Enhancing Nature-based Solutions in Bosnia and Herzegovina

The role of ecosystems in disaster risk reduction and climate change adaptation

Marijana Kapović Solomun



ADAPT
NATURE-BASED SOLUTIONS FOR RESILIENT SOCIETIES IN THE WESTERN BALKANS

Sida

About IUCN

IUCN is a membership Union uniquely composed of both government and civil society organisations. It provides public, private and non-governmental organisations with the knowledge and tools that enable human progress, economic development and nature conservation to take place together.

Created in 1948, IUCN is now the world's largest and most diverse environmental network, harnessing the knowledge, resources and reach of more than 1,500 Member organisations and some 18,000 experts. It is a leading provider of conservation data, assessments and analysis. Its broad membership enables IUCN to fill the role of incubator and trusted repository of best practices, tools and international standards.

IUCN provides a neutral space in which diverse stakeholders including governments, NGOs, scientists, businesses, local communities, indigenous people organisations and others can work together to forge and implement solutions to environmental challenges and achieve sustainable development.

Working with many partners and supporters, IUCN implements a large and diverse portfolio of conservation projects worldwide. Combining the latest science with the traditional knowledge of local communities, these projects work to reverse habitat loss, restore ecosystems and improve people's well-being.

www.iucn.org

https://twitter.com/IUCN/

Enhancing Nature-based Solutions in Bosnia and Herzegovina

The role of ecosystems in disaster risk reduction and climate change adaptation

Marijana Kapović Solomun

The designation of geographical entities in this book, and the presentation of the material, do not imply the expression of any opinion whatsoever on the part of IUCN or other participating organisations concerning the legal status of any country, territory or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The views expressed in this publication do not necessarily reflect those of other participating organisations.

IUCN is pleased to acknowledge the support of its Framework Partners who provide core funding: Ministry of Foreign Affairs of Denmark; Ministry for Foreign Affairs of Finland; Government of France and the French Development Agency (AFD); the Ministry of Environment, Republic of Korea; the Norwegian Agency for Development Cooperation (Norad); the Swedish International Development Cooperation Agency (Sida); the Swiss Agency for Development and Cooperation (SDC) and the United States Department of State.

This publication has been made possible in part by funding from the Swedish International Development Cooperation Agency (Sida). The collaborative nature of the development of the study would not have been possible without the range of contributors from the coordination group.

Published by: IUCN, Gland, Switzerland

Produced by: IUCN Regional Office for Eastern Europe and Central Asia (ECARO)

Copyright: © 2022 IUCN, International Union for Conservation of Nature and Natural Resources

Reproduction of this publication for educational or other non-commercial purposes is authorised without prior written permission from the copyright holder provided the source is fully acknowledged.

Reproduction of this publication for resale or other commercial purposes is prohibited without prior written permission of the copyright holder.

Recommended citation: Kapović Solomun, M. (2022). *Enhancing Nature-based Solutions in Bosnia and Herzegovina: the role of ecosystems in disaster risk reduction and climate change adaptation*. Gland, Switzerland: IUCN.

Front cover photo: Dimitor Mountain © Djordjije Milanović

Layout by: IUCN ECARO

Table of contents

Executive summary v
Acknowledgements ix
Acronyms x
1. Purpose and methodology of the scoping study 1
1.1 The ADAPT Project 2
2. Introduction 3
3. Country context and basic data 8
3.1 Geography and territory 8
3.2 Demographics 10
3.3 Socio-economic structure 11
3.4 Biodiversity and ecosystems 12
3.5 Land use 13
3.6 Climatic conditions and climate change 13
3.7 Disaster risks 15
3.7.1 Floods 16
3.7.2 Drought and extreme temperatures 17
3.7.3 Landslides 19
3.7.4 Wildfires 20
4. Gender context 22
5. Stakeholder analysis 23
5.1 Primary stakeholders – decision-making level 24
5.2 Secondary stakeholders – operational level 25
5.3 Other stakeholders 26
6. Key stakeholders for Nature-based Solutions 30
7. Nature-based Solutions in policy frameworks 33
7.1 Existing policy and institutional frameworks 33
7.1.1 Climate change policy framework 34
7.1.2 Disaster risk reduction policy framework 38
7.1.3 Environmental policy framework 40
7.2 State legislation framework 42
7.3 Entity legislation 43
7.3.1 Climate change entity legislation 43
7.3.2 Disaster risk reduction entity legislation 44
7.3.3 Environment entity legislation 46

7.4 Gender issues within CC and DRR policies 48
7.5 Other CC and DRR relevant sectors 51
7.5.1 Forestry 51
7.5.2 Agriculture 56
7.5.3 Hydrology and water resources 58
8. Main challenges for NbS application in B&H 62
9. Recommendations and next steps in NbS application 65
10. Nature-based Solutions experiences in B&H 68
10.1 Potential case studies 68
10.2 Potential sites for NbS 73
ANNEXES 74
Annex I: Key terms and definitions 74
Annex II: Nature-based Solutions for disasters risk reduction (DRR) and climate change adaptation (CCA) 75
Annex III: Global agreements relevant to NbS 77
Annex IV: Global conventions relevant to NbS 79
Annex V: Relevant laws to NbS 81

Executive summary

As the Western Balkans is a region at high risk of the impacts of climate change, in particular in relation to increasingly severe disasters, it will be a priority in the coming years for Bosnia and Herzegovina (B&H) to build resilience into its economic, social and environmental strategies. Nature-based Solutions (NbS) offer an integrated solution to both climate change and disaster risk reduction challenges; however, to fully deliver on this potential, an understanding of the baseline and identification of opportunities for mainstreaming this innovative approach are required. Considering the administrative, institutional and political structure of B&H, one of the critical obstacles for better planning and understanding the risks posed by climate change and disaster is the lack of analyses that would enable the assessment of impacts and improve long-term planning and adaptation.[1] This scoping study, based on the current context in B&H, mapped relevant stakeholders and policies to identify barriers, opportunities and suggest recommendations to secure a just transition to a sustainable future. The following main challenges and related opportunities were identified to be used as a framework for further consultation with relevant stakeholders.

- **The key sectors identified for future NbS interventions include agriculture, forestry and water resources**;

- The shortage of **synchronised, up-to-date and accessible data,** especially regarding environmental monitoring at all levels, is a key barrier to understanding the context of NbS in B&H, and a key shortcoming of B&H regarding the EU climate policy. **Recommendation:** Develop new platforms at the entity levels, coordinated and properly correlated at the state level to better understand the risks and level of exposure, while also identifying locations where NbS implementation of NbS could reduce disasters,

- Barriers to **communication and coordination among different levels of decision-makers and policy entities** further exacerbate the lack of

[1] UNDP, UNEP and GEF (2013). National Adaptation Plans in focus: Lessons from Bosnia and Herzegovina. Project brief. UNDP-UN Environment National Adaptation Plan Global Support Programme.

accessibility to reliable data**.** Complex constitutional arrangements and weak communication among institutions are also reflected in the disaster risk management system and mechanisms in the country. Considering the administrative structure of B&H, this study illustrates the great complexity of the current system relevant for mainstreaming NbS, bringing into focus the need for coordination and collaboration among entities and the Brčko District (BD), state and entities, then among different sectors within each entity and governance levels in B&H. Climate change adaptation actions rely on important economic sectors in B&H, particularly agriculture, forestry and water management (AFWM), which are not synchronised and official communication and coordination is insufficient, oftentimes even among departments within the same Ministry. For example, natural disasters are mostly related to the sectors AFWM, while climate change issues, environment and biodiversity are addressed by another entity institution, thereby complicating institutional horizontal and vertical communication. **Recommendation:** Prioritise showing the case studies and benefits of NbS towards building a common understanding in the relevant stakeholders including a tailor-made minimum framework for understanding NbS at the state and entity levels in B&H. Dedicate sufficient time and efforts to mobilise local community actors and stakeholders, to ensure two-way communication with the public, and to educate and promote concepts and approaches, respecting equal gender inclusion in the process. Further research among various identified interested groups of stakeholders, including reflections on gender and vulnerable groups, should be considered to ensure local knowledge is incorporated into the data.

- Decision-makers including ministries at the state, entity and cantonal levels, and local governments, have limited **capacities and formal competencies** to integrate climate change adaptation or disaster risk reduction (DRR) into their policies and plans. The capacity gap for implementation, other than the economic aspects of a particular measure, requires appropriate policy and strategic frameworks, represents a further challenge. Institutional capacities and policy development are a precondition for environmental

sustainability, climate action and the introduction of NbS at the state and entity levels in B&H. The most important priority for B&H in addressing climate change mitigation and disaster risk reduction, is to strengthen its institutional and professional capacities for developing and implementing climate policy, monitoring indicators for the environment, planning, implementation, reporting and verifying mitigation actions. **Recommendation:** Organise round tables, workshops and seminars (by the agriculture advisory service, academia, etc.) for local stakeholders, and actively promote NbS as a new opportunity for DRR and climate change mitigation at the local level, with a focus on remote sensing techniques and software.

- Considering the urgency of the climate and disaster risks facing B&H, it is also paramount to start **design and implementation of on-the-ground action** for strong NbS. The most vulnerable sectors in regards to climate change (CC) and DRR are agriculture, forestry and hydrology and water resources. **Recommendation:** Identify and analyse the application of NbS in the context of a watershed-based approach to be further explored as a priority. NbS should also be a priority when considered within existing agriculture and forest management as an opportunity for the prevention of floods, landslides, torrents and wildfires. NbS need to be integrated into and applied through the existing state, entity and cantonal policy and institutional framework, mainly in the DRR and CC sectors, and further mainstreamed and incorporated within urban development, agriculture and rural development, land-use, forestry, water management, biodiversity and nature protection,

- NbS are not captured in existing policies nor is this approach institutionalised, and it is quite unknown in B&H. **Recommendation:** Key institutional partners should work closely with the scientific community and NGO sector to raise awareness about the many benefits of NbS. Capturing local knowledge is very important since many NbS approaches and

practices are implemented by local people but not documented, and thus they cannot be analysed.

Acknowledgements

I would like to express my deepest appreciation to all those who provided me with the possibility to complete this comprehensive report, particular to representatives of the institutions of Republic of Srpska and Federation of BiH, relevant for NbS. A special gratitude I give to IUCN project officer, Ms Mihaela Dragan Lebovics, whose contribution in stimulating suggestions and encouragement. Furthermore, I would also like to acknowledge with much appreciation the role of other IUCN staff, Ms Milica Radanović and Ms Vesna Bjedov, who gave me excellent support and helped in writing the report. Last but not least, many thanks go to Mr Boris Erg who has invested his full effort in guiding the team in achieving the goal.

Acronyms

AFWM	Agriculture, forestry and water management
B&H	Bosnia and Herzegovina
BAM	Bosnia and Herzegovina convertible mark
BD	Brčko district
CC	Climate change
CCA	Climate change adaptation
CSO	Civil society organisation
DRR	Disaster risk reduction
EbA	Ecosystem-based approach
Eco-DRR	Ecosystem disaster risks reduction
FB&H	Federation of Bosnia and Herzegovina
GDP	Gross domestic product
GHG	Greenhouse gases
INSPIRE	Infrastructure for Spatial Information in the European Community
IUCN	International Union for Conservation of Nature
LDN	Land degradation neutrality
MoFTER	Ministry of Foreign Trade and Economic Relations
NbS	Nature-based Solutions
NM	National monument
NP	National park
PA	Protected area
PL	Protected landscape
RCC	Regional Cooperation Council
RS	Republic of Srpska
SEE	Southeast Europe
Sida	Swedish International Development Cooperation Agency
UNCBD	United Nations on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention to Climate Change

1. Purpose and methodology of the scoping study

The overall purpose of the scoping study (hereinafter: Study) is to provide a state-of-the art overview of the **context in regard to the application of Nature-based Solutions approaches for climate change adaptation and disaster risk reduction in Bosnia and Herzegovina.**

Moreover, the objectives of this Study are to: 1) understand the existing context, in terms of institutional, policy and legal framework for the application of NbS, 2) provide an overview of the most common natural hazards and disasters in B&H and correlated risks, 3) elaborate on the added benefit of deploying NbS in the given context, 4) identify knowledge, institutional and capacity gaps and barriers for the application of NbS, and 5) provide recommendations and entry points for mainstreaming NbS into national DRR and CC policies and strategies.

The Study relies on available and accessible data and information originating from existing policies, programmes and strategies (global, regional and state/entity), considering data collected in past and ongoing initiatives, projects and activities in B&H on Nature-based Solutions for DRR, and impacts on CC and the environment. It includes a rapid overview of the current development in relation to NbS and their application in the B&H context, followed by semi-structured interviews and discussions with selected key partners and relevant national stakeholders. Furthermore, a comprehensive desk study was performed during the initial phase to compile data and information on all ongoing projects, programmes, activities or initiatives that are currently applying Nature-based Solutions in B&H, with the aim of identifying and highlighting the best practice cases and examples of NbS application.

Special attention has been given to screening and examining relevant state and entity documents and policies: strategies, plans and programmes that reveal existing or potential linkages between Nature-based Solutions, climate smart adaptation and DRR policies and measures, including climate and biodiversity, and climate and gender interconnections. The Study also includes mapping and identification of experiences with NbS in/or involving Bosnia and Herzegovina that can illustrate the benefits and applicability of NbS and reveal entry points for possible scale-up of NbS interventions based on existing experiences.

The main findings and conclusion of the Study were cross-checked prior to finalisation, including gathering and incorporating inputs and suggestions of stakeholders and partners. In addition to feedback from relevant stakeholders and other actors across various sectors on the identified priorities and potential pilot sites proposed for B&H, this process contributed to

knowledge building and awareness raising through the sharing of data and information on the current state of affairs regarding disaster risks, climate change impacts and the identification of opportunities presented by the application of NbS.

This Study has been developed under the auspices of the project ADAPT: *Nature-based Solutions for resilient societies in the Western Balkans*, funded by the Swedish International Development Cooperation Agency (Sida) and implemented by IUCN.

1.1 The ADAPT Project

The ADAPT: *Nature-based Solutions for resilient societies in the Western Balkans* project aims to increase ecosystem and community resilience to climate change and environmental degradation in the Western Balkans. This regional umbrella initiative works with the six Western Balkan economies, regional and local partners.

ADAPT aims to introduce Nature-based Solutions as a contribution to reducing environmental degradation and increasing climate resilience, including social equity and gender equality, in the Western Balkan region. In order to achieve balanced results and realise a positive long-term impact on communities and ecosystems in the region, the project has strong regional and national components. Regionally, it focuses on aligning NbS and DRR policy, knowledge generation and sharing, capacity development and networking, while the focus at the national level is on national policy, stakeholder engagement and demonstration through pilot NbS projects.

The project is implemented through the following three strategies:

- ✓ Enhance knowledge and awareness of Nature-based Solutions for disaster risk reduction among decision makers, natural resource managers and local communities, with a specific focus on gender;
- ✓ Integration of Nature-based Solutions and equitable climate-smart planning into adaptation and disaster reduction policy; and
- ✓ Implementation of Nature-based Solutions for disaster risk reduction and their scale-up.

2. Introduction

The Western Balkans has been recognised as a natural disaster hotspot in Europe facing ongoing climate change.[2] Research has shown that Balkan countries along the Danube River will experience a 'progressive and strong increase in overall climate hazards',[3] and that the Western Balkans is a highly vulnerable region in Europe for climate change and its environmental impacts.

Meanwhile, the Western Balkans is also a uniquely biodiverse region of Europe, consisting of a diversity of ecosystems. It is these ecosystems that play a vital role in sustaining society with significant potential to address development concerns through NbS. Though NbS have the potential to address societal challenges such as human health, economic and social development, environmental degradation and biodiversity loss, food security and water security, this Study focuses on the links to CC adaptation and DRR.

In the European Environment Agency report on climate change,[4] South East Europe (SEE) has been recognised as extremely vulnerable to climate change effects due to the frequent and disastrous floods, drought and wildfires in the past decade. According to the climate scenarios provided by the Regional Cooperation Council (RCC) study on climate change in the Western Balkans in 2018,[5] a temperature increase of 1.2ºC is expected over the whole territory in the next decade, with further warming by 1.7–4.0°C, depending on the global effort to reduce greenhouse gas (GHG) emissions. This is a serious and pressing call for the whole region, including B&H, to focus on possible mitigation and adaptation measures. The priority for these measures should be given to the most affected sectors, particularly AFWM. This is an urgent priority and also an opportunity to introduce Nature-based Solutions (NbS) and complementary measures in key sectors to reduce the risks posed by natural hazards, to benefit biodiversity, and to protect human well-being.

NbS are *"actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits*."

- IUCN Resolution (WCC 2016 Res 069)

[2] European Environmental Agency (2017).*Climate change adaptation and disaster risk reduction in Europe*. Report No 15. Luxembourg: European Union Publication Office.
[3] Forzieri, G., Feyen L., Russo S., Vousdoukas M., Alfieri L., Outten S., Migliavacca M., Bianchi A., Rojas R., Cid A. (2016). Multi-hazard assessment in Europe under climate change. *Climatic Change* 137: 1-2. https://10.1007/s10584-016-1661-x.
[4] European Environmental Agency (2017). *Climate change impacts and vulnerabilities 2016*. Report No.1. Luxembourg: European Union Publication Office.
[5] RCC (2018). *Study on climate change in the Western Balkans region*. Sarajevo, Bosnia and Herzegovina: Regional Cooperation Council Secretariat.

The main natural disasters affecting B&H, such as floods, droughts, forest fires, torrents, landslides and heatwaves, have been identified in different strategic documents and reports.[6] These events are anticipated to become more frequent and severe in the future, due to the increased impacts of climate change.

The 2017 World Risk Report[7] ranked B&H as a country of high exposure to natural hazards, with 91 of 145 local governments considered to be under very significant risk of floods and landslides, and 27 under high risk. This was reiterated in the 2020 World Risk Report,[8] where B&H was identified as the country with the highest vulnerability in Europe, together with Moldova, Albania, North Macedonia and Azerbaijan. Already in May 2014, B&H suffered the worst floods in the last 120 years that affected 30% of the territory, causing 2,000 landslides, killing 23 people, and disturbing several minefields further exposing the population to risks from unexploded landmines.[9] These impacts once again showed how vulnerable the people of B&H are to disasters. The May 2014 floods and landslides caused an estimated BAM 2.79 billion damage to infrastructure, agriculture, public institutions and the local economy. One of B&H's greatest challenges is repairing the damage and restoring living conditions for the millions of people affected by these floods, while stressing the pressing need for significant investment, focus and attention into disaster prevention and preparedness.

This need is currently being somewhat addressed by various programmes and projects in B&H supported by international donors. For example, the programme "Disaster Risk Reduction for Sustainable Development in B&H" that started in 2018 addresses the key priorities in disaster risk reduction as identified by local authorities and various actors in the different sectors, such as protection and rescue, education, social and child protection, health and agriculture. The programme places particular emphasis on improving local coordination mechanisms in DRR, and on affirmation of the strategic risk planning process, especially for the most vulnerable categories of the population.[10] Currently, nation-wide funding for DRR accounts for only 0.5% of GDP, which further reduces the local capacity to invest in research to better understand climate change mitigation and adaptation measures.[11]

[6] Čustović, H. and Ljuša, M. (2018). *Reports of the LDN Target Setting Programme*. Sarajevo, Bosnia and Herzegovina: United Nations Convention to Combat Desertification.
[7] Bündnis Entwicklung Hilft (2017). *World Risk Report, Analysis and prospects*. Berlin, Germany: Bündnis Entwicklung Hilft.
[8] Bündnis Entwicklung Hilft (2020). *World Risk Report, Focus: Forced Displacement and Migration*. Berlin, Germany: Bündnis Entwicklung Hilft.
[9] UN, EU and World Bank (2014). *Bosnia and Herzegovina Floods, 2014 – Recovery needs assessment*. Sarajevo, Bosnia and Herzegovina: World Bank.
[10] UNDP [website]. Joint Swiss UN Programme (2019-2022). Disaster Risk Reduction for Sustainable Development in Bosnia and Herzegovina. Accessed on: 25 September, 2021.
[11] UNDP (2013). *Climate Change Adaptation and Low Emission Development Strategy for Bosnia and Herzegovina.* Sarajevo, Bosnia and Herzegovina: United Nations Development Programme.

Even though climate change is predicted to exacerbate and intensify the frequency and scale of disasters, it is still perceived as a low priority risk in B&H. According to a 2020 global survey conducted by the United Nations (UN), in B&H the importance of taking climate change action ranked as a second priority, while better employment opportunities were in first place.[12] Additionally, climate risk and climate-based disasters are not included in the budgets at either the state or entity levels. A critical obstacle to better planning and understanding the risks posed by climate change is the lack of reliable information that would enable the assessment of climate change impacts and improve long-term planning and adaptation.[13] Institutional capacities and policy development also are a requirement for environmental sustainability, climate action and the introduction of NbS at the state and entity levels in B&H.

Nature can provide solutions that are cost-effective and can contribute to the community's resilience beyond its capacity to absorb and recover from a single disaster, such as a flood, landslide or drought. At the IUCN World Conservation Congress in 2016, NbS was defined as "actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits".[14]



Figure 1. Major societal challenges addressed by NbS. The first six challenges, from left to right, were formulated within the IUCN definition. *(Source: IUCN, 2020[15])*

While still an emerging concept, Nature-based Solutions (NbS) (Figure 2) have clearly demonstrated their value in providing multiple benefits to societies, e.g., mitigating and adapting to climate change impacts, reducing disaster risks, improving community resilience and livelihoods, and safeguarding ecosystems and biodiversity (for key terms, definitions and more details on the global NbS context and approach please see Annexes I and II of the Study).

[12] UN (2020). *UN annual result report for Bosnia and Herzegovina*. Sarajevo, Bosnia and Herzegovina: United Nations.
[13] UNDP, UNEP and GEF (2019). National Adaptation Plans in focus: Lessons from Bosnia and Herzegovina. Project brief. UNDP-UN Environment National Adaptation Plan Global Support Programme.
[14] IUCN (2016). *Defining Nature-based Solutions*. Gland, Switzerland: IUCN.
[15] IUCN (2020). *IUCN Global Standard for Nature-based Solutions: a user-friendly framework for the verification, design and scaling up of NbS.* First edition. Gland, Switzerland: IUCN.

For example, water management practices based on NbS offer strategies to maintain the hydrological cycle as close to the natural state as possible, while balancing human needs and addressing water security. Other examples show that while reducing the occurrence of floods, landslides and drought, NbS also improves mitigation and adaptation to global changes (including both land-use and climate change) and provides services for maintaining and restoring ecological functions.[16] The biodiversity and development benefits achieved by application of the NbS concept contribute to the UN 2030 Agenda for Sustainable Development Goals and development of circular economy.[17]

Various approaches can support the application of NbS in different fields, such as green infrastructure, which includes a network of natural and designed landscape components with an important role of water regulation, flood risk mitigation and management,[18] and reduction of water pollution. Ecosystem-based Disaster Risk Reduction (Eco-DRR) and Ecosystem-based Adaptation (EbA) are two examples of relevant approaches specific to societal challenges of DRR and CCA and mitigation. It is equally important to implement measures facilitating the practical implementation of NbS through policy development and enforcement, stakeholder involvement and capacity building of national institutions



Figure 2. NbS approaches based on the IUCN definition including the seven societal challenges that NbS address (climate change adaptation and mitigation, disaster risk reduction, economic and social development, human health, food security, water security and ecosystem degradation and biodiversity loss. *(Source: IUCN, 2020, see footnote 20).*

[16] Ferreira, C., Potočki, K., Kapović Solomun, M., Kalantari, Z. (2021). Nature-based Solutions for flood mitigation and resilience in urban areas, In: *The Handbook of Environmental Chemistry*. Berlin, Heidelberg, Germany: Springer Nature. DOI:10.1007/698_2021_758.

[17] UN (2020). *UN annual result report for Bosnia and Herzegovina*. Sarajevo, Bosnia and Herzegovina: United Nations.

[18] Ferreira, C., Kalantari, Z., Seifollahi-Aghmiuni, S., Ghajarnia, N., Rahmati, R., Kapović Solomun, M. (2021). Rainfall-runoff-erosion processes in urban areas, In: J. Rodrigo-Comino (ed). *Precipitation: Earth Surface Responses and Processes*, pp. 481-498. Amsterdam, Netherlands: Elsevier.

and/or local communities.[19] The IUCN Global Standard for Nature-based Solutions™[20] launched in July 2020, with its associated guidance[21] operationalises NbS to provide a common language and framework aimed at designing, verifying and scaling up NbS applications and policies. There are four main advantages of NbS: i) sustainable systematic and integrative approach, ii) resource efficiency, iii) long-term cost-efficiency, and iv) co-benefits. Practical implementation of NbS requires participatory involvement, institutional and human resources capacity building that includes local communities and vulnerable groups. As the NbS movement grows in momentum globally, so do the opportunities for the potential for NbS to address societal challenges in B&H. To understand the complexity of issues in B&H and the general country context in terms of disaster risk, climate change and mainstreaming NbS to address community resilience, it is important to present the current cross-cutting issues and policies through disaster vulnerable sectors.

[19] UNDP (2019). *Study on Nature-based Climate Solutions in Serbia*. Belgrade, Serbia: United Nations Development Programme.
[20] IUCN (2020). Global Standard for Nature-based Solutions. A user-friendly framework for the verification, design and scaling up of NbS. First edition. Gland, Switzerland: IUCN.
[21] IUCN (2020). Guidance for using the IUCN Global Standard for Nature-based Solutions. A user-friendly framework for the verification, design and scaling up of Nature-based Solutions. First edition. Gland, Switzerland: IUCN.

3. Country context and basic data

3.1 Geography and territory

B&H is located in South East Europe on the Western Balkan peninsula. It has a total surface area of 51,209.2 km^2, of which approximately 210 km^2 is coastal area. Its coastline is about 21.2 km in length and is located in the Herzegovina-Neretva Canton of the Federation of Bosnia and Herzegovina (FB&H).[22] The country is largely hilly and mountainous, with an average altitude of 500 meters (Figure 3). Of its total land area, 5% is lowland, 24% are hills, 42% are mountains and 29% are karst regions. B&H's longest river is the Sava River, which forms a natural border with both Croatia and Serbia, while the Drina River forms a natural border with Serbia. In total, there are seven river basins (Una, Vrbas, Bosna, Drina, Sava, Neretva with Trebišnjica, and Cetina), of which 75.5% and 24.3% fall under the Black Sea and the Adriatic Sea Basins, respectively.[23]

B&H is a decentralised country comprising two entities: Republic of Srpska (RS) and Federation of Bosnia and Herzegovina (FB&H), and additionally the Brčko District (Figure 4). FB&H is subdivided into ten cantons (Figure 5). The entities and Brčko District (BD) independently manage environmental issues through laws, regulations, strategies and standards.

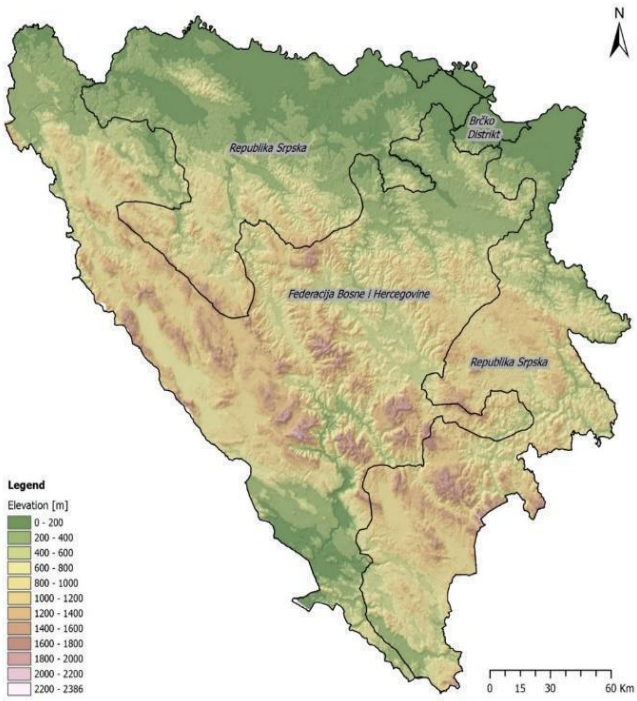


Figure 3. Hypsometric map of Bosnia and Herzegovina showing the digital height model of the terrain. *(Source: Map designed by the report author)*

Decision-making involves the Council of Ministers, and the governments of both entities and BD.

[22] EUNETMAR (2014). *Identifying challenges and gaps towards sustainable and responsible coastal and maritime tourism in the Mediterranean*. MED Sustainable Tourism Community's 1st thematic paper. EUNETMAR.
[23] UNEP (2017). *Action Programme to Combat Land Degradation and Mitigate Drought Effects in Bosnia and Herzegovina*. Sarajevo, Bosnia and Herzegovina: United Nations Environment Programme.

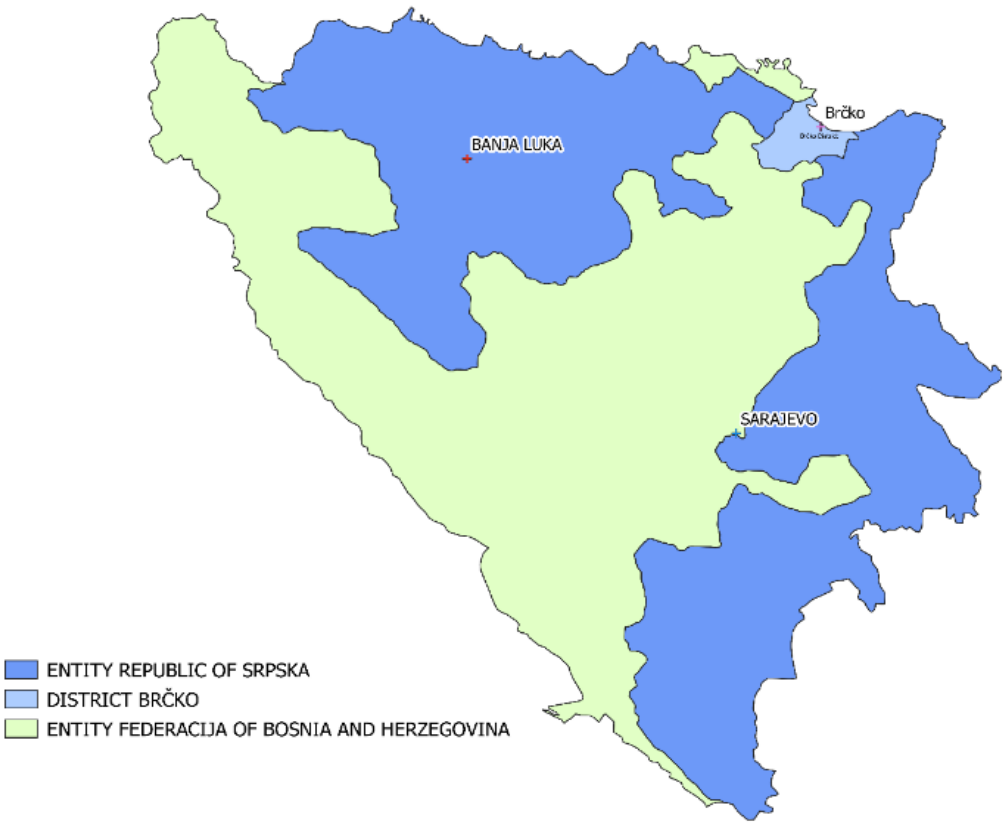


Figure 4. Administrative arrangements of B&H. *(Source: Map designed by the report author)*

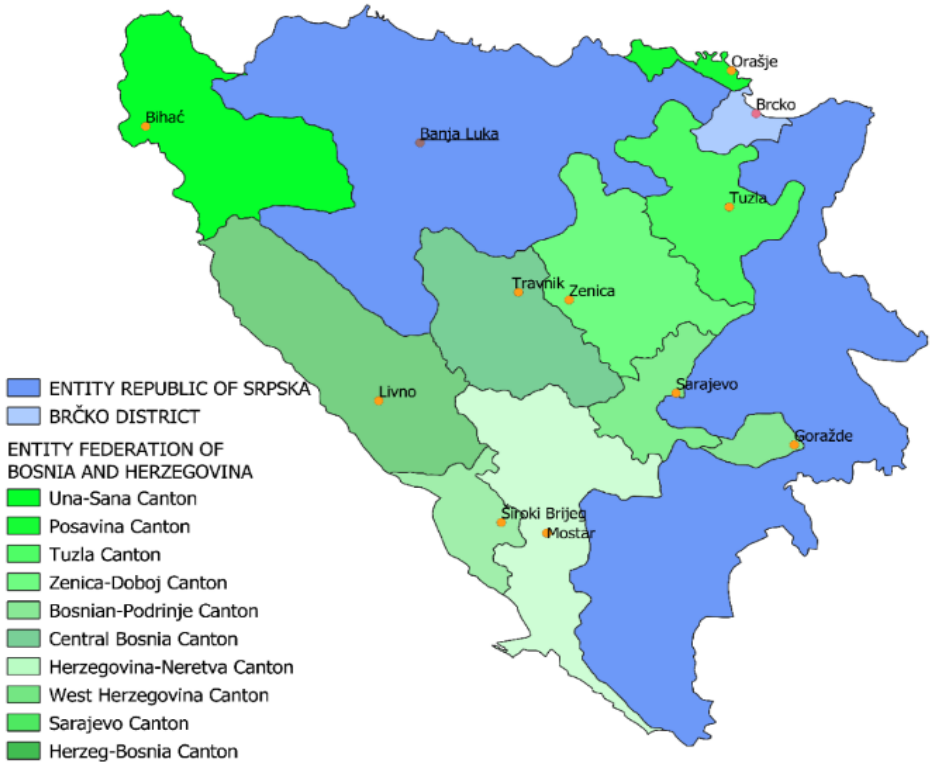


Figure 5. Administrative map of B&H, its two entities: RS and FB&H (with 10 cantons), and BD. *(Source: Map designed by the report author)*

Each entity has a government divided into the usual three branches, legislative (parliament), executive (government) and judiciary. The head of the entity is the president, elected by a popular vote every four years, while the head of the government is the prime minister. The territorial organisation of the RS entity includes 64 administrative units, including 8 towns/cities and 56 municipalities. The FB&H entity is divided into 10 cantons (Figure 4), each with its own cantonal government and ministries. FB&H includes 79 administrative units, 15 towns/cities and 64 municipalities.[24]

3.2 Demographics

The estimated population in RS is 1,142,495,[25] and in FB&H 2,219,220.[26] In regards to gender, in the RS 51.2% are women and 48.8% are men, while in FB&H 51% are women and 49% are men. The official languages are Bosnian, Serbian and Croatian, with Cyrillic and Latin as the official alphabets. The majority of the population is urban with intensive rural to urban internal migrations. The rural population is dependent mostly on agriculture, farming and food production, making it extremely vulnerable to natural disasters such as floods, drought and extreme heat waves.

Table 1. Basic statistics at the state level of B&H *(Source: Agency of Statistics BiH)*[27]

Currency	Bosnia and Herzegovina convertible mark (BAM)
Country group	Developing/Emerging Upper-middle income economy
Population	▼ 3,531,159 (provisional as of 1 January 2020)
GDP	BAM 35.229 million
GDP per capita	▲ USD 6009 (nominal, 2020 est.) ▲ USD14,894 (2020 est.)
GDP by sector	agriculture: 7.8% industry: 26.8% services: 65.4% (2017 est.)

[24] Data of the Statistical Yearbook of Bosnia and Herzegovina for 2019. Available at: https://bhas.gov.ba/data/Publikacije/Bilteni/2021/DEM_00_2020_TB_1_BS.pdf. Accessed on 15 July 2021.
[25] Data of the Statistical Yearbook of Republic of Srpska for 2020. Available at: https://www.rzs.rs.ba/static/uploads/bilteni/godisnjak/2020/StatistickiGodisnjak_2020_WEB_II.pdf. Accessed on 17 July 2021.
[26] Data of the Agency of Statistics BiH for 2019. Available at: https://bhas.gov.ba/data/Publikacije/Saopstenja/2020/NAC_02_2019_Y1_0_BS.pdf. Accessed on 20 August 2021.

[27] Data of the Agency of Statistics BiH for 2019. Available at: https://bhas.gov.ba/data/Publikacije/Saopstenja/2020/NAC_02_2019_Y1_0_BS.pdf. Accessed on 20 August 2021.

Population below the poverty line	▼16.9% (2015) 3.9% on less than $5.50/day (2011)
Unemployment	15.7% (April 2019) ▼33.8% youth unemployment (2019)
Average gross salary	▲ BAM 1,492 / €758.96 / $899.50 (July 2020)
Average net salary	▲ BAM 965 / €490.87 / $581.77 (July 2020)

According to the 1991 census, the country had a population of 4.37 million, though an unofficial UNHCR census in 1996 estimated that it had fallen to 3.9 million. In 2013, the population dropped even further to 3.79 million. The annual population growth rate in B&H in 2019 was 0.69%[28] and is not expected to grow in the near future. Current projections show that emigration will steadily increase and the annual growth rate will decline to -0.63% by 2050, with the population dipping below 3 million by around 2055.

> "Some of the most job-intensive activities that are an integral part of many Nature-based Solutions include **reforestation, ecosystem or watershed rehabilitation and restoration, management of invasive species** and **the use of agroecological approaches in food production."**
>
> *WWF/ILO (2020) (see footnote 30)*

3.3 Socio-economic structure

According to the Annual progress report of the European Commission 2020[29], the unemployment rate in B&H is 15.7% (13.6% men; 18.8% women), particularly affecting the 15–24 cohort (31.3% for young males and 37.9% for young females). The employment and activity rates are particularly low, at 35.5% and 42.1% respectively. The gender gap is relatively high, and so are the disparities between entities. The absence of coordination between entities and the lack of an active labour market measures targeting women are likely a source of the problem. The activity and employment rates are by far the highest in the 25 to 49 age group (73.4% and 60.7%, respectively).

In 2019, industry, including construction, accounted for 23.7% of GDP, while agriculture, forestry and fishing for only 6.1% of GDP. Import of goods and services accounted for up to 55.7%, which is a characteristic indicator of developing countries and weak economies.[30]

[28] World Population Review [website]. Bosnia and Herzegovina Population 2021. Accessed on 25 May 2021.
[29] European Commission (2020). Bosnia and Herzegovina 2020 Report, 2020 Communication on EU Enlargement Policy. Brussels, Belgium: European Commission.
[30] World Bank [website]: World Development Indicators: B&H. Accessed on 13 October 2021. https://databank.worldbank.org/reports.aspx?source=2&country=B&H

Thus, job creation is a priority; there are potential opportunities for creating nature-based "green jobs", particularly post-COVID-19. Some multilateral development banks have already started to recognise that the economic recovery from COVID-19 is an opportunity to both tackle the climate crisis and build higher societal resilience through nature. A growing range of NbS exists, for which real-world experience and expertise are available, that could effectively be harnessed to create employment while simultaneously protecting nature, mitigating climate change, and making human societies safer, healthier and more resilient. NbS provide cost-effective approaches that could contribute to achieving a number of the Sustainable Development Goals (SDGs), particularly those related to poverty, food and water security, human health and climate action.[31]

3.4 Biodiversity and ecosystems

The ratio of the number of species to the total surface area of the country indicates that it is among the most biodiverse countries in Europe. B&H has a particularly rich biodiversity due to its location being influenced by three distinct geological and climatic regions: (i) the Mediterranean region, (ii) the Euro Siberian-Bore American region, and (iii) the Alpine-Nordic region. Landscapes can be further classified into Mediterranean, sub-Mediterranean, Mediterranean-mountain, Pannonian, peri-Pannonian, upland, relic-refugial, wetland and karst fields. As a result of its unique orography, geological surface, hydrology and eco-climate, B&H has among the highest diversity of species of plants and animals in Europe. The vascular flora includes about 5,000 confirmed taxa of species, subspecies, and variety and form levels. As much as 30% of the total endemic flora in the Balkans (1,800 species) is found in the territory of B&H.

In relation to the status of biodiversity information, some progress has been achieved since 2011 when RS established the register of Protected Areas. Eight documents developed after 2011 present data about the status of biodiversity using 15 relevant indicators, and in 2018, the List of environment indicators for B&H included 21 indicators for biodiversity. The B&H Agency for Statistics included three indicators for biodiversity in their 2013 statistical report.

However, new areas of special importance to biodiversity and new unique aspects of biodiversity have not been identified since 2011. Unique aspects of biodiversity in protected areas that most likely contain new (undiscovered) species are still undocumented.[32] Bosnia

[31] WWF and ILO (2020). *NATURE HIRES: How Nature-based Solutions can power a green jobs recovery*. Gland, Geneva, Switzerland: World Wide Fund for Nature and International Labour Organization.
[32] CBD, GEF and UNDP (2019). *Sixth National Report of B&H to the Convention on Biological Diversity.* Sarajevo, Bosnia and Herzegovina: Convention on Biological Diversity, Global Environment Facility and United Nations Development Programme.

and Herzegovina currently has three sites designated as Wetlands of International Importance (Ramsar Sites), with a total surface area of 57,192 hectares (Bardača Wetland – 3,500 ha; Hutovo Blato - 7824 ha; Livanjsko Polje – 45,868 ha).[33] As reported in the 2016 Biodiversity Analysis, systematic collection and analysis of biodiversity data in B&H and biodiversity status monitoring in Bosnia and its entities are nearly non-existent.

Although studies on species diversity are lacking or obsolete, some studies regarding ecosystem services in B&H have been conducted. At the ecosystem level, in 2017 the European Commission initiated the European Red List of Habitats,[34] assessing a total of 490 habitats across 35 countries in Europe to determine their risk of collapse. This assessment benefits from the knowledge and expertise of over 300 experts, with relatively complete datasets received from B&H. Meanwhile, data on the current state and size of protected areas in the country are obsolete.

The state of environment has also not been regularly monitored by relevant institutions at the state, entity or BD level. Recently, the list of indicators for environment monitoring in B&H has been adopted[35], though implementation has not yet started.

3.5 Land use

According to statistical data from 2019,[36] RS has 1,008,000 ha of agricultural land and 816,000 ha (80.9%) of cropland suitable for food production (3.3% of RS territory), while in FB&H, total agricultural land covers 1,179,000 ha[37] (4.5% of FB&H territory) and 61% is suitable for food production. More information in terms of land and main land degradation drivers will be outlined in the following sections.

3.6 Climatic conditions and climate change

B&H is characterised by several different climate types, including the temperate continental climate in the north, the sub-mountainous and mountainous climate in the central parts of the country and the Adriatic and modified Adriatic type in the south. During the period 1981–2010, mean annual temperatures varied from 1.6°C (Bjelašnica) to 15.2°C (Mostar). Throughout the country, an annual temperature increase was observed, ranging from 0.4 to 1.0°C and more

[33] Ramsar [website]. B&H Country profile (interactive map). Accessed on December 02, 2020.
[34] European Union (2016). *European Red List of Habitats, Part 2. Terrestrial and freshwater habitats*. Luxembourg, Luxembourg: Publications Office of the European Union.
[35] UNEP (2018). List of environmental indicators in B&H. Sarajevo, Bosnia and Herzegovina: United Nations Environment Programme.
[36] Republic of Srpska Institute of Statistics (2020). Statistical Yearbook of Republic of Srpska. Agriculture and Fishery. Banja Luka, Bosnia and Herzegovina: Republic of Srpska Institute of Statistics
[37] FB&H Institute for Statistics (2019). Statistical Yearbook of the Federation of B&H. Sarajevo, Bosnia and Herzegovina: FB&H Institute for Statistics.

than 1.5°C in the north-western part (Banja Luka) of the country.

Annual precipitation varies from 792 mm in the north-eastern part of the country (Semberija–Bijeljina) to 1,707 mm (Herzegovina-Trebinje), with less rainfall during the summer months. During the last two decades, there has been a slight increase in annual precipitation nationwide, with increasing seasonal variation. This increased variation and changes in the distribution of rainfall, combined with rising temperatures have resulted in both floods and droughts.[38]

Over past decades, climate change has contributed to extreme weather events; for example, the years 2002, 2003, 2007, 2008, 2011, 2012, 2013, and 2015 were considered very dry to extremely dry, while the floods of 2001, 2002, 2009, 2010, and 2014 severely impacted the country's economy, people and environment.[39] These events are predicted to become more severe and frequent in the coming decades. Most natural hazards affecting B&H are caused by climate change,[40] and this is expected to be an increasingly serious issue since a steady rise in temperatures (+1 to +2.4°C) is predicted, together with an initial increase followed by a decrease in precipitation (+5% is expected for most of the country) from 2040 onwards.

Some reviews and analyses in B&H have discussed the threat of climate change impacts on different sectors, including sensitivity and adaptation, however the case studies and end measures included in the analysis were deficient. Some predictions for forestry and biodiversity in B&H based on climate scenarios show how climate change can influence the forests in such ways that it may potentially transform entire forest systems over time, shifting forest distribution and composition.[41] Severe temperatures and climate conditions such as frost and heat stress, as well as changes in the form, timing and amount of precipitation (e.g., snow versus rain, drought versus flood) can affect individual trees, stands and forest systems because it can lead to greater susceptibility to pests, pathogens and severe weather events. Another significant threat to forest ecosystems is the increase in forest fires. In terms of biodiversity within forest ecosystems, the changes in precipitation and water availability will likely also have an effect on fauna communities by leading to concentrations of certain populations in specific areas and increasing their vulnerability to pathogens. The sub-

[38] Kapović Solomun, M. (2020). Drought Management Plan of the Republic of Srpska. Banja Luka, Bosnia and Herzegovina: Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska.
[39] Ibid.
[40] Ristić, R., Polovina, S., Malušević, I., Radić, B., Milčanović, V. and Ristić, M. (2017). Disaster Risk Reduction Based on a GIS Case Study of the Čađavica River Watershed. *South-east European Forestry* (2):99-106. DOI: https://doi.org/10.15177/seefor.17-12.
[41] FAO (2010). *Forests and Climate Change Working Paper 8 – Forests and Climate Change in Eastern Europe and Central Asia.* Rome, Italy: Food and Agriculture Organization of the United Nations.

Mediterranean forests of B&H are threatened by changes in soil chemistry, with decreased pH levels that will not support the current species. The greatest threat will be to the oaks, which mostly grow at low altitudes (less than 860 m). The threats can undoubtedly cause shifts in species distribution ranges.

Another issue in terms of biodiversity and forest areas is related to protected areas. Bosnia and Herzegovina has only a very small area protected under IUCN categorisation (less than 1% of the territory), which is far below the regional averages and the natural potential of the country. Due to climate change, there is a possibility that in the future, these already insufficiently small areas might fail to protect the target species, features and processes. This calls for a reassessment of existing protected areas with their possible expansion, as well as the inclusion of new areas in the network, taking forest ecosystems of high conservation value into account.

3.7 Disaster risks

Due to its specific natural characteristics and climate, B&H is frequently affected by various natural hazards, including floods, droughts, landslides, storms and extreme temperatures (Figures 6 and 7).[42] Disasters significantly affect the B&H economy. For example, in May 2014, 90,000 people were displaced and some 81 municipalities were affected by floods. The total cost of damage and losses was over EUR 2 billion, which is equivalent to 15% of the country's GDP in 2014. Over half of the damage occurred in the Federation of B&H, which was estimated at EUR 1.04 billion, while the damage in the RS was about EUR 0.97 billion and in BD EUR 0.30 billion. The agriculture sector was most affected, with total agricultural damage and losses calculated at EUR 140 million, of which EUR 78 million was in damage and EUR 62 million was in losses.[43]

The risks are not uniform across the country and vary from region to region depending on the type of hazard, exposure, vulnerability and coping capacity.

[42] UNEP (2017). Action Programme to Combat Land Degradation and Mitigate Drought Effects. Sarajevo, Bosnia and Herzegovina: United Nations Environment Programme.
[43] FAO (2020). *Comprehensive analysis of Disaster Risk Reduction and Management System for agriculture in Bosnia and Herzegovina.* Sarajevo, Bosnia and Herzegovina: Food and Agriculture Organization of the United Nations.

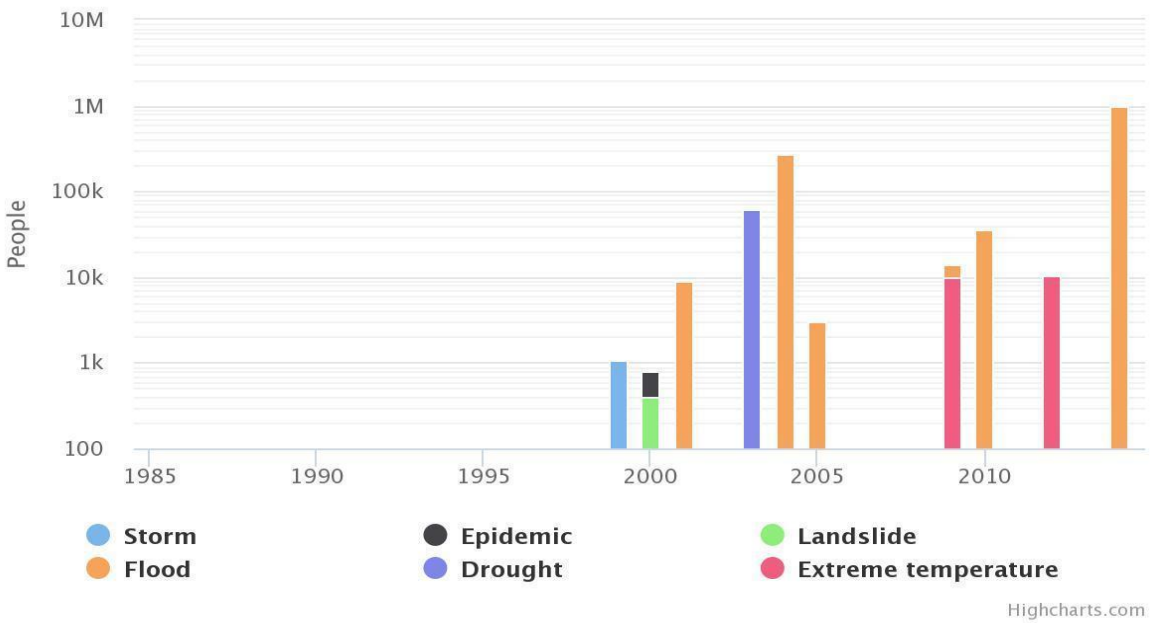


Figure 6. Key natural hazard statistics in B&H with number of people affected, for the period 1985–2018 *(Source: World Bank)*[44]

3.7.1 Floods

Floods are the most frequent natural disaster affecting B&H. They are usually caused by overflowing rivers, most often in spring and autumn. A recent history of flood events in B&H showed that several major floods have affected the country, including 1976 when three floods affected 43 of 109 municipalities, and in April 2004 that affected 300,000 people in 48 municipalities and 20,000 hectares of farmland.[45] A few years later, in December 2010, the country experienced one of the largest precipitation events recorded in the past century that caused extensive flooding.[46] Heavy rainfall in May 2014 led to devastating floods across the Balkan region, hitting B&H and Serbia the hardest and causing great economic consequences and the loss of human life.

In addition to climate change, flood control facilities damaged in the Bosnian war (1992–1995) is another reason for weak and insufficient flood mitigation and control. Currently, flood protection infrastructure is also not regularly maintained, especially along the Sava and Bosna Rivers. Human impacts, such as deforestation (particularly during and after the war) is another reason why heavy rains often result in extensive inundation and flooding across the country, while illegal construction of houses by refugees in flood-prone areas stand directly in the path

[44] Climate Knowledge Portal [website]. Bosnia and Herzegovina. Accessed on 13 June 2020.
[45] World Meteorological Organisation (2013). WMO statement on the status of the global climate in 2012. Geneva, Switzerland: World Meteorological Organisation.
[46] European Commission [website]: Key findings of the 2014 Progress Report on Bosnia and Herzegovina. Accessed on 2 November 2020.

of the floodwaters, increasing property damages.[47]

3.7.2 Drought and extreme temperatures

Drought and extreme temperatures are very frequent natural hazards in B&H especially in the northeast (Semberija and Posavina region) and southwest of the country (Herzegovina). Drought represents a long period with pronounced rainfall deficit that leads to damage to plants and reduced yields in agriculture, also having a negative impact on the economy, environment and population of the affected area. As a slow-moving disaster, drought rarely causes intense and dramatic damage (such as floods), but due to lack of food production as a direct consequence, overall damage can be more dramatic than any other natural disaster. If a drought occurs for two consecutive years, it inevitably leads to a hydrological drought characterised by low river water levels and groundwater levels, with the drying up of springs and wells and the occurrence of wildfires that have multiple effects on communities and their livelihoods, endangering human lives.

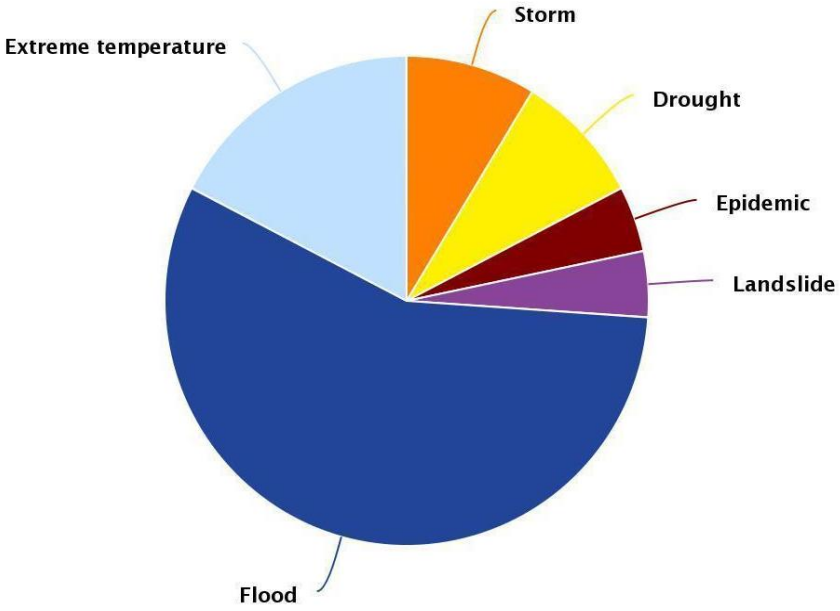


Figure 7. Average annual natural hazard occurrence in B&H for the period 1900–2018 *(Source: World Bank)*[48]

Drought was identified as a key driver of land degradation in B&H in the UNEP 2017 Action Program to Combat Land Degradation and Mitigate Drought Effects.[49] Drought is a particularly severe problem in regions with intensive agriculture production, and in southern B&H where it creates the preconditions for frequent wildfires. Drought causes significant economic damage in B&H. For example, the indirect damages to agriculture of the Republic of Srpska caused by

[47] Ibid.
[48] Climate Knowledge Portal [website]. Bosnia and Herzegovina. Accessed on 13 June 2020.
[49] UNEP (2017). Action Programme to Combat Land Degradation and Mitigate Drought Effects. Sarajevo, Bosnia and Herzegovina: United Nations Environment Programme.

drought in 2015 were estimated at EUR 250 million, while the drought in 2012 completely devastated corn crops sown on 140,000 ha in RS, on the shallow and skeletal soils of Lijevče Polje, reducing yield by 50–60% throughout RS, amounting about 2.5 t/ha. Damage caused by drought on maize alone in 2012 compared to production from earlier years (2004, 2005 and 2006) was 350,000–400,000 tonnes of grain. During that year, crop and grain yields were reduced by 40 to 50%, and meadow and pasture yields were also reduced by about 60%. The most recent drought hit B&H in the summer of 2017, which substantially impacted all agricultural subsectors. Unfortunately, the entity governments decided not to conduct a detailed assessment of the damage and losses, due to the lack of financial resources for compensation. RS has recently developed a Drought Management Plan, while in FB&H this process is ongoing.

The significant losses caused by drought can be seen in Table 2.

Table 2. Examples of the impact of droughts and floods on agriculture in B&H 2002–2012 *(Source: WMO, 2012[50])*

Event	**Year**	**Impact on agriculture**
Drought, Worst in 120 years	August 2002	Decrease of agricultural production by 60%, led to a serious food crisis
Drought, for 4 months of duration, and storms	Summer 2003	EUR 200 million damage to agriculture sector, approx. 200,000 people affected
Drought	Summer 2007	Over 40% of the country's crop production was destroyed and 250 ha land affected by forest fires, leading to high food prices
Drought	Summer and autumn 2012	Over USD 1 billion in agriculture production losses and 70% reduction in yields of grains and vegetables

Regional studies[51] on the vulnerability of the Western Balkan countries to climate change have revealed that the temperature throughout the region is rising faster than the global average trend, with especially pronounced signals during the summer season and an even more accelerated increase of maximum temperature, highlighting the alarming disturbance of the

[50] WMO (2012). *Strengthening multi-hazard early warning systems and risk assessments in the Western Balkans and Turkey: assessment of gaps and capacity needs*. Geneva, Switzerland: World Meteorological Organization, Regional Office for Europe.
[51] RCC (2018). *Study on Climate Change in the Western Balkans Region*. Sarajevo, Bosnia and Herzegovina: Regional Cooperation Council Secretariat.

Western Balkan climate.

3.7.3 Landslides

The occurrence of landslides in the hilly and mountainous areas of B&H is quite common (Figure 8). The 1992–1995 war in the country caused a massive migration of people, linked to the illegal construction of houses on hillsides or alongside riverbanks. Furthermore, a lack of spatial planning documentation based on geological analysis has led to unsustainable territorial development and infrastructure investments that create landslide hazards in the long-term. The total area of B&H exposed to a very significant risk of landslides is 7571 ha, whereas the area at significant risk of landslides is 26,073 ha. In addition to uneven precipitation, human activities, including deforestation, illegal and unplanned construction in the vicinity of urban areas were important trigger factors for the landslides that occurred in the country in 2006, 2010 and 2014.[52]

The morphological and geological structure additionally contribute to the occurrence of landslides, together with heavy rainfall, long periods of droughts, snow melt, underground water flows, and anthropogenic activities. The main areas prone to landslides are located in northern B&H, made of clastic tertiary soft rock with a thick crust of surface decomposition formed by weathering. The remaining landslides occur in central Bosnia (Bosnia schist mountains) and in the southern parts of B&H (made of flysch sediment) (Figure 8). The total possible damage suffered by the housing sector in the areas at a very significant risk of landslide is estimated at BAM 4,266,443,520, of which the hardest hit is Centre Sarajevo (BAM 642,378,240) followed by Tuzla (BAM 320,486,400), Novi Grad Sarajevo (BAM 301,478,400), Stari Grad Sarajevo (BAM 235,042,560) and Novo Sarajevo (BAM 225,826,560).[53] There are around 1,800 active landslides in B&H, of which 754 in FB&H, over 1,000 in RS, and 43 in BD.[54]

Depending on the climate conditions, B&H can have more than 1,000 landslides annually, some of which are old landslides that have reactivated, while others are new. These numbers have increased significantly in the past 20 years and it should be emphasised that landslides are among the top priority environmental issues in B&H. For example, Sarajevo Canton alone has 763 registered landslides that pose a significant threat to human life and the

[52] UNDP (2016). *Landslide Risk Management Study in Bosnia and Herzegovina*. Sarajevo, Bosnia and Herzegovina: United Nations Development Programme.
[53] HIES (2015). Floods and landslides risk assessment for the housing sector in Bosnia and Herzegovina. Sarajevo, Bosnia and Herzegovina: Hydro-Engineering Institute Sarajevo.
[54] UNDP (2018). Disaster response assessment and roadmap for Bosnia and Herzegovina. Available at http://fucz.gov.ba/wp-content/uploads/2019/02/disaster-response-assessment-and-roadmap-for-bosnia-and-herzegovina.pdf. Accessed on 11 August 2020.

environment.[55]

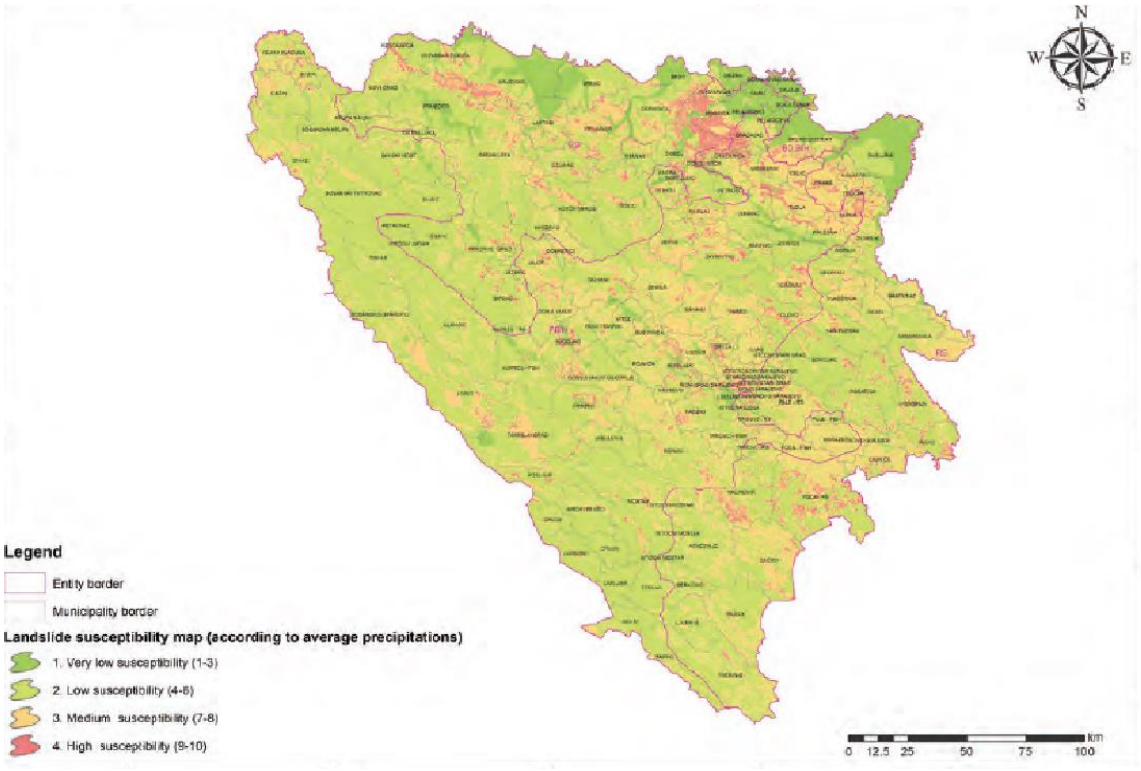


Figure 8. Landslide susceptibility map of B&H *(Source: HIES, 2015)*[56]

3.7.4 Wildfires

Fire dynamic occurrence in B&H is determined with two maximums over the year: the primary in March and the secondary in August. Drought periods over the summer, as well as human influence, have increased the number of wildfires in recent decades in B&H.[57] Rural abandonment is another factor as it contributes to weed expansion, vegetation succession and the transition of cropland into bush and sparsely vegetated areas, both of which are highly vulnerable to wildfires.[58]

This problem is typical for post-conflict societies, such as B&H, where increasing wildfires due to abandoned land are common disasters and drivers of land degradation. The main “hot spot” in terms of wildfires is the Herzegovina region, where destroyed soils and vegetation every year endanger water resources, food security and sometimes even human life (Table 3).

[55] UNEP (2017). Action Programme to Combat Land Degradation and Mitigate Drought Effects. Sarajevo, Bosnia and Herzegovina: United Nations Environment Programme.
[56] HIES (2015). Floods and landslides risk assessment for the housing sector in Bosnia and Herzegovina. Sarajevo, Bosnia and Herzegovina: Hydro-Engineering Institute Sarajevo.
[57] Kapović Solomun, M., Ferreira, C.S.S., Zupanc, V., Ristić, R., Drobnjak, A. and Kalantari, Z. (2022). Flood legislation and land policy framework of EU and non-EU countries in Southern Europe. *Wiley Interdisciplinary Reviews: Water*. 9(1), e1566. https://doi.org/10.1002/wat2.1566.
[58] Kapović Solomun, M., Barger, M., Cerda, A., Keesstra, S., Marković, M. (2018). Assessing land condition as a first step to achieving Land Degradation Neutrality: A case study of the Republic of Srpska, *Environmental Science and Policy* 90:19-27.

Table 3. Overview of fire affected area for the period 2008–2017 *(Source: Agency of Statistics of the Republic of Srpska)*[59]

Year	FB&H		RS		B&H	
	km^2	%	km^2	%	km^2	%
2008	53.86	0.21	56.46	0.23	110.86	0.22
2009	18.81	0.07	12.81	0.05	31.81	0.06
2010	8.19	0.03	16.98	0.07	25.25	0.05
2011	74.32	0.28	203.12	0.83	278.19	0.54
2012	458.38	1.76	337.81	1.38	800.79	1.56
2013	24.47	0.09	4.15	0.02	28.87	0.06
2014	7.47	0.03	2.9	0.01	10.44	0.02
2015	78.13	0.30	58.04	0.24	136.95	0.27
2016	64.73	0.25	38.6	0.16	103.98	0.20
2017	279.75	1.07	229.77	0.94	512.33	1.00
TOTAL	**1068.11**	**4.09**	**960.64**	**3.92**	**2039.47**	**3.98**

[59] Agency of Statistics of the Republic of Srpska. Statistical Reports for Forestry 2012-2018. Available at: https://www.rzs.rs.ba/front/category/8/?left_mi=287&add=287. Accessed 1 March 2021; Agency of Statistics of FBiH. Statistical reports for Forestry 2012-2018. Available at: http://fzs.ba/index.php/publikacije/statisticki-godisnjaciljetopisi/ Accessed 3 March 2021.

4. Gender context

The gender context represents an important aspect that should be considered in demographic, socioeconomic, disaster risk reduction and climate change adaptation study analyses. This is also the case when investigating pressures on biodiversity and ecosystem services where genders may play different roles in conservation, sustainable management and protections, as well as in activities that threaten biodiversity and ecosystems such as activities in infrastructure and agriculture.

According to the 2019 Labour Force Survey, unemployment affects women to a greater extent in B&H: the average unemployment rate is 15.7% (13.6% men; 18.8% women), particularly affecting the 15–24 cohort (31.3% for young males and 37.9% for young females). The employment and activity rates show a similar gender difference: 35.5% women and 42.1% men. The gender gap is relatively high, and so are the disparities between entities. The absence of coordination between entities and the lack of an active labour market measures targeting women are likely the key causes of this problem. Additionally, social contribution rates contribute to a high tax on the labour earnings of low-income earners, resulting in a disincentive to work for this category and for their employers to formalise employment, therefore often confining them, especially women, to informal work.[60]

Bosnia and Herzegovina is a traditional society in which women struggle for a better position every day. Regular stereotypes about the role of women in society, lower wages and longer periods of unemployment are just a few of the problems faced by women in B&H. Their activities and livelihoods have also been seriously affected by climate change and natural disasters in the recent decade. The process of introducing gender equality in all areas of social life in B&H requires, above all, awareness raising and increasing knowledge about the causes and consequences of gender-based discrimination, and acknowledgment of the benefits and added value of taking a gender-inclusive approach (a central component of NbS according to the IUCN Global Standard for NbS). In the last ten years, significant efforts have been made in B&H to develop a domestic legal, institutional, and policy framework for the application of the principles of gender equality, which are largely in line with international standards. However, gender equality is still not treated as a priority of development and other strategies and is still considered a matter that concerns only women.

[60] World Bank [website]. World Development Indicators. Available at: https://databank.worldbank.org/reports.aspx?source=2&country=B&H. Accessed on 2 April 2020.

5. Stakeholder analysis

The institutional structure in B&H is complicated; the B&H Constitution states that the country is decentralised, consisting of two entities: FB&H and RS. Each entity has its own constitution, government and parliament, its own budget, and it acts independently. In addition, there is BD, which is located in the north-eastern part of the country and is by decree independent from the two entities. BD operates under the administrative rule of the BD government and under the exclusive sovereignty of B&H. In addition, FB&H is made up of ten cantons, each consisting of municipalities. Cantons also have their own governments and parliaments, which can develop policies and adopt laws pertaining to their competences, managing their own budgets, and act independently. RS is not divided into cantons.

Mainstreaming Nature-based Solutions into policy and strategic frameworks and their successful implementation depends on stakeholder awareness, interest and understanding of the importance of NbS for CCA and DRR. Since B&H is a complex country in the administrative sense, it is very important to identify and analyse the role of and relations among each stakeholder at the state and entity level to identify opportunities and barriers.

In addition, due to the interdisciplinary nature of NbS, they can be applied in different sectors including agriculture, forestry, water management, biodiversity, spatial planning and urban development. Different institutions are interconnected with their formal competencies and jurisdictions over several of these sectors; some are responsible for policy framework development, while others are involved in implementation. Parts of these strategic and policy frameworks are closely related to NbS, DRR and CCA, so a wide range of institutions and stakeholder groups are influential in mainstreaming the NbS concept. Thus, an important aspect of this analysis is the identification and recognition of stakeholder competencies and their potential influence on mainstreaming the NbS concept in B&H and its entities.

The administrative structure of B&H illustrates the great complexity of the current system relevant to the mainstreaming of NbS, and highlights the need for stronger coordination and collaboration among entities and BD, the state and entities, and then also among different sectors under each entity and at different governance levels in B&H.

For example, at the state level, MoFTER is a coordination institution, where NbS are relevant for the work of the Department for Water Resources, the Department for Environmental Protection, and the Department for Agriculture, Food, Forestry and Rural Development. At the entity level, the situation becomes even more complex, particularly in FB&H where each of

the ten cantons has its own government and ministries, with some assigned to NbS through their jurisdictions.

In RS, the competencies relevant for NbS application are divided amongst sectors within a single ministry, and also among different ministries. For example, the Ministry for Environmental Protection is entrusted with biodiversity, climate change, nature protection and protected areas, while agriculture, forestry and water management lie exclusively under the jurisdiction of the Ministry for Agriculture, Forestry and Water Management. In comparison, the only institution at the state level with jurisdiction in environmental issues is the Ministry of Foreign Trade and Economic Relations (MoFTER), while environmental legislation operates at the entity and BD level. All international agreements and projects are coordinated through the MoFTER. Due to this complex structure, monitoring any component of the environment relies on the entity institutions, with coordination at the state level.

This analysis is a brief overview of the most important groups of stakeholders related to NbS, and their possible roles and positions. Considering the scope of this study and the administrative complexity of B&H, it was not possible to develop a detailed analysis on DRR impacts through the implementation of NbS at the cantonal and local level; the analysis was limited to the state and entity levels. Therefore, further research among various relevant groups of stakeholders, including reflections on gender and other especially vulnerable groups, should be considered.

5.1 Primary stakeholders – decision-making level

The **state level** decision-making institutions (e.g., MoFTER, Ministry of Communications and Transport) and **entity level** government bodies (primarily line ministries responsible for forestry, water management, agriculture, climate change, DRR and environmental protection in both entities and BD) together form the most important stakeholder group of institutions in regards to policy and strategy development, planning and monitoring. In FB&H, each of the ten **cantons** and their relevant government bodies and ministries responsible for forestry, water management, agriculture, climate change, DRR and environmental protection are relevant for NbS. These institutions represent key entry points for mainstreaming NbS into the existing policy and strategic framework. Besides ministries, other institutions relevant for DRR and NbS are also important, such as the Ministry of Agriculture, Forestry and Water Management that assign tasks to public enterprises for the drafting of and monitoring of forest operational plans that are important for DRR and future introduction of NbS-related programmes and projects. The actors at the local decision-making level (cities and

municipalities) are also identified as important partners (particularly those threatened by natural hazards in B&H), but due to the scope of this study they will not be analysed in detail.

5.2 Secondary stakeholders – operational level

Professional institutions, public enterprises and local communities are critical for the implementation of NbS measures, particularly the **local communities** most affected by disasters. Others may have a lack of interest as they do not perceive themselves as being frequently affected by natural hazards. However, climate change is a phenomenon that underpins disasters across B&H, meaning the interest in this topic in each local community is likely to grow in the future.

Local governments are champions in the field of implementation of NbS, so their leaders and associate departments should be involved in the process of mainstreaming NbS actions on the ground. On the other hand, **public enterprises** mandated with environmental work have key operational roles related to NbS. For example, public enterprises mandated to manage forests are the main operational institutions responsible for afforestation, restoration of wildfire affected areas, forest fires and illegal cutting, while public institutions for water management maintain water quality, flood protection, and watershed and river basin management.

Both of these public enterprises are key operational institutions that should be further acknowledged and engaged in the application of NbS throughout B&H. An example of the complexity of the context in B&H is taken from the forestry sector, where the public forest enterprises in B&H (only at entity and cantonal levels, without local public forest management enterprises) are as follows: in RS: public enterprise Šume Republike Srpske Sokolac; and in FB&H: Federal Forestry Administration, and the public enterprises or forestry management companies (Sarajevo šume in Sarajevo, Šumsko-privredno društvo Zeničko-dobojskog kantona in Zavidovići, Hercegbosanske šume in Kupres, Šumsko-gospodarsko društvo Županije Zapadnohercegovačke in

BRIGHT EXAMPLE

The NGO Centre for Environment Banja Luka actively advocates the importance of increasing of the number of protected areas and public involvement in decision-making processes related to the management of natural resources and protected areas. Activities aim to achieve institutional communication, enriching cross-sectoral cooperation to preserve the environment, introduce sustainable management of protected areas and natural resources, and draw public attention to the need for active participation in decision-making on nature conservation.

Posušje, Šume Tuzlanskog kantona in Kladanj, Unsko-sanske šume in Bosanska Krupa, Bosansko-podrinjske šume in Goražde, Šume Središnje Bosne/Srednjobosanske šume in Donji Vakuf and Šume Hercegovačko-neretvanske in Mostar). In this sense, coordination and mutual cooperation should be facilitated between entities and the state in general, particularly in the context of NbS-related matters as the top priority for successful mainstreaming.

5.3 Other stakeholders

Other important stakeholders include academic/scientific institutes and organisations, agriculture extension services, union of municipalities and cities of RS and FB&H, media, NGOs, and CSOs, all of which have interest in this topic and negotiation capacity, but without significant influence in developing the policy and strategic framework or decision-making regarding NbS and their application. This group is very important for capacity building, awareness raising and knowledge transfer among other stakeholders, particularly in regards to the academic community.

Another important group of stakeholders are women, youth and socially vulnerable groups who are at a particular risk for disasters and the effects of climate change in rural areas. These groups should be considered separately and with particular attention.

There are many great examples of civil societies and NGOs actively involved or leading actions important for promoting and mainstreaming of NbS.

In Table 4, relevant stakeholders are assessed in terms of their importance and influence and their primary role in the application of NbS. This preliminary analysis can be used for further consultation with these stakeholders.

Table 4. Stakeholder power-interest grid analysis and primary roles *(Source: Data compiled by the report author)*

Stakeholder*	**Importance (score 1 - 5)**	**Influence (Score 1 – 5)**	**Total score (Imp x interest)**	**Primary role in NbS application**
State level				
MoFTER	4	3	12	Policy coordination
Republic of Srpska entity				
Ministry of Agriculture, Forestry and Water Management	5	4	20	Policy development and coordination

Ministry of Spatial planning, Construction and Ecology	5	4	20	Policy development and coordination
Ministry of industry and energy	3	4	12	Policy development and coordination
public forest enterprise Šume Republike Srpske, Sokolac	4	3	12	Policy enforcement/ NbS application
public enterprise Vode Republike Srpske	4	3	12	Policy enforcement/ NbS application
Water Agency for the Sava River District (WASR);	3	3	9	Policy enforcement/ NbS application
Water Agency for the Trebisnjica River District (WATR).	3	3	9	Policy enforcement/ NbS application
Agriculture Extension Services	4	3	12	Community engagement
Local community	3	4	12	Advocacy/application of NbS
Union of municipalities and cities of RS	3	4	12	Advocacy and community engagement
Private companies	3	3	9	NbS implementation
Academia	3	3	9	Policy/NbS applicability
Vulnerable groups	3	2	6	Advocacy/community engagement
Media	2	4	8	Advocacy
CSOs and NGOs	3	2	6	Advocacy/community engagement
Federation of B&H entity				
Ministry of Agriculture, Forestry and Water Management	5	4	20	Policy development and coordination
Ministry of Tourism and Ecology	5	4	20	Policy development and coordination
Ministry of Energy, Mining and Industry	3	4	12	Policy development and coordination
Cantonal Ministry of Agriculture, Forestry and Water Management (ten institutions)	4	4	16	Policy development and coordination

Cantonal Ministry of Tourism and Ecology (ten institutions)	4	4	16	Policy development and coordination
Cantonal Ministry of Energy, Mining and Industry (ten institutions)	4	4	16	Policy development and coordination
Federal Forestry Management	4	3	12	Policy enforcement/ NbS application
Public enterprise Sarajevo šume, Sarajevo	4	3	12	Policy enforcement/ NbS application
Public enterprise Šumsko-privredno društvo Zeničko-dobojskog kantona, Zavidovići	4	3	12	Policy enforcement/ NbS application
Public enterprise Hercegbosanske šume, Kupres	4	3	12	Policy enforcement/ NbS application
Šumsko-gospodarsko društvo Županije Zapadnohercegovačke, Posušje	4	3	12	Policy enforcement/ NbS application
Public enterprise Šume Tuzlanskog kantona, Kladanj	4	3	12	Policy enforcement/ NbS application
Public enterprise Unsko-sanske šume, Bosanska Krupa	4	3	12	Policy enforcement/ NbS application
Public enterprise Bosansko-podrinjske šume, Goražde	4	3	12	Policy enforcement/ NbS application
Public enterprise Šume Središnje Bosne/ Srednjobosanske šume, Donji Vakuf	4	3	12	Policy enforcement/ NbS application
Public enterprise Šume Hercegovačko-neretvanske, Mostar	4	3	12	Policy enforcement/ NbS application
Agency for Watershed of Sava River	3	3	9	Policy enforcement/ bBS application
Agency for the Watershed of Adriatic Sea (AWAS)				Policy enforcement/ NbS application
Agriculture Extension Services	4	3	12	Community engagement

Cantonal Agricultural Extension Services	3	3	12	Community engagement
Local community	3	4	12	Advocacy/application of NbS
Union of municipalities and cities	3	4	12	Advocacy and community engagement
Private companies	3	3	9	NbS implementation
Academia	3	3	9	Policy/NbS applicability
Vulnerable groups	3	2	6	Advocacy/community engagement
Media	2	4	8	Advocacy
CSOs and NGOs	3	2	6	Advocacy/community engagement
Brčko District				
Department of Agriculture, Forestry and Water management	5	4	20	Policy development and coordination
Office of Agricultural Extension Services	4	3	12	Community engagement
Local community	3	4	12	Advocacy/application of NbS
Private companies	3	3	9	NbS implementation
Academia	3	3	9	Policy/NbS applicability
Vulnerable groups	3	2	6	Advocacy/community engagement
Media	2	4	8	Advocacy
CSOs and NGOs	3	2	6	Advocacy/community engagement

**Score on a five-point scale, where 1 indicates very little importance or influence and 5 indicates very high importance or influence.*

6. Key stakeholders for Nature-based Solutions

The **Ministry of Agriculture, Forestry and Water Management of RS (focal institution for UNCCD),** the **Ministry of Agriculture, Forestry and Water Management of FB&H,** and the **Department of Agriculture, Forestry and Water Management of BD** are the key institutions responsible for reporting to UNCCD (the most recent report was submitted in 2018) on the implementation of the process of Land Degradation Neutrality, agriculture and forest management, flood protection and water management at the entity, district and cantonal levels in B&H. The Departments for water management within these ministries are in close cooperation with water agencies in charge for the flood protection infrastructure and flood control planning. They also coordinate international water management through different programmes and projects, with particular focus on flood risk assessment and mapping methodologies. They also focus on hydrological drought management and provide advice on the accumulation and flows regimes if water levels are low. Flood control in watersheds is organised and implemented by the public water management companies (public enterprise Vode Republike Srpske, Water Agency for the Sava River District, and Water Agency for the Trebišnjica River District in RS; Agency for Watershed of the Sava River and Agency for Watershed of the Adriatic Sea for FB&H. These companies are directed by the Ministry of Agriculture, Forestry and Water Management and local self-government units within their territories.

By comparison, water and flood management of level 2 watercourses are within the mandate of **local governments** which are endorsed for preparation of Flood Risk Management Plans (e.g., for the Vrbas River with the support of UNDP), implementation of flood control measures, and during emergencies to coordinate and lead operational activities with support of higher-level decision-making institutions (republic level in RS, and cantonal and federal level in FB&H). They are also responsible for coordination and evaluation of contingency infrastructural works and managing technical, human and financial resources. The main responsibility for monitoring drought and heatwaves lies with the hydrological and meteorological institutes of both entities, but to date no early warning system and drought preparedness system has been officially established or made functional. Drought is addressed by the Department of Agriculture within the same ministries, while forestry related issues are the concern of the Departments of Forestry.

The **Ministry of Environment and Tourism of FB&H (UNCBD focal institution)** and the **Ministry of Spatial planning, Construction and Ecology of RS (UNFCCC focal institution)** are the main government institutions responsible for the coordination of the

process of preparation of National Communications toward UNFCCC and Biennial Update Reports, development of reports toward UNCBD and for overall compliance and coordination with UN Conventions and EU climate/biodiversity policy requirements. Climate change adaptation and mitigation are important issues reflected in those reports, and also when examined from the perspective of disaster risk (particularly floods, drought, wildfires and landslides) as a manifestation of climate change. The Fourth National Communication and Third Biennial Update Report for B&H under the UNFCCC is under preparation and it is expected to be submitted in 2022.

Public forest enterprises, such as the public enterprise Šume Republike Srpske (Forests of Republic of Srpska) is under the authority of the Ministry of Agriculture, Forestry and Water Management of RS, and is entrusted with the management of public forests over the total area of 1,100,268 ha.[61] The organisational structure covers 26 forest management units that in places align with the territory of RS municipalities and cities. The Centre for Karst Management, Centre for Seed Nursery Production, and Research-Development Centre act as organisational units within the public enterprise. Sustainable forest management is the main aim of this enterprise, which holds a Forest Stewardship Certificate awarded by the Forest Stewardship Council (FSC). Forest certification is a market-based conservation initiative that aims to promote the environmentally appropriate, socially beneficial, and economically viable management of forests. These certificates are revised and re-confirmed every four years. The public forest enterprise creates and implements forestry strategy in accordance with the Law on Forests (Official Gazette of RS 75/08), which is currently in the drafting process for period the 2022–2032.

The federal Forestry Management of FB&H is the main institution at the entity level, and it coordinates with all ten cantonal public forest enterprises aiming to provide sustainable forest management throughout the entire territory. However, each canton is independent from its neighbouring cantons. Currently, there is no Law on Forests enacted at the entity level, while each canton has adopted its own Law on Forests. Additionally, only two cantons (Tuzlanski and Srednjobosanski Canton) are FSC-certified. Generally, public enterprises are responsible for breeding, protection, management of protected natural values, maintenance and regeneration of forests, production of forest seeds and planting material and growing new forests and forest plantation, as well as forest use, silviculture, projection of the organisational structure of each unit, etc.

[61] Republic of Srpska Institute of Statistics (2020). *Statistical Yearbook of Republic of Srpska: Forestry*. Banja Luka, Bosnia and Herzegovina: Republic of Srpska Institute of Statistics.

The **public water management companies** perform activities of public interest related to water management on a specific territory usually within larger watersheds. The main activities of these companies within both entities are related to integral water management and public water resources in accordance with the Law on Waters (Official Gazette of RS 50/06, 92/09, 121/12; Official Gazette of FB&H 70/06), characterisation of structures, types and bodies, surface and groundwater, water resources and water bodies, undertaking interventions on public water resources in accordance with the Law on Waters, organising the management of water facilities and systems. The following public water management companies and agencies operate in B&H: in RS: public enterprise Vode Srpske, Water Agency for the Sava River District and Water Agency for the Trebisnjica River District; in FB&H: Agency for the Watershed of the Sava River and Agency for the Watershed of the Adriatic Sea.

Local Self-government Units (cities and municipalities) also have a mandate for environment protection and protection from natural and other disasters (Article 8, Law on Principles of Local Self-Governments of FB&H; Article 11, Law on Local Government and Self-government of RS 98/13). They also perform other duties and services delegated through the legislation's provisions in the areas of protection and rescue from natural disasters, firefighting, etc.

7. Nature-based Solutions in policy frameworks

Nature-based Solutions are actions that work with and enhance nature to help address societal challenges. The concept is grounded in the knowledge that healthy natural and managed ecosystems produce a diverse range of services on which human wellbeing depends. NbS is an 'umbrella concept' for other established nature-based approaches, such as ecosystem-based adaptation and mitigation, disaster risk reduction, green infrastructure in urban areas and natural climate solutions. They therefore offer a major opportunity for innovation, with possibilities to deliver lasting and tangible benefits across different social groups, in a range of environmental, economic and cultural settings (Figure 2).

For B&H, this is a relatively new approach, arising from different international and regional agreements, frameworks and conventions that influence and provide provisions for NbS globally guiding state and entity actions. NbS are not explicitly recognised in existing state and entity policy framework in B&H, while many strategic documents and international reports in the country (NDCs, Natural Biodiversity Strategies and Action Plans (NBSAPs), Action Programme to Combat Land Degradation and Mitigate Drought Effects in B&H (AP), Land Degradation Neutrality Reports) are focused on nature-based measures, approaches and interventions; in other words, they use the approaches that fall under the NbS umbrella without explicitly defining them as "Nature-based Solutions". This means that NbS should first be understood by the main stakeholders, then mainstreamed into policy and legislation framework, and later deployed at the operational level in the areas of forestry, agriculture, agroforestry, biodiversity, ecosystem conservation and restoration. NbS can combine climate change mitigation, adaptation, disaster risk reduction, biodiversity conservation, restoration, and sustainable resource management measures to achieve outcomes that are fundamental for the maintenance of the economy and livelihoods in any context.

This chapter provides an overview of the existing policy frameworks related to NbS in B&H, including climate and DRR, forestry, water management, biodiversity and other relevant policies.

7.1 Existing policy and institutional frameworks

Considering that NbS is a new approach, the legislative framework in B&H does not recognise it explicitly. On the other hand, many strategies and legislation recognise the importance of ecosystem services and the role of ecosystems in preventing disasters and reducing disaster risks, and therefore NbS-related policies and strategies will be presented, jointly with relevant international commitments and ratified conventions.

7.1.1 Climate change policy framework

B&H has ratified many international agreements related to recognition of the influence of climate change on ecosystem services and disaster risk reduction, including the UN Conventions. B&H ratified the UN Framework Convention on Climate Change, UNFCCC (Official Gazette of B&H 19/00) in 2000, which provides a global framework to help countries cope with the adverse effects of climate change. B&H is already taking measures to address climate change, starting from the Initial National Communication (INC) that was completed in October 2009, and adopted by the Council of Ministers and the entity governments, and submitted to the UNFCCC secretariat in May 2010.

Following the reporting requirements under the UNFCCC, B&H submitted its Initial Communication in 2010,[62] the Second National report in 2013,[63] First Biennial report in 2014, and Third National and Second Biennial report in 2016[64] as official obligations under the UNFCCC providing an overview of and proposing measures for climate change mitigation and adaptation in the relevant sectors. The main gaps and challenges recognised in these reports focus on the institutional and financial constraints together with human resources issues. The key institutional constraints are: conflicting and overlapping mandates, poor coordination and lack of efficient agreement. According to the Dayton Agreement and the Constitution of B&H, the implementation of environmental policy in B&H falls within the competence of the entities and the district government in BD. The state level Ministry of Foreign Trade and Economic Relations of Bosnia and Herzegovina is endorsed for the fulfilment of international obligations of B&H in the field of environmental protection, while the responsibility under the UNFCCC and development of the National Communications of B&H rests with the UNFCCC Focal Point that belongs to the Ministry of Physical Planning, Civil Engineering and Ecology of RS. In B&H, jurisdiction of the state administration in environmental and natural resources matters covers only international cooperation and the necessary coordination with prior approval of the entities. There is no overall supervision of the environment and data collection system, resulting in a lack of systematic information on environmental protection. For the time being, different institutions collect different data without sufficiently developed coordination and unified databases. Data exchange and communication between institutions collecting data and governmental organisations is insufficient, and there is no information exchange on

[62] UNDP (2010). *The Initial National Communication (INC) of Bosnia and Herzegovina under UNFCCC Convention*. Banja Luka, Bosnia and Herzegovina: United Nations Development Programme.
[63] UNDP (2013). *Second National Communication (INC) of Bosnia and Herzegovina under UNFCCC Convention*. Sarajevo, Bosnia and Herzegovina: United Nations Development Programme.
[64] UNDP (2016). *Third National Communication and Second Biennial Update Report on Greenhouse Gas Emissions of Bosnia and Herzegovina under the United Nations Framework Convention on Climate Change*. Sarajevo, Bosnia and Herzegovina: United Nations Development Programme.

existing data. Administrative capacity in the environmental sector in B&H is quite low and requires additional support and capacity building, not only to identify climate change adaptation and mitigation measures in B&H, but also to build capacity for coping with disaster risk under different climate regions. In the official communications of B&H under the UNFCCC, it is recognised that strong climate extremes impact the most sensitive sectors, such as agriculture, forestry, water resources and protected areas, together with the impacts of natural disasters in B&H, where floods, drought, wildfires and landslides are the most important ones. For example, the Third National Communication to UNFCCC highlighted that vulnerability assessments were made for the following sectors: agriculture, forest ecosystem, biodiversity and sensitive ecosystems, hydrology and water resources, tourism and human health. Possible adaptation measures for these sectors were developed, with the aim of mitigating the effects of climate change (particularly extreme events and natural disasters occurring in the recent decade).

Additionally, B&H developed the Climate Change Adaptation and Low Emission Development Strategy for B&H adopted in 2013,[65] prepared more as a framework than a detailed operational plan specifying all necessary actions. The need to strengthen capacities is identified in this Strategy as an important assumption for combatting climate change; i.e., institutional and staff training with development and improvement of meteorological monitoring. It is recommended that the relevant environmental and air protection laws be revised in accordance with general requirements of EU Directive (EU) No 525/2013 on the mechanism for monitoring and reporting of GHG emissions, to harmonise statistical data and methodology with IPCC methodology requirements.

In the framework of the Paris Agreement and in light of updating of Intended Nationally Determined Contributions (INDC), the existing INDC indicators have been analysed. It is stated that B&H could reduce its emissions, compared to the business-as-usual scenario, by 2% by 2030, which would mean 18% higher emissions compared to the base year 1990. Significant emission reduction can only be achieved with international support, which would result in a 3% reduction of emissions compared to 1990, while compared to the Business As Usual scenario it represents a possible reduction of 23%.[66]

Meanwhile, the Paris Agreement underlines the need for development of National Adaptation

[65] UNDP (2013). *Climate Change Adaptation and Low-Emission Development Strategy for Bosnia and Herzegovina*. Sarajevo, Bosnia and Herzegovina: United Nations Development Programme.
[66] UNCC [website]. Submission: Intended Nationally Determined Contributions as communicated by Parties for 2015. Bosnia and Herzegovina. Accessed on: July 19, 2020.

Plans (NAPs) and establishment of appropriate and efficient processes for planning and implementation of adaptation measures and actions. B&H has already prepared its NAP with the support of Green Climate Fund that provides financial resources (up to USD 3 million) to UNFCCC Parties for establishment of planning and implementation processes for adaptation measures and actions, including development of NAPs.

Considering the obligations under the UNFCCC, the process of harmonisation with the EU *Acquis* and the high vulnerability of the region, development of legislation could significantly contribute to better adaptation planning and its integration into all relevant sectors. Moreover, joint identification of vulnerability and adaptation possibilities, which is the main scope of this Study, and the implementation of adaptation actions and measures at the regional level, could ensure climate resilience and sustainable development not only of B&H, but also of all economies in the WB region.

According to the official documents,[67,68] the most important priority for B&H in climate change mitigation is to strengthen its institutional and professional capacities which would support development and implementation of climate policy, monitoring greenhouse gas emissions, and planning, implementation, monitoring, reporting and verification of mitigation actions (Table 5).

Unfortunately, the negative consequences of climate change are already visible in B&H, even though the country contributes little to the causes of climate change. The country per capita emissions are nearly half the EU average: 5.18 tons CO_2 equivalent per capita per annum in 2008, compared to the EU average of 9.93 tons. But if relative wealth is considered, then B&H's emissions are almost four times higher than those of the EU. Greenhouse gas emissions per unit of GDP were 1.59 kg CO_2 equivalent per EUR in 2008, while the EU average was 0.4 kg per EUR. According to a European Commission Report, *"Bosnia and Herzegovina is at an early stage of preparation/has some level of preparation in the area of environment and climate change. A countrywide harmonized approach in strategic planning needs to be ensured to address alignment with the EU environmental acquis at all levels of government in a consistent and comprehensive manner, including on air quality. Significant efforts are needed on implementation and enforcement. B&H should in particular: implement the countrywide environmental approximation strategy, and accordingly enhance the legal framework, strengthen administrative capacity and monitoring systems, and improve inter-*

[67] Ministry of Physical Planning, Construction and Ecology [website]. Legal and administrative framework. Accessed on 6 February 2021.
[68] Federal Ministry of Environment and Tourism [website]. Legislative acts. Accessed on 6 September 2020.

institutional coordination among all relevant authorities; formalize the procedures for the appointment and functions of the national focal points (NFP) for Bosnia and Herzegovina for the implementation of all environmental conventions to which Bosnia and Herzegovina is a signatory; start implementing the Paris Agreement by putting in place policies and measures to deliver on its nationally determined contribution (NDC), update and implement the climate change adaptation and low emissions development strategy, and develop an integrated national energy and climate plan (NECP) in line with the Energy Community recommendation." [69]

The lack of availability of adequate statistical information is an important gap of B&H in relation to EU climate policy. This is important since the process of EU accession requires full alignment of the existing legislation with the EU *Acquis*.

Table 5. Vulnerability and adaptation measures for B&H's key sectors *(Source: Data compiled by the report author)*

Key sector	**Vulnerability**	**Adaptation measures**
Agriculture	I. Increased change in the precipitation regime II. Increase of seasonal average temperature III. Decrease in arable land areas of good quality IV. Lack of an early warning system for drought V. Frequent drought VI. Lack of snow cover for protection of winter crops	I. Crop rotation II. Development of irrigation systems in drought affected regions III. Introduction of drought resistant species IV. Establishment of a functional early warning system V. Sustainable land management practices
Forestry	I. Frequent wildfires II. Physiologically weakened forests susceptible to pests and diseases III. Loss of biodiversity IV. Unsustainable practices that lead to soil erosion, torrents and floods downstream	I. Afforestation of bare land II. Introduction of drought resistant species and a climate smart forestry approach III. Improvement of existing afforestation techniques IV. Introduction of NbS upstream (retention objects) V. Increased protection of forests
Water management	I. Changes in seasonal river flows	I. Improved water management system adapted to seasonal variations and introduction of an early warning system

[69] European Commission (2021). *Bosnia and Herzegovina Report 2021*. Communication on EU Enlargement Policy. Strasbourg, France: European Commission.

	II. Decrease of quantity of water flows in rivers III. Lack of early warning systems for floods IV. Absence of Nature-based Solutions for flood prevention and mitigation	II. "Make space for rivers" approach particularly in urban areas III. Introduction of green infrastructure in urban zones IV. Introduction of NbS in forest management upstream to prevent floods, torrents and soil erosion to increase water storage capacity
Land/soil	I. Land degradation caused by drought II. Increased soil erosion due to frequent floods III. Soil destruction under wildfires and landslides	I. Implementation of NbS throughout the country to prevent and mitigate floods, torrents and erosion II. Introduction of sustainable land practice to mitigate drought III. Sustainable forest land management upstream
Education	I. Lack of existing knowledge among stakeholders to cope with climate change and its impacts	I. Introduction of curriculum related to climate changes at all education levels II. Introduction of climate change related topics into agriculture advisory systems III. Media support to promote this topic

**Other International Agreements and directives relevant for climate changes are listed in Annex I.*

7.1.2 Disaster risk reduction policy framework

Increased natural disaster losses over recent decades are due to more frequent extreme weather events, such as floods, drought and wildfires. This signals that a comprehensive understanding of DRR by all relevant stakeholders is an urgent need for B&H. The existing institutional framework for DRR is fragmented among the state, entity, cantonal and local levels of decision-making and it lacks both vertical and horizontal integration. Complex constitutional arrangements and weak communication among institutions also affect the disaster risk management system and mechanisms in the country. On the other hand, B&H is in the process of implementing international policy frameworks and directives in the field of disaster risk management, for example:

- **Sendai Framework for Disaster Risk Reduction** (2015–2030), building on the Hyogo Framework for Action 2005–2015, ratified by B&H, reflecting the country's commitment to reduce disaster risks and build the people's resilience. This voluntary and non-binding agreement outlines seven global targets to be achieved over the next 15 years, highlighting the importance of ecosystems and biodiversity and knowledge transfer to

build resilience and reduce disaster risk, with four priorities: understanding disaster risk; strengthen disaster risk governance to manage disaster risk; investing in disaster risk reduction for resilience, and enhancing disaster preparedness for effective response. The Ministry of Security of B&H and relevant authorities in 2019 pledged a long-term commitment and partnership in increasing disaster resilience across the country.

Particular attention is given to transposition of the EU Directives e.g., the Water Framework Directive, Urban Waste Water Treatment Directive, and Drinking Water Directives into the state and entity legislation. This has been achieved, though unfortunately implementation is still insufficient. So far, many improvements have been observed, but since B&H is a decentralised country with complex political and administrative relations, many of these activities are implemented only at the entity level.

- **Floods Directive 2007/60/EC** is very important and states that floods can cause human casualties, population evacuation, and environmental damage, endangering economic development and weakening economic activities of society. However, some human activities (such as expanding settlements, the production of economic goods in floodplains, and the reduction of space for natural water retention as a consequence of land use) and climate change, contribute to increasing the likelihood and adverse effects of floods. It is therefore necessary and desirable to apply measures to reduce the risks of adverse effects of floods, in particular on human health and life, the environment, cultural heritage, economic activities and infrastructure. Since floods, but also water scarcity and droughts are occurring more often, the EU Floods Directive 2007/60/EC requires Member States to prepare flood risk assessments for all its river basins and flood hazard maps. In Bosnia and Herzegovina, both FB&H and RS have only partly transposed the EU Flood Directive.
- **Flood risk management plans** According to Article 7, on the basis of the maps referred to in Article 6 of Directive 2007/06/EC, Member States shall establish Flood Risk Management Plans harmonised at the level of the river basin district for the management units referred to in Article 3(2)(b), areas identified under Article 5(1) and areas covered by Article 13(1)(b), in accordance with paragraphs 2 and 3 of Article 7. The Flood Risk Management Plans will address all aspects of flood risk management, with a focus on prevention, protection and preparedness, including flood forecasts and early warning systems and considering the characteristics of a particular river basin or sub-basin. Flood risk management plans can promote sustainable land use practices, improve water retention and control flooding of certain areas in the event of a flood.

B&H has developed Flood Risk Management Plans for rivers prone to flooding (e.g., Vrbas and Sava Rivers) with the support of international donors.

- **Water Framework Directive 2000/60/EC** This Directive was adopted in 2000 and is complemented by other, more specific EU laws. It manages and protects water at the state and entity level, but also goes beyond political borders to ensure good water quality in cooperation with neighbouring countries that share rivers. Furthermore, other goals include achieving a good ecological and chemical status of surface water bodies and a good status of groundwater. Public participation is also required to achieve public support. The Commission monitors implementation progress through drafting implementation reports and progress reviews. In Bosnia and Herzegovina, B&H, FB&H and RS have partially transposed the EU water framework directive into their legislation.

Floods, drought, wildfires and landslides are identified as the most important disasters that have been affecting B&H in the last decade,[70,71] thus water legislation is most important for disaster risk management. According to the Report of the European Commission in 2021,[72] B&H still lacks a consistent and harmonised countrywide strategy and investment plans on water management that would include implementing legislation and monitoring. In line with Directive 2007/2/EC of March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE), the plan for flood protection and river management in Bosnia and Herzegovina for 2014–2021 is currently in preparation. Flood hazards and risks are being mapped for the entire country. It was also acknowledged that FB&H and RS have both implemented water management strategies. B&H today is facing many challenges across sectors, including a lack of financial resources, and this has been particularly pronounced during the COVID-19 crisis. On the other hand, high investments are expected for DRR through EU funding, though the recommendation is to place the focus on other issues, including institutional capacity development. Other DRR relevant policies are listed in Annex II.

7.1.3 Environmental policy framework

The Strategy and Action Plan for the Protection of Biological Diversity of B&H (NBSAP B&H) 2015–2020, adopted by the Council of Ministers of B&H in May 2017, sets a national target to complete the inventory of: (i) flora, fauna and fungi in B&H and (ii) ecosystems and types of

[70] Kapović Solomun, M. Barger, M., Cerda, A., Keesstra, S., Marković, M. (2018). Assessing land condition as a first step to achieving Land Degradation Neutrality: A case study of the Republic of Srpska, *Environmental Science and Policy* 90:19-27.
[71] Kapović. Solomun, M., Ferreira, C.S.S., Barger, N., Tošić, R., Eremija, S. (2020). Understanding the role of policy framework on land degradation in stakeholder's perception from a post conflict perspective of Bosnia and Herzegovina. *Land Degradation and Development*, 32(12): 1-10. https://doi.org/10.1002/ldr.3744
[72] European Commission (2021). *Bosnia and Herzegovina Report 2021*. Communication on EU Enlargement Policy. Strasbourg, France: European Commission.

habitats in B&H by 2020. The Sixth National Report to the UNCBD stated that the current data on flora, fauna, fungi, ecosystems and habitat inventories were incomplete, and data quality varied significantly depending on the categories of organisms in question.[73] Additionally, it is important to highlight that the Council of Ministers of B&H adopted the List of Selected Environmental Indicators in B&H in September 2019 with 59 indicators in four thematic areas (biodiversity, land degradation, air quality, and climate change), relevant for monitoring the state of environment in B&H and reporting according to the three Rio Conventions. In addition, the NBSAP B&H (2015–2020) contains a list of 38 proposed indicators for the measurement of progress towards 21 National Targets defined in the Strategy.[74] Pursuant to the entity legislation on nature protection, the system of protection of natural areas foresees the establishment of PAs (in line with IUCN categories) and Natura 2000 sites. However, IBA and Ramsar sites are not integrated into the national PA system, as they are not recognised in the legislation on nature protection in either FB&H or RS. Considering protected areas, the current percentage of territory under protection in B&H is 2.28% (compared to 1.96% in 2016), with 3.24% and 1.30% in the FB&H and RS, respectively.

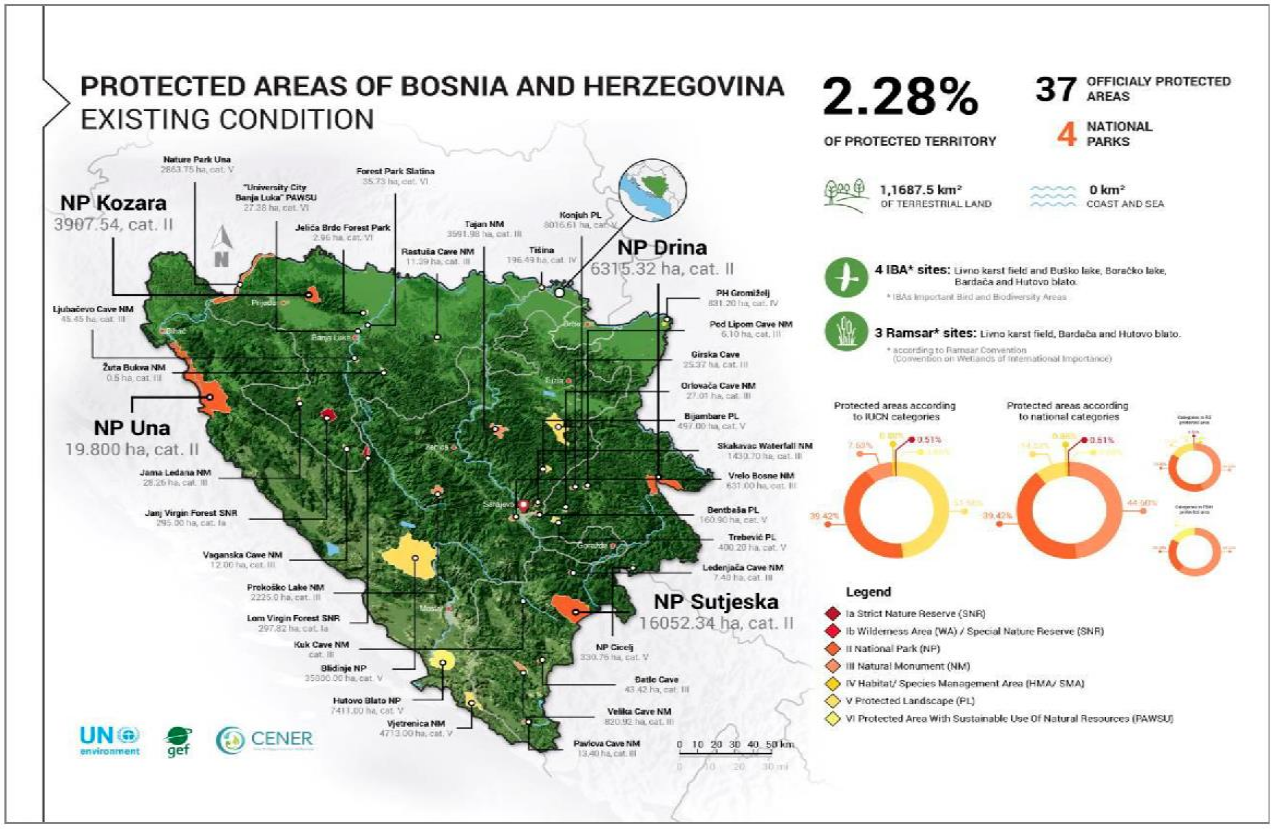


Figure 9. Map of protected areas in B&H *(Source: USAID, 2020)*[75]

[73] CBD, GEF and UNDP (2019). *Sixth National Report of B&H to the Convention on Biological Diversity*. Sarajevo, Bosnia and Herzegovina: FB&H Ministry of Environment and Tourism.

[75] USAID (2020). *Bosnia and Herzegovina Biodiversity Analysis and Addressing the Biodiversity Needs*. Sarajevo, Bosnia and Herzegovina: USAID/B&H.

In FB&H, there are 11 protected areas, of which only one is a national park (Una NP), four are natural monument (NMs) and six are protected landscapes (PLs). The majority of PAs are managed by dedicated management institutions. Only one new PA has been established since 2016, the Bentbasa Protected Landscape in 2017. In the Republic of Srpska, there are 26 protected areas of which three are national parks (Kozara, Sutjeska, and Drina), 14 are natural monuments, three are protected areas with sustainable use of natural resources, two are protected landscapes, and two are habitat/species management areas. The following ten new protected areas have been created since 2016: University City Monument of Park Architecture (2016), Slatina Forest Park (2016), Drina National Park (2017), Kuk Cave Natural Monument (2018), Gromizelj Protected Nature Reserve (2018), Cicelj Nature Park (2018), Jelića Brdo Forest Park (2018), Lijevčanski Knez Natural Monument (2018), Una Nature Park (2019) and Tišina Protected Nature Reserve (2019). There are no protected areas in the Brčko District.[76] Protection under Natura 2000 is proposed for 122 areas (about 19% of the territory of B&H) covering 200 species and 60 habitats, but these areas have not yet been officially proclaimed.[77] The most important threats for biodiversity, as defined in the official reports,[78,79] include: conversion of habitats, over-exploitation of resources, pollution, climate change, invasive species, and anthropogenic actions and economic development activities, in addition to poor waste management, excessive and illegal logging and deforestation, and energy generation.

7.2 State legislation framework

At present, there is no DRR plan, policy or strategy at the state level in Bosnia and Herzegovina, and this is also not mandated by the Constitution. The Council of Ministers of B&H is responsible for the implementation of policies and decisions in the areas referred to in the Article III.1, III.4 and III.5 of the Constitution of B&H, whose organisation, work and decision-making process has been regulated by the Law on the Council of Ministers of B&H. In the Law on Ministries and Other Administrative Bodies of B&H, Article 9 defines that the Ministry of Foreign Trade and Economic Relations of B&H is responsible within the competence of B&H to define policy, coordinate activities and harmonise plans of entity authorities and institutions at the international level in the areas of energy, environmental protection, development and use of natural resources, and tourism. Since B&H exists as a

[76] UNEP (2019). *Analysis of Financial Mechanisms for Protected Areas in B&H and the Region*. Sarajevo, Bosnia and Herzegovina: United Nations Environment Programme.
[77] FB&H Ministry of Environment and Tourism [website]: Ecological Network - Natura 2000. Available at: https://www.fmoit.gov.ba/bs/okolis/zastita-prirode/ekoloska-mreza-natura-2000. Accessed on 17 April 2020.
[78] UNEP (2014). *Fifth National Report of B&H to the Convention on Biological Diversity of B&H*. Sarajevo, Bosnia and Herzegovina: United Nations Environment Programme.
[79] USAID (2016). *Country Biodiversity Analysis: Bosnia and Herzegovina*. Sarajevo, Bosnia and Herzegovina: UNAID/B&H.

decentralised state, some state level legislation related to climate change and natural disasters has been adopted, while the majority rely on the entities in terms of development and implementation.

Framework Law on Protection and Rescue of People and Material Goods from Natural or Other Disasters in Bosnia and Herzegovina (Official Gazette of B&H 50/08)
This Law lays the foundation for disaster risk reduction (DRR) at the state level in B&H. This law demands the establishment of a development programme, which includes the development of mechanisms for DRR. Also it regulates the protection and rescue of people and material goods from natural or other disasters in B&H, as follows: fulfilment of international obligations and cooperation in the implementation of protection and rescue, i.e., civil protection; building competencies of institutions and bodies of B&H in the field of protection and rescue of people and material goods from natural or other disasters in B&H; coordination of activities of institutions and bodies of B&H, entity civil protection administrations and the competent body for civil protection of the BD of B&H; adoption and coordination of plans and programmes for protection and rescue from natural or other disasters; public information and public relations; financing etc. It is also stated that the system of protection and rescue of people and material goods from natural or other disasters in the entities and the BD of B&H is regulated by entity laws and the law of the BD of B&H.

Law on Ministries and Other Administrative Bodies of Bosnia and Herzegovina (Official Gazette of B&H 5/03, 42/03, 26/04, 42/04, 45/06, 88/07, 35/09, 59/09 and 103/09) This Law establishes the Ministries and their administrative organisation, as well as other institutions of B&H that perform administrative tasks within the competence of B&H, determines their scope of work, management, as well as other issues of importance for their organisation and operation, including jurisdictions over issues related to natural disasters. Other state laws relevant for environmental issues are listed in the Annex III.

7.3 Entity legislation

Considering jurisdictions, climate change and DRR are closely connected to forestry, agriculture and water management, jointly with environment and biodiversity legislation. There are no laws on climate change or DRR at any level of decision-making in B&H.

7.3.1 Climate change entity legislation

According to the Constitution of Bosnia and Herzegovina, the legislative competence for the environment belongs to the entities in B&H and BD. The current legislative framework of both

entities and BD does not provide a basis to address climate change and its impact on different sectors, thus creating an additional problem in the process of prevention, adaptation and mitigation of changed climate conditions. Analysing the entire legislative framework in B&H, it can be observed that all laws or bylaws address this problem within the framework of the term “climate”, which is certainly not enough. The only legislation addressing the issue of climate change is the Rulebook on the drafting, content and formation of spatial planning documents (2013) in the Republic of Srpska, which clearly defines the methodological approach to drafting spatial planning documents, emphasising that climate change is one of the conditions that must be considered when defining the content of space and spatial documents.

The existing spatial planning systems in B&H do not consider climate change as a dynamic impact factor, so the existing legislative framework does not recognise this issue as an important influencing factor.

Additionally, NbS are not recognised as a possible measure to address climate change. Therefore, it is of great importance to initiate procedures to amend the existing legal framework in both entities and BD in terms of integrating the concepts of “climate change” and “adaptation to climate change using NbS” in the most vulnerable sectors.

In addition, the integration of climate change into the strategic framework of the most vulnerable sectors at the entity and cantonal levels is first necessary for the integration of climate change into regulatory and spatial plans at the local level. It is necessary to draft and adopt a Law on Climate Change in both entities, noting that Republic of Srpska, in cooperation with the UNDP of Bosnia and Herzegovina, has already embarked on this process.

7.3.2 Disaster risk reduction entity legislation

Existing policy and strategic framework at the entity level mostly does not recognise DRR or natural hazards or has examples of these hazards and climate change relations. Usually, DRR is mentioned within the context of support provided to help prevent or mitigate the effects of climate change. Natural hazards, such as floods, drought, landslides and wildfires are mentioned in strategic documents within the context of climate change, which are expected to increase in frequency and intensity during the century. For example, in the Strategy of Agriculture for Federation of Bosnia and Herzegovina for 2015–2020, DRR is mentioned within the chapter “Challenges of Agriculture of Federation B&H” as climate change is reflected in the identified temperature increase and frequent inclement weather (drought, flood, hailstones, storms, etc.). These conditions are caused by changes in the vegetation period

(start, duration), precipitation schedules (availability of water), increased risk for producers in terms of frost, hailstones, drought, and an increase in the incidence of diseases and pests. Finally, DRR is not a self-standing outcome, but it has been linked to natural resource management, in particular for reducing the impact of drought, such as the use of irrigation to mitigate the impact of this natural hazard.

At the entity level, the legislative framework relevant for DRR relies on two main laws:

- Law on Protection and Rescue in Crisis Situations in Republic of Srpska (Official Gazette of RS 121/12),
- Law on Protection and Rescue of People and Goods from Natural Disasters in FB&H (Official Gazette of FB&H 39/03, 22/06 and 43/10).

These two laws define the different roles and responsibilities, including the tasks to conduct disaster risk assessments and to establish protection and rescue plans. The rescue plan of RS was drafted in 2003, while the plan for FB&H was drafted in 2008. BD does not have such a plan. Considering floods and drought as the main natural disasters in B&H, the responsibilities related to the hydrological and meteorological institutes are outlined in two laws in FB&H:

- Law on Federal Ministries and other Authorities of the Federal Administration (Official Gazette FB&H 19/03),
- Law on Hydrological and Meteorological Affairs of Interest to the Republic of Bosnia and Herzegovina (Official Gazette RB&H 10/76), as a law originating from the former Republic of Bosnia and Herzegovina and the former Socialist Federal Republic of Yugoslavia.

Relevant legislation for the Republic Hydrological and Meteorological Service of the Republic of Srpska, with regard to floods and droughts, are:

- Law of Administration of the Republic (Official Gazette of RS 11/08),
- Law on Meteorological and Hydrological activity in the Republic of Srpska (Official Gazette of RS 20/00).

On the other hand, important laws that address floods, drought and landslides indirectly are the entity water laws that are focused on flood prevention and mitigation to protect people and households from flooding. In FBiH there are:

- Law on Water (Official Gazette of the Federation B&H 70/06), and
- Regulation on the types and the contents of the plans for the protection from harmful effects of water (Official Gazette of the Federation B&H 26/09).

In the Republic of Srpska there are:

- Law on Water (Official Gazette of RS 01-557/06), and
- Flood Risk Directive (Official Gazette of RS 50/06).

The Law on Water of the RS prescribes the obligation of locals to facilitate planning of the flood protection measures as well as support the construction and management of protection facilities, such as dams and dikes. However, these sectoral laws do not include disaster risk reduction or references for prevention, mitigation and preparedness, or the NbS concept. On the other hand, entities preparing several hazard plans in accordance with the requirements prescribed by the EU Flood Directive to which B&H aims to adhere to, even though it is no so obliged as it is not yet an EU Member State. Some flood plans have been developed in collaboration with other countries due to the transboundary river basin to which these countries belong. One example is the Sava River Commission, which prepared the Sava River Action Plan in 2009 in line with the EU Flood Directive, and which focuses on prevention, protection and preparedness.[80] In addition, the Republic of Srpska was also involved in the preparation of the action plan for sustainable flood risk management in the Danube Basin for the 2010–2021 period, with specific reference to the sub-basin of the Sava River and flood risk management plan for the Vrbas River developed by both entities with the support of UNDP.

However, the RS entity, in close cooperation with the UNCCD secretariat under leadership of Ministry of Agriculture, Forestry and Water Management, developed the Drought Management Plan of the Republic of Srpska[81] as the baseline for a strategic approach to preparedness, adaptation and mitigation of drought, where drought, floods and wildfires are identified as the main natural disasters. In FB&H, this process is still ongoing.

7.3.3 Environment entity legislation

With the assistance of the European Commission, both B&H entities drafted and adopted (in 2002 in RS and in 2003 in FBiH) the following five key environmental laws:

1. Law on Environmental Protection,
2. Law on Nature Protection,
3. Law on Air Protection,
4. Law on Water Protection, and

[80] FAO (2020). *Comprehensive analysis of Disaster Risk Reduction and Management System for agriculture in Bosnia and Herzegovina*. Sarajevo, Bosnia and Herzegovina: Food and Agriculture Organization of the United Nations.
[81] Kapović Solomun, M. (2020). Drought Management Plan of the Republic of Srpska. Banja Luka, Bosnia and Herzegovina: Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska.

5. Law on Waste Management.

Currently in FB&H, activities are ongoing to prepare a new Law on Environmental Protection, and it is expected that NbS will be considered within this document. In both entities, these laws are mostly being implemented through the by-laws (regulations and decrees), which are more or less under preparation and adoption. Entity environmental legislation is, to a limited extent, aligned with the EU *Acquis*, which brings into focus the necessity for alignment with the EU environmental *Acquis* at all levels of government in a harmonised and coordinated manner and to strengthen administrative capacities for efficient implementation. The countrywide environmental approximation strategy adopted in 2017 and supplemented by more specific environmental approximation programs for the entities and the BD needs to be updated and fully implemented. The sub-sector strategies remain non-harmonised between the entities for the respective areas covered, leaving the environment sector unevenly covered across the country.

The countrywide environmental protection strategy for B&H is now under development, while still the country remains without a standardised system or methods for gathering, transferring and reporting environmental data. Public access to information and its participation in the decision-making process is limited. Also, there has been no progress in establishing a system in Bosnia and Herzegovina for collecting biodiversity information and systematic monitoring.[82] Environmental institutions also need to increase their capacities to be capable of making environmental information available and disseminating it to the public through an established system (in terms of adequate staffing, databases and reporting facilities and publicising). Coordination between relevant competent environmental authorities and other authorities in the country that keep environmental information should be established.[83]

At the moment, only FB&H has adopted an Environmental Protection Strategy for the period 2008–2018. Under the Federