violence. The effects of CE hazards on family separation, exploitative practices, and neglect, abuse, and violence are described in more detail below.

Family separation

Children's risk of being unaccompanied or separated from their families increases during extreme events that result in emergency situations due to loss of shelter, separation during evacuation, or through the death of their parents or guardians¹⁴¹. Family separation occurred during the 2014 floods in Serbia, where a misunderstanding of the instruction to prioritize rescue of children resulted in men forcibly separating infants from their mothers. During the same event, many people were also evacuated, further increasing the

¹³³ Comprehensive analysis of the disaster risk reduction and management system for the agricultural sector in Serbia, FAO (2018). Available at: <http://www.fao.org/3/I8364EN/i8364en.pdf>

¹³⁴ Ibid.

¹³⁵ <http://www.belgradeforum.org/climate-change-as-a-human-security-issue-in-the-western-balkans/>

¹³⁶ Ibid.

¹³⁷ Serbia floods 2014, UN, World Bank Group (2014). Available at: <http://www.obnova.gov.rs/uploads/useruploads/Documents/RNA-REPORT-140714.pdf>

¹³⁸ Analysis of the severe weather event in Serbia: Cold spell in February 2012, Republic of Serbia Hydrometeorological Service (2012). Available at: http://www.hidmet.gov.rs/podaci/meteorologija/eng/Ekstremni_klimatski_dogadjaji.pdf

¹³⁹ The challenges of climate change: Children on the front line, UNICEF Office of Research (2014). Available at: https://www.unicef-irc.org/publications/pdf/ccc_final_2014.pdf

¹⁴⁰ <https://www.who.int/nutgrowthdb/about/introduction/en/index2.html>

¹⁴¹ https://resourcecentre.savethechildren.net/node/9496/pdf/what_is_child_protection.pdf



risk of family separation. The largest single evacuation was from the municipality of Obrenovac, where 25,000 people were evacuated. Approximately 20% of evacuees were placed in reception centers, of which 1,270 were children and over 200 were babies¹⁴².

Exploitative practices

Upon experiencing financial hardship due to loss of shelter or livelihood, children's parents or guardians may turn to negative coping mechanisms to help their household financially recover, such as child labour and child marriage. Though child labour is prohibited in Serbia, about 10% of children are currently engaged in this practice, about a third of which work in hazardous

conditions¹⁴³. This is most prevalent in younger children (aged 5–11 years)¹⁴⁴, as compared to children under five or adolescents, and among boys from rural populations working on family farms¹⁴⁵. While no data is available on the increased application of negative coping mechanisms due to climate related circumstances in the case of Serbia, existing conditions in Serbia and experience from other countries indicate that Serbia may also experience this.

Literature shows that child labour increases when a family experiences a shock, and case studies from

¹⁴² Serbia floods 2014, UN, World Bank Group (2014). Available at: <http://www.obnova.gov.rs/uploads/useruploads/Documents/RNA-REPORT-140714.pdf>

¹⁴³ Situation analysis of children and adolescents in Serbia, UNICEF (2019). Available at: https://www.unicef.org/serbia/sites/unicef.org/serbia/files/2020-01/SitAn_2019.pdf

¹⁴⁴ Voluntary national review of the Republic of Serbia on the implementation of the 2030 agenda for sustainable development, Republic of Serbia (2019). Available at: https://sustainabledevelopment.un.org/content/documents/23471Serbia_VNR_Report_2019_final.pdf

¹⁴⁵ Climate vulnerability assessment: Serbia, WWF (2012). Available at: http://www.seeclimateforum.org/upload/document/cva_srbija_english_final.pdf

other countries demonstrate that child labour has increased following extreme weather events¹⁴⁶. In addition to extreme weather events, climate change can exacerbate the effects of child labour on rural children. Climate variability is found to increase the time spent working for rural children on farms¹⁴⁷, who are already disproportionately affected by child labour in Serbia. Additionally, in the event of resulting food insecurity from CE hazards, families in other countries have also married their daughters to reduce household financial strain¹⁴⁸. Similarly, in Serbia, child marriage has been used as a coping strategy for financial hardship, since it is seen as a means of increasing the economic security of girls¹⁴⁹, particularly among Roma families¹⁵⁰.

Neglect, abuse and violence

As families and communities experience emotional stress due to the physical and financial effects of extreme weather events, children are at increased risk of neglect, abuse, violence and exploitation¹⁵¹, threatening both their physical and mental health. For example, it has been observed in other countries that heads of households resort to substance abuse during drought, such as alcohol and drug consumption¹⁵², increasing the risk of domestic and gender-based

violence, which is already prevalent in Serbia¹⁵³. Preliminary research also indicates that trafficking can increase by 20 to 30% during extreme weather events¹⁵⁴, to which children who are unaccompanied or separated from their family are exceptionally vulnerable.

CE can also result in resource scarcity by depleting food and water resources, which has led to conflict and migration in other countries. This resource scarcity and migration can erode community and cultural ties¹⁵⁵, increasing the risk of violence and conflict. In the Serbian context, CE-induced migration is expected to result in difficulties maintaining social cohesion, similar to the tensions observed during the 2015–2016 refugee and migration crisis¹⁵⁶. Globally, an increase in violence has been observed as a means to exert control over scarce natural resources¹⁵⁷, leaving children of migrants, and those who already experience discrimination, at greater risk. Increased temperatures can exacerbate these effects, as multiple studies indicate that conflict increases with higher temperatures¹⁵⁸. In Serbia, higher crime rates have been identified as a potential effect of heat waves¹⁵⁹.

¹⁴⁶ https://resourcecentre.savethechildren.net/node/10294/pdf/responding_to_child_labour_in_emergencies_-_interactive_ia_toolkit_-_fin.pdf

¹⁴⁷ Climate variability, child labour and schooling: Evidence on the intensive and extensive margin, Colmer (2013). Available at: <https://www.cccep.ac.uk/wp-content/uploads/2015/10/WP132-Climate-variability-child-labour-and-schooling.pdf>

¹⁴⁸ Gender-based violence and environmental linkages, IUCN (2020). Available at: <https://portals.iucn.org/library/sites/library/files/documents/2020-002-En.pdf>

¹⁴⁹ Child marriage in Serbia: Analytical report, UNICEF (2016). Available at: https://www.unicef.org/serbia/sites/unicef.org/serbia/files/2018-04/Child_marriage_in_Serbia.pdf

¹⁵⁰ Child marriage among the Roma population in Serbia: Ethnographic research, UNICEF (2018). Accessible at: https://www.unicef.org/serbia/sites/unicef.org/serbia/files/2018-04/Child_marriage_among_the_Roma_population_in_Serbia.pdf

¹⁵¹ https://resourcecentre.savethechildren.net/node/9496/pdf/what_is_child_protection.pdf

¹⁵² Climate change, women's health, wellbeing and experiences of gender based violence in Australia, Whittenbury, K. (2013). Available at: https://link.springer.com/chapter/10.1007/978-94-007-5518-5_15

¹⁵³ <https://www.osac.gov/Country/Serbia/Content/Detail/Report/452bd4dc-9d15-491b-b271-15f4aeb34077>

¹⁵⁴ Gender-based violence and environmental linkages, IUCN (2020). Available at: <https://portals.iucn.org/library/sites/library/files/documents/2020-002-En.pdf>

¹⁵⁵ Ibid.

¹⁵⁶ <http://www.belgradeforum.org/climate-change-as-a-human-security-issue-in-the-western-balkans/>

¹⁵⁷ Gender-based violence and environmental linkages, IUCN (2020). Available at: <https://portals.iucn.org/library/sites/library/files/documents/2020-002-En.pdf>






¹⁵⁸ Ibid.

¹⁵⁹ Climate change adaptation action plan and vulnerability assessment, City of Belgrade (2015). Available at: http://www.beograd.rs/images/data/c83d368b72364ac6c9f9740f9cda05ed_6180150278.pdf

EFFECTS OF INEQUALITY

The effects of inequality on CE impacts to children is two-fold. Existing inequalities can i) increase children's exposure and vulnerability to CE hazards, and ii) impair their ability to recover from the impacts. Left unaddressed, these effects can perpetuate intergenerational cycles of inequality.

There are a number of existing factors (i.e., inequality dimensions) that influence the extent to which children are exposed to, or impacted by, CE hazards, as described below. It is important to note that these dimensions are interrelated and are not mutually exclusive. For example, dimensions such as ethnicity and location are largely correlated with economic status in Serbia.

	Economic status	Children from poorer households are likely to have less access to services such as healthcare, education, adequate nutrition and safe water, electricity and sanitation.
	Ethnicity	The largest ethnic minority groups in Serbia include Hungarians, Bosniaks, Roma and Albanians. Based on available data, there is an abundance of evidence that the Roma population is marginalized in Serbia. They typically have much lower social inclusion, in terms of education and employment, and are more likely to live in extreme poverty without access to basic services ¹⁶⁰ . Migrant children are also more vulnerable as they typically have poor living conditions.
	Gender	Children from different genders are exposed to different types and levels of risks. For example, girls are at greater risk of gender-based or sexual exploitation, while boys face a higher risk of child labour in rural areas. Roma girls also have much higher instances of child marriage.
	Location	The location of children's communities can impact children's exposure to CE hazards. Their community, predominantly whether it is urban or rural, will also determine access to services like water and sanitation, education and healthcare. Some regions are also generally poorer than others, demonstrating a link between community and economic status.
	Disability and pre-existing health conditions	Children with disabilities and pre-existing health conditions are more vulnerable to the acute and chronic health impacts of CE hazards. In Serbia, they typically face barriers to accessing basic and social services. The majority of families also do not have sufficient income to provide adequate care for their children with disabilities ¹⁶¹ .

The below case studies demonstrate how different dimensions of inequality can exacerbate the impacts that children face due to CE hazards. The analysis is presented in terms of i) exposure, ii) vulnerability and iii) resilience. Exposure refers to the likelihood that the population will experience the hazard, vulnerability indicates how deeply they will be impacted; resilience is a measure of an individual's or a population's ability to recover from these impacts.



¹⁶⁰ National ethnic minorities in Serbia with a particular focus on the Albanian minority, Nuhui (2019). Available at: https://www.academia.edu/40184676/National-Ethnic_Minorities_in_Serbia_with_a_Particular_Focus_on_the_Albanian_Minority

¹⁶¹ Voluntary national review of the Republic of Serbia on the implementation of the 2030 agenda for sustainable development, Republic of Serbia (2019). Available at: https://sustainabledevelopment.un.org/content/documents/23471Serbia_VNR_Report_2019_final.pdf

Case study 1: Flooding

Flooding is commonly identified as an especially high-risk CE hazard in Serbia¹⁶². The floods of 2014 demonstrated the scale of the impacts that flooding can have on children, especially those who are members of vulnerable groups.

Exposure

During extreme rainfall events, populations living nearby rivers are at risk of experiencing flooding due to river overflow, while those living in urban areas are at greater risk of flooding due to excessive runoff and/or inadequate infrastructure¹⁶³. Over the next decade, children living in communities highlighted in Figure 5 below are expected to be most likely to experience riverine and urban flooding, respectively. Children in the southern regions of Pcinjski, Jablanicki, Pirotski and Zajecarski are much more likely to experience urban flooding than riverine flooding. There is also some overlap between areas with high exposure to urban flooding and poorest regions in Serbia (see Figure 5). Children in these regions are at particularly high risk, as they have a high likelihood of experiencing a flood and low financial resources to cope with its effects. Additional dimensions of vulnerability and resilience are discussed below.

Vulnerability and resilience

During flooding, children are exposed to health impacts (i.e., injury, disease contraction and mental health challenges), reduced access to nutrition and services, and protection risks as a result of evacuation, financial losses at the household level, and/or unrest at the community level. Physical inequality dimensions, such as health status, ability and geographic location can increase children's vulnerability to health impacts. Furthermore, financial inequalities reduce children's resilience to recover from these health impacts and increase the likelihood that they will be exposed to increased protection risks. The groups which are most vulnerable to flooding in Serbia are children with disabilities or pre-existing health conditions, migrant children, rural children, and girls.



Children with disabilities and pre-existing health conditions will likely experience greater challenges in an emergency evacuation, as preparedness and response systems (e.g., early warning systems, evacuation systems, and shelters) may not be accessible (i.e., adapted to fit their needs)⁷¹. For example, information may only be available via writing or only audio, which some children will not be able to access. In the 2014 floods, many people with disabilities or pre-existing health conditions were evacuated without their required medical equipment, prescriptions, or documentation, leaving them in a more vulnerable state¹⁶⁴. Children with pre-existing health conditions are particularly vulnerable to communicable diseases as a result of drinking unsafe

Figure 5 / Riverine (left) and urban (right) flood risk in Serbia over the next decade

Data not available for Kosovo.
Retrieved from: <https://thinkhazard.org/en/report/2648-serbia>

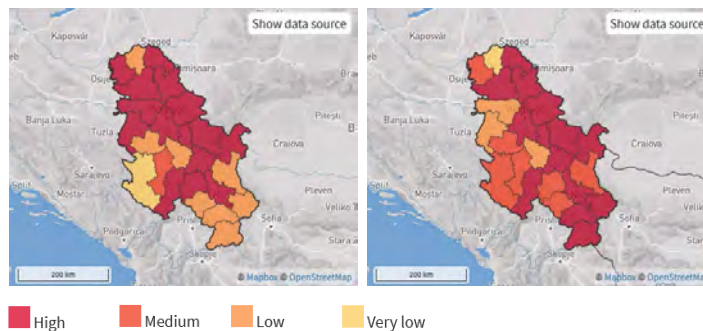
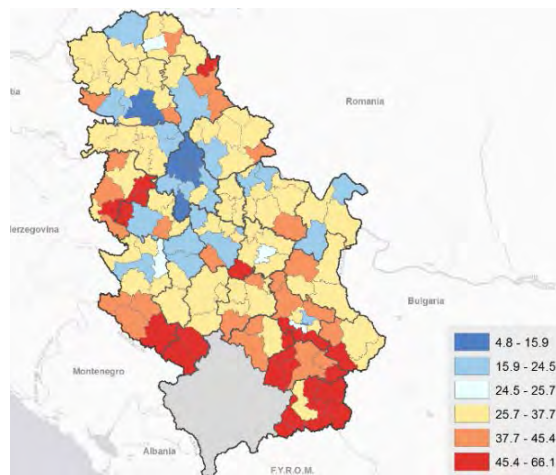


Figure 6 / At risk of poverty rate in Serbia by region, highlighting areas with higher risk of both flooding and poverty

Data not available for Kosovo. Flood risk based on Figure 5 above.
Retrieved from: <https://www.worldbank.org/en/country/serbia/publication/poverty-map-of-serbia>



¹⁶² INFORM Report 2019: Shared evidence for managing crises and disasters, INFORM Index for Risk Management (European Commission) (2019). Available at: <https://reliefweb.int/sites/reliefweb.int/files/resources/Inform%202019%20WEB%20spreads.pdf>

¹⁶³ Study on the socio-economic aspects of climate change in the Republic of Serbia, UNDP (2019). Available at: <https://www.rs.undp.org/content/dam/serbia/Draft%20Study%20on%20Socio-economic%20aspects%20of%20climate%20change%20in%20Serbia.pdf>

¹⁶⁴ Serbia floods 2014, UN, World Bank Group (2014). Available at: <http://www.obnova.gov.rs/uploads/useruploads/Documents/RNA-REPORT-140714.pdf>

water following a flood, as their immune systems are already compromised. The acute and chronic stresses from experiencing such an extreme event can also have greater effects on children with existing mental health challenges. Lastly, families of children with disabilities in Serbia face financial strains due to the costs to care for their child¹⁶⁵, reducing their resilience to cope with the financial impacts of flooding.



Most refugees and internally displaced persons (i.e., migrants) in Serbia still live in unofficial centres or homes with inadequate construction¹⁶⁶, leaving them more vulnerable to injury, mortality, or family separation as a result of damage or destruction during flooding. As of May 2018, there were over 68,000 internally displaced people in need of improved living conditions, and about 4,000 refugees housed in asylum and reception centres¹⁶⁷. Due to lower financial resilience and existing cultural practices, Roma children in particular are also more likely to turn to negative coping mechanisms such as child labour and child marriage, as described below.



Children among rural populations have less access to improved sanitation (15% lack access, compared to 5% from the wealthiest, urban population), and typically use scale water supplies, such as wells, for their water supply, increasing their risk of contracting diarrheal diseases following a flood. Due to financial and logistical constraints¹⁶⁸, rural children are also less able to access food, education, and health services, thereby reducing their resilience to cope with the impacts of flooding. Expert interviews noted that rural children in remote areas generally have greater difficulty reaching school or health services, and during the 2014 floods, food distribution from the Red Cross was delayed due to inaccessible road infrastructure¹⁶⁹, upon which rural communities are more dependent. The 2014 flood also damaged farming equipment and killed livestock, eliminating household income for the year¹⁷⁰. Given that 60% of child labour occurs in rural areas in Serbia¹⁷¹ and the fact that child labour has occurred as a result of flooding and other disasters in other countries¹⁷², this is considered a particularly high risk for rural children in Serbia.



Girls are particularly vulnerable to physical or sexual violence in shelters as a result of evacuation due to flooding. During the 2014 floods, 125,000 people fell below the poverty line due to impacts on livelihood and damage or destruction of their homes¹⁷³. This drove about 5,000 people to seek shelter in reception centres for an uncertain amount of time¹⁷⁴ leaving women and girls with prolonged stay exposed to assault. In Serbia, a small scale survey ascertained that one third of women and girls have experienced assault in reception and asylum centres¹⁷⁵.

¹⁶⁵ Voluntary national review of the Republic of Serbia on the implementation of the 2030 agenda for sustainable development, Republic of Serbia (2019). Available at: https://sustainabledevelopment.un.org/content/documents/23471Serbia_VNR_Report_2019_final.pdf

¹⁶⁶ Study on the socio-economic aspects of climate change in the Republic of Serbia, UNDP (2019). Available at: <https://www.rs.undp.org/content/dam/serbia/Draft%20Study%20on%20Socio-economic%20aspects%20of%20climate%20change%20in%20Serbia.pdf>

¹⁶⁷ Voluntary national review of the Republic of Serbia on the implementation of the 2030 agenda for sustainable development, Republic of Serbia (2019). Available at: https://sustainabledevelopment.un.org/content/documents/23471Serbia_VNR_Report_2019_final.pdf

¹⁶⁸ Study on the socio-economic aspects of climate change in the Republic of Serbia, UNDP (2019). Available at: <https://www.rs.undp.org/content/dam/serbia/Draft%20Study%20on%20Socio-economic%20aspects%20of%20climate%20change%20in%20Serbia.pdf>

¹⁶⁹ <https://reliefweb.int/sites/reliefweb.int/files/resources/MDRRS009do.pdf>

¹⁷⁰ Serbia floods 2014, UN, World Bank Group (2014). Available at: <http://www.obnova.gov.rs/uploads/useruploads/Documents/RNA-REPORT-140714.pdf>

¹⁷¹ Situation analysis of children and adolescents in Serbia, UNICEF (2019). Available at: https://www.unicef.org/serbia/sites/unicef.org.serbia/files/2020-01/SitAn_2019.pdf

¹⁷² Sri Lanka: Assessment of the effects of annual drought and floods on child labour, ILO (2013). Available at: https://www.ilo.org/wcmsp5/groups/public/---ed_norm/---ipec/documents/publication/wcms_651800.pdf and Child poverty, disasters and climate change, Diwakar et al. (2019). Available at: <https://www.odi.org/sites/odi.org.uk/files/resource-documents/12618.pdf>

¹⁷³ Floods in Serbia, Bosnia and Herzegovina, and Croatia. Available at: https://reliefweb.int/sites/reliefweb.int/files/resources/briefing_note_floods_in_serbia_bosnia_and_herzegovina_and_croatia_may_2014_update.pdf

¹⁷⁴ Serbia floods 2014, UN, World Bank Group (2014). Available at: <http://www.obnova.gov.rs/uploads/useruploads/Documents/RNA-REPORT-140714.pdf>

¹⁷⁵ ATINA, 'Violence against women and girls among refugee and migrant population in Serbia', Belgrade, 2017, <<https://serbia.unfpa.org/sites/default/files/pub-pdf/Vilence%20against%20women%20and%20girls.pdf>>, accessed 20 March 2019

Case study 2: Air pollution

Concentrations of air pollutants, especially PM, in Serbia regularly exceed levels recommended for human health¹⁷⁶, and premature death due to air pollution is higher in Serbia than all Balkan countries¹⁷⁷. Air pollution consists of both ambient (outdoor) and indoor air pollution. It is estimated that 6,600 deaths were attributed to both ambient and indoor air pollution in Serbia in 2016¹⁷⁸. Globally, about 9% of deaths due to air pollution are children¹⁷⁹.

Exposure

In Serbia, existing inequalities stemming from socioeconomic conditions and access to electricity considerably influence the extent to which children are exposed to indoor and ambient air pollution. Children's exposure also depends on the time they spend indoors in the presence of burning fuels, and outdoors in urban areas, where air quality is poorer.



Firstly, children's location largely determines their exposure to air pollution. Children in urban areas are likely to experience higher ambient air pollution as a result of fossil fuel combustion for energy production, transport, and waste management. In particular, the cities of Belgrade, Smederevo, Lazarevac, Obrenovac, Užice, Valjevo and Kragujevac, Niš, and Novi Sad have higher concentrations of PM and nitrous oxides, which are common air pollutants¹⁸⁰. Specifically, concentration of PM10¹⁸¹ exceed permissible limits in many areas, including Belgrade and Niš. The highest concentrations of PM10 are in Rajka and Čoka, where concentrations exceeded permissible limits by over 50%¹⁸².



Conversely, children with lower economic status and without access to electricity are more likely to experience indoor air pollution as a result of using alternative fuels (such as wood, coal, and even waste) for cooking or heating.



Consumption of alternative fuels is especially prominent in rural areas, where over half of the population relies on solid fuels for cooking¹⁸³, as well as among Roma populations or migrants living in temporary settlements¹⁸⁴, and those living in poverty.



Time spent indoors and nearby sources of air pollution, such as stoves, also increases exposure to air pollution. In dwellings with poor ventilation, which is more likely to be the case in substandard housing and settlements, emissions of fine PM and other pollutants from stoves can reach 100 times the maximum recommended exposure level¹⁸⁵. Within households, women, girls and babies are likely to have greater exposure to indoor air pollution, as they are typically responsible for household tasks, such as cooking, increasing their direct exposure to these pollutants¹⁸⁶.

Vulnerability

Younger children are more vulnerable to the effects of ambient and household air pollution, as children under 5 have much higher mortality rates (8.8 of every 100,000 children) than children aged 5–14 (0.6 of every 100,000 children), based on data for low-middle income countries in the European region¹⁸⁷. The health effects of air pollution on children are further exacerbated by existing inequalities related to health, ability, and economic status, as described below.

- ¹⁷⁶ Health impact of ambient air pollution in Serbia, WHO (2019). Available at: https://serbia.un.org/sites/default/files/2019-10/Health-impact-pollution-Serbia_0.pdf
- ¹⁷⁷ Chronic coal pollution, Europe Beyond Coal Campaign (2019). Available at: <https://www.env-health.org/wp-content/uploads/2019/02/Chronic-Coal-Pollution-report.pdf>
- ¹⁷⁸ Health impact of ambient air pollution in Serbia, WHO (2019). Available at: https://serbia.un.org/sites/default/files/2019-10/Health-impact-pollution-Serbia_0.pdf
- ¹⁷⁹ Air pollution and child health, WHO (2018). Available at: https://www.who.int/ceh/publications/Advance-copy-Oct24_18150_Air-Pollution-and-Child-Health-merged-compressed.pdf?ua=1
- ¹⁸⁰ Health impact of ambient air pollution in Serbia, WHO (2019). Available at: https://serbia.un.org/sites/default/files/2019-10/Health-impact-pollution-Serbia_0.pdf
- ¹⁸¹ PM10 refers to particulate matter with a size of <10 microns, which can be inhaled into the lungs and cause adverse health effects
- ¹⁸² Health statistical yearbook of Republic of Serbia, Institute of Public Health of Serbia (2019). Available at: <http://www.batut.org.rs/download/publikacije/pub2019a.pdf>
- ¹⁸³ Study on the socio-economic aspects of climate change in the Republic of Serbia, UNDP (2019). Available at: <https://www.rs.undp.org/content/dam/serbia/Draft%20Study%20on%20Socio-economic%20aspects%20of%20climate%20change%20in%20Serbia.pdf>
- ¹⁸⁴ Air pollution and child health, WHO (2018). Available at: https://www.who.int/ceh/publications/Advance-copy-Oct24_18150_Air-Pollution-and-Child-Health-merged-compressed.pdf?ua=1
- ¹⁸⁵ Air pollution and child health, WHO (2018). Available at: https://www.who.int/ceh/publications/Advance-copy-Oct24_18150_Air-Pollution-and-Child-Health-merged-compressed.pdf?ua=1
- ¹⁸⁶ Air pollution and child health, WHO (2018). Available at: https://www.who.int/ceh/publications/Advance-copy-Oct24_18150_Air-Pollution-and-Child-Health-merged-compressed.pdf?ua=1
- ¹⁸⁷ Air pollution and child health, WHO (2018). Available at: https://www.who.int/ceh/publications/Advance-copy-Oct24_18150_Air-Pollution-and-Child-Health-merged-compressed.pdf?ua=1

The impacts of air pollution on children are predominantly health-related. Poor air quality causes respiratory illness, such as asthma, bronchitis and broncho-pneumonia, as well as longer-term effects like diabetes and cardiovascular conditions (arrhythmias, cardiac failure, and stroke), and impaired physical or cognitive development. Therefore, children who are most vulnerable to these effects are those with pre-existing health conditions or disabilities, specifically respiratory (asthma, chronic obstructive pulmonary disease¹⁸⁸) and cardiovascular disease, and cognitive, mental health or behavioural challenges¹⁸⁹. Of these pre-existing conditions, asthma is the most commonly linked with increased vulnerability to air pollution in children.

Expert interviews indicated that children from poorer families are less likely to attend kindergarden, which could exacerbate impacts of impaired cognitive development due to long-term exposure to air pollution. Children in Roma settlements are also particularly susceptible to physical and cognitive impacts due to lower education rates, as described in the Spotlight, below. Children living in poverty also have lower resilience to cope with the effects of air pollution, as they have more limited access to information and healthcare resources¹⁹⁰.

COVID-19 and air pollution



A growing body of research suggests that populations which are more exposed to severe air pollution could have heightened vulnerability to COVID-19, as they could contract the disease more quickly and have a more severe reaction once the disease is contracted. This is largely due to the fact that they are more likely to have chronic respiratory conditions and are more susceptible to infections¹⁹¹. The most concerning findings indicate that those living in more polluted areas are far more likely to die from coronavirus¹⁹². While these studies do not focus specifically on children and more research is required to draw conclusions, children

living in areas or homes with high levels of air pollution, and children who experience resulting health conditions, may face increased risks associated with COVID-19.

Spotlight on children living in Roma settlements

Why children living in Roma settlements?

Children living in Roma settlements¹⁹³ are particularly vulnerable to CE hazards, as they experience multidimensional inequalities resulting from social exclusion, lack of financial resources, and cultural practices and beliefs. This spotlight focuses on the circumstances that increase children's exposure and vulnerability to, and decrease their resilience to cope with, the effects of flooding and air pollution.

How are they impacted differently?

About 40% of the Roma population lacks access to secure housing, often residing in settlements¹⁹⁴. Children living in Roma settlements typically lack access to improved sanitation, potable drinking water and electricity. Their homes are often substandard and some are built in flood-prone areas¹⁹⁵, increasing the risks of injury/mortality or displacement due to damaged or destroyed homes¹⁹⁶ during flooding. During the 2014 floods, about 2,600 Roma children had their homes damaged or destroyed¹⁹⁷. Living in informal settlements also reduces their access to improved sanitation, which stands

¹⁸⁸ Health effects of outdoor air pollution: Approach to counseling patients using the Air Quality Health Index, Abelson (2011). Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3155438/>

¹⁸⁹ Who's at Risk? Gauging Susceptibility to Air Pollutant, Mead (2011). Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3080959/>

¹⁹⁰ Air pollution and child health, WHO (2018). Available at: https://www.who.int/ceh/publications/Advance-copy-Oct24_18150_Air-Pollution-and-Child-Health-merged-compressed.pdf?ua=1

¹⁹¹ Western Balkans Regular Economic Report: The economic and social impact of COVID-19 — Air pollution challenges, World Bank Group (2020). Available at: <http://documents1.worldbank.org/curated/en/590751590682058272/pdf/The-Economic-and-Social-Impact-of-COVID-19-Education.pdf>

¹⁹² <https://www.theguardian.com/environment/2020/apr/07/air-pollution-linked-to-far-higher-covid-19-death-rates-study-finds>

¹⁹³ In the case where statistical data refers specifically to "children living in Roma settlements", this term is used in place of "Roma children". Therefore, a combination of "Roma children" and "children living in Roma settlements" is used aligned with the reports cited. This reflects that children living in Roma settlements are found to experience unique vulnerabilities based on their environment regardless of their ethnicity.

¹⁹⁴ Serbia floods 2014, UN, World Bank Group (2014). Available at: <http://www.obnova.gov.rs/uploads/useruploads/Documents/RNA-REPORT-140714.pdf>

¹⁹⁵ Assessment of the situation in substandard Roma settlements in 21 municipalities in Serbia, Jovanovic (2014). Available at: <https://www.osce.org/files/f/ documents/0/5/162221.pdf>

¹⁹⁶ Serbia floods 2014, UN, World Bank Group (2014). Available at: <http://www.obnova.gov.rs/uploads/useruploads/Documents/RNA-REPORT-140714.pdf>

¹⁹⁷ Ibid.

at about 70% for the Roma population, compared to over 90% for the rest of Serbia, and many have inadequate access to potable water. Similarly, 37% of all Roma households in settlements do not have adequate access to drinking water at home, compared to 8% of the general population¹⁹⁸, increasing the likelihood that they contract communicable diseases from contaminated water after a flood. The lack of energy access among children living in Roma settlements also introduces health risks associated with indoor air pollution, as their households have a higher proportion (about 50%¹⁹⁹) of burning alternative fuels for heating and cooking.

In addition to a lack of access to drinking water and sanitation and exposure to air pollution, children living in Roma settlements have immune systems that are further compromised by significantly lower vaccination rates and higher instances of malnutrition. These effects are primarily seen in children from 0–5 years of age. About 60% of children living in Roma settlements have full immunization coverage²⁰⁰, compared with 80% for the rest of the child population²⁰¹, and children living in Roma settlements have higher instances of stunting²⁰² (17%, compared to 5% among the rest of the child population²⁰³) up to five years of age compared to the rest of the Serbian population, mainly as a result of the poor economic situation of their families²⁰⁴. Not only does this compromise their immune system to fight off diseases, but it leaves them at greater risk of malnutrition in the event that food supplies are restricted due to contamination from flooding, and at greater risk of illness or decreased height and weight due to air pollution. Built-in forms of discrimination can exacerbate these effects by restricting Roma access to food supplies in emergency situations. For instance, after the 2014 floods, food was distributed firstly among working population²⁰⁵, which largely excludes the Roma population.

As a result of these inequality dimensions, are more likely to live in poverty, making them less capable of coping with the health impacts of flooding or air pollution. Financial strains and existing practices of child labour, child marriage, and domestic violence increase children's exposure to protection risks, particularly those living in Roma settlements. Child labour, exploitation and child marriage may be seen as a means to recover financially, as children in Roma communities are currently engaged in forced begging and commercial sexual exploitation at higher rates²⁰⁶. Child marriage is especially prominent among children living Roma settlements, particularly for adolescent girls, where 41% of girls from the poorest households are married before the age of 19²⁰⁷. Often, child marriage also leads to increased rates of domestic and gender-based violence, which Roma women experience from their husbands and in-laws, since they typically live together in one household²⁰⁸. Children living in Roma settlements are also at greater risk of domestic

Children in Roma settlement in Serbia

Retrieved from: <http://europa.rs/8-april-international-roma-day/?lang=en>



¹⁹⁸ <https://rm.coe.int/third-report-on-serbia/16808b5bf4>

¹⁹⁹ Assessment of the situation in substandard Roma settlements in 21 municipalities in Serbia, Jovanovic (2014). Available at: <https://www.osce.org/files/f/ documents/0/5/162221.pdf>

²⁰⁰ Defined as receiving all vaccines recommended in Serbia, at any time before the survey, excluding the vaccine against pneumococcal infections / disease and revaccinations

²⁰¹ Statistical Snapshot: Serbia Multiple Indicator Cluster Survey 2019, UNICEF et al (2019). Available at: https://mics-surveys-prod.s3.amazonaws.com/MICS6/Europe%20and%20Central%20Asia/Serbia%20%28Roma%20Settlements%29/2019/Snapshots/Serbia%20%28National%20and%20Roma%20Settlements%29%202019%20MICS%20Statistical%20Snapshots_English.pdf

²⁰² Refers to a child that is too short for their age

²⁰³ <https://rm.coe.int/third-report-on-serbia/16808b5bf4>

²⁰⁴ Voluntary national review of the Republic of Serbia on the implementation of the 2030 agenda for sustainable development, Republic of Serbia (2019). Available at: https://sustainabledevelopment.un.org/content/documents/23471Serbia_VNR_Report_2019_final.pdf

²⁰⁵ Serbia floods 2014, UN, World Bank Group (2014). Available at: <http://www.obnova.gov.rs/uploads/useruploads/Documents/RNA-REPORT-140714.pdf>

²⁰⁶ https://www.dol.gov/sites/dolgov/files/ILAB/child_labor_reports/tda2018/Serbia.pdf

²⁰⁷ Multiple Index Cluster Survey (MICS 6), Serbia, UNICEF (2019): Available at: <https://www.unicef.org/serbia/en/MICS6-Multiple-Indicator-Cluster-Survey-for-2019>

²⁰⁸ Child marriage in Serbia: Analytical report, UNICEF (2016). Available at: https://www.unicef.org/serbia/sites/unicef.org.serbia/files/2018-04/Child_marriage_in_Serbia.pdf

violence, as children from 1–14 years old experience much higher instances of psychological aggression or physical punishment than non-Roma children²⁰⁹. These protection risks extend beyond Roma children’s home and community. In the event that Roma children are forced to migrate due to damage of their home, or reduced availability of resources, they may face a greater risk of violence, as Roma are common targets of discrimination and societal violence against minorities in Serbia²¹⁰.

The health impacts and protection risks that Roma children experience can have potential lifelong implications. Malnutrition and frequent illness lead to irreversible effects on healthy brain and physical development, higher susceptibility to chronic illness, and reduced schooling and income during adulthood²¹¹, further perpetuating the cycle of inequality. These children are also significantly less likely to restore any lost learning as a result of the effects of air pollution and/or flooding, such as absence due to illness, impaired cognitive development, and school closures, as they have much lower school completion rates at both the primary and secondary level. Primary school completion rates are much lower (64%) compared with the rest of the child population (nearly 100%). Most notably, girls living in Roma settlements complete secondary school at lower rates than their male counterparts, at an average ratio of 0.89:1²¹². This is largely due in to the prevalence of child marriage in the Roma community (up to 43% drop out to get married) and the perception is that education is an unnecessary resource, particularly for girls²¹³. These disproportionate impacts to the health, education and protection of children living on Roma settlements can perpetuate inequalities in the long term by increasing their social isolation and reducing their ability to secure employment and lift themselves out of poverty.



²⁰⁹ https://www.dol.gov/sites/dolgov/files/ILAB/child_labor_reports/tda2018/Serbia.pdf

²¹⁰ Situation analysis of children and adolescents in Serbia, UNICEF (2019). Available at: https://www.unicef.org/serbia/sites/unicef.org.serbia/files/2020-01/SitAn_2019.pdf

²¹¹ <https://www.who.int/nutgrowthdb/about/introduction/en/index2.html>

²¹² https://www.dol.gov/sites/dolgov/files/ILAB/child_labor_reports/tda2018/Serbia.pdf

²¹³ Child marriage in Serbia: Analytical report, UNICEF (2016). Available at: https://www.unicef.org/serbia/sites/unicef.org.serbia/files/2018-04/Child_marriage_in_Serbia.pdf

CONCLUSION

Serbia's lack of infrastructure and presence of heavy-polluting industry, combined with the effects of climate change, contribute to the presence of CE hazards in the country. These hazards have already, and will continue to, have significant and widespread impacts on children's health, access to services, nutrition, and protection. The most notable event-based CE hazards are flooding, drought and wildfire, as well as extreme temperatures, whereas air pollution and hazardous chemicals are the most significant persistent CE hazards.

Children can experience injury or mortality, mental stresses, and illness from extreme weather events and conditions. Further, they can contract diseases from exposure to pathogens, and experience impaired development or chronic illnesses from exposure to air pollution and hazardous chemicals. These health impacts can have potential lifelong implications for their development and future opportunities, which are exacerbated by disruptions in food availability, and reduced access to education and healthcare that result from extreme weather events. Children also face protection risks during and after extreme weather events that result in loss of shelter, loss of livelihood, and/or increased resource scarcity.

Not all children in Serbia will experience these effects equally. Based on the case study findings, children with disabilities and pre-existing health conditions, rural children, migrants, and girls will

experience more significant impacts from CE hazards, specifically flooding and air pollution. Children living in Roma settlements are particularly at risk due to multidimensional aspects of inequality. They are physically more vulnerable, with higher instances of stunting and low immunization rates, and vulnerable to protection risks due to their low economic status and existing practices and beliefs among their community. The lack of financial resources makes children living in Roma settlements less resilient to these effects; coupled with significantly lower levels of school completion, CE hazards can contribute to the persistence of multigenerational inequalities experienced by children living in Roma settlements. The persistent and worsening nature of CE hazards over time, combined with disproportionate impacts to the abovementioned vulnerable groups, threaten to deepen existing inequalities among children in Serbia. Unless targeted action is taken to mitigate these CE hazards and proactively address impacts, specifically focusing on these vulnerable groups, children will continue to be at risk.

This chapter provided an overview of the main CE hazards and the linkages with children's well-being and inequality in Serbia. The following two chapters will examine the extent to which relevant action is being taken by Serbia's public sector, private sector and international financiers to address CE hazards and the impacts on children.





PUBLIC SECTOR ENGAGEMENT

This chapter provides an overview of the policy landscape, strategic framework, and funding allocation from the public sector toward climate and environment initiatives and assesses existing gaps and the potential costs of inaction on children.

OVERVIEW OF PUBLIC SECTOR ENGAGEMENT

This chapter will explore the ways in which Serbia's public sector is engaged on CE, focusing on the hazards affecting children covered in Chapter 1. First, the chapter will provide an overview of Serbia's political and economic context and priorities related to CE. Then, it will summarize the governance structure, policy framework and budget allocations that constitute the environment for action on these CE priorities. Focusing on children, the chapter then analyzes the implications and costs of inaction on CE and outlines financial and administrative constraints that may act as barriers to enhancing Serbia's future child-sensitive CE agenda.

Current priorities

Economic development is often perceived to conflict with CE action, as it is linked with higher GHG emissions²¹⁴ and environmental degradation due to industrial activity. This dichotomy is especially apparent in Serbia, where a heavy economic reliance on coal mining and fossil-fuel based energy generation²¹⁵ creates barriers to prioritizing CE action. Driven by a

number of recessions in the past decade²¹⁶ and the desire to achieve growth, Serbia often prioritizes economic development above CE action. For instance, the Government of Serbia's Serbia 2025 Agenda is heavily focused on economic development through infrastructure and agricultural development. While social topics such as health and education are incorporated, there is no evidence of a focus on CE topics²¹⁷. Similarly, existing efforts to realize the UN's 2030 Agenda prioritize economic and financial stability²¹⁸ with limited focus on inclusive and green growth. As recently announced, the priorities of the new 2020 government continue the prioritization of European integration and economic growth²¹⁹. While both of these priorities have implications for CE progress, connections between the spheres of economy, CE and vulnerable populations have not been specifically identified.

Despite the relative prioritization of economic development, Serbia has created an enabling environment to address critical CE hazards and contributing factors that were found to impact children in Chapter 1, including: air pollution, the

²¹⁴ <https://donortracker.org/insights/financing-future-climate-finance-and-role-oda>

²¹⁵ Key stakeholder interview

²¹⁶ Republic of Serbia Country Partnership Framework 2016–2020, World Bank Group (2015). Available at: <http://pubdocs.worldbank.org/en/111121446462343202/Serbia-CPF-eng-web.pdf>

²¹⁷ <https://www.predsednik.rs/en/press-center/news/presentation-of-the-programme-serbia-2025#:~:text=%22We%20will%20make%20our%20country,public%20enterprises%20and%20a%20sustainable;https://www.srbija.gov.rs/vest/en/162061/serbia-2025-priority-programme-for-new-government.php>

²¹⁸ Voluntary national review of the Republic of Serbia on the implementation of the 2030 agenda for sustainable development, Republic of Serbia (2019). Available at: https://sustainabledevelopment.un.org/content/documents/23471Serbia_VNR_Report_2019_final.pdf

²¹⁹ <https://www.srbija.gov.rs/vest/en/162304/composition-of-new-serbian-government-to-be-presented-in-coming-days.php>

need for water, wastewater and waste infrastructure (i.e., environmental infrastructure), and resilience to extreme events, such as flooding. Related to these CE hazards, public sector engagement is also aligned with international conventions. With European integration as a strategic goal and the key foreign policy priority of Serbia, the government is working toward transposing EU laws on critical CE topics such as energy, air pollution, waste management, water quality and industrial pollution²²⁰. In addition, Serbia is actively contributing to global efforts on GHG emissions reduction, most notably through ratification of the Paris Agreement in 2017. Under the Paris Agreement, Serbia is committed to reduce its GHG emissions by 9.8% by 2030 compared to 1990 levels²²¹.

Governance structure

Current responsibilities related to the planning, implementation and oversight of CE initiatives are divided between Serbia's national and local governments²²², as well as state agencies and public enterprises²²³.

Serbia's national government focuses on implementing strategies to meet national CE objectives in alignment with international conventions and EU accession. As a cross-cutting issue, responsibilities span multiple government ministries, with the Ministry of Environmental Protection and its legal entity, the Environmental Protection Agency, as the main parties leading Serbia's CE agenda. Noteworthy responsibilities of the Ministry of Environmental Protection include implementation, monitoring

and reporting on air quality in alignment with EU Directives, and overseeing reporting to UN Framework Convention on Climate Change (UNFCCC) on progress against the Paris Agreement targets. Within the Ministry of Environmental Protection, there are multiple assistant ministers dedicated to specific focus areas, such as waste and wastewater management, nature protection, financial management, and European integration.

In addition to the Ministry of Environmental Protection, responsibilities related to CE initiatives are divided among a number of other relevant ministries, such as the Ministry of Agriculture, Forestry and Water Management, Ministry of Mining and Energy²²⁴ and Ministry of Health, which have various roles related to the development and implementation of relevant policy and strategic frameworks, while the Ministry of Finance oversees funding and budgeting for CE initiatives²²⁵. In addition, the Ministry of Youth and Sport has supported some projects in the past five years related to environmental education, volunteerism, and activism²²⁶. Additionally, the Ministry of Interior also leads the National Emergency Management Headquarters Disaster Risk Reduction and Emergency Management System, which includes response to extreme weather events²²⁷. Complementary to these efforts, the Public Investment Management Office (PIMO) is the national government body responsible for managing reconstruction and aid following emergency situations, most notably post-flood reconstruction²²⁸. Under the same umbrella, PIMO has been designated to implement

²²⁰ Serbia 2020 Report, European Commission (2020). Available at: https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/serbia_report_2020.pdf

²²¹ Walking in the mist: Shadow Report on Chapter 27, Koalicija29 (2020). Available at: <https://www.koalicija27.org/wp-content/uploads/2020/10/report-2020.pdf>

²²² This includes autonomous provinces and municipalities.

²²³ Public enterprises primarily refer to local public utility companies.

²²⁴ Investments in environmental protection: a social and fiscal priority, Republic of Serbia Fiscal Council (2019): Available at: <http://www.fiskalni.savet.rs/doc/eng/FC%20-%20Investments%20in%20environmental%20protection.pdf>

²²⁵ Interview with key stakeholder

²²⁶ Ibid.

²²⁷ Comprehensive analysis of the disaster risk reduction and management system for the agricultural sector in Serbia, FAO (2018). Available at: <http://www.fao.org/3/I8364EN/i8364en.pdf>

²²⁸ <http://www.obnova.gov.rs/english/about-us>

government programs related to energy efficiency of public buildings²²⁹. Separately, the Ministry of Labour, Employment, Veterans and Social Affairs and Ministry of Family Care and Demography are responsible for social protection. Finally, school curricula and teacher training fall under the responsibilities of the Ministry of Education, Science and Technological Development. For example, Disaster risk reduction (DRR) and CE-related courses²³⁰ have been introduced into curricula.

In October of 2020, Serbia's new government announced new ministries that address matters related to children and vulnerable groups: The Ministry of Family Welfare and Demography and Ministry for Human and Minority Rights and Social Dialogue. The former is responsible for matters related to population, reproductive health, family and children, and is expected to oversee matters such as financial assistance for families with children²³¹. The latter oversees state administration related to human rights, gender equality and anti-discrimination²³². Given that these ministries have been formed recently, additional details on their agendas are still forthcoming; yet it is expected they these agendas will have implications on the extent to which children are affected by CE.

Recognizing that CE topics require cross-functional engagement, Serbia has also formed inter-ministerial working groups to facilitate alignment with international protocols, although their functions are limited. The Inter-Ministerial Working Group on the Implementation of the UN Agenda for Sustainable Development by 2030, was established in 2015 to coordinate government policies to implement Agenda 2030 and achieve the

SDGs. Similarly, the National Climate Change Committee was formed in November 2014 to monitor the fulfillment of UNFCCC commitments²³³.

Topics of children's health, education and social protection are housed in separate ministries at both the national and local level. Nationally, the Ministry of Labor, Employment, Veteran and Social Affairs carries out tasks related to family protection, gender equality, and the protection of vulnerable groups, such as Roma and persons with disabilities²³⁴. Local self-governments and public enterprises are responsible for the provision of water and waste services, and implementation of initiatives related to air quality monitoring, energy efficiency (EE) and disaster risk management²³⁵. Yet, in local government services, children are not given special consideration apart from being identified as part of vulnerable communities at higher risk. For example, the majority of municipalities have begun to establish flood risk assessments, which identify children as a vulnerable group (in addition to others such as Roma, those with disabilities, etc.) that require special consideration²³⁶.

While the roles and responsibilities related to CE and children are well-defined between different levels of government, the existing governance structure segregates various focus areas. Particularly, CE matters and social matters focused on vulnerable groups and children are handled by separate bodies. There is no evidence of mechanisms to support collaboration between these bodies, which prevents a holistic approach from being taken²³⁷.

²²⁹ <http://documents1.worldbank.org/curated/en/379321509847225185/pdf/Serbia-PfR-PAD-10162017.pdf>

²³⁰ The World around Us, Nature and Society, and a new Education for Sustainable Development course for high school students

²³¹ Interview with key stakeholder

²³² <https://www.propisi.net/zakon-o-ministarstvima/>

²³³ Interview with key stakeholder

²³⁴ <https://www.devex.com/organizations/ministry-of-labor-employment-veteran-and-social-affairs-molevsa-serbia-128290>

²³⁵ Local governments are required to manage flood risk and emergency management coordination activities.

²³⁶ Interview with key stakeholder

²³⁷ The governance structure described below is subject to change in the coming months due to the change in government as a result of the June 2020 election.

Environment for CE action

Serbia's public sector has created an enabling environment for action on CE hazards through the development and implementation of: i) legal and strategic frameworks (e.g., laws, policies, strategies, programmes, and action plans), and ii) funding allocation. The following sections analyze the overarching policies, noteworthy strategies and action plans, and funding allocations related to the critical CE hazards covered in Chapter 1. Based on this overview, gaps and areas for improvement are also highlighted. A more detailed summary of noteworthy legal and strategic frameworks and funding can also be found in Annex B: Supplementary data for Chapter 2.

Legal and strategic frameworks

Serbia is currently strengthening its CE policies and strategic frameworks to align with EU requirements. To this effect, the country's policies and strategic frameworks align with the critical CE hazards impacting children, such as air pollution and flooding, and contributing factors, such as environmental infrastructure gaps and industrial pollution. While enabling laws and plans are current and aligned with the critical CE hazards in the country, they are not fully harmonized with one another or incumbent plans and policies, and consideration of vulnerable groups is limited and nascent.

Overall, the policy environment is focused predominantly on water and air quality, waste management, EE²³⁸, and disaster risk management. Targeted laws, such as the Law on Environmental Protection, the Law on Water, the Law on Waste Management and the Law on Climate Change broadly mandate the protection of the environment, including land, air, water and biota, through pollution

prevention. Disaster risk management has also gained significant focus at the national and local level, largely spurred on by the 2014 floods. To increase resilience to extreme events such as floods, landslides and wildfire, Serbia developed the National Disaster Risk Management Programme (NDRMP) and action plan (2016–2020). At the local level, the city of Belgrade also published a Climate Change Adaptation Action Plan and Vulnerability Assessment, which outlined and prioritized climate change adaptation measures to increase resilience to CE hazards.

Within the current CE agenda, there are instances of misalignment between CE strategies and action plans, such as those related to energy and climate change. Further, CE strategies and action plans are not harmonized with existing policies and strategic frameworks on related topics. In particular, there are a number of strategies and supporting action plans that target the energy sector, although they are fragmented. The Energy Development Strategy 2025, National Emission Reduction Plan (NERP)(2020), and National Renewable Energy Action Plan (until 2020), are aimed at reducing GHG emissions and air pollution associated with energy production in the country. With the same overarching goal, these strategies and action plans each focus on particular areas of a sectoral challenge, as opposed to integrating into a holistic plan. Lastly, the European Commission (EC) has found that Environmental Impact Assessment (EIA) legislation is not harmonized with relevant existing laws, particularly the law on planning and construction²³⁹.

As mentioned previously, vulnerable groups are beginning to be considered in the CE agenda, although this is limited and nascent. The needs of vulnerable groups are recognized and addressed in several

²³⁸ Energy efficiency is not part of the environmental sector policy environment, but does have implications for CE hazards in Serbia, such as air pollution

²³⁹ Serbia 2020 Report, European Commission (2020). Available at: https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/serbia_report_2020.pdf

strategies in other sectors, yet these are not linked with the CE agenda. Within the CE agenda, consideration of vulnerable groups is in early stages and predominantly gender focused. The National Gender Equality Strategy (2016–2020) recognizes lower education rates and child marriage among Roma girls, as well as gender-based violence more broadly. Similarly, the Strategy for the Social Inclusion of Roma for the period (2016–2025), is designed to address education, housing conditions, employment, access to healthcare, and access to financial aid. While addressing these issues would improve resilience to CE hazards among vulnerable populations, these linkages are not recognized; more work is needed to integrate targeted action to address these vulnerabilities into the CE agenda.

More recently, CE has been linked with gender in the public sector. The Draft Gender and Climate Change Monitoring Framework provides guidance on gender mainstreaming in reporting on climate change. Moreover, the government has begun to focus on gender mainstreaming in CE at the national level. To begin, UNECE will be providing training and resources to support gender integration into environmental policies (e.g., related to air pollution, water and waste) for all staff of the Ministry of Environmental Protection in late November 2020. Going forward, there are plans to expand these efforts to increase leadership of women decision makers in environmental sector, raise awareness at the local level about gender and CE, conduct a gender analysis of existing financial mechanisms for CE (e.g., EE), and introduce gender mainstreaming into local policies and strategies. Similarly, United Nations Development Programme (UNDP) has supported the government in introducing gender considerations into climate action at both the local and national level through policy analyses and capacity building, focusing on topics such as increased vulnerability to extreme weather events²⁴⁰.

²⁴⁰ Interview with key stakeholder

Funding allocation

In Serbia, the main source of public sector funding toward CE is the national budget, followed by local budgets, which are earmarked for environmental protection²⁴¹. This funding is derived largely from environmental taxes and fees charged by the government for activities that result in environmental pollution, emissions, use of resources and waste disposal. To collect and house these fees, Serbia reestablished the Green Fund in late 2016 (activated in 2018)²⁴².

In 2018, revenues from environmental fees amounted to 14 billion Serbian Dinar (RSD) (about EUR 120 million, or 0.28% of gross domestic product (GDP))²⁴³. This same year, expenditures from the national budget towards environmental protection amounted to 15.2 billion RSD (about EUR 129 million, or 0.3% of GDP); about 0.1% of GDP came from the national budget while 0.2% of GDP were expenditures at the local level²⁴⁴. It was noted that RSD 6.3 billion was collected in environmental fees in 2019²⁴⁵, though it is unclear how much went toward environmental protection. On the other hand, the Ministry of Environmental Protection was allocated 7.9 billion RSD²⁴⁶ in 2020, though these funds were later constrained due to the COVID-19 pandemic, described in greater detail in the Spotlight below.

²⁴¹ National data categorizes investments as “environmental protection”. When referring to national or local government documents and budgets, the term “environmental protection” will be used in place of CE in order to remain consistent with official terminology in Serbia.

²⁴² The Fund for Environmental Protection was in place from 2009–2012, which operated similarly to the Green Fund wherein taxes and fees were collected for the purpose of environmental protection

²⁴³ Report on Economic Instruments for Environmental Protection, Republic of Serbia Ministry of Environmental Protection (2018). Available at: http://www.sepa.gov.rs/download/Ekonomski_Instrumenti_2018.pdf

²⁴⁴ <https://www.devex.com/organizations/ministry-of-labor-employment-veteran-and-social-affairs-molevs-a-serbia-128290>

²⁴⁵ Serbia 2020 Report, European Commission (2020). Available at: https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/serbia_report_2020.pdf

²⁴⁶ COVID-19: Socio-economic impact assessment, UN Serbia and UNDP (2020). Available at: https://serbia.un.org/sites/default/files/2020-09/serbia_report%20%281%29.pdf

Spotlight on the impact of the COVID-19 pandemic on funding for CE



In 2020, allocated funds for environmental protection were reduced from the original budget plan due to the COVID-19 pandemic. To prepare for the economic impacts of the pandemic, all areas of Serbia's national budget were reduced by 20% in April of 2020, resulting in a reduction of the Ministry of Environmental Protection budget from 7.9 billion RSD to 6.4 billion RSD²⁴⁷. The effects of these budgetary cuts will likely be exacerbated by uncollected environmental taxes and fees under the circumstances of the COVID-19 pandemic, further limiting available funding. Resulting financial and administrative constraints are also expected to delay planned investments for environmental and energy infrastructure²⁴⁸, which can have significant implications for Serbia's ability to meet its Paris Agreement targets and address CE hazards related to air pollution, waste management, and sanitation. Further, Serbia is not initiating a green recovery whereby financial assistance is contingent upon CE performance, which is being done in other jurisdictions such as the EU.

Public access to documents on projects financed by the Green Fund is limited; however, there is evidence that these funds have been dedicated toward municipal landfill remediation, as well as afforestation²⁴⁹. At the national level, expenditures for environmental protection are divided into air protection, wastewater management, waste management, and other (i.e., remediation of land and water, noise protection and nature protection, etc.). According to the most recent data (from 2018), waste management makes up the large majority (69%) of total expenditures, followed by wastewater management (11.2%) and air pollution (3.8%)²⁵⁰. The breakdown of expenditures can also be found in Figure 18 in Annex B.

Focusing at the local level (based on a sample of 25 municipalities), within the umbrella of environmental protection, nature protection receives the most funding (31%), followed by waste management (23%),

wastewater management (14%) and research and development (10%), as outlined in Table 1 below. As a percentage of total expenditure at the municipal level, environmental protection has increased from 2.6% to 4.3% on average from 2016–2018. However, there is significant variability among municipalities, indicating that the level prioritization CE receives at the local level is quite varied. Some locations with higher spend, such as Pančevo and Novi Sad, are likely dedicating funds to rehabilitation and clean-up activities due to active petrochemical and refinery activities, respectively. On the other hand, locations such as Uzice and Šabac are investing in large environmental infrastructure projects, such as sanitary landfills and wastewater treatment facilities. Notably, Beograd has the second highest overall expenditure, only 1.7% of which is allocated toward environmental protection, demonstrating a relatively low prioritization of CE in terms of spend. These findings are summarized in Table 2 below.

²⁴⁷ Report on Economic Instruments for Environmental Protection, Republic of Serbia Ministry of Environmental Protection (2018). Available at: http://www.sepa.gov.rs/download/Ekonomski_Instrumenti_2018.pdf

²⁴⁸ Ibid.

²⁴⁹ Serbia 2020 Report, European Commission (2020). Dostupno na: https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/serbia_report_2020.pdf

²⁵⁰ Statistical Release: Expenditures for environmental protection 2018, Statistical Office of the Republic of Serbia (2019). Available at: <https://publikacije.stat.gov.rs/G2019/PdfE/G20191309.pdf>

Table 1 / Breakdown of CE expenditure at the municipal level by CE topic (2018)

CE topic	Million RSD			Percent (average over three years)
	2016	2017	2018	
Nature protection (flora, fauna, and landscape)	1,083	1,548	2,054	31
Waste management	968	927	1,636	23
Other	704	999	1,236	19
Wastewater management	350	579	1,233	14
Research and development	833	383	342	10
Pollution reduction	106	100	181	3
Total	4,044	4,536	6,681	100

Source: Local self-government expenditure data collected and provided by UNICEF Serbia

Table 2 / Environmental protection as a percentage of total expenditure for select municipalities (2018)

Municipality	Spend on environmental protection (Million RSD)	Total spend (Million RSD)	% of spend on environmental protection
Pančevo	802	5,047	15.9
Novi Sad	1,876	23,004	8.2
Užice	204	2,766	7.4
Valjevo	168	2,828	6.0
Šabac	250	4,704	5.3
Paraćin	44	1,416	3.1
Čačak	81	3,565	2.3
Subotica	116	5,672	2.0
Niš	149	7,798	1.9
Beograd	1,588	95,808	1.7

Source: Local self-government expenditure data collected and provided by UNICEF Serbia

In addition to environmental fees and taxes into the national budget, Serbia's funding for CE is supplemented by private sector and international support. This money is then disseminated to local governments to spend on localized CE priorities. As shown in Figure 7, below, international loans far surpass other sources of funding for environmental protection, demonstrating that this support heavily subsidizes the amount of funding available for investments in environmental protection. Specifically, as of 2018, the largest bilateral supporters for environmental protection in Serbia were the Federal

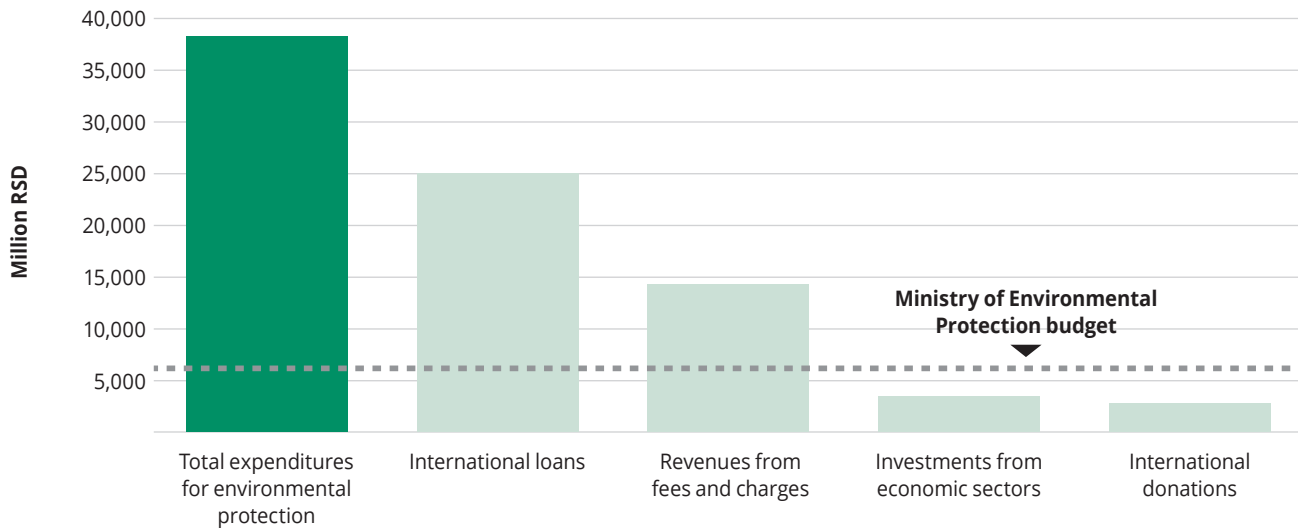
Republic of Germany (RSD 986 million, or EUR 8.4 million), Kingdom of Sweden (RSD 300 million, or EUR 2.6 million), and EU (RSD 289 million, or EUR 2.5 million)²⁵¹. The EU has also contributed significant funds under the Instrument for Pre-Accession (IPA), amounting to EUR 104 million toward CE in 2019²⁵². Interestingly, as shown in Figure 8, international loans

²⁵¹ Report on Economic Instruments for Environmental Protection, Republic of Serbia Ministry of Environmental Protection (2018). Available at: http://www.sepa.gov.rs/download/Ekonomski_Instrumenti_2018.pdf

²⁵² https://ec.europa.eu/neighbourhood-enlargement/instruments/funding-by-country/serbia_en

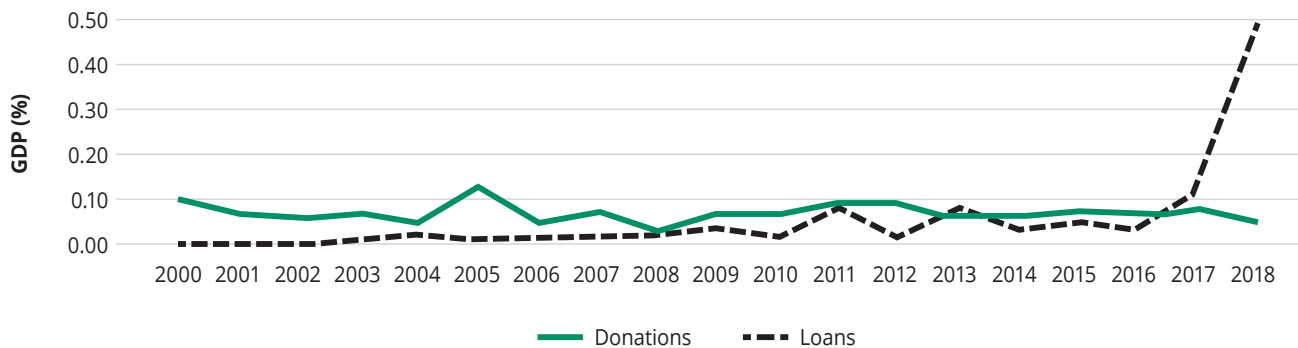
have only recently exceeded international donations for environmental protection, demonstrating a trend in relying more heavily on credit.

Figure 7 / Expenditures vs. funding sources for environmental protection in 2018



Source: Report on Economic Instruments for Environmental Protection, Republic of Serbia Ministry of Environmental Protection (2018). Available at: http://www.sepa.gov.rs/download/Ekonomski_Instrumenti_2018.pdf; and Chapter 27 in Serbia: Money Talks, Koalicija27 (2019). Available at: <https://www.koalicija27.org/en/publications/>. Note that 2018 data was used because this is the most recent year for which funding sources are publicly available.

Figure 8 / International financial support through donations and loans toward environmental protection (expressed in % GDP)



Source: Report on Economic Instruments for Environmental Protection, Republic of Serbia Ministry of Environmental Protection (2018). Available at: http://www.sepa.gov.rs/download/Ekonomski_Instrumenti_2018.pdf;

Alongside financial contributions, bilateral support and EU contributions aid in capacity-building within the public sector to design, manage and implement CE projects. Consistent with the figures above and based on publicly available data, Swedish International Development Cooperation Agency (SIDA), Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) and the EU provide important contributions in this area. Both SIDA and GIZ have supported the implementation of waste management projects, and the EU has developed management and operational capacity in public utility companies for both energy and wastewater projects²⁵³. These contributions also cover public consultation with vulnerable groups and children. SIDA has set an example for public consultation, focusing on including women and children through its work in the municipality of Mali Zvornik's knowledge on the environment and how to reduce landslides and flooding²⁵⁴. To this end, the EU also formally considers minorities and vulnerable groups in CE projects through its IPA²⁵⁵. It is therefore important to note that public sector engagement on CE does not happen in isolation; rather, it is supported, both financially and otherwise, by bilateral and international actors. These support mechanisms are described in greater detail in Chapter 3: Private sector and international financier engagement.

IMPLICATIONS FOR CHILDREN AND VULNERABLE GROUPS

Current state

Despite the fact that children are among the most vulnerable to CE hazards, child-rights focus in Serbia's CE planning is limited in scope. CE strategies commonly identify children as being vulnerable, particularly related to health impacts²⁵⁶, but there is limited evidence that action plans are adapted to account for these vulnerabilities. For example, Belgrade's Climate Change Adaptation Action Plan and Vulnerability Assessment identifies children as particularly vulnerable to extreme temperatures, drought and flooding, and Serbia's Draft National Program for Environment and Public Health (2020–2022)²⁵⁷ consider children under the age of five as particularly sensitive to environmental risk factors. The NDRMP demonstrates some child-sensitive planning, as it includes an action item to develop a population database of the most vulnerable populations, including children, youth, and persons with disabilities, in order to provide appropriate accommodation during a disaster²⁵⁸. The Ministry of Labour, Employment, Veteran and Social Affairs is currently implementing this action, referred to as a social registry, with the aim of prioritizing these most vulnerable groups in disaster relief efforts²⁵⁹. The government has also implemented child-sensitive CE projects that target vulnerable groups, most notably related to water and sanitation. For instance, the Action Plan to Ensure Equitable Access to Water and Sanitation in the Region of

²⁵³ Instrument for Pre-accession Assistance (IPA II) 2014–2020 — Serbia: EU for Environment and Climate action, European Commission (2018). Available at: https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/annexes/ipa_2018_-_05_eu_for_environment_and_climate_action.pdf

²⁵⁴ Environmental Performance Review: Serbia — third edition, UN Economic Commission for Europe (2015). Available at: https://www.unece.org/fileadmin/DAM/env/epr/epr_studies/ECE_CEP_174.pdf

²⁵⁵ https://ec.europa.eu/neighbourhood-enlargement/instruments/funding-by-country/serbia_en

²⁵⁶ Key stakeholder interview

²⁵⁷ This program was developed based on the Ostrava Declaration on Environment and Health. Member States are responsible for developing a national portfolio for action in seven priority areas and aligning with the European Environment and Health Process.

²⁵⁸ Action plan for the Implementation of the National Disaster Risk Management Programme (2016–2020), Republic of Serbia (2016). Available at: <https://www.cadri.net/sites/default/files/SERBIA-National-Plan-DRR-final-29-02-16-ENG.pdf>

²⁵⁹ Key stakeholder interview

Šumadija and Pomoravlje (2017)²⁶⁰ included a situation analysis on access to drinking water and sanitation for children in primary schools in rural areas to address data gaps²⁶¹.

To build upon existing efforts and enhance the consideration of children in Serbia's CE agenda, public consultation and engagement will be a key tool. However, children are not engaged via current mechanisms for public consultation. While there is currently an enabling policy framework²⁶² to promote public consultation and social impact assessment, the perspectives of youth and vulnerable groups are not always included during planning or impact assessment phases of projects. Accordingly, over 90% of youth surveyed through U-Report this year stated that governments are not doing enough to involve young people in climate change decision-making²⁶³. Additional studies have found that public participation of youth in decision-making processes related to environmental matters has been found to be inadequate²⁶⁴, which has been attributed to a lack of capacity to carry out public consultations²⁶⁵. This may also be due to the fact that EIA legislation does not prescribe consultation of children (or youth) in particular; the EC EIA Directives mandate that the "public concerned"²⁶⁶ is consulted,

but does not specify whether children, youth or vulnerable groups must be included. Similarly, the Law on Planning System indicates that "stakeholders and "target group"²⁶⁷ are consulted, without specification of children, youth or vulnerable groups²⁶⁸. Without consultation of children and vulnerable groups, their perspectives and unique challenges cannot be sufficiently integrated into the national CE agenda and will go unaddressed. The resulting consequences will lead to significant social and financial costs, now and in the years to come, for which today's children will bear the brunt. These costs are demonstrated below.

The costs of inaction

If the disproportionate impacts on children are not considered while developing a CE agenda, Serbia's children will continue to face health challenges, reduced access to basic services and protection risks as a result of CE hazards. These impacts harm children's overall well-being and can result in significant social and financial costs ('costs of inaction'). These costs of inaction on children are outlined through the analysis below. The analysis focuses specifically on air pollution and flooding due to the wide range of potential impacts on children from these CE hazards and greater data availability. Additional details on the methodology and assumptions used for this analysis can be found in Annex B: Supplementary data for Chapter 2.

Air pollution

Air pollution remains one of the major environmental issues in Serbia. Due to its implications on human health, air pollution results in significant downstream socio-economic costs. Socio-economic costs of environmental risks such as air pollution can be estimated and analyzed based on a standardized and

²⁶⁰ Action plan to ensure equitable access to water and sanitation in the region of Šumadija and Pomoravlje, Republic of Serbia et al. (2018). Available at: https://www.unece.org/fileadmin/DAM/env/water/activities/Equitable_access/Action_plan_Serbia_final_Ang_27_02.pdf

²⁶¹ Situation analysis of access to healthy drinking water and sanitation for children in primary schools in rural areas of the Šumadija and Pomoravlje Districts, Biljana Filipovic, Ministry of Agriculture and Environmental Protection (2016). Available at: https://www.unece.org/fileadmin/DAM/env/documents/2016/wat/11Nov_14-16_MOP4_PWH/Side_events/5_Biljana_Filipovic__Serbia.pdf

²⁶² This includes the Law on EIA, Law on Environmental Protection and Law on Integrated Environmental Pollution Prevention and Control.

²⁶³ U-Report Poll on Climate Change and U-Report Poll on Environment, UNICEF (2020). Provided by UNICEF

²⁶⁴ Prava deteta u oblasti životne sredine u Republici Srbiji (Children's rights in the field of environment in the Republic of Serbia), Ivana Savić (2012)

²⁶⁵ <https://www.srbija.gov.rs/vest/en/162304/composition-of-new-serbian-government-to-be-presented-in-coming-days.php>

²⁶⁶ The "public concerned" is defined as those who will be affected by, or have an interest in, environmental decision-making.

²⁶⁷ "Stakeholders" and "target group" are defined as authorities, organizations, natural and legal persons having an interest in public policy measures.

²⁶⁸ Law on the Planning System of the Republic of Serbia. Available at: <https://rsjp.gov.rs/wp-content/uploads/Law-on-Planning-System.pdf>

widely recognized methodology, data and definitions provided by the Organisation for Economic Co-operation and Development (OECD).

To calculate these socioeconomic costs, OECD first defines the following terms²⁶⁹:

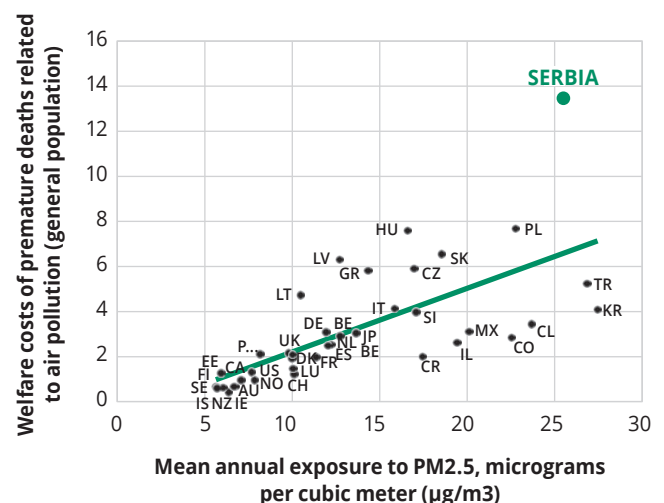
- **Premature deaths attributable to air pollution:** Air pollution, via particulate matter such as PM2.5²⁷⁰, can lead to harmful health effects on the cardiovascular system, respiratory system, and physical and cognitive development, as outlined in Chapter 1. This metric is a statistical estimate of the amount of premature deaths that occur in a population as a result of the health implications of air pollution. It is important to note that these values are based on disease rates, not actual records of deaths.
- **Value of a Statistical Life (VSL):** VSL can be understood as the cost that the population at large would be willing to pay to reduce the risk of mortality. It is important to emphasize that the VSL is not the value of an identified person's life, but rather an aggregation of individual values for small changes in risk of death. Essentially, it is a tool for cost-benefit analysis and a measure of the tradeoff between the costs of mortality, and the cost to reduce the risk of mortality. Additionally, using OECD methodology, VSL is a function of GDP; since Serbia has experienced economic challenges, its VSL is low compared to OECD and regional peers.
- **Welfare costs:** OECD uses welfare costs, hypothetical lost value resulted from failing to maintain quality of life, associated with premature

deaths as one of the key parameters to estimate the socio-economic cost of air pollution. This cost is calculated by multiplying number of premature deaths attributable to the air pollution with VSL through the equation below. Notably, it does not include any morbidity impacts (e.g., labour productivity losses, treatment costs and willingness to pay to avoid pain and suffering from illness, etc.). It also excludes impacts other than those on human health (e.g. on built structures, agricultural productivity, ecosystem health, etc.).

$$\text{Welfare cost} = \text{VSL} * \# \text{ premature deaths}$$

Generally, welfare cost due to air pollution will increase as air pollution levels and/or GDP increase. Figure 9 below illustrates mean annual exposure to ambient air pollution (in this case, PM2.5 particulates) and the resulting welfare costs related to premature deaths for the general population. The scale of air pollution exposure and the associated welfare cost is presented for OECD and Central and Eastern European (CEE) countries, including Serbia.

Figure 9 / Welfare cost of premature deaths. Total population, 2019, OECD countries and Serbia



Source: Deloitte analysis based on the OECD data

²⁶⁹ Additional definitions and methodology are available in: Mortality, Morbidity and Welfare Cost from Exposure to Environment-Related Risks, OECD (2020). Available at: <http://stats.oecd.org/wbos/fileview2.aspx?IDFile=1356df09-6bd4-4b0b-9a95-d56e145769ad>

²⁷⁰ Fine particulate matter (PM2.5) is an air pollutant that causes human health concerns when concentrations in the air are above a certain limit. PM2.5 was chosen as an indicator based on data availability in the OECD database, as it is a commonly used air quality indicator.

The linear correlation in the graph shows that the concentration of air pollution (measured in µg/cubic meter) is proportional to the welfare costs of premature deaths (measured in % GDP equivalent), meaning that welfare costs of premature deaths are expected to increase as air pollution and/or GDP increases. As illustrated in Figure 9, among OECD member countries and other CEE, Serbia sees one of the highest exposure to air pollution and welfare costs associated with air pollution.

Building upon this correlation shown in Figure 9, the analysis in this study is based upon econometric modelling that also considered other exogenous factors that could affect welfare costs (e.g., GDP, urban population, etc.), focusing specifically on children (i.e., the population under 15²⁷¹) and the Serbian context. This approach has multiple benefits: i) it allows current and future welfare costs to be modelled more precisely, ii) it focuses on the welfare costs specific to children, who are more vulnerable to the effects of air pollution as discussed in Chapter 1, and iii) it accounts for the local context in Serbia.

In this analysis, historical data was first collected and analyzed in order to observe the specific correlation between air pollution and welfare costs for children in Serbia and develop the econometric model. Historical data of welfare cost due to air pollution in Serbia shows an increase compared to 1990 (beginning of OECD data²⁷²). In 1990, it was 11.7% of GDP²⁷³ and peaked in 2005, at an equivalent of 16.3% of GDP²⁷⁴. While levels have been decreasing steadily since 2005, levels in 2019 are still higher than 1990 levels, standing at 13.5%

of GDP. Welfare costs from air pollution in Serbia for children under the age of 15 from 2010 to 2019 follow the same trend as exposure to air pollution. Figure 10 validates the intuition shared above, that as exposure to air pollution decreases, so will the burden related to it, and demonstrates that the welfare cost for population under 15 has been declining as exposure to PM2.5 was falling from an average of 35.3 micrograms per cubic meter in 1990 to 25.6 micrograms per cubic meter in 2019.

The econometric modelling of these historical observations demonstrates that a 1% growth in exposure to PM2.5 translates into an increase of 0.79% in welfare cost. These results validate the observed correlation between air pollution and welfare cost. Further, robustness of this result has been confirmed by estimation of similar models that explain links between air pollution and welfare (for the details please read the Annex B).

Next, this econometric model was used to model future welfare costs (i.e., costs of inaction). In order to model these impacts into the future and estimate cost of inaction regarding air pollution in Serbia from 2020–2025, two scenarios were constructed:

- Scenario 1 assumes continuation of observed trend of exposure to PM2.5 until 2025;
- Scenario 2 assumes for the same period an additional effort and investments which generate a reduction of PM2.5 that is twice as fast as in Scenario 1.

The level of exposure to PM2.5 for each scenario is shown in Figure 11 below. Until 2019, it shows the actual exposure to air pollution (obtained from OECD data²⁷⁵), whilst for the period 2020–2025 it shows the

²⁷¹ Population under 15 was selected based on available data

²⁷² Note that the data from 1990 is not included in the graphs as it is not available in the same time increments as 2010–2019

²⁷³ It is important to remember that these are GDP equivalents, not gross value. As Serbia's GDP rose, so did the monetary gross value of the welfare cost.

²⁷⁴ OECD — Environmental Database — Mortality, morbidity and welfare costs from exposure to environment-related risks. Accessed February 2021.

²⁷⁵ OECD Data, Air pollution exposure, Serbia. <https://data.oecd.org/air/air-pollution-exposure.htm>, Accessed September 2020.

predicted exposure according to Scenario 1 (darker green line) and Scenario 2 (lighter green line), as outlined above.

Figure 10 / Welfare cost and exposure to PM2.5 in Serbia
(population under 15 years old)

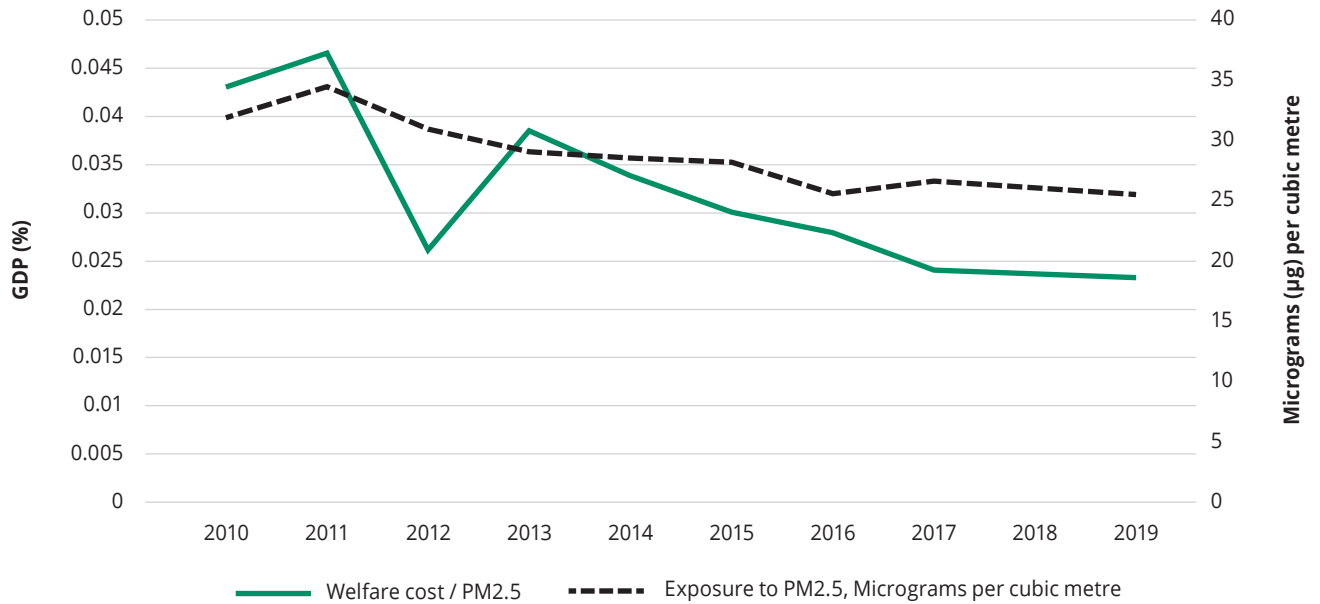
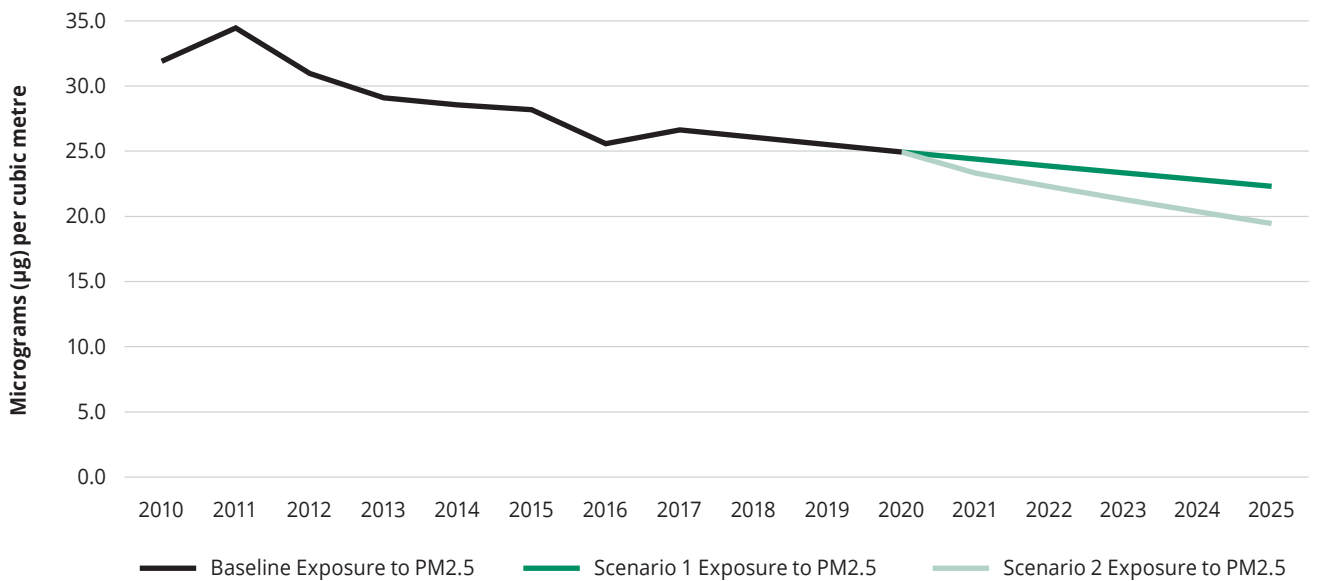
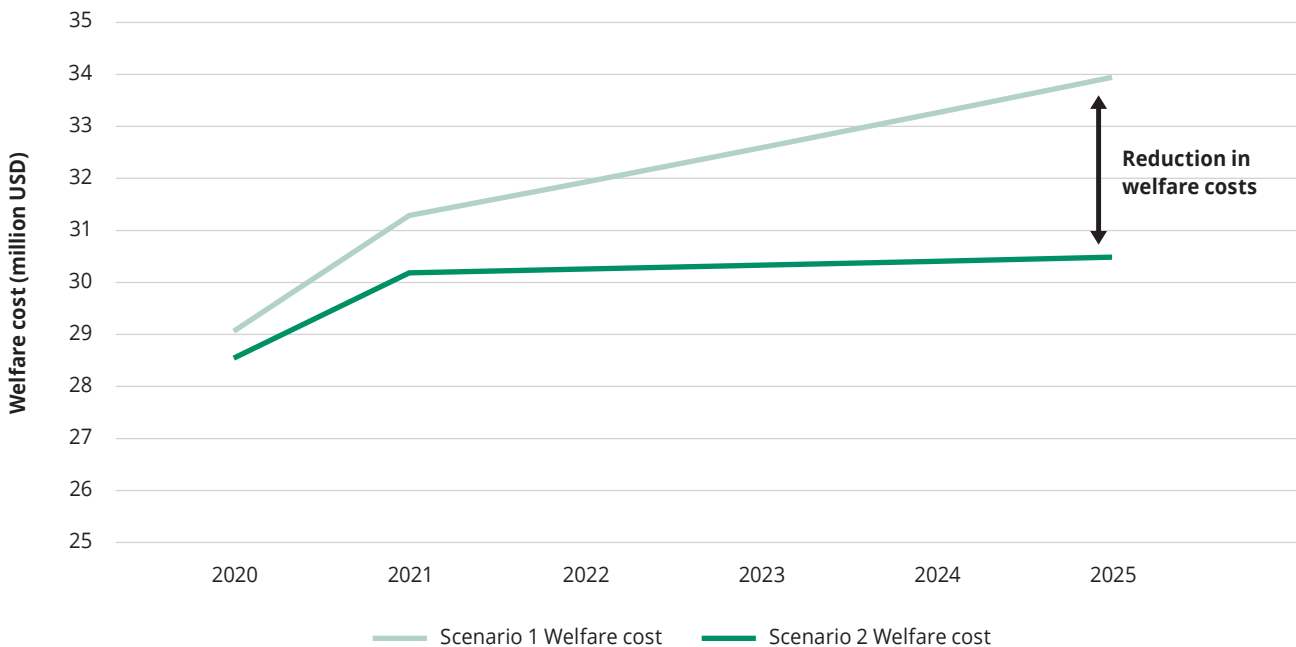


Figure 11 / Scenario assumptions — exposure to PM2.5



Based on these scenarios for children’s exposure to PM2.5, projected impact on welfare costs were calculated using the econometric model. This difference is presented in Figure 12, which illustrates the rising reduction in welfare costs under Scenario 2 of up to USD 3.5 million in 2025 compared to scenario 1.

Figure 12 / Welfare costs for population under 15 years of age (million USD) associated with each scenario



More specifically, the results conclude that welfare costs increase between 2020–2025 in both scenarios, meaning that the burden of welfare costs to children from air pollution are expected to increase in both scenarios²⁷⁶, even with investment in reducing air pollution levels. However, the darker green line shows that the welfare costs increase at a lower rate in Scenario 2 where additional efforts and investment

reduce PM2.5 levels in Serbia at twice the historical rate. Thus, effort exerted in reducing the levels of air pollution will have positive effect on the well-being of children.

The net present value (NPV) of welfare cost from 2020–2025 in Scenario 1 amounts to USD 168 million (about RSD 16.7 billion or EUR 142 million), decreasing to USD 158 million (about RSD 15.8 billion or EUR 134 million) in Scenario 2. This means that under the second scenario, where additional effort is taken to reduce the air pollution exposure trend, Serbian children’s welfare burden would be decreased by about USD 10 million cumulatively between 2020 and 2025.

²⁷⁶ The continued increase of welfare costs in both of the scenarios also has to do with the fact that Serbia’s VSL is expected to continue to rise (see Figure 18 in Annex B: Supplementary data for Chapter 2 on historical VSL growth). As VSL increases, being one of the multipliers in the welfare cost, welfare cost might increase even if the number of premature deaths attributable to the air pollution decreases unless most effective measures to reduce air pollution, both in terms of reducing PM and offsetting the resulting welfare burden for children in Serbia, are found.

In addition to welfare costs resulting from premature deaths, air pollution can result in increased healthcare costs, reduced school attendance and future income, and protection risks, all as a result of related illnesses. Further research was conducted to include these additional factors into the cost of inaction, as summarized in Table 3 below:

Table 3 / Additional costs of inaction on air pollution for children

Impact	Associated costs and implications for children
Increased incidence of respiratory illness (i.e., bronchitis and asthma)	Air pollution from Serbian coal plants has been estimated to cause 1,042 cases of bronchitis in children, as well as 10,682 asthma symptom days in children, annually ²⁷⁷ . Air pollution from heating at the individual household level, via burning fossil fuels, can have similar effects on children. For asthma, research has found that average annual treatment costs per patient stand at USD 1,900 (EUR 1,600) in Europe, albeit for the population as a whole ²⁷⁸ . A case study in another CEE country (Czech Republic) also found that treatment costs for bronchitis in children average at EUR 34 per case for children up to fifteen years of age ²⁷⁹ .
Increased healthcare costs	Among Western Balkan countries, Serbia is estimated to have the highest healthcare costs associated with the health effects of coal pollution. These costs were estimated between EUR 890 million to EUR 1.68 billion in 2016 ²⁸⁰ . Given that children are about 17% of the population, this would amount to proportional healthcare costs of EUR 150 million to EUR 285 million for children associated with air pollution from coal power plants.
Reduced school attendance and future income	One study determined that the average return, in terms of future earning potential, for an additional year of school is 17% in Serbia ²⁸¹ . Chronic school absenteeism (defined as missing more than 10% of school days in an academic year) is also found to increase the chances of school dropout, consequently affecting future individual earnings ²⁸² . If children are absent due to chronic illness, such as asthma or bronchitis, this can impact their future earning potential, which will have downstream implications on the country's economy. Moreover, school absences have been shown to lead to reduced school performance and consequent psychological effects in asthmatic children ¹¹⁶ .
Protection risks from reduced household income	The value of lost working days due to air pollution have been valued between EUR 174 million to EUR 391 million per year in Serbia ²⁸³ . This can have implications on children, especially poor children, increasing protection risks if household income is reduced due to impaired health of their caregiver(s).

²⁷⁷ Chronic coal pollution, Europe Beyond Coal Campaign (2019). Available at: <https://www.env-health.org/wp-content/uploads/2019/02/Chronic-Coal-Pollution-report.pdf>

²⁷⁸ Asthma costs and social impact, Nunes et al (2017). Available at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5219738/>

²⁷⁹ Respiratory Diseases in Children and Air Pollution — The Cost of — Illness Assessment in Ostrava City, Tóthová (2020). Available at: <https://content.sciendo.com/view/journals/cejpp/14/1/article-p43.xml>

²⁸⁰ Chronic coal pollution, Europe Beyond Coal Campaign (2019). Available at: <https://www.env-health.org/wp-content/uploads/2019/02/Chronic-Coal-Pollution-report.pdf>

²⁸¹ Comparable estimates of returns to schooling around the world, Montenegro and Patrinos (2014). Available at: <http://documents1.worldbank.org/curated/en/830831468147839247/pdf/WPS7020.pdf>

²⁸² Mongolia's air pollution crisis: A call to action to protect children's health, UNICEF (2018). Available at: <https://www.unicef.org/mongolia/reports/call-action-protect-childrens-health>

²⁸³ Costs, benefits and economic impacts of the EU Clean Air Strategy and their implications on innovation and competitiveness, IIASA (2017). Available at: https://ec.europa.eu/environment/air/pdf/clean_air_outlook_economic_impact_report.pdf

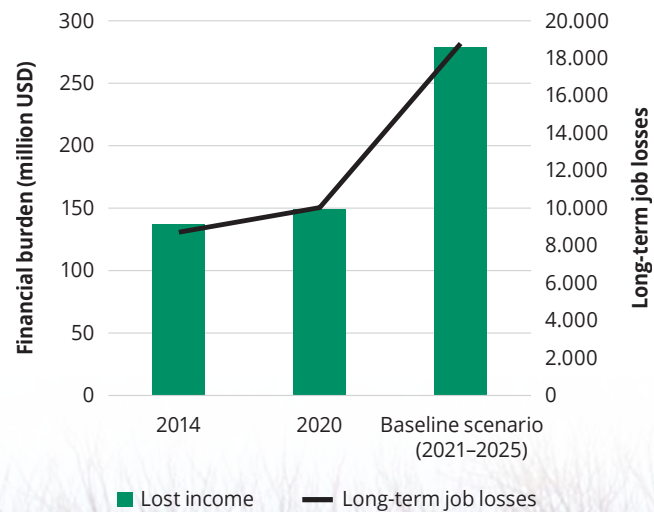
Flooding

Flooding has resulted in devastating economic consequences in Serbia, which can have downstream effects on children. As described in Chapter 1, children are more likely to experience various forms of neglect, violence and exploitation following financial hardship at the household level. Such financial hardship was experienced during the floods in 2014, where damaged and destroyed homes and infrastructure, and loss of livelihood contributed to an economic recession, significantly threatening household income and resulting in increased protection risks for children.

To determine the relative increase in financially driven protection risks to children in Serbia, this analysis projects the financial burden of lost income and long-term job losses due to flooding over the next five years. Using the impacts of the 2014 flood as a baseline²⁸⁴, the financial burden was estimated assuming the 2014 flood was to occur in 2020 using updated economic and social variables, such as household income and labour force growth. Using these 2020-adjusted flood costs, the

future costs (2021–2025) were determined based on a projected increase in the rate of extreme flooding events in future years due to climate change, per historical flooding data from the Emergency Events Database (EM-DAT) International Disasters Database. The results of the analysis are summarized in Figure 13 below.

Figure 13 / Financial burden from flooding based on historical and forecasted impacts



²⁸⁴ Serbia floods 2014, UN, World Bank Group (2014). Available at: <http://www.obnova.gov.rs/uploads/useruploads/Documents/RNA-REPORT-140714.pdf>

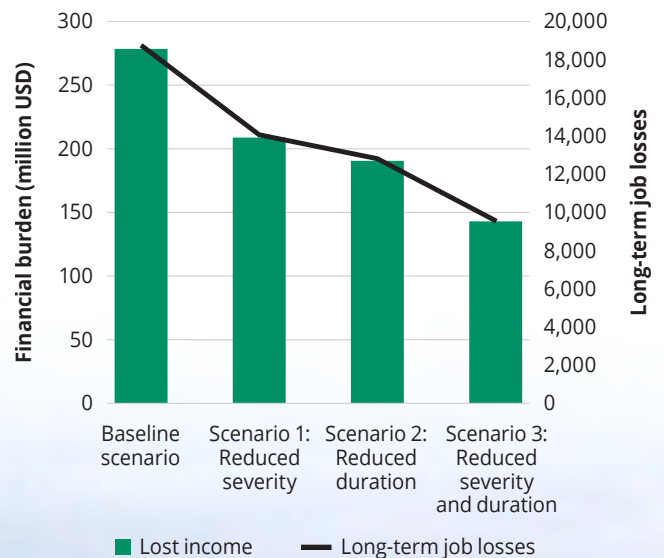


To assess the future effects of increased flood resilience, the following three scenarios were constructed:

- **Baseline scenario** represents the financial burden for 2021–2025 demonstrated in Figure 13, based on the historical impacts of the 2014 floods and projected future changes in flooding (shown in Figure 13 above). While this analysis acknowledges that there have been investments made in additional resilience measures since the 2014 floods, this analysis does not include an assessment of the current or future implications of these investments on Serbia’s overall level of resilience. Therefore, the analysis assumes that the level of resilience in 2021–2025 remains consistent with levels in 2014.
- **Scenario 1 (Reduced severity)** assumes that while disaster risk management cannot reduce the days of extreme flooding, it can reduce the impact felt through the improvement in flood protection infrastructure. To represent the scenario in which funding for Disaster Risk Management is funded to the required EUR 1 billion (roughly), we hypothetically assume a 25% reduction in job loss and income loss.

- **Scenario 2 (Reduced duration)** assumes that emergency response and flood protection measures can effectively reduce the number of extreme floods in the time period 2021–2025 and retain them at the rate of 15.1 average days per year.
- **Scenario 3 (Reduced severity and duration)** assumes that effective mitigation and adaption can both offset the financial burden per flood and the number of extreme floods that would take place. This scenario assumes reductions of impact on scale with the first scenario and reduction of extreme floods in line with the second.

Figure 14 / Cost of inaction from flooding across all scenarios (2021–2025)



As shown in Figure 14 above, flooding is projected to have significant consequences for household income in the coming years; however, based on the assumptions used in this analysis, these financial consequences reduce by almost one half in Scenario 3 (Reduced severity and duration). Therefore, when investing in flood resilience, Serbia should focus on both physical infrastructure, as well as emergency response and preparedness, to reduce both the severity and duration of flooding. Together, these investments can significantly reduce the amount of lost income and long-term job losses as a result of flooding in future years, which are directly tied to children's protection risks. By reducing financial losses from flooding at the household level, the need for coping mechanisms such as child marriage and child labour, as well as the likelihood of domestic violence as a result of financial and emotional stressors, will not be further exacerbated by CE. Further, investing in flood resilience can reduce damage to homes, reducing the likelihood that children will face evacuation and subsequent protection risks, such as violence, abuse and exploitation. The cost of these investments will depend on the flood resilience measures implemented, which would be informed by detailed technical studies, stakeholder consultation and overall levels of motivation among decision makers. Costs can vary significantly based on the location, type of measure (e.g., green infrastructure²⁸⁵, home retrofits, levy, etc.), and overall scale and more detailed analysis is required for a cost-benefit analysis.

The costs of inaction outlined above demonstrate the social and financial benefits of addressing CE hazards, particularly with respect to children. These benefits demonstrate that developing a child-sensitive CE

agenda goes hand in hand with Serbia's objectives for economic growth. As Serbia develops and strengthens its child-sensitive CE agenda, efforts should focus on adapting CE planning and execution to account for disproportionate impacts to children and vulnerable groups. To this effect, engaging children and youth in the planning and implementation process will be critical to ensure their perspectives and ideas are taken into account. However, there are existing challenges that must first be addressed in order to effectively develop this agenda which are described in more detail in the following section.

CHALLENGES IN DEVELOPING A CHILD-SENSITIVE CE AGENDA IN SERBIA

Public sector initiatives, including policy instruments and funding, provide a foundation for Serbia to address the CE hazards that present the greatest risks to children. Funding sources, via environmental fees, government budgets, and international support are well-established and have been consistent over the past decade. In addition, Serbia has made progress in transposing EU environmental directives, and continues to align with ambitious UN protocols such as the Paris Agreement²⁸⁶ and UN Agenda 2030.

Despite these efforts that provide a strong foundation, there remain some challenges to push the child-sensitive CE agenda forward in Serbia. Most notably, the level of available funding and administrative capacity are low due to economic challenges and a lack of supporting policy for CE expenditure. Serbia has experienced significant economic challenges over the past decade, facing three recessions between 2009–2014²⁸⁷, followed by a recent COVID-19 pandemic

²⁸⁵ Green infrastructure includes a variety of permeable surfaces to manage stormwater and prevent flooding, such as rain gardens, green roofs, permeable pavement, etc

²⁸⁶ Update of Serbia's nationally determined contribution in CCM Part, Aleksander Jovic (2020). Available at: <https://www.klimatskepromene.rs/wp-content/uploads/2020/08/NDC-struktura-AJovic.pdf>

²⁸⁷ Key stakeholder interview

related recession²⁸⁸. In addition, due to changes to the Budget Law System and delays in the operationalization of the Green Fund, funds from environmental fees are now able to be diverted for spending on other purposes²⁸⁹. Further, in 2019, only 75% of the Ministry of Environmental Protection's operational budget was spent²⁹⁰.

Due to these financial and policy constraints, Serbia's investment in environmental protection is low compared to other countries in the region. In the past decade, the public and private sector in Serbia have invested only a third of the funds (by percentage of GDP) invested by other CEE countries²⁹¹. Over the past six years, 24 municipalities have also cancelled funding for environmental protection²⁹². The economic situation has also led to a public sector hiring ban that has spanned several years²⁹³, resulting in more limited staff and expertise to support the CE agenda. These resource constraints, both financial and administrative, may hinder Serbia's future progress in developing its child-sensitive CE agenda.

Financial constraints

Serbia requires large amounts of investment to achieve and expand its CE agenda. For environmental protection more broadly, Serbia's allocation of RSD 7.9 billion (reduced to RSD 6.4 billion due to the

COVID-19 pandemic, or about EUR 54 million) for 2020 falls short of the Fiscal Council's estimate of EUR 500 million of annual investment for environmental protection over the next 10–15 years²⁹⁴. Among CE topics, environmental infrastructure and pollution prevention are identified as key areas in need of additional investment²⁹⁵. Required investments to achieve the most expensive water and waste EU Directives have been recently estimated at EUR 7.5 billion, while investments to achieve full compliance with industrial emissions reductions requirements were recently estimated between EUR 1.3 billion²⁹⁶ to EUR 2.4 billion²⁹⁷. To address air pollution and GHG emissions, modernization of district heating systems according to existing plans is estimated to require double the amount of current investment, at about EUR 20 million annually²⁹⁸.

At the local level, there is no data available on specific funding gaps for CE objectives; however, as of 2017, the Fiscal Council identified local debt as a key threat to Serbia's public finances and found that local government investment is about half that of other CEE countries (1% of GDP vs. 2% of GDP)²⁹⁹. While these findings apply to public expenditures more broadly, given this context, it can be assumed that local governments face similar financial constraints to those at the national level.

²⁸⁸ The COVID-19 Crisis in Serbia, OECD (2020). Available at: <https://www.oecd.org/south-east-europe/COVID-19-Crisis-in-Serbia.pdf>

²⁸⁹ Investments in environmental protection: a social and fiscal priority, Republic of Serbia Fiscal Council (2019): Available at: <http://www.fiskalniasvet.rs/doc/eng/FC%20-%20Investments%20in%20environmental%20protection.pdf>

²⁹⁰ Walking in the mist: Shadow Report on Chapter 27, Koalicija29 (2020). Available at: <https://www.koalicija27.org/wp-content/uploads/2020/10/report-2020.pdf>

²⁹¹ Investments in environmental protection: a social and fiscal priority, Republic of Serbia Fiscal Council (2019): Available at: <http://www.fiskalniasvet.rs/doc/eng/FC%20-%20Investments%20in%20environmental%20protection.pdf>

²⁹² Walking in the mist: Shadow Report on Chapter 27, Koalicija29 (2020). Available at: <https://www.koalicija27.org/wp-content/uploads/2020/10/report-2020.pdf>

²⁹³ Key stakeholder interview

²⁹⁴ Investments in environmental protection: a social and fiscal priority, Republic of Serbia Fiscal Council (2019): Available at: <http://www.fiskalniasvet.rs/doc/eng/FC%20-%20Investments%20in%20environmental%20protection.pdf>

²⁹⁵ Ibid.

²⁹⁶ DRAFT Negotiating Position for Chapter 27 (Confidential), Republic of Serbia (2020). Excerpts provided by key stakeholder.

²⁹⁷ Investments in environmental protection: a social and fiscal priority, Republic of Serbia Fiscal Council (2019): Available at: <http://www.fiskalniasvet.rs/doc/eng/FC%20-%20Investments%20in%20environmental%20protection.pdf>

²⁹⁸ Ibid.

²⁹⁹ Local public finances: Issues, risks and recommendations, Fiscal Council of the Republic of Serbia (2017). Available at: [http://www.fiskalniasvet.rs/doc/eng/Summary_%20Local%20public%20finances%20-%20problems%20risks%20and%20reccomendations%20\(2017\).pdf](http://www.fiskalniasvet.rs/doc/eng/Summary_%20Local%20public%20finances%20-%20problems%20risks%20and%20reccomendations%20(2017).pdf)

To address these funding gaps, the government requires additional sources of financing, such as private sector investments and international financial support, often provided through loans. Specifically, water and waste objectives are expected to be primarily (78%) financed by EU funds and loans³⁰⁰. Similarly, Serbia has identified that financial support from international sources is essential to achieving climate change objectives³⁰¹. The extent to which the private sector and international supporters address these funding gaps will be discussed in Chapter 3.

Administrative constraints

As a result of the long-term hiring ban in the public sector, Serbia faces human resource constraints related to its CE agenda, both in terms of number of staff and subject matter expertise. In addition, the existing governance structure, delays in approving policies, and processes can hinder the integration of children and vulnerable groups into CE initiatives. The EC has identified that administrative capacity should be enhanced among many departments, including the Environmental Protection Agency³⁰², the Ministry of Mining Energy's department for EE, and the Ministry of Environmental Protection, particularly for climate change monitoring and reporting³⁰³ and program development³⁰⁴. Limited capacity is also present at the local level. Specifically, increased local capacity

is required to collect environmental fees³⁰⁵ and conduct public consultation³⁰⁶, and rural areas lack skilled workers in the sanitation and water sector³⁰⁷. Secondly, it is found that the public sector requires additional subject matter expertise related to certain CE hazards, such as hazardous chemicals³⁰⁸, as a result of the departure of several experienced individuals³⁰⁹. Additional expertise related to the intersection of CE hazards and children's issues would also be beneficial to support the development of a child-sensitive CE agenda. According to the Action Plan for Administrative Capacity Development in the Environmental Sector, an additional 1,450 employees are required in the environmental sector at the national, provincial and local level to align with EU Directives³¹⁰.

The structure of existing staff also introduces challenges to implementing an integrated approach on children and CE. As mentioned above in Governance structure, ministries are separated by focus area (e.g., environment, energy, social protection, health etc.), limiting an integrative approach that considers environmental, health, and social protection, as well as impacts on children and vulnerable groups, holistically. While the Ministry of Health and Ministry of Labour, Employment, Veterans and Social Affairs are listed as stakeholders in the NDMRP Action Plan 2016–2020, an evaluation conducted in 2018 found that there is no routine engagement of the Ministry of Labour,

³⁰⁰ DRAFT Negotiating Position for Chapter 27 (Confidential), Republic of Serbia (2020). Excerpts provided by key stakeholder.

³⁰¹ Second National Communication of the Republic of Serbia under the United Nations Framework Convention on Climate Change under the United Nations Framework Convention on Climate Change, Ministry of Environmental Protection (2017). Available at: http://www.klimatskepromene.rs/wp-content/uploads/2017/09/SNC_eng.pdf

³⁰² Serbia 2020 Report, European Commission (2020). Available at: https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/serbia_report_2020.pdf

³⁰³ Serbia 2019 Report, European Commission (2019). Available at: https://www.mei.gov.rs/upload/documents/eu_dokumenta/godisnji_izvestaji_ek_o_napretku/Serbia_2019_Report.pdf

³⁰⁴ Interview with key stakeholder

³⁰⁵ Serbia 2020 Report, European Commission (2020). Available at: https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/serbia_report_2020.pdf

³⁰⁶ Serbia 2019 Report, European Commission (2019). Available at: https://www.mei.gov.rs/upload/documents/eu_dokumenta/godisnji_izvestaji_ek_o_napretku/Serbia_2019_Report.pdf

³⁰⁷ Interview with key stakeholder

³⁰⁸ Chapter 27 in Serbia: No-Progress Report. Shadow Report on Chapter 27 Environment and Climate Change, Young Researchers of Serbia (2018). Available at: https://rs.boell.org/sites/default/files/izvestaj_k27_2018_eng_web.pdf

³⁰⁹ Walking in the mist: Shadow Report on Chapter 27, Koalicija29 (2020). Available at: <https://www.koalicija27.org/wp-content/uploads/2020/10/report-2020.pdf>

³¹⁰ Key stakeholder interview

Employment, Veterans and Social Affairs in emergency or preparedness planning³¹¹. While inter-sectoral working groups, such as the Inter-Ministerial Working Group on the Implementation of the UN Agenda for Sustainable Development and the National Climate Change Committee have formed, few meetings were conducted and progress was minimal³¹². Further, in the 2020 Law on the Ministry, there is no clear successor to coordinate these inter-ministerial activities³¹³.

In addition to structural constraints, the current policy framework and processes introduce challenges associated with the approval and implementation of CE initiatives. With respect to disaster risk management, policy and capacity constraints can hinder the government's ability to provide additional social assistance following a disaster, such as flooding³¹⁴. Social assistance falls under two laws: The Law on Financial Support to Families with Children and the Law on Social Protection. The former does not include considerations of emergency situations, while the latter does permit one-off emergency payments, as long as it falls under a government decree. Though there is the ability to expand assistance in an emergency event through this decree, there are some shortfalls. First, government decrees are granted in an ad-hoc manner, which can lead to inconsistent levels of support. Administrative delays also result from capacity constraints and the lack of standard operating procedures related to approval and dissemination of funds. During the 2014 floods, these delays resulted in support being received 6–12 months following the event, which is more recovery-focused than response-focused, and could leave impacts on children unaddressed for long periods of time. Lastly, the support is dependent on formal documentation,

which vulnerable groups, such as Roma, refugees and migrants, may not be able to provide³¹⁵. This limits the government's ability to flexibly and quickly respond to extreme events, such as flooding, by providing financial support to those most in need, specifically vulnerable groups and children³¹⁶.

More broadly, in 2018, the Law on Planning System of Republic of Serbia mandated that all development plans must align with the Development Plan and Spatial Plan of the Republic of Serbia³¹⁷. While this is meant to be a policy enabler, it has resulted in some delays related to the approval of CE related public policy documents³¹⁸. Similarly, there have been recent changes related to the Green Fund approval process for expenditure³¹⁹, which has resulted in delays in funding for CE initiatives. Lastly, many policy and strategic frameworks, such as the Law on Climate Change awaited approval for multiple years³²⁰.

Availability of expenditure data

There is limited available data on expenditures and progress against plans for Serbia's CE initiatives. Existing data varies in terms of source and quality and is dispersed among multiple sources including official reports (e.g., policies, strategies, statistical data), unofficial assessments (e.g., independent reviews) and academic research. Resulting data inconsistencies and gaps make it difficult to measure the impact of current initiatives and investments and revise accordingly.

While Serbia reports on expenditures for CE, the data is aggregated and difficult to interpret. Every year, environmental expenditures are presented to

³¹¹ Serbia Cash Preparedness, Phelps (2018). Provided by UNICEF Serbia

³¹² Key stakeholder interview

³¹³ Key stakeholder interview

³¹⁴ These provisions are in place in other countries in the region, such as Bosnia and Herzegovina.

³¹⁵ Serbia Cash Preparedness, Phelps (2018). Provided by UNICEF Serbia

³¹⁶ Key stakeholder interview

³¹⁷ <https://www.pravno-informacioni-sistem.rs/SlGlasnikPortal/eli/rep/sgrs/skupstina/zakon/2018/30/1/reg>

³¹⁸ Key stakeholder interview

³¹⁹ Key stakeholder interview

³²⁰ Key stakeholder interview

and approved by parliament, though this level of transparency does not extend to the public domain. Official published expenditures on environmental protection are categorized by focus area (i.e., air protection, waste management, water management) (see Figure 18 in Annex A: Supplementary data for Chapter 1). However, this data does not provide details on the types of initiatives that were funded; for example, water management could include drinking water, sanitation and/or hygiene, but this is not specified. In addition, there is no information available on the source of funding for specific initiatives (e.g., national budget, loans, donations, etc.)³²¹. Moreover, the data is reported inconsistently across sources³²². Therefore, it is difficult for members of the public or CE experts to compare year-over-year and analyze the flow of funding.

In addition to a lack of funding data, there is limited information available on progress against plans. Published action plans, such as the Children's Environment and Health Action Plan (CEHAP) discussed in the case study below, include indicators upon which to measure progress. However, there are often no subsequent reports measuring progress against these indicators.

Implementation against plans

A number of public sector CE initiatives have not been implemented according to plan due to a combination of factors including limited financial and administrative capacity, as well as discontinuity in government. One reason for this is that strategies did not previously require a cost analysis prior to approval, and instead rely on already planned expenditures for environmental protection^{323, 324}. Without this level of financial planning for implementation, it was not guaranteed that there would be sufficient resources to implement all strategies and action plans. Similarly, low numbers of staff can limit implementation efforts. Further, when there is discontinuity in government, existing strategies are often replaced. Therefore, going forward, it is uncertain whether existing initiatives that span 2021 will continue under any future government³²⁵.

Some noteworthy examples of CE initiatives that were not implemented according to plan include the Sustainable Development Strategy (expired 2017) and Biodiversity Strategy (expired 2018). Moreover, the National Renewable Energy Action Plan is expiring this year, while the EC has found that additional capacity and continued investment is required to achieve renewable energy targets and alignment with EU Acquis³²⁶. The expiration of the Sustainable Development Strategy also reduced support for the publication of Local Environmental Action Plans (LEAPs), which involved citizen participation, focusing on vulnerable populations, such as Roma,

³²¹ Report on Economic Instruments for Environmental Protection, Republic of Serbia Ministry of Environmental Protection (2018). Available at: http://www.sepa.gov.rs/download/Ekonomski_Instrumenti_2018.pdf

³²² It is not clear how much money is spent on environmental protection in 2018. This paper states that it was 0.3% of GDP in 2018 (amounting to 15,199 million RSD by calculating), and this report from the Statistical Office states that it was 38,266.7 million RSD.

³²³ Key stakeholder interview

³²⁴ The Law on Planning System has since required that all action plans include the required funds for implementation and specified sources of funding

³²⁵ These include: The Water management Strategy, National Programme for the Adoption of the Acquis (NPAA) — third revision, Strategy for Sustainable Use of Natural Resources and Goods, Strategy on Sustainable Urban Development, and the Strategy for Agriculture and Rural Development.

³²⁶ Serbia 2020 Report, European Commission (2020). Available at: https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/serbia_report_2020.pdf

refugees, and internally displaced persons³²⁷. The below spotlight on the CEHAP in Serbia provides an illustration of how the abovementioned challenges impaired progress on Serbia's child-sensitive CE agenda in the past.

Spotlight on Children's Environment and Health Action Plan (CEHAP)



The Children's Environment and *Health Action Plan (CEHAP)* for the period 2010–2019 was adopted by the Serbian government in 2009. The adoption of CEHAP demonstrated the government's ability to connect children's issues and environment issues, which was done in response to the Children's Environment and Health Action Plan for Europe, approved in 2004³²⁸. The items in the action plan addressed many of the CE hazards that still present risks to children and vulnerable groups, as outlined in Chapter 1, including indoor and outdoor air pollution, hazardous chemicals, safe drinking water and adequate sanitation.

In 2019, the CEHAP expired without documented progress against indicators, and without a successor. Some measures were eventually implemented but no targeted effort on implementation took place. Consequently, many problematic areas targeted by CEHAP (i.e., air quality, hazardous chemicals) still present a risk to children in Serbia. The lack of transparency and implementation can be attributed to similar limitations as those mentioned above; namely, relatively low prioritization of CE at the national level, as well as limited administrative and financial capacity. The main contributing factors are as follows³²⁹:

1. **Insufficient budget allocations for implementation:** This is attributed to a limited access to expertise; therefore, the cost of implementation for the projected activities were not well understood during the planning phase;
2. **Budgetary cuts:** There was a discontinuity in funding towards environmental protection and environmental health after 2012, which halted many related public sector initiatives in these areas; and
3. **Lack of understanding of the connection between health and environment:** At the policy level, healthcare investments and initiatives are often linked with hospitals or medical facilities, rather than improving the quality of the environment to address the cause of illness (e.g., air pollution), which limits resource allocation for environmental initiatives.

³²⁷ Key stakeholder interview

³²⁸ Applicability of children's environment and health action plan in Serbia, Ilic (2010). Available at: <https://scindeks-clanci.ceon.rs/data/pdf/0025-8105/2010/0025-81051012789K.pdf>

³²⁹ Key stakeholder interview

CONCLUSIONS AND RECOMMENDATIONS

Against the backdrop of prioritized economic development and a reliance on polluting activities, such as coal-based energy production, Serbia has taken important foundational steps for its CE agenda. Guided by EU Accession and international commitments, the country's policy and strategic frameworks cover key CE hazards that impact children. Progress is being made in terms of incorporating vulnerable groups into the CE agenda, especially related to gender, although this is still in early days. Most notably, there is limited evidence of child-sensitive CE planning. A few CE plans consider children's particular vulnerabilities, however there is limited evidence that targeted actions are being taken to address these vulnerabilities, particularly from a child rights perspective.

If children's vulnerabilities are not addressed, there will be significant social and financial implications, including increased healthcare costs, reduced household income and negative implications for children's education, protection and future income, as well as their future in general. Going forward, Serbia will need to continue to balance CE engagement with its focus on economic development in order to address the disproportionate impacts from CE hazards on children and vulnerable groups and move toward sustainable development. Child-sensitive investments in low-carbon energy and environmental

infrastructure, as well as disaster risk management, can support this objective by minimizing the costs of inaction related to air pollution and flooding presented in this chapter.

To realize these social and financial benefits and further its child-sensitive CE agenda, Serbia will need to address existing challenges, namely financial and administrative constraints facing the public sector. To start, policies and processes should be adapted to support the integration of CE and child-related planning through mechanisms such as inter-ministerial working groups and mechanisms for participation of children and youth. It is also imperative that plans include sufficient financing and resource allocation for their implementation, and that there is succession planning for strategies, policies, processes and programmes that will ensure continuity, which is of critical importance. Overall, this will help to incorporate considerations of children into the CE agenda, while a focus on implementation and continuity will ensure that benefits to children and vulnerable groups are realized, measured and sustained. Beyond the public sector, other stakeholders will play a key role in addressing existing challenges and driving Serbia's child-sensitive CE agenda forward. The private sector and international financiers can also help to address existing gaps, which is covered in more detail in Chapter 3.





ENGAGEMENT OF SERBIA'S PRIVATE SECTOR AND INTERNATIONAL FINANCIERS

This chapter summarizes the various support mechanisms provided by the private sector and international financiers (including international financial institutions and development banks), which contribute to progress on CE in Serbia. Based on these findings, this chapter also identifies opportunities for future action among these actors.

OVERVIEW OF CURRENT STATE

Building upon the previous chapter on public sector engagement, this chapter will focus on the private sector and international financiers, outlining the various contributions of actors that play a significant role in shaping the CE agenda. The two main groups of actors referred to in this chapter are:

- i) Serbia's private sector: These actors include small-medium enterprises (SMEs), large domestic companies, multi-national companies and business associations; and
- ii) International financiers: These actors include IFIs, development banks, and other financing mechanisms implemented by international organizations.

The focus on Serbia's private sector and international financiers arises from the special role these actors play in addressing CE hazards and

shaping the CE agenda. These contributions make strides toward achieving EU accession, aligning with international protocols, and realizing domestic CE strategies and action plans. Through various support mechanisms, these contributions make significant headway in addressing the financial and administrative (i.e., human resource capacity and technical expertise) constraints faced by the public sector, as discussed in previous chapter.

Overall, Serbia's private sector and international financiers provide important contributions to its CE agenda that should be maintained as the agenda evolves. Yet, there are noteworthy limitations that remain, which compromise the long-term sustainability of these efforts and extent to which these efforts benefit children. The closing section of this chapter outlines opportunities for future action to address these limitations going forward.

Support mechanisms

When analyzing the contribution of these actors to addressing CE hazards and shaping Serbia's CE agenda, four main engagement methods surface:

- i) **Financing and capacity building:** Providing financing to support Serbia's CE agenda, as well as building capacity of the public sector to deliver and maintain CE projects;

- ii) **Policy guidance and alignment:** Aligning policies with perspectives and priorities of relevant stakeholders;
- iii) **Core business practices:** Reducing the environmental implications of business operations; and
- iv) **Education and engagement:** Delivering CE-focused educational and employment programming to children.

The following paragraphs describe the extent to which each engagement method incorporates a child-sensitive and climate-sensitive lens, and outline opportunities for further engagement.

Financing and capacity building

Upon analysis of the CE situation in Serbia and public sector engagement, it was shown that financial and administrative constraints are a major factor limiting CE action. Available funding and resources are low compared to the state of CE hazards and needs in the country, which has downstream effects on children's well-being. Combined, contributions from the private sector and international financiers help to mitigate these impacts. Serbia's private sector increases the pool of public funds for environmental protection by paying eco taxes and fees to the government. Further, international financiers provide financing and public sector capacity building (e.g., project management and implementation, technical expertise, etc.) for CE-related projects. These contributions have been, and will continue to be, critical in addressing financial and administrative gaps related to CE in the public sector; however, limitations are still present. Funds collected through eco-taxes and fees are not necessarily allocated toward Serbia's CE agenda and a reliance on debt financing for CE projects can compromise Serbia's ability to sustain benefits from these projects.

Private sector fees comprise a significant portion (over one third in 2018³³⁰) of the national expenditures for environmental protection. Based on the "polluter pays" principle in the Law on Environmental Protection, businesses are required to pay compliance-based fees for activities that impact the environment, such as waste disposal and emissions. These funds contribute significantly to the available national budget for environmental protection. In 2018, total revenues from these fees amounted to RSD 14,166.5 million (about EUR 120 million); most of the fees resulted from air pollution and waste disposal, followed by fees for products that will become special waste streams³³¹. The majority of these fees (about 85%) are collected from the energy sector³³², which is consistent with the fact that this sector (combined with transportation) contributes over 80% of GHG emissions in the country. However, it is important to note that these fees are not always spent on environmental activities due to recent regulatory changes, whereby fees collected through the Green Fund are not required to be spent on environmental protection.

In addition to mandatory fees, Serbia's private sector also contributes financially to CE through donations and investments to reduce the environmental impact of operations; however, there is very limited data available on these contributions. On a national level, private sector investments in environmental protection are disaggregated by sector. For instance, in 2018, the energy sector contributed to the majority of investments. In addition, industry³³³, waste and water

³³⁰ Total expenditures in 2018 amounted to RSD 38,267 million (see Figure 18), while revenues from environmental fees amounted to RSD 14,197 million (http://www.sepa.gov.rs/download/Ekonomski_Instrumenti_2018.pdf)

³³¹ Report on Economic Instruments for Environmental Protection, Republic of Serbia Ministry of Environmental Protection (2018). Available at: http://www.sepa.gov.rs/download/Ekonomski_Instrumenti_2018.pdf

³³² Ibid.

³³³ Industry is not disaggregated by sector based on available data

sectors contributing relatively smaller amounts (less than five percent each) toward overall investments in environmental protection³³⁴, which is quite low considering the relevance of CE to their operations, namely air, water and land pollution. The data is not disaggregated further to specify the types of initiatives the investments are put toward, or the impacts of these investments.

At the company level, data related to investments and donations for CE is available in an ad-hoc manner. Companies, mainly large domestic or multinational companies, disclose financial commitments toward CE initiatives. According to a recent 2018 survey, total private sector donations amounted to a total of RSD 839 million (EUR 7.1 million), with an average donation of RSD 25 million (EUR 200 thousand) per large company. These funds, however, were not disaggregated by focus area, and most projects are focused on social initiatives as opposed to CE³³⁵. Therefore, private sector donations do not contribute significantly to Serbia's CE agenda as they are relatively small amounts of money and are more socially oriented. Further, investments to improve operations are also largely undisclosed.

In addition to private sector contributions, international financiers play a significant role in financing Serbia's CE agenda by dedicating large sums of money, via project-specific loans and grants. This money goes toward project planning (e.g., cost analysis, feasibility studies, impact assessments) and implementation, as well as public sector capacity-building. Most of this funding is provided in the form of loans, either to the national or local government.




In Serbia, international financiers typically focus their contributions on environmental infrastructure, the energy sector (EE and renewables), and resilience to extreme weather events. These common themes are largely guided by Serbia's priorities in line with EU accession, as Serbia is required to align with EU environmental directives. For IFIs, Serbian priorities are established via consultation by local branches, through which country strategies are then developed. For other international financiers that are active on CE in Serbia, additional details on the amount of financing, including disaggregation between grants and loans, and CE focus areas are provided below. These details are based on publicly available data, supplemented by insights from stakeholder interviews.

³³⁴ Report on Economic Instruments for Environmental Protection, Republic of Serbia Ministry of Environmental Protection (2018). Available at: http://www.sepa.gov.rs/download/Ekonomski_Instrumenti_2018.pdf

³³⁵ Bolji Biznis za Bolje Društvo (Better Business for Better Society), USAID, Responsible Business Forum, Smark Kolektiv, Fondacija Ana I Vlade Divac). Available at: http://odgovornoposlovanje.rs/wp-content/uploads/2019/10/Bolji-biznis-za-bolje-dru%C5%A1tvo_2019f.pdf



Table 4 / Overview of international financier contributions to Serbia's CE agenda

	<p>CE focus area(s): EE and low-carbon energy</p> <p>Financing mechanism(s): Grants and loans</p> <p>The GCF has included Serbia in multi-country projects focusing on low-carbon technologies in the industrial sector, low-carbon development in cities, and sustainable energy financing in the industrial, commercial, residential, transport and agricultural sectors over the coming decade³³⁶. Of these funds, a combined total of USD 78 million (EUR 65 million) has been allocated to Serbia for these projects, as of December 2020. For these projects, grants range from 2 to 33% of total financing³³⁷.</p>
	<p>CE focus area(s): Disaster risk management (i.e., extreme events)</p> <p>Financing mechanism(s): Loans</p> <p>The World Bank secured EUR 62.4 million to support the development of the Action Plan for the Implementation of the National Disaster Risk Management Programme (2016–2020), which includes a USD 70 million (EUR 59 million) loan in the case of an emergency, such as flooding and heat waves³³⁸. The World Bank also provided a loan of USD 300 million (EUR 253 million) to the Floods Emergency Recovery Project following the 2014 floods³³⁹. Further, the World Bank loaned EUR 40 million in 2017 to support PIMO in implementing EE upgrades of public buildings under the Program for Reconstruction and Improvement of State-Owned public Facilities³⁴⁰. Future priorities and funding amounts are currently under negotiation with the EU and the Serbian government.</p>
	<p>CE focus area(s): EE, public transportation</p> <p>Financing mechanism(s): Loans</p> <p>The European Bank for Reconstruction and Development (EBRD) has just announced a record investment of EUR 516 million for private sector and green projects, over 41% of which is dedicated to green projects, amounting to about EUR 211 million³⁴¹. In 2019 and 2021, EBRD provided loans for number of CE projects, primarily related to EE, transportation³⁴², waste management and climate-resilient agriculture. EBRD will also provide impact loans whereby interest rates are reduced if a business demonstrates engagement in key CE topics, such as circular economy³⁴³.</p>

³³⁶ <https://www.greenclimate.fund/countries/serbia>

³³⁷ This is based on available data for total project financing, aggregated across all countries in which the projects are implemented

³³⁸ <http://documents1.worldbank.org/curated/en/563521494036096285/pdf/Serbia-Final-PD-04122017.pdf>

³³⁹ https://projects.worldbank.org/en/projects-operations/projects-list?lang=en&searchTerm=&countrycode_exact=YF

³⁴⁰ <https://balkangreenenergynews.com/world-bank-provides-eur-40-million-loan-for-energy-efficiency-in-serbia/>

³⁴¹ <https://www.ebrd.com/news/2020/ebd-invests-record-516-million-in-serbia-in-2019.html>

³⁴² <https://www.ebrd.com/work-with-us/project-finance/project-summary-documents.html?1=1&filterCountry=Serbia>

³⁴³ Study on the socio-economic aspects of climate change in the Republic of Serbia, UNDP (2019). Available at: <https://www.rs.undp.org/content/dam/serbia/Draft%20Study%20on%20Socio-economic%20aspects%20of%20climate%20change%20in%20Serbia.pdf>



CE focus area(s): EE, water, waste and wastewater management

Financial mechanism(s): Loans and grants

In 2019, KfW committed EUR 50 million to EE and EUR 40.5 million toward water and sanitation³⁴⁴. In the future, KfW plans to either maintain or increase this level of support. The majority of funds are loaned, though funds used for project planning, feasibility studies, and capacity building are granted. Typically, the national government bears the brunt of the loan burden, particularly when municipalities receiving the funds have socio-economic limitations³⁴⁵.



CE focus area(s): EE, wastewater management

Financial mechanism(s): Loans

Oesterreichische Entwicklungsbank (OeEB) provides credit lines for energy infrastructure as well as operational efficiency in the private sector. In 2019, funds for OeEB's Green Growth Fund (focused on EE) were increased by EUR 25 million, though this was for multiple countries. In Serbia, OeEB has provided a EUR 35 million credit line for a waste to energy facility in 2019 and EUR 24 million for a wind farm in 2018. Credit lines totaling over EUR 65 million were also provided to large private sector companies to help improve efficiency and reduce pollution³⁴⁶.

Based on publicly available data for 2019, international financiers have provided about EUR 300 million in financing toward CE initiatives in Serbia³⁴⁷. As presented in Chapter 2, the current funding gap ranges from EUR 20–500 million annually, with cumulative investment ranging from EUR 1.3–7.5 billion to achieve EU Directives. Coupled with other donations and loans from the EU and bilateral contributions mentioned in Chapter 2, Serbia is able to make great strides in addressing public sector funding gaps for CE topics. It is important to consider, however, that a large portion of these funds are loans and will therefore need to be paid back. The public sector's responsibility to pay back loans underscores the importance of capacity building

in the public sector to ensure long-term sustainability of CE initiatives.

Together with these financing tools, there is also an important focus on public sector capacity-building among international financiers. The aim of public sector capacity building is to have national and/or local governments assume responsibility of projects following completion. This capacity building support typically consists of project planning, technical studies and project implementation, particularly in the waste management and energy sectors. For example, Kreditanstalt fuer Wiederaufbau (KfW) grants a portion of project funds toward training and capacity building throughout the duration of projects. Capacity-building is typically built into specific organizations' standard approach, as is the case with KfW, or done on an ad-hoc manner depending on the scope of the project. Therefore, it is not guaranteed that capacity-building will follow financial support for CE projects, which can have implications for the operationalization and long-term sustainability of projects.

³⁴⁴ <https://www.kfw.de/microsites/Microsite/transparenz.kfw.de/#/country/SRB/2019>

³⁴⁵ Interview with key stakeholder

³⁴⁶ <https://www.oe-eb.at/en/our-projects/projects-at-a-glance.html>

³⁴⁷ The total is based on available data from KfW (EUR 90.45 million), and EBRD (EUR 211 million). KfW funds are classified as commitments and EBRD as investments. Other IFIs only had project specific data available, which was not included in the total for 2019, as these commitments spanned multiple years.

One emerging model that international financiers and the private sector can use to simultaneously provide both financial and capacity-building support are public-private partnerships (PPPs). Bringing together the private sector, international financiers and governments, PPPs are an effective mechanism used around the world to deliver public sector CE projects. Globally, climate-sensitive PPPs span CEE, Africa, Asia, Latin America, the Caribbean and, to a lesser extent, North America. These projects are primarily focused on reducing GHG emissions through EE, renewables and improved public transportation, both globally and in Serbia. Other global focus areas focus on climate resilience through stormwater management, water treatment, sustainable agriculture and forestry, and nature conservation^{348, 349}. Globally, projects tend to prioritize GHG emissions reduction over resilience to extreme events, though the latter is increasingly important as countries experience the physical effects of climate change.

While PPPs are not yet a common delivery model for CE projects in Serbia, this model is relevant to the Serbian context where addressing CE hazards goes hand in hand with improving public environmental infrastructure. Most notably, the Vinča landfill waste treatment plant construction is being delivered through a PPP. Together with the City of Belgrade, IFIs (IFC, EBRD, OeEB), other international actors (Government of Canada), and private sector (SUEZ France, a utility company in the water and waste management sector; ITOCHU Japan, a large trading and investment company; and investment fund Margarite Luxemburg) are working to remediate the existing landfill and construct a new landfill and waste to energy facility. Standing at a total of EUR 370 million, the project is one of the largest PPPs in Serbia to date, providing

both private funding and expertise to a public sector project. As of October 2020, the project was in the public consultation phase following an EIA³⁵⁰, and is under construction as of December 2020. Other PPPs include the City of Pančevo's ecological buses / public transportation system (RSD 1.2 billion³⁵¹, or EUR 10.2 million) and the recently tendered City of Gornji Milanovac's reconstruction of district heating system from biomass (estimated at EUR 4.5–5 million)³⁵². Given their relevance to Serbia's CE hazards and commitment to public sector capacity-building, PPPs hold significant potential for the delivery and sustainability of environmental infrastructure projects in the country.

Policy guidance and alignment

Serbia's business associations and international financiers provide important contributions to guide CE policy development in Serbia. First, they provide technical expertise and tools to inform decision making. Secondly, they ensure that the perspectives and needs of multiple stakeholders are incorporated into CE policy, including the EU, private sector and community members, thereby increasing its relevance.

To start with the private sectors' role, to ensure that private sector priorities are reflected in the public sector CE agenda, business associations advocate on behalf of their member companies for changes to CE policies and regulation based on companies' needs and priorities³⁵³. Acting as a conduit between companies and the government, these associations provide relevant private sector perspectives and technical expertise, including considerations for

³⁴⁸ Public-Private Partnerships for Climate Finance, Norden (2016). Available at: <https://norden.diva-portal.org/smash/get/diva2:915864/FULLTEXT01.pdf>

³⁴⁹ <https://www.thegef.org/content/public-private-partnership-program>

³⁵⁰ <https://serbia-energy.eu/serbia-waste-to-energy-plant-eia-updated-in-line-with-eu-regulations/>

³⁵¹ <https://www.lokalnevesti.rs/2020/06/05/u-pancevo-stigli-novi-ekoloski-autobusi-kroz-javno-privatno-partnerstvo-obezbedjeno-60-novih-autobusa/>

³⁵² <https://gminfo.rs/vecnici-usvojiliu-predlog-projekta-javno-privatnog-partnerstva-za-rekonstrukciju-sistema-daljinskog-grejanja/>

³⁵³ Report on activities of Chamber of Commerce and Industry of Serbia in accordance with Ten Principles of UN Global Compact, Chamber of Commerce and Industry Serbia (2017). Provided by key stakeholder

sustainable development, while legislation is being drafted, particularly related to GHG emissions and waste and environmental taxes. For example, National Alliance for Local Economic Development (NALED)³⁵⁴ has created an environmental alliance, an arm of their association dedicated to environmental issues. By bringing together companies, local government and academia, and non-governmental organizations the environmental alliance will decide on CE focus areas and action plans. Currently, they are focused on hazardous waste, food waste, and environmental taxes. Among other business associations, waste is also the primary focus, and multiple business associations have collaborated to provide technical consultation for the public sector to support waste-related legislation. For example, the Association for Packaging and Development (SEPEN)³⁵⁵, NALED and Chamber of Commerce and Industry of Serbia (CCIS) have supported the development of the Draft Law on Packaging and Packaging Waste. Similarly, on the topic of climate change, the CCIS has supported the strategy and action plan of the Draft Law on Climate Change through a coordinated working group. Once legislation is adopted, these associations support member companies' adoption of these policies and action plans and advocate for updates to legislation if needed. Engagement with the public sector can include the issuing of formal letters, phone calls, and invitations to participate in roundtables or panels³⁵⁶.

On the international front, international financiers support in policy development by focusing on alignment with international commitments and EU priorities, particularly related to EE and GHG

reduction. To achieve this, international financiers have collaborated with government departments through project-specific working groups spanning multiple topics (i.e., energy, agriculture, transport, construction, social inclusion) and support with CE project planning and implementation. Currently, the World Bank³⁵⁷ is planning to support Serbia's compliance with the new European Green Deal, which will require increased investment in sustainable development, including CE topics such as EE, pollution prevention and control, waste management, and increased climate resilience³⁵⁸. The World Bank is also providing advisory support for Serbia's EE and renewable energy agenda³⁵⁹, and is in the process of selecting additional CE topics to prioritize in Serbia based on collaboration with the EU and Serbian government³⁶⁰. At the local level, European Bank for Reconstruction and Development (EBRD) is supporting the City of Belgrade in developing a Green Cities Action Plan, which addresses issues related to water, air, soil and climate change³⁶¹.

In addition to supporting alignment with EU priorities, international financiers support public sector decision making by assisting with data collection and sharing technical expertise on key CE topics. To improve data collection, The World Bank has provided technical assistance to the Ministry of Labour in developing the Social Card Registry, which will include a database of vulnerable persons, including children, as prescribed by the NDRMP. This will support the development of a social protection system for disaster risk management³⁶². Along the same line, a number of

³⁵⁴ NALED is a non-profit and non-partisan association of businesses, local governments and CSOs that collaborate to create better conditions for living and working in Serbia.

³⁵⁵ SEPEN was founded by the Coca-Cola HBC, Ball Packaging Europe and Terra Production in 2016, with the objective of connecting private sector actors on the issue of packaging, packaging waste, and environmental protection in Serbia.

³⁵⁶ Interview with key stakeholder

³⁵⁷ <https://www.worldbank.org/en/country/serbia/overview#2>

³⁵⁸ <https://www.europarl.europa.eu/news/en/headlines/economy/20200604STO80509/eu-defines-green-investments-to-boost-sustainable-finance>

³⁵⁹ Interview with key stakeholder

³⁶⁰ Interview with key stakeholder

³⁶¹ Instrument for Pre-accession Assistance (IPA II) 2014-2020 — Serbia: EU for Environment and Climate action, European Commission (2018). Available at: https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/annexes/ipa_2018_-_05_eu_for_environment_and_climate_action.pdf

³⁶² Interview with key stakeholder

IFIs³⁶³ performed a recovery needs assessment after the 2014 floods in Serbia³⁶⁴, highlighting key impact areas and the level of funding required for recovery, which provided guidance for the Serbian government's response efforts. To enhance local technical expertise to facilitate CE policy development, OeEb, the development bank of Austria, provides technical training on EE for local banking partners in order to comply with international standards through its Green Growth Fund (GGF)^{365, 366}. Lastly, EBRD has also assisted with policy dialogue to remove administrative and legal barriers that prevent corporations from accepting loans for EE initiatives³⁶⁷.

By facilitating multi-stakeholder consultation, Serbia's private sector and international financiers help align Serbia's CE policies and strategic frameworks to both domestic and international priorities. Business associations, multi-national companies, IFIs and development banks have created platforms for public consultation, bringing together various actors such as local governments, CSOs and community members, though examples of targeting children and vulnerable groups are limited. CCIS plans local meetings that include businesses, local community members and CSOs to discuss topics, which sometimes include CE matters³⁶⁸. Within Serbia's private sector, multi-national companies with established CSR programs also regularly organize meetings with local communities to determine their needs and their findings are then used to plan and budget their efforts accordingly³⁶⁹.

However, there is no evidence that these needs are considered beyond CSR programming to influence the policy environment.

Core business practices

As discussed in Chapter 1, Serbia's industry, particularly energy and mining, is a major contributor to CE hazards through the release of GHGs and other pollutants. Other industries, such as the textile industry, also consume large amounts of resources, such as water, and releases pollutants, such as hazardous chemicals³⁷⁰. Furthermore, environmental infrastructure gaps add to the level of water and land pollution resulting from these operations. Therefore, companies' efforts to improve the CE situation in Serbia is critical. Overall, progress towards climate-sensitive core business practices is promising in Serbia. Serbia's increased adoption of voluntary environmental certifications and commitments, especially among organizations with large footprints, as well as the fostering of innovation demonstrates a proactive culture among the private sector. However, much more work is required to address the CE needs in the country.

While companies have historically been more focused on programming targeting social sectors, interviews with the representatives of Serbian private sector, as well as recent surveys³⁷¹ indicate that CE is emerging as a priority among Serbia's private sector. Where companies do focus on CE initiatives, most are focused on the management of energy conservation and waste avoidance³⁷², with many using voluntary environmental certifications to demonstrate and measure their efforts. Sectors focused on operational efficiency

³⁶³ This includes The World Bank, Global Facility for Disaster Reduction and Recovery (GFDRR), EU and UNDP.

³⁶⁴ Comprehensive disaster risk management in Serbia, Global Facility for Disaster Reduction and Recovery (GFDRR) (2018). Available at: <https://www.gfdrr.org/sites/default/files/publication/Serbia.pdf>

³⁶⁵ GGF finances renewable energy and energy efficiency projects in Southeast Europe

³⁶⁶ <https://www.oe-eb.at/en/our-projects/projects-at-a-glance/green-for-growth-fund.html>

³⁶⁷ Interview with key stakeholder

³⁶⁸ Interview with key stakeholder

³⁶⁹ Interview with key stakeholder

³⁷⁰ Engaging with the private sector in Serbia: Situation analysis 2019 (Internal UNICEF document, DRAFT), UNICEF (2019). Provided by key stakeholder

³⁷¹ CSR Focusing on children, UNICEF Serbia (2017). Provided by UNICEF Serbia

³⁷² Corporate Social Responsibility in Serbia: Between Corporate Philanthropy and Standards, Stokic et al. (2015): Available at: https://www.researchgate.net/publication/302498514_Corporate_Social_Responsibility_in_Serbia_Between_Corporate_Philanthropy_and_Standards

include buildings, agriculture and tourism³⁷³. In the built environment, Serbia has increased from only nine LEED³⁷⁴ certified buildings in 2015³⁷⁵ to about 60 Leadership in Energy and Environmental Design (LEED) or Building Research Establishment Environmental Assessment Method (BREEAM)³⁷⁶ certified buildings in Serbia, most of which are located in Belgrade³⁷⁷, which includes IKEA's first location³⁷⁸. An additional 970 buildings have energy passports, which is a European certification for EE³⁷⁹. In addition, the number of companies with environmental management systems (EMS), such as International Organization for Standardization (ISO) 14000³⁸⁰, steadily grew from 2006–2012³⁸¹. Research indicates that companies, particularly in the food and beverage sector, are primarily motivated to implement an EMS for pollution prevention, as well as customer relations³⁸². Foundation for Environmental Education Serbia also provides industry-specific voluntary environmental certifications, such as Green Key for hotels and Blue Flag for beaches and marinas³⁸³.

³⁷³ Engaging with the private sector in Serbia: Situation analysis 2019 (Internal UNICEF document), UNICEF (2019). Provided by key stakeholder

³⁷⁴ LEED is an internationally recognized green building certification system, providing third-party verification that a building designed and built in a manner that reduces energy, water, waste, etc.

³⁷⁵ <https://www.usgbc.org/articles/leed-retail%E2%80%94ready-boom-serbia>

³⁷⁶ BREEAM is a sustainability assessment method that is used to masterplan projects, infrastructure and buildings

³⁷⁷ <http://www.gbig.org/places/839/activities?page=3>

³⁷⁸ <https://www.bilfinger.com/en/geothermal-energy-ikea-serbia/>

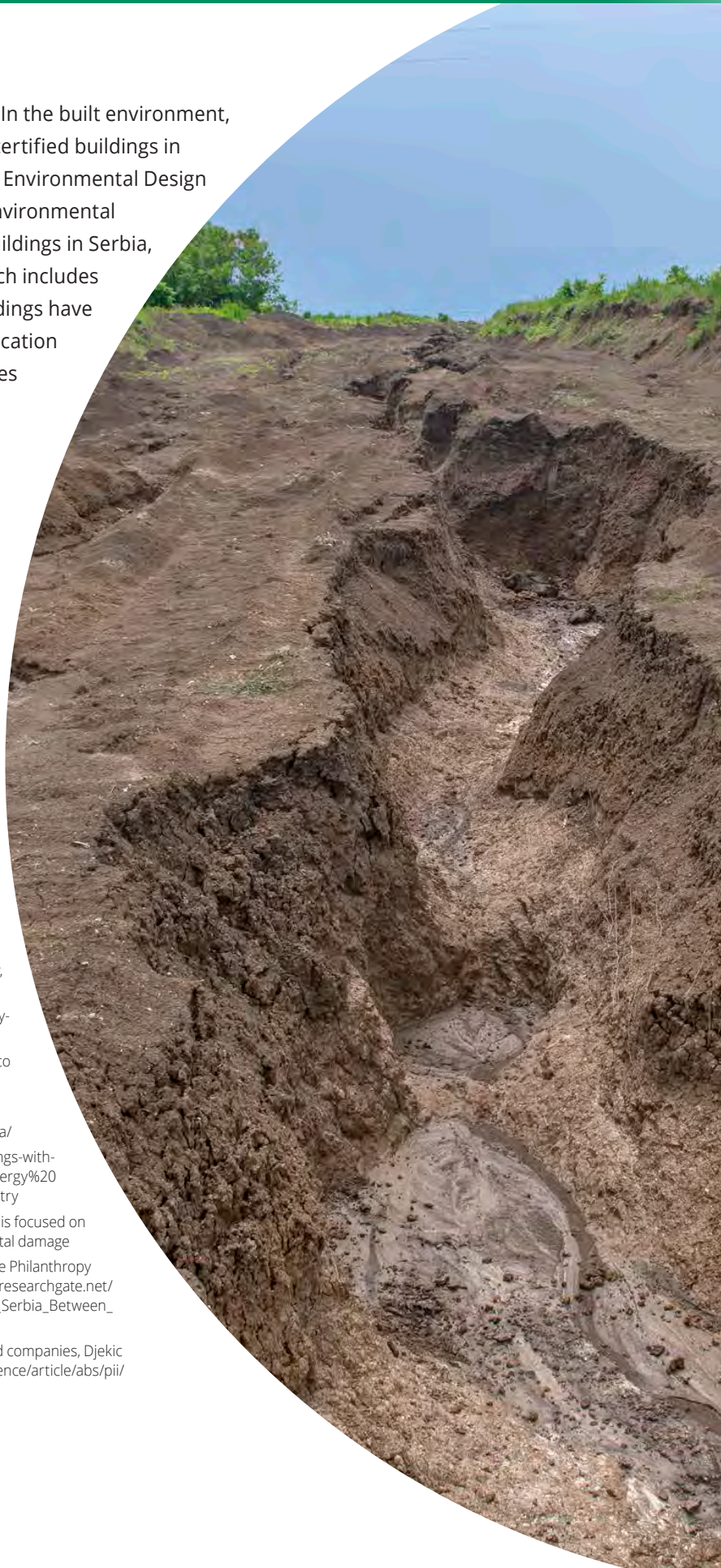
³⁷⁹ <https://balkangreenenergynews.com/serbia-has-970-buildings-with-energy-passport/#:~:text=Central%20Register%20of%20Energy%20Passports,Chamber%20of%20Commerce%20and%20Industry>

³⁸⁰ ISO 14000 is part of an international set of standards, which is focused on helping companies reduce industrial waste and environmental damage

³⁸¹ Corporate Social Responsibility in Serbia: Between Corporate Philanthropy and Standards, Stokic et al. (2015); Available at: https://www.researchgate.net/publication/302498514_Corporate_Social_Responsibility_in_Serbia_Between_Corporate_Philanthropy_and_Standards

³⁸² Environmental management effects in certified Serbian food companies, Djekic et al. (2014). Available at: <https://www.sciencedirect.com/science/article/abs/pii/S0959652614004181?via%3Dihub>

³⁸³ <http://feeserbia.com/>



Large domestic and multinational companies also disclose a number of environmental initiatives related to energy and waste through their sustainability reports and websites. For example, Nelt, a large domestic distribution and logistics company has implemented technology to track and reduce energy consumption³⁸⁴. Nectar Group, another large domestic company in the food and beverage sector announced this year that it will invest in plant-based packaging and renewable energy, and aims to reduce GHGs by 20% by 2030, driven by alignment with the SDGs³⁸⁵. Complementing these efforts, large multinational companies have existing global goals that can improve the CE situation in Serbia by providing more sustainable products. For example, Zara is increasing the availability of sustainable textiles and aims to eliminate single-use plastic for consumers³⁸⁶, and IKEA has a goal to consume 100% renewable energy by 2025, and to phase out fossil-fuel based energy by 2030³⁸⁷.

Business associations play a key role in providing information and tools to support companies in adopting CE-sensitive core business practices. The CCIS hosts seminars and round tables and provides consultation and training related to CE topics. These topics include eco-labelling (voluntary compliance with environmental performance certifications); implementation of EMS; green procurement (procuring goods and services with a reduced environmental impact); waste management and circular economy³⁸⁸. Some trainings are also industry-specific, such as environmental protection in mining and energy, GHG reduction in livestock production, end-of-life vehicle

disposal, and electric vehicles³⁸⁹. The CCIS is also aligned with, and works to promote, the 10 UN Global Compact (UNGC) principles, three of which are focused on the environment³⁹⁰.

In addition to these abovementioned initiatives, new technologies and business models are emerging in Serbia to support companies in reducing their environmental footprint and address CE hazards in the country. Founded in 2006 by large European companies, including Coca-Cola HBC, Ball Packaging and Tetra Pak, Sekopak's innovative business model facilitates extended producer responsibility (EPR)³⁹¹ in Serbia. Acting as a mediator between the national and local governments, private sector, and community, Sekopak helps consumers identify products with recyclable packaging, and provides collection and recycling of large amounts of packaging waste^{392, 393}. Additionally, public sector funding for environmental entrepreneurship has resulted in the formation of new companies that benefit Serbia's CE agenda. The Serbian government's Innovation Fund, for which the World Bank and EU have provided administrative, financial and implementation support³⁹⁴, has also supported a number of companies that address relevant CE hazards. These companies offer a range of innovative solutions including renewable energy, such as solar energy products, technology to increase crop resilience to climate change, eco-friendly packaging and products, and waste management and EE solutions³⁹⁵.

³⁸⁴ Excellence and Responsibility for the Future: Nelt Group Sustainable Business Report 2018/2019, Nelt Group (2020). Available at: <https://www.nelt.com/en/media-center/reports/>

³⁸⁵ <http://rs.n1info.com/Biznis/a572891/Nektar-uvodi-ambalazu-biljnog-porekla-i-investira-u-proizvodnju-zelene-energije.html>

³⁸⁶ <https://www.zara.com/rs/en/z-commitment-mkt1390.html>

³⁸⁷ <https://www.weforum.org/agenda/2019/09/owner-ikea-exceed-renewable-energy-goal-years-end/>

³⁸⁸ Circular economy is defined as the elimination of waste associated with consumption, replaced by a continual use of resources in a cyclical fashion

³⁸⁹ Report on activities of Chamber of Commerce and Industry of Serbia in accordance with Ten Principles of UN Global Compact, Chamber of Commerce and Industry Serbia (2017). Provided by key stakeholder

³⁹⁰ Ibid.

³⁹¹ Extended producer responsibility is a strategy for producers to take financial and physical responsibility for the environmental costs associated with a product throughout its life cycle

³⁹² <https://sekopak.com/o-nama/>

³⁹³ In 2018, over 88,000 tons of packaging waste was collected and recycled

³⁹⁴ <http://www.inovacionifond.rs/finished-int-projects/innovation-serbia-project>; <https://www.worldbank.org/en/news/press-release/2019/12/13/world-bank-supports-knowledge-and-innovation-based-economic-development-in-serbia>

³⁹⁵ <http://www.inovacionifond.rs/programs/mini-grants-program/funded/pr-svi-projekti#dropdown-menu>

Alongside this positive momentum, some challenges remain in improving CE performance of the private sector in Serbia. SOEs present a particular challenge, as many are energy providers whose operations have significant environmental impacts, primarily through the release of GHGs and contribution to air pollution in the country. Other SOEs operate in industries that also relate to CE hazards, such as municipal waste and wastewater management. Constrained by public funding and energy prices which are about 35% lower than surrounding countries, SOEs in the energy sector do not have sufficient funds available investments for CE. Most notably, EPS has been identified as one of the largest polluters in Europe and will be required to meet EU environmental regulations as Serbia works toward EU accession. Specifically, Serbia has committed to reduce its emissions to levels set by EU Industrial Emissions Directive by 2027 at the latest in its National Emissions Reduction Plan³⁹⁶. Making these changes will require significant amount of investment, ranging from EUR 1.3 to 2.4 billion, which have fallen short in the past. From 2015–2018 only a third of the planned and required EUR 1.2 billion was invested in environmental protection for Elektroprivreda Srbije (EPS), largely due to financial constraints³⁹⁷. Because electricity prices are not high enough for costs to be recovered, investments in efficiency and reducing GHG emissions are held back³⁹⁸. As mentioned above, international financiers have, and will continue to, play a critical role in addressing such challenges by financing projects that address energy and environmental infrastructure needs.

³⁹⁶ EPS Performance Analysis and Recommendations for Investments Increase, Republic of Serbia Fiscal Council (2019). Available at: http://www.fiskalniasvet.rs/doc/eng/FC_Summary_EPS_Performance_analysis_and_recommendation_for_investments_increase.pdf

³⁹⁷ EPS Performance Analysis and Recommendations for Investments Increase, Republic of Serbia Fiscal Council (2019). Available at: http://www.fiskalniasvet.rs/doc/eng/FC_Summary_EPS_Performance_analysis_and_recommendation_for_investments_increase.pdf

³⁹⁸ Commission Staff Working Document: Economic Reform Programme of Serbia (2020–2022) Commission Assessment, Council of the European Union (2020)

Education and engagement

Upon analyzing the contributions of Serbia’s private sector and international financiers to the country’s CE agenda, education and engagement arises as the only support mechanism whereby a focus on both children and CE are brought together through extra-curricular programming. This extra-curricular CE education programming is important to supplement children’s formal education, as school curricula have minimal coverage of CE concepts and these concepts are not fully embedded into relevant courses (e.g., geography, biology, etc.)³⁹⁹. Further, national surveys have also recognized the importance of CE education in Serbia, with over one third of respondents seeing education as a means to improve the CE situation in the long run and develop responsible behavior toward the environment⁴⁰⁰.

Serbia’s private sector, sometimes via collaboration with CSOs, supports environmental education and engagement platforms for children. In addition, international financiers also provide programming to encourage youth education and employment in CE. These efforts help equip children to become active, informed stakeholders influencing CE policy, and expand opportunities for green jobs⁴⁰¹. However, the overall scale and reach of these initiatives is limited, as there are only a few notable examples of child-focused CE education programming. Further, these programs are often limited to Eco-Schools (described in the Spotlight below), of which there are about 130 across the country.

One such example of child-targeted CE education programming is through EPS, Serbia’s largest state-owned electric utility power company, which

³⁹⁹ Interviews with health and child rights experts in Serbia

⁴⁰⁰ Preservation of Natural Environment, Segmentation Study, Smart PLUS Research, WWF (2020). Provided by UNICEF Serbia.

⁴⁰¹ Green jobs refer to jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources

focuses much of its CSR efforts on children. Through partnership with a CSO (the Goran Movement of Serbia), EPS supports children's eco-camps, which provide informal environmental education through summer programs⁴⁰². Another noteworthy example is that of VodaVoda, a Serbian mineral water producer. The company partnered with doctors and experts to host a conference teaching children about the importance of water quality for their health⁴⁰³. This is a promising example of highlighting the link between CE and topics that have typically been socially focused, such as children's health.

In addition to these opportunities, there are other examples of private sector and CSO partnerships to provide school-based programming. Private sector companies, superficially large multinational companies, support CSO programming as a method of community engagement through their CSR agendas, which typically exist outside of their core business practices. There are a few examples of environmental school-based programs, albeit to a lesser extent than programs targeting the social sectors. For instance, the Toyota Fund for Europe supported biodiversity education for children for the past four years⁴⁰⁴. The other projects in the Spotlight below are also supported by the large multi-national companies, namely Tetra Pak and Ball Packaging Europe. EKO-PAKET is exclusive to Eco-Schools, whereas Every Can Counts is run in both Eco-Schools and others.

There are also professional development programs for children that focus on CE innovation and employment, which are facilitated by business associations and international financiers. The CCIS is implementing the European Institute for Technology (EIT) Climate Knowledge and Innovation Community (Climate-KIC) program (the largest EU public-private partnership on climate change⁴⁰⁵), which includes school programs and hackathons where youth can participate to develop innovative solutions related to climate change⁴⁰⁶. Following this trend, the EBRD has implemented an internship program for high school students related to CE topics and is currently exploring opportunities to develop youth ambassadors to generate awareness on CE issues in the country⁴⁰⁷. Similarly, the World Bank has also engaged children in grassroots community development whereby students were involved in the improvement of school EE and later became ambassadors for energy use awareness; however, this has not yet been implemented in Serbia. Together with the private sector, this past year, Smart Kolektiv⁴⁰⁸ ran a CSR internship program, whereby youth were trained in all phases of CSR project planning and implementation, as well as collaboration between the companies and CSOs⁴⁰⁹.

⁴⁰² <http://www.eps.rs/eng/Pages/Odgovorno-poslovanje.aspx>

⁴⁰³ Children's Rights and Business Principles — Corporate Social Responsibility Focused on Children: Examples of Good practice, UNICEF Serbia (2017). Provided by UNICEF Serbia

⁴⁰⁴ Key stakeholder interview

⁴⁰⁵ EIT Climate-KIC receives funding from public and private partners, including an annual grant from the European Commission

⁴⁰⁶ Key stakeholder interview

⁴⁰⁷ Key stakeholder interview

⁴⁰⁸ Smart Kolektiv is a not-for-profit organization that promotes CSR practices and youth entrepreneurship in Serbia through a variety of programs

⁴⁰⁹ UN Global Compact: Communication on Engagement, Responsible Business Forum (2020). Available at: https://ungc-production.s3.us-west-2.amazonaws.com/attachments/cop_2020/485048/original/RBF_COE_for_Global_Compact_2018-2019.pdf?1586615288

Spotlight on school-based CE programming

While most programming address CE hazards and children separately, below are noteworthy examples of school-based CE programming as a result of cooperation between CSOs and the private sector. These initiatives focus on engaging children through CE education as well as hands-on waste management activities.



Eco-Schools: Eco-Schools is an international program that focuses on sustainable development and environmental education in Serbian schools nationwide, kindergarten to secondary school, as well as universities. Eco-Schools provide environmental educational programming to students through interactive and action-based techniques such as workshops, competitions, and volunteerism. To ensure that children from vulnerable groups are also able to participate, Eco-Schools also include children with disabilities, whereby programming is adapted to their needs, and there is an even distribution of rural and urban Eco-Schools allowing for more Roma children to participate, as there is a higher proportion of Roma children in rural schools⁴¹⁰.



Tetra Pak's EKO-PAKET project: Tetra Pak is a multinational food packaging and processing company that operates in Serbia. As part of its CSR efforts, Tetra Pak was the main sponsor of the Eco-Schools program until recently⁴¹¹. Under the Eco-Schools program, Tetra Pak implemented the EKO-PAKET project, which includes a series of workshops for children in Eco-Schools, specifically focused on the importance of recycling and environmental protection⁴¹². To incentivize participation, this project included a yearly competition on the use of Tetra Pak packaging to create different designs, with awards to students and schools⁴¹³. With Tetra Pak's previous support, Eco-Schools was also able to increase their reach from three schools to 100 schools over six years.



Recan Foundation's Every Can Counts: Starting in 2017, Ball Packaging Europe's Recan Foundation runs Every Can Counts, a program that includes educational workshops and can collection for recycling within Eco-Schools. So far, over eight Eco-Schools have been involved in the project in Serbia, resulting in over 4,000 kg of cans collected⁴¹⁴.

Opportunities for further action

The support mechanisms outlined above cover relevant CE topics that will have downstream benefits for children and vulnerable groups. For example, EE can lead to reduced air pollution, waste management can reduce exposure to diseases or hazardous chemicals, and disaster risk management can reduce protection risks. However, even with the abovementioned contributions, further action and coordination is required to address CE hazards in a manner that ensures sustained benefits for children and vulnerable groups. As in the case of the public sector, children are often not integrated into existing

initiatives; they are either not considered, or they are considered in separate initiatives focused on social sectors, such as those related to healthcare and education. Secondly, SMEs, which make up a large percentage of the Serbian economy, are not regularly or deeply engaged in initiatives that address CE topics. Third, there is a lack of transparency on the details of initiatives, particularly related to impacts and funding. Lastly, increased focus on multi-sectoral collaboration is required to achieve efficiencies and sustain the impact of initiatives over the long-term. Each of these opportunities are described in more detail below.

Integration of children's issues in CE planning

Beyond limited examples of child-targeted CE education programming, CE engagement by the private sector and international financiers is not child centered. In the private sector, children are often focused on

⁴¹⁰ Key stakeholder interview

⁴¹¹ After six successful years, Tetra Pak has recently discontinued this project due to shifting priorities

⁴¹² <https://ips.edu.rs/ecoschool/>

⁴¹³ Key stakeholder interview

⁴¹⁴ <https://www.recan.org.rs/>

separately from CE topics. According to the UNGC and UNICEF, Serbia's private sector is prioritizing action on both climate change and children's well-being; however, they are currently treated as separate issues. Existing statistics demonstrate this separation, as 35% of CSR projects submitted to the CCIS are dedicated to the environment, while one third were focused on social topics, such as the promotion of education and employment⁴¹⁵, and providing funding for healthcare or shelter⁴¹⁶. A number of social initiatives in the private sector focus on vulnerable groups, such as people with disabilities and Roma⁴¹⁷. This focus on children and vulnerable groups does not carry over to environmental initiatives; similar to the public sector, there is minimal focus on children or vulnerable groups related to private sector engagement in CE initiatives.

Likewise, international financiers generally do not formally incorporate considerations of children into CE project assessments, though they do consider vulnerable groups more broadly, and are particularly focused on women. For instance, the World Bank focuses on gender in its social and environmental assessments and monitoring and evaluation processes, focusing on female participants and beneficiaries of EE projects. Children are sometimes included in these considerations of gender issues, though not substantially or consistently. On the topic of inequality considerations, KfW consults with vulnerable groups, such as Roma and migrants, albeit predominantly for projects targeting social sectors⁴¹⁸. EBRD also incorporates consideration of vulnerable groups in its projects through a comprehensive environmental and social due diligences process. In the broader context, both the EBRD and World Bank are driving toward an

inclusive and just transition to a low-carbon economy that considers implications on vulnerable groups.

While children are targeted in a few initiatives related to CE education, as outlined in the Spotlight above, there is potential to expand the considerations of children into CE initiatives beyond education programming. The private sector can integrate its initiatives to holistically consider the environment, children and vulnerable groups, while IFIs can incorporate children into formal assessment processes that currently consider other vulnerable groups, such as Roma and women, more broadly.

Engagement of SMEs

Given that SMEs make up 99.9% of Serbian economy and 35% of Serbia's GDP, they are an important sub-group of the private sector to engage in CE initiatives⁴¹⁹. There is significant untapped potential to contribute to CE initiatives in the country, as SMEs are not as active in CE initiatives compared to large domestic (e.g., Delta Holding, Telekom Srbija) or multi-national companies (e.g., IKEA, Telenor). The primary reason for this is a lack of financial resources and economic uncertainty among Serbian companies⁴²⁰, echoing the public sector's strong focus on economic development. Further, among SMEs, there is a lack of awareness of how a focus on CE or children can generate reputational and financial gains through factors such as improved employee attraction and retention and supplier relations⁴²¹.

Large domestic or multi-national companies operating in the country often have established funds and strategies for CE initiatives at their headquarters, while SMEs have fewer resources and guidance. As

⁴¹⁵ Key stakeholder interview

⁴¹⁶ Engaging with the private sector in Serbia: Situation analysis 2019 (Internal UNICEF document), UNICEF (2019). Provided by key stakeholder

⁴¹⁷ <https://cordmagazine.com/sector-in-focus/corporate-social-responsibility/dusan-stokic-chamber-commerce-serbia-ccis/>

⁴¹⁸ Key stakeholder interview

⁴¹⁹ Engaging with the private sector in Serbia: Situation analysis 2019 (Internal UNICEF document), UNICEF (2019). Provided by key stakeholder

⁴²⁰ Evaluating the strategic approach to CSR in Serbia, Krstic et al. (2017). Available at: https://www.researchgate.net/publication/321071399_EVALUATING_THE_STRATEGIC_APPROACH_TO_CSR_IN_SERBIA

⁴²¹ Engaging with the private sector in Serbia: Situation analysis 2019 (Internal UNICEF document), UNICEF (2019). Provided by key stakeholder

a result, SMEs limit their engagement in CE to small ad-hoc initiatives and rely on external tools and guidelines to support planning implementation for CE initiatives. These companies are also unable to secure environmental certifications and do not disclose the impact of their initiatives, which are both common practice among larger organizations. In addition, data with regards to the investment made by large domestic and multi-national companies on CE is publicly available. However, this is not the case for SMEs making it difficult to measure the impact or consistency of SME engagement.

Impact measurement and reporting

In Serbia, there is limited published information on the project details and impacts of CE initiatives in private sector companies, both related to internal initiatives in core business operations and external initiatives through CSR agendas. Generally, there is more data available on company CSR initiatives, such as those involving community engagement. One primary reason for this is that companies focus on public relations when engaging in external child-targeted or CE projects, so this information is more widely available⁴²².

Publicly available data is limited to disclosures of a few large domestic and multi-national companies and is mostly reported in an ad-hoc manner. For example, large domestic and multi-national companies such as Nelt, Coca Cola HBC and Delta Holding disclose metrics such as reduction in water and energy consumption, and the number of individuals benefitting from community programs or donations⁴²³. However, as companies are not required to disclose details of their initiatives, and disclosures are not published in a standardized format, they do not capture the

full breadth of initiatives being implemented in the country. International sustainability reporting standards, such as the Global Reporting Initiative (GRI), are not widely used in Serbia⁴²⁴ and a recent national platform, the CSR Index Serbia, has been discontinued since its introduction in 2016 due to a lack of funding⁴²⁵. As a result, research relies on third-party surveys, which have varying methodologies (e.g., survey questions, sample size). Data is often not disaggregated or provided year over year. For instance, statistics on private sector CSR initiatives are recorded by broad focus area (i.e., environment, community, vulnerable groups), but not by specific project type. In addition, there are no available insights on how the focus on CE topics varies over time, by geography or by sector. Therefore, it is difficult to identify areas where there has been progress, and those which require increased engagement.

When it comes to international financiers, there is publicly available data on investment amounts, focus areas of investments, and in some cases, detailed project descriptions. However, assessments of the social and environmental benefits of these investments are not publicly available and cannot be determined with the level of information provided. Therefore, it is not possible to evaluate the effectiveness of current spending, nor is it possible to identify how spending can be re-allocated to benefit children. Likewise, it is unclear where eco taxes and fees are being spent, and not possible to determine the benefits of these private sector contributions for the Serbian population, specifically children.

⁴²² Key stakeholder interview

⁴²³ <http://www.amcham.rs/news.33.html?newsId=2469>; <http://www.amcham.rs/news.33.html?newsId=2437>

⁴²⁴ Measuring corporate social responsibility: The GRI approach, Berber et al. (2018). Available at: <http://isc2018.ekonomskifakultet.rs/ISCpdfs/ISC2018-15.pdf>

⁴²⁵ Engaging with the private sector in Serbia: Situation analysis 2019 (Internal UNICEF document), UNICEF (2019). Provided by key stakeholder

Multi-sectoral coordination for sustained benefits

Several actors provide unique contributions to the CE agenda in Serbia. Platforms for strategic alignment between each set of actors are required to create efficient use of resources, maximize impact and ensure long-term sustainability of initiatives. Similarly, there will need to be better coordination mechanisms because each actor has a specific role to play in Serbia's CE agenda. For example, greater synergy between multiple stakeholders has been identified as crucial for achieving the SDGs in Serbia⁴²⁶.

Currently, there are interdependencies and collaboration between actors, though these mechanisms are not formalized, which can create limitations and/or inefficiencies. Going forward, increased effort will be required to align Serbia's CE agenda and public sector plans with those of the private sector and international financiers. As mentioned earlier, contributions from IFIs are largely shaped by country priorities via formal processes such as country diagnostics and country partnership frameworks⁴²⁷, while EU contributions are governed by more objective requirements for EU accession. Therefore, it is imperative that Serbia's public sector demonstrates a prioritization of CE hazards impacting children, such as air pollution, flooding, or others mentioned in these reports, in order to enable targeted support from IFIs. Serbia's public sector will also need to align plans for resource allocation (i.e., funding and staffing) with the requirements to maintain CE initiatives, such as environmental infrastructure, in the long term. Currently, it is unclear whether planned budgetary expenditures for environmental protection account for the upkeep of new environmental infrastructure or the implementation of CE policies and strategies, as

this is not specified in current data⁴²⁸. Similarly, Serbia's public sector will need to create a policy environment to support private sector engagement in CE, including both core business practices such as reducing consumption and waste, as well as participating in CSR initiatives. Previously, the government had adopted the Strategy for the Development and Promotion of CSR in the Republic of Serbia (2010–2015), though it has since been discontinued. Similar strategies and action plans would be beneficial to provide guidance for companies on how to incorporate CSR into existing functions and align with local and national CE priorities. Further, incentives for investing in CE improvements to operations could be beneficial in securing uptake in the private sector, specifically in heavily polluting industries such as mining or textiles.

In the future, innovative financing mechanisms that bolster partnerships between private sector, CSOs and international actors while being cost-effective for the public sector will be instrumental to sustain impact. Innovative financing mechanisms will be particularly important in the coming years as the government will be faced with paying back loans to IFIs, which can have downstream effects on local governments and communities. To facilitate both financial support and capacity building, PPPs are a promising model for Serbia. PPPs are a natural fit as Serbia requires improved energy and environmental infrastructure, much of which is public operating as SOEs. CSOs will also be great allies for setting CE priorities in the public and private sector. By engaging directly with children and vulnerable populations and/or advocating for CE action as part of their mandate, CSOs can provide valuable perspectives to child-sensitize Serbia's CE agenda. This could have significant beneficial impacts if large companies, business associations and international actors dedicate resources in line with priorities influenced by CSOs.

⁴²⁶ UN Global Compact: Communication on Engagement, Responsible Business Forum (2020). Available at: https://ungc-production.s3.us-west-2.amazonaws.com/attachments/cop_2020/485048/original/RBF_COE_for_Global_Compact_2018-2019.pdf?1586615288

⁴²⁷ Key stakeholder interview

⁴²⁸ Data on environmental expenditures can be found in Chapter 2.

CONCLUSION AND RECOMMENDATIONS

Based on current contributions toward CE and child targeted initiatives, Serbia's private sector and international financiers display significant potential in helping to develop a child-sensitive CE agenda in the country. Through mandatory fees, Serbia's private sector expands the available pool of government funding for environmental protection. Perhaps more promising is Serbia's private sector voluntary engagement in CE: business associations provide critical support in policy development, and companies align with CE policies and strategies through the adoption of voluntary CE initiatives, including adjusting core business practices to reduce environmental impacts and donations. In addition, international financiers are dedicated to improving energy and environmental infrastructure in the country through project-based loans, public sector capacity building, and providing support in aligning with international CE commitments. Lastly, the private sector, in partnership with CSOs, delivers CE focused education programming that provides important opportunities for children. Along the same lines, international financiers have implemented internship programs to provide CE related employment opportunities.

Combined, these contributions make great strides in addressing the administrative and financial constraints experienced by the public sector outlined in Chapter 2. Going forward, greater integration of children into CE initiatives beyond CE education programming, coupled with improved data and transparency, will allow for children's unique needs and benefits to be more widely recognized. Further, engagement of SMEs can significantly expand existing private sector and international contributions. Most importantly, coordination between the public sector, private sector, international actors and CSOs, through harmonized priorities, policies and budgets, as well as innovative financing mechanisms, will ensure efficiency and sufficient resources to sustain the impacts of initiatives in the long run. The next chapter will provide additional cross-cutting recommendations to strengthen and child-sensitive Serbia's CE agenda.





CONCLUSIONS AND RECOMMENDATIONS

This chapter provides a summary of the current CE agenda in Serbia, highlighting the main contributions from each actor, and where opportunities remain for future action and contributions from stakeholders.

SUMMARY OF THE CE ACTION IN SERBIA

Despite the fact that children, particularly those who are members of vulnerable groups, have been and will continue to bear the brunt of CE hazards in Serbia, such as air pollution and flooding, the CE agenda in Serbia does not sufficiently address their needs.

First and foremost, increased and collaborated CE action is required from all relevant stakeholders. While the public sector has created an enabling environment for CE action, driven by EU accession and international commitments, financial and administrative capacity constraints hold back progress, resulting from a combination of factors. Due to a number of recent economic recessions, the public sector has limited funds and administrative capacity to begin with. To recover from this economic situation, there is also a strong prioritization of economic development, which further limits financial and administrative resources for other topic areas, such as environmental protection. Other actors, including the private sector and international financiers help to expand CE action in Serbia through a variety of means; however, these efforts are not sufficient to fill existing gaps, particularly not in a manner that is sustainable over

the long term. In the private sector, CE initiatives are voluntary and ad-hoc, typically based on companies' own objectives and plans. Through international financiers, significant financial contributions are provided, though this is primarily available for discrete projects and/or action plans and most of the funds are loaned and must be paid back by the public sector, which has limited financial capacity.

Secondly, CE action in Serbia is not child-sensitive. Among the public sector and other actors, children and vulnerable groups are considered in separate initiatives targeting social sectors rather than integrated into CE initiatives. There are a few examples of integrating children and vulnerable groups into CE initiatives, particularly among international actors, though this is nascent. Children have been identified as members of vulnerable groups, however there is no evidence of adjusting policies or plans to accommodate for their unique needs. The main example of integrating children and CE is through child targeted CE education programming provided by private sector companies, sometimes in partnership with CSOs. While this programming contributes to the required culture shift and helps to empower children to make changes in their lifestyles today (such as learning about recycling) and makes them informed citizens to develop the CE agenda in the future, this does not address the risks they face today as a result of CE hazards.

Lastly, there is a lack of data to inform child-sensitive CE action, both in the public sector and beyond. Overall,

data is not standardized and impacts of initiatives are often not measured and reported. Public sector data is not available in a consistent format or location, nor is it disaggregated based on specific CE hazards, topics, or population groups making it difficult to analyze expenditures and progress against plans. Some CE plans are also not implemented as planned, making it difficult to assess overall benefits to society or children. For plans that are implemented, evaluations often do not include consider children, though they do consider vulnerable groups, albeit narrowly, by focusing on gender. In the private sector, company disclosures are published in an ad-hoc manner depending on company reporting processes. Similarly, most IFIs do not make their impact reporting publicly available. Looking at the public and private sector and IFIs holistically, the current state of CE data creates challenges in evaluating the impacts of current efforts on children and identifying where the biggest gaps remain to inform future action. Upon evaluating the CE situation and Serbia and current state of action, it is clear that children will continue to experience the costs of inaction, as outlined in Chapter 2, if further efforts are not taken to strengthen the CE agenda and address the gaps described above.

Greater action on CE will also be necessary to achieve Serbia's alignment with international commitments that holistically consider children and CE, specifically the SDGs. There are important CE targets ahead for the 2030 agenda, primarily those related to energy, water and waste, which Serbia is yet not progressing on⁴²⁹. There has been some progress toward Goal 15: Life on Land through nature conservation by significantly increasing proportion of forested land and expenditure. Similarly, there has been improvement in Goal 6: Clean water and sanitation through increased access to wastewater treatment, though the significant majority of the population still does not have access.

There remain important gaps in achieving other CE related SDGs, namely a lack of clean energy options due to coal-based energy production and lack of energy access in rural and Roma communities (Goal 7: Affordable and clean energy). Further, very low rates of waste management and recycling compromise Serbia's ability to meet Goal 11: Sustainable cities and communities and Goal 12: Responsible consumption and production. As these CE goals are not being met, the disproportionate impacts of resulting CE hazards can further limit progress against social goals. For example, the impacts of CE hazards and/or resulting protection risks can inhibit progress against Goal 1: No poverty, Goal 2: No hunger, Goal 3: Health, Goal 5: Gender equality, Goal 10: Reduced inequalities, and Goal 16: Peace, justice and strong institutions. Additionally, if children's access to basic services are affected, Goal 4: Quality education can be compromised.

CONCLUSION AND RECOMMENDATIONS FOR FUTURE ACTION

Multiple stakeholders are contributing to the CE agenda in Serbia in a variety of ways. However, taken together, these efforts still leave the impacts of CE hazards on children largely unaddressed, resulting in costs to children and a compromised ability for Serbia to achieve the SDGs.

These gaps remain because efforts targeting CE and children's issues are compartmentalized due to the current mindset, which is fed by a lack of i) data and awareness on how these two topics intersect, ii) multi-sectoral collaboration and iii) availability of sustainable funding sources. In light of these gaps with regards to the CE agenda, there are important steps that could be taken to help mitigate the effects of CE hazards in children and contribute to progress in line with the above-mentioned SDGs.

⁴²⁹ http://sdg.indikatori.rs/media/1501/sdg_serbia.pdf

Below are two main recommendations to support Serbia's child-sensitive CE agenda. While implementing these recommendations to be able to support an efficient and sustainable process, *multi-sectoral collaboration* stands out as the key principle on the way forward. Through collaboration among public sector, private sector, international actors, CSOs and youth, CE action could be designed and implemented based on the assets, networks, strengths and capacity of each stakeholder. This process would benefit from a combination of both soft approaches (e.g., advocacy) and hard approaches (e.g., establishment of data platforms and/or financing mechanisms).

1) Integrate children and vulnerable groups into CE action

There is an important need to bring both a child rights and inequality lens to existing CE action in Serbia. Child-sensitizing the current CE policies, strategies, action plans and programs could be considered as a good starting point. Child-sensitization should be coupled with the consideration of vulnerable groups, such as children living in Roma settlements, children with disabilities or pre-existing health conditions, and children with low socioeconomic status. This will require provision of technical expertise from relevant stakeholders. Consultations among stakeholders, including children and youth, should be used for the design as well as the implementation of child-sensitive CE action.

In order to actualize this, firstly, more data will be required to have an evidence-based approach. This could be done in two ways:

i) Collection of additional data: For instance, CE and inequality related questions could be added in the existing surveys targeting children and/or children related questions could be added in CE related surveys. These will help to gather data on number of children

affected by extreme weather events, or children experiencing respiratory illness, disaggregated by factors such as age, ethnicity and location to identify vulnerable groups. Additional studies could also be implemented on CE and children, focusing in greater detail on specific hazards, impacts, and/or groups of children to get a deeper understanding of the situation.

ii) Improved transparency and analysis of the existing public and private sector data: Increased collaboration between Statistical Office of the Republic of Serbia and other data generating stakeholders, including the private sector, could help to inform the collection and dissemination of child-sensitive CE data to better understand implications for children. Example indicators that could be included for further analysis are: healthcare costs for air pollution disaggregated by age group; school attendance and drop-outs, child labour and gender-based violence following flood events; expenditure on child-related CE initiatives; outcomes and/or impacts of investments in child-related initiatives. This data could also be disaggregated by location and income level to further facilitate targeted CE action.

Secondly, active participation of children and youth in all stages of this process will be key to bring the child rights lens as they are the subjects of the CE hazards. It will ensure that their unique needs are considered and addressed. Education will be a key tool to encourage child/youth engagement. If children and youth are informed on the importance of addressing CE topics, they are more likely to be engaged. Children and youth in Serbia have already identified this gap, noting that there is a lack of interest in CE advocacy, and that this likely stems from limited formal environmental education⁴³⁰. There are programmes in place to address these gaps yet further opportunities could be created for children and youth to improve

⁴³⁰ Interview with key stakeholder

their learnings and practice their knowledge to contribute to the CE agenda in the country.

2) Address funding gaps for child-sensitive CE action

Availability of evidence can help inform areas where funding is most needed to address the impacts of CE hazards on children, and how it can be most effectively spent. As part of the efforts for multi-sectoral collaboration, multiple actors could be convened, particularly those with more substantial financial resources, such as international financiers and large companies, to partner and fund CE action, thereby working to address the costs of inaction on children. In developing financing mechanisms and plans, those which are evidence-based, applying child-sensitive data to inform decisions, and those which engage youth in decision-making and/or implementation should be prioritized. Long-term sustainability should also be prioritized, particularly in the Serbian context where the public sector faces financial constraints.

Adoption of innovative financing mechanisms should be considered to facilitate the convening of multiple stakeholders, balance risk, ensure mutual benefits for both investors and children, and encourage long-term sustainability of investments. One promising example of this is results-based financing, whereby investors receive a more favourable return if previously agreed-upon results are achieved.

Implementation of these two recommendations can begin to fill the remaining gaps related Serbia's CE agenda by bringing together the expertise and resources of multiple sectors and ensuring that children and vulnerable groups' unique needs are addressed.

CLIMATE LANDSCAPE ANALYSIS AND ITS IMPACTS ON CHILDREN IN SERBIA



ANNEX



ANNEX A

SUPPLEMENTARY DATA FOR CHAPTER 1

Event-based CE hazards

Extreme temperatures

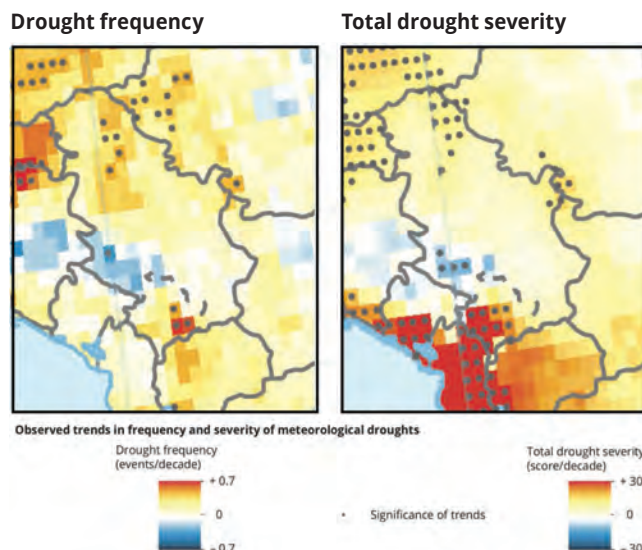
Cities are more prone to extreme heat due to the urban heat island effect⁴³¹; in particular, Belgrade has experienced seven instances of heat waves from 2000–2013, and in 2012 temperatures exceeded 35°C for 50 consecutive days. Over the past two decades, the country has also experienced multiple extreme cold events, consistently from 2007–2009, and most recently in 2012 and 2017⁴³². Conversely, extreme cold events have decreased in terms of frequency, duration and intensity from 1961–2010⁴³³. As future climate projections expect an increase in air temperatures during the winter season, the probability of future extreme cold events in Serbia is expected to decrease⁴³⁴.

Drought

Climate change has already influenced drought in Serbia as a result of precipitation changes, increased temperatures, and increased evapotranspiration⁴³⁵. The province of Vojvodina is especially susceptible, as it has the lowest water availability in Serbia⁴³⁶.

Figure 15 / Trends in frequency (left) and severity (right) of meteorological droughts (1950–2012)

Trends are based on a combination of three different drought indices — SPI, SPEI and RDI accumulated over 12-month periods. Dots: trends significant at $\geq 95\%$. Retrieved from: https://knowledge.unccd.int/sites/default/files/country_profile_documents/NDP_SERBIA_2020.pdf



⁴³¹ Urban areas can get significantly warmer than surrounding non-urban areas due to the replacement of vegetation, which reflects the Sun's heat, with materials that absorb the Sun's, such as asphalt and concrete

⁴³² <https://www.rferl.org/a/extreme-cold-heavy-snow-killing-dozens-balkans-eastern-europe-greece-migrants-serbia/28227143.html>

⁴³³ Heat and cold waves trends in the Carpathian Region from 1961 to 2010, Spinoni et al (2015). Available at: <https://rmets.onlinelibrary.wiley.com/doi/full/10.1002/joc.4279>

⁴³⁴ Climate change adaptation action plan and vulnerability assessment, City of Belgrade (2015). Available at: http://www.beograd.rs/images/data/c83d368b72364ac6c9f9740f9cda05ed_6180150278.pdf

⁴³⁵ Evapotranspiration is the combination of evaporation from the soil and other surfaces, as well as plant transpiration, both of which transfer water from the land to the atmosphere

⁴³⁶ Drought Initiative — Republic of Serbia: Recommendations for development of the National Drought Plan of the Republic of Serbia, UNCCD (2020). Available at: https://knowledge.unccd.int/sites/default/files/country_profile_documents/NDP_SERBIA_2020.pdf

Flooding

In Serbia, flooding typically occurs as a result of summer storms, long periods of rainfall and/or intensive snow melt⁴³⁷. The flood in the spring of 2014 was the worst recorded in the past 120 years in terms of affected area, water levels, and duration⁴³⁸. The flood affected 1.6 million people⁴³⁹ across 38 municipalities, particularly the city of Belgrade, including Obrenovac and Lazarevac, as well as Grocka⁴⁴⁰. More recently, in June 2020, heavy rains caused rivers to overflow and flood areas in western and central Serbia⁴⁴¹, leading numerous municipalities to declare an emergency situation.

Wildfire

With over 30% of its area forested, Serbia is more exposed to wildfire spread. Historically, Serbia experienced over 850 forest fires between 1998–2008; in 2007 alone, 250 fires burned over 5,200 hectares⁴⁴².

Extreme wind

The Košava winds originate in the northeast of Serbia, from Romania, and follow the Danube to Belgrade. These strong winds also cause snowdrifts in northern Serbia, reaching up to 2 meters in height, which most heavily impact the central regions of the country⁴⁴³.

Disease outbreaks

Reduced water availability from droughts could cause people to consume poor quality water and food due to lack of availability. Similarly, flooding can deteriorate the quality of regular water and food sources^{444,445} by allowing pathogens to enter drinking water supplies or crops. Officials warned not to drink water or consume crops from the affected areas for this reason⁴⁴⁶. Further, flooding can facilitate the proliferation of mosquitos, and thereby the spread of vector-borne diseases, which was a concern after the 2014 floods⁴⁴⁷. This is a particular risk to Serbia; in 2018, Serbia was the second European country (after Italy) most affected by WNV with 415 reported cases and 35 deaths⁴⁴⁸.



⁴³⁷ Comprehensive analysis of the disaster risk reduction and management system for the agricultural sector in Serbia, FAO (2018). Available at: <http://www.fao.org/3/I8364EN/i8364en.pdf>

⁴³⁸ Floods in the Republic of Serbia — Vulnerability and human Security, Gacic et al. (2015). Available at: https://www.researchgate.net/publication/279922594_Floods_in_the_Republic_of_Serbia_-_Vulnerability_and_human_security_-_Poplave_u_Republici_Srbiji_-_ugrozenost_i_ljudska_bezbednost

⁴³⁹ Climate risk profile: Serbia, USAID (2017). Available at: https://www.climatelinks.org/sites/default/files/asset/document/2017_USAID_Climate%20Change%20Risk%20Profile_Serbia.pdf

⁴⁴⁰ <https://reliefweb.int/report/serbia/floods-serbia-bosnia-and-herzegovina-and-croatia-23-may-2014>

⁴⁴¹ <https://balkaninsight.com/2020/06/23/flood-prone-parts-of-serbia-bosnia-inundated-by-water-despite-investment/>

⁴⁴² Comprehensive analysis of the disaster risk reduction and management system for the agricultural sector in Serbia, FAO (2018). Available at: <http://www.fao.org/3/I8364EN/i8364en.pdf>

⁴⁴³ <https://www.desinventar.net/DesInventar/profiletab.jsp>

⁴⁴⁴ Climate vulnerability assessment: Serbia, WWF (2012). Available at: http://www.seclimateforum.org/upload/document/cva_srbija_english_final.pdf

⁴⁴⁵ Climate change adaptation action plan and vulnerability assessment, City of Belgrade (2015). Available at: http://www.beograd.rs/images/data/c83d368b72364ac6c9f9740f9cda05ed_6180150278.pdf

⁴⁴⁶ https://reliefweb.int/sites/reliefweb.int/files/resources/briefing_note_floods_in_serbia_bosnia_and_herzegovina_and_croatia_may_2014_update.pdf

⁴⁴⁷ Serbia floods 2014, UN, World Bank Group (2014). Available at: <http://www.obnova.gov.rs/uploads/useruploads/Documents/RNA-REPORT-140714.pdf>

⁴⁴⁸ Assessment of climate change impact on the malaria vector *Anopheles hyrcanus*, West Nile disease, and incidence of melanoma in the Vojvodina Province (Serbia) using data from a regional climate model, Mihailović DT, Petrić D, Petrović T, Hrnjaković-Cvjetković I, Djurdjević V, Nikolić-Dorić E, et al. (2020). Available at: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0227679>

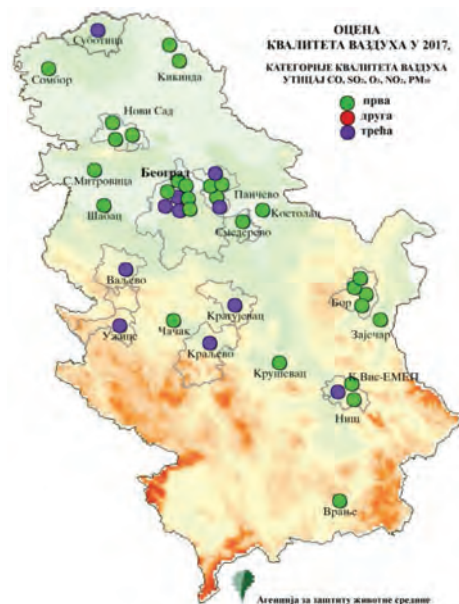
Persistent CE hazards

Air pollution

Air pollution from coal production is of particular concern in urban areas, where PM concentrations are higher than rural areas, largely due to increasing road traffic, among other industrial sources. Most prominently, forest fires release large amounts of PM⁴⁴⁹, while stagnant air during heat and droughts can also cause a higher concentration of pollutants and allergens in the air⁴⁵⁰. Serbia also experiences reduced air quality during cold waves⁴⁵¹, as higher heating demands lead to greater release of pollutants, and cold waves without wind can increase the concentration of pollutants in the air⁴⁵².

Figure 16 / Air Pollution in Serbia in 2017

Retrieved from: <http://www.sepa.gov.rs/download/VAZDUH2017.pdf>



Hazardous chemicals

Serbia has many mining and processing sites, such as the copper mining and smelting complex in the city of Bor. These facilities release of hazardous chemicals into the environment⁴⁵³, which can then enter into people's bodies. Industry, as well as lack of infrastructure, also contribute to the release of mercury, another harmful heavy metal. Coal combustion, informal dumpsites, and wastewater are the primary contributors of mercury in the air, soil and water, respectively⁴⁵⁴.

Prenatal exposure to pesticides in the Vojvodina province were found at levels comparable to those reported in "Caribbean countries and the Palestinian region"⁴⁵⁵. Similarly, according to a study of EDCs in the Danube River basin, natural and synthetic estrogens were present in surface and wastewater⁴⁵⁶. Bisphenol A (BPA)⁴⁵⁷ was the also abundant in drinking water. In addition, despite Serbia's restrictions on phthalates⁴⁵⁸ in toys and childcare products, it has been found that almost half of these products on the market contained concentrations above the assigned limit⁴⁵⁹.

- 453 Interviews with health and child rights experts in Serbia
- 454 Minamata Initial Assessment for the Republic of Serbia, Ministry of Environmental Protection (2018). Available at: https://www.researchgate.net/publication/330514455_Mercury_initial_assessment_for_the_Republic_of_Serbia
- 455 Prenatal Exposure to Organophosphate Pesticides in Vojvodina, Živković et al. (2019). Available at: <http://journaljamr.com/index.php/JAMMR/article/view/29025>
- 456 Occurrence and assessment of environmental risks of endocrine disrupting compounds in drinking, surface and wastewaters in Serbia, Celic et al. (2020). Available at: <https://www.sciencedirect.com/science/article/abs/pii/S0269749119362645>
- 457 BPA is an industrial chemical commonly used to make plastics which has endocrine-disrupting and carcinogenic effects; it is also supposed to elevate risk of obesity, diabetes and heart disease in humans
- 458 Phthalates are an EDC primarily used to soften plastics in consumer products
- 459 Cry-game: Phthalates in plastic toys and childcare articles, IPEN (2019). Available at: <https://ipen.org/sites/default/files/documents/cry-game.pdf>

449 The challenges of climate change: Children on the front line, UNICEF Office of Research (2014). Available at: https://www.unicef-irc.org/publications/pdf/ccc_final_2014.pdf

450 Climate change adaptation action plan and vulnerability assessment, City of Belgrade (2015). Available at: http://www.beograd.rs/images/data/c83d368b72364ac6c9f9740f9cda05ed_6180150278.pdf

451 Ibid.

452 <https://www.ncdc.noaa.gov/news/impact-weather-and-climate-extremes-air-and-water-quality>

Ultraviolet radiation

Ozone-depleting chemicals (usually containing chlorine, fluorine, bromine, carbon, and hydrogen) cause the depletion of the ozone layer, the layer in the Earth's stratosphere which absorbs most of the Sun's radiation. Between 1979–2008, stratospheric ozone over Serbia decreased by 2.5% per decade, decreasing protection from UVR⁴⁶⁰.

Changing temperature and precipitation patterns

Since the 1960s, temperatures have increased an average of 0.36°C/decade⁴⁶¹. For instance, the city of Belgrade experienced the highest increase in mean annual temperatures over the period 1949–2009⁴⁶². Analyses suggest a continual, gradual and relatively strong warming of about 1°C by 2030 compared with recent decades⁴⁶³, increasing to about over 2°C by 2050⁴⁶⁴, and up to 4°C in the final decades of this century⁴⁶⁵. Serbia is generally expected to become drier, with 11–18% more consecutive dry days, a decrease of in annual precipitation up to 3.5% by 2050, and a decrease in national water flow

by 3% by the latter half of the century⁴⁶⁶. During the summer season, the decrease in precipitation is expected to reach 30% across almost the whole territory of Serbia⁴⁶⁷. Conversely, precipitation during extreme rainfall events is expected to increase 20–30% by 2050⁴⁶⁸. River flows have also declined between 10–30% over the past 100 years, and are expected to continue to decrease further during the upcoming century⁴⁶⁹. The Vojvodina province typically has higher variability in precipitation⁴⁷⁰, and is thus expected to experience greater impacts from changing temperature and precipitation patterns⁴⁷¹. Figure 17 above demonstrates that the southern regions of the country will experience the greatest variability in water supply by 2030.

- ⁴⁶⁰ Stratospheric ozone fluctuation and ultraviolet radiation over Serbia, Martić-Bursac (2011). Available at: https://www.researchgate.net/publication/273866689_Stratospheric_ozone_fluctuation_and_ultraviolet_radiation_over_Serbia
- ⁴⁶¹ Draft Low Carbon Development Strategy with Action Plan, Project Identification No. EuropeAid/1365966/DH/SER/RS, 2016/375-531 (2019). Available at: http://www.klimatskastrategija.eu/wp-content/uploads/2019/12/Low-Carbon-Development-Strategy-with-Action-plan_eng.pdf
- ⁴⁶² <https://www.climatechangepost.com/serbia/climate-change/>
- ⁴⁶³ Study on climate change in the Western Balkans region, Regional Cooperation Council (2018). Available at: <https://www.rcc.int/pubs/62/it-is-our-duty-to-fight-discrimination-wherever-we-see-it-article-by-orhan-usein-team-leader-of-roma-integration-2020-project-on-the-occasion-of-the-first-anniversary-of-poznan-declaration>
- ⁴⁶⁴ <https://climateknowledgeportal.worldbank.org/country/republic-serbia/climate-data-projections>
- ⁴⁶⁵ Study on the socio-economic aspects of climate change in the Republic of Serbia, UNDP (2019). Available at: <https://www.rs.undp.org/content/dam/serbia/Draft%20Study%20on%20Socio-economic%20aspects%20of%20climate%20change%20in%20Serbia.pdf>

- ⁴⁶⁶ Climate changes observed in Serbia and future climate projections based on different scenarios of future emissions, UNDP (2018). Available at: http://www.klimatskepromene.rs/wp-content/uploads/2019/11/CLIMATE-CHANGES-OBSERVED-IN-SERBIA-AND-FUTURE-CLIMATE-PROJECTIONS_compressed.pdf
- ⁴⁶⁷ Study on the socio-economic aspects of climate change in the Republic of Serbia, UNDP (2019). Available at: <https://www.rs.undp.org/content/dam/serbia/Draft%20Study%20on%20Socio-economic%20aspects%20of%20climate%20change%20in%20Serbia.pdf>
- ⁴⁶⁸ Study on climate change in the Western Balkans region, Regional Cooperation Council (2018). Available at: <https://www.rcc.int/pubs/62/it-is-our-duty-to-fight-discrimination-wherever-we-see-it-article-by-orhan-usein-team-leader-of-roma-integration-2020-project-on-the-occasion-of-the-first-anniversary-of-poznan-declaration>
- ⁴⁶⁹ Study on the socio-economic aspects of climate change in the Republic of Serbia, UNDP (2019). Available at: <https://www.rs.undp.org/content/dam/serbia/Draft%20Study%20on%20Socio-economic%20aspects%20of%20climate%20change%20in%20Serbia.pdf>
- ⁴⁷⁰ Drought Initiative — Republic of Serbia: Recommendations for development of the National Drought Plan of the Republic of Serbia, UNCCD (2020). Available at: https://knowledge.unccd.int/sites/default/files/country_profile_documents/NDP_SERBIA_2020.pdf
- ⁴⁷¹ <https://www.climatechangepost.com/serbia/climate-change/>

Figure 17 / Seasonal variability in water supply from groundwater and renewable surface supplies, business-as-usual scenario

Retrieved from: <https://www.wri.org/aqueduct>



ANNEX B

SUPPLEMENTARY DATA FOR CHAPTER 2

Supplementary research

Figure 18 / Summary of expenditures on environmental protection

Source: <https://publikacije.stat.gov.rs/G2019/PdfE/G20191309.pdf>

1. Expenditures for environmental protection by activities

Republic of Serbia

	Total, RSD million		Share, %
	2017	2018	2018
Expenditures for environmental protection	34402.3	38266.7	100
Air protection	2000.5	3077.5	8.0
Wastewater management	4465.9	4681.8	12.2
Waste management	20236.9	24434.6	63.9
Other*	7699.0	6072.7	15.9
Investments for environmental protection	6592.7	7437.7	100
Air protection	871.9	1899.8	25.5
Wastewater management	758.2	1214.4	16.3
Waste management	2474.8	3135.1	42.2
Other*	2487.8	1188.4	16.0
Current expenditures for environmental protection	27809.6	30828.9	100
Air protection	1128.6	1177.7	3.8
Wastewater management	3707.7	3467.4	11.2
Waste management	17762.1	21299.5	69.1
Other*	5211.2	4884.3	15.8

* Protection and remediation of land, underground and surface waters; Noise and vibration protection; Nature protection; Other activities related to environmental protection

Table 5 / Summary of relevant selected existing initiatives categorized by CE topic

CE topic	Political instruments	Financial instruments
General	<p>Laws</p> <ul style="list-style-type: none"> • Law on Environmental Protection (2004, 2009, 2011, 2016) mandates the prevention, control reduction and remediation of all forms of pollution in land, water and air 	<ul style="list-style-type: none"> • Green Fund was established by the Decision of the Government in November 2016 to collect revenues from environmental fees. It has been in force since January 2017 but is not yet fully operational
Hazardous chemicals (via waste and water management)	<p>Laws</p> <ul style="list-style-type: none"> • Law on Water incorporates the EU Water Framework Directive and limits values of hazardous substances • The Law on Waste Management, which is harmonized with all relevant EU directives, contains provisions that relate to hazardous chemicals <p>Strategies and action plans</p> <ul style="list-style-type: none"> • The Draft Waste Management Strategy (2020–2025) has been published, with the aim of aligning with relevant EU directives • Water Management Strategy (up to 2030) is aimed at improving water efficiency and quality and flood prevention through enhanced governance and funding for infrastructure 	<ul style="list-style-type: none"> • In 2018, the majority of expenditures on environmental protection were dedicated to waste management (21.3 billion RSD)⁴⁷² • Protection and remediation of soil, groundwater and surface water has decreased significantly from 2015–2017, with about 3.09 million RSD in expenditures in 2017⁴⁷³. • The Water Fund, as the part of state budget, finances in accordance with the Decrees on water management program adopted by the Government. The host Ministry for this fund is Ministry of Agriculture, Forestry and Water Management • Funds of RSD 99.6 million will be dedicated for seven waste management projects⁴⁷⁴

⁴⁷² <https://publikacije.stat.gov.rs/G2019/PdfE/G20191309.pdf>

⁴⁷³ <https://data.stat.gov.rs/Home/Result/0902030103?languageCode=en-US>

⁴⁷⁴ <https://www.ekologija.gov.rs/wp-content/uploads/konkursi/2020/rang%20lista%20Otpad%202020.pdf>

CE topic	Political instruments	Financial instruments
Air pollution	<p>Laws</p> <ul style="list-style-type: none"> • Law on Environmental Protection (2009, 2013) Article 24 mandates that air protection shall be ensured through air quality monitoring and reducing pollution, and monitoring impact on human health and environment <p>Strategies and action plans</p> <ul style="list-style-type: none"> • Biennial Update Report and National Communication Under the UNFCCC align with reporting obligations to develop GHG inventory and develop plans to reduce emissions • NERP (2020) National Emission Reduction Plan is awaiting approval • Energy Development Strategy (2025) covers energy efficiency improvements, renewable energy, and environmental protection as strategic priorities • National Renewable Energy Action Plan (until 2020): sets a target to achieve 27% renewable energy in Serbia's energy consumption by 2020, including measures required to achieve the target 	<ul style="list-style-type: none"> • Lowest proportion of expenditures on environmental protection were dedicated to air pollution in 2018 (1.18 billion RSD). This was similar in 2017⁴⁷⁵ • The Energy Efficiency Fund is a dedicated as budgetary fund in the government to support EE initiatives. Its host Ministry is the Ministry of Energy and Mining

⁴⁷⁵ Climate changes observed in Serbia and future climate projections based on different scenarios of future emissions, UNDP (2018). Available at: http://www.klimatskepromene.rs/wp-content/uploads/2019/11/CLIMATE-CHANGES-OBSERVED-IN-SERBIA-AND-FUTURE-CLIMATE-PROJECTIONS_compressed.pdf

CE topic	Political instruments	Financial instruments
Extreme events	<p>Strategies and action plans</p> <ul style="list-style-type: none"> The National Disaster Risk Management Program (NDRMP) released in late 2014 focuses primarily on floods, landslides and fire The Action Plan for the Implementation of NDRMP (2016–2020) supplements the NDRMP above 	<ul style="list-style-type: none"> The NDRMP Action Plan secures EUR 320,000.00.⁴⁷⁶ The Budget Law of the Republic of Serbia for 2019 and 2020 indicate that RSD 15 million have been allocated to the Ministry of Environmental Protection for the “Local Development Resilient to Climate Change” project⁴⁷⁷ The Budget Law of the Republic of Serbia for 2020 allocated RSD 56 million to the Republic Hydrometeorological Service for the monitoring and analysis of climate and forecasts of climate variability and climate change⁴⁷⁸
Vulnerable groups (i.e., Roma, girls)	<p>Strategies and action plans</p> <ul style="list-style-type: none"> National Gender Equality Strategy (2016–2020) and supporting Action Plan (2016–2018) are aimed at ensuring equal opportunities for women while preventing discrimination and gender-based violence Serbia is the only country outside the EU measuring and reporting its Gender Equality Index⁴⁷⁹ Strategy for the social inclusion of Roma (2016–2025) and supporting Action Plan (2017–2018) is aimed at creating an enabling environment for the Roma population to exercise their right to education, health and social security, adequate housing and work 	<i>Not publicly available</i>

⁴⁷⁶ Instrument for Pre-accession Assistance (IPA II) 2014–2020 — Serbia: EU for Environment and Climate action, European Commission (2018). Available at: https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/annexes/ipa_2018_-_05_eu_for_environment_and_climate_action.pdf

⁴⁷⁷ Walking in the mist: Shadow Report on Chapter 27, Koalicija 29 (2020). Available at: <https://www.koalicija27.org/wp-content/uploads/2020/10/report-2020.pdf>

⁴⁷⁸ Ibid.

⁴⁷⁹ <http://sociojalnoukljucivanje.gov.rs/en/new-gender-equality-index-for-the-republic-of-serbia-published/>

Methodology for analysis of the cost of inaction

Air pollution

Step 1) Regression analysis

Regression analysis was used to evaluate the impact of air pollution on the welfare, morbidity, and mortality of children in Serbia. Using data from the databases of the OECD, the World Bank, Eurostat, EEA and SPI for 2019, the following variables were included in the regression analysis:

Dependent variables

- **Welfare costs**⁴⁸⁰ — welfare costs of premature deaths (% GDP equivalent) related to air pollution (ambient PM) for population aged under 15 (source: OECD).
- **DALYs** — disability-adjusted life years per 1 thousand inhabitants related to air pollution (ambient PM) for population aged under 15 (source: OECD).
- **Premature deaths** — premature deaths per 1 million inhabitants related to air pollution (ambient PM) for population aged under 15 (source: OECD).

Independent variables

- **PM2.5** — PM2.5 air pollution, mean annual exposure (micrograms per cubic meter), (source: OECD). *This is our explanatory variable of key interest, as we use PM2.5 as our measure of air pollution.*
- **GDP pc** — GDP per capita (constant US\$), (source: World Bank). *The theory behind this explanatory variable is that countries with higher economic development allows for investment in clean*

technologies, higher expenditures on health and is positively associated with social awareness.

- **Renewables** — renewable energy consumption (percent of gross final energy consumption), (source: EEA). *This variable is an intuitive candidate for explanatory variable; we can expect that the higher share of clean energy, the better air quality and thus lower welfare costs.*
- **Urban pop** — urban population (percent of total population), (source: World Bank). *We have utilized urban population as an explanatory variable as we have found that urban data is one of the most important factors in explaining the level and dynamics of air pollution among cities in Europe.*
- **SPI** — Social Progress Index value, composite indicator, (source: Social Progress Imperative)

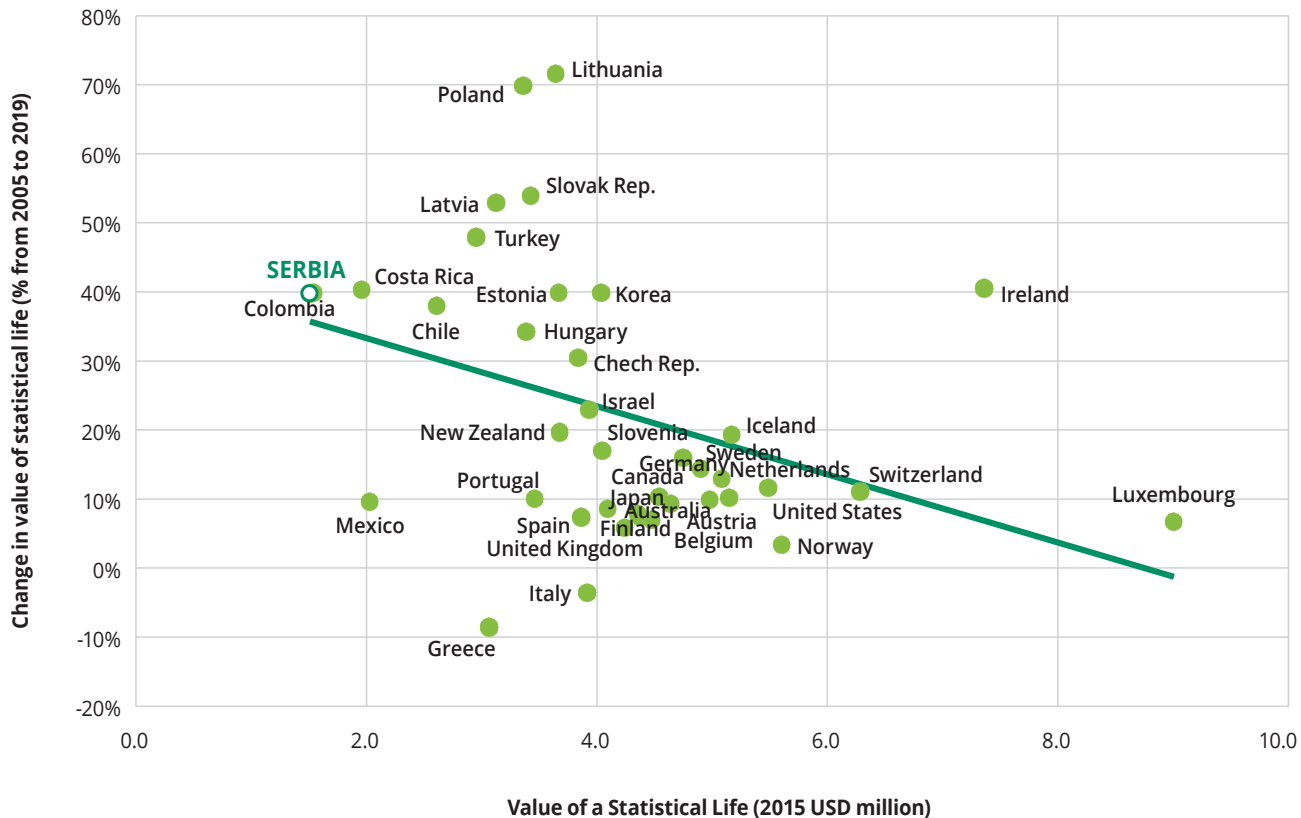
In order to utilize the most recent 2019 data, the regression was done on EU countries and Serbia. Based on the analysis of the data sample, as summarized in Table 6 below, Serbia is below average in GDP per capita, and urban population, while it is above average for exposure to PM2.5, and all dependent variables regarding welfare of children on air pollution.

⁴⁸⁰ Cost estimates represent only the cost of premature mortalities. They are calculated using estimates of the VSL and the number of premature deaths attributable to each environmental risk.

Table 6 / Summary of data for statistically significant variables

Summary of the sample statistics	Independent Variables				Dependent Variables		
	GDP per capita (constant US\$)	PM2.5 air pollution, mean annual exposure	Renewable energy cons. (% of total)	Urban population (% of total population)	Welfare cost of premature deaths, % GDP	DALYs per 1 thousand inhabitants	Premature deaths per 1 million inhabitants
min	9828.1	5.6383	8.4	53.729	0.27	0.16	1.7210
median	28729.0	12.466	18.2	72.782	0.97	0.53	5.8845
average	35550.0	12.887	21.7	73.923	1.04	0.59	6.6307
max	114704.6	22.766	55.8	98.041	3.48	1.76	19.927
Serbia	7411.8	25.50	—	56.26	1.95	1.01	11.28

Figure 19 / Serbia's relative VSL (2019)



Step 2) Simulation of future costs

Finally, using PM2.5 as the independent variable and the coefficients generated in Table 7 below, the analysis simulated the welfare costs of air pollution from 2020–2025. These values were then converted to net-present value (NPV) using the compound annual growth rate (CAGR) in GDP over the past 15 years.

Table 7 / Results of regression analysis for air pollution

Note: "ln" denotes natural logarithm of the variable; (***), (**), (*) indicates statistical significance at 1, 5, and 10% levels respectively. Data for 2019, sources: OECD, World Bank, Social Progress Imperative, EEA, Eurostat

	Explained variable		
	ln_welfare costs	ln_DALYs	ln_premature deaths
Explanatory variables			
ln_PM2.5	0.79(**)	0.81 (***)	0.77 (***)
ln_GDP pc	0.29	-1.06 (***)	-1.05 (***)
ln_renewables	-0.35	-0.35 (***)	-0.33 (***)
ln_urban pop	0.66	0.59 (*)	0.62 (*)
ln_SPI	-9.00(**)	-1.18	-1.38
Regression statistics			
Observations	28	28	28
R ²	0.64	0.69	0.68
R ² adjusted	0.55	0.61	0.61

Flooding

Step 1) Analysis of historical and projected flooding data

Using historic trends on flooding from the EM-DAT International Disaster Database from 1970 to 2019, a forecast was constructed for 2020–2029, as summarized below:

Table 8 / Historical flooding data by period (including forecasts)

Time Period	Extreme Flooding, Average Days per Year
1970–1979	0
1980–1989	2.3
1990–1999	2.8
2000–2009	10.3
2010–2019	15.1
2020–2029 (Forecasted past IX 2020)	22.1

Step 2) Forecasting financial burden

Using documented costs from the 2014 flood as a baseline, the estimated costs for 2020 were based on updated economic and social variables (including: including household income growth from the National Statistical Office, labour force growth from the Labour Force Survey from Eurostat, and rising value of life in Serbia using OECD data). Additionally, it was assumed that the 2014 levels of protective measures remained constant in 2020.

The following approach and assumptions were used for each scenario to project impacts from 2021–2025:

- **Baseline scenario:** Based on the predicted rate of extreme flooding outline for the years 2020–2025 in part 1.1 based on the historic data from the EM-DAT International Disaster Database and the 2020-adjusted flood costs of 2014, we calculate the financial burden of extreme flooding from 2021–2025. This calculation assumes the scenario in which no further development for disaster management is made.
- **Scenario 1 (Reduced severity):** In this scenario we assume that while disaster risk management cannot reduce the days of extreme flooding, it can reduce the impact felt through to the improvement in anti-flood infrastructure. We hypothetically assume a 75% reduction in deaths, and a 25% in job loss and income loss.

- **Scenario 2 (Reduced duration):** In this scenario, we assume that flooding protection can effectively reduce the number of extreme floods in the time period 2021–2025, and retain them at the rate of 15.1 average days per year (consistent with 2010–2019 levels)
- **Scenario 3 (Reduced severity and duration):** The third scenario assumes that effective mitigation and adaption can both offset the financial burden per flood and the number of extreme floods that would take place. This scenario assumes reductions of impact on scale with the first scenario and reduction of extreme floods in line with the second.

In each scenario, the financial impacts of the 2014 flood are scaled based on respective assumptions. These financial impacts are used as a proxy for financially driven protection risks that children face following extreme events such as flooding.

ANNEX C

KEY STAKEHOLDER INTERVIEWEES

Below is a consolidated list of organizations and areas of expertise included in stakeholder interviews for this study

Table 9 / List of key stakeholder interviewees by organization and area of expertise

Organization / sector	Area of expertise
UNICEF	<ul style="list-style-type: none"> • Private sector engagement • Fundraising
Chamber of Commerce and Industry of Serbia (CCIS)	<ul style="list-style-type: none"> • Corporate social responsibility • Multi-national and SME engagement
United Nations Development Program (UNDP)	<ul style="list-style-type: none"> • Climate change and environment • Youth engagement • Innovation
AmCham	<ul style="list-style-type: none"> • Regulatory affairs
NALED	<ul style="list-style-type: none"> • Environmental alliance
European Bank for Reconstruction and Development (EBRD)	<ul style="list-style-type: none"> • Green economy
KfW	<ul style="list-style-type: none"> • Municipal infrastructure
World Bank	<ul style="list-style-type: none"> • Disaster risk management • Energy efficiency • Energy economics • Environmental initiatives • Social protection • Youth engagement
Environmental Ambassadors for Sustainable Development (EASD)	<ul style="list-style-type: none"> • Eco-Schools
Indigo	<ul style="list-style-type: none"> • Programming for children and vulnerable groups
Ministry of Environmental Protection	<ul style="list-style-type: none"> • Climate change • Health • EU Accession • Environmental Impact Assessment
Ministry of Youth and Sport	<ul style="list-style-type: none"> • Environmental youth-based initiatives
World Health Organization (WHO)	<ul style="list-style-type: none"> • Environment and health
Academia	<ul style="list-style-type: none"> • Child poverty • Environmental rights of the child • Public health and environmental health
Not affiliated	<ul style="list-style-type: none"> • Youth climate and environment activism

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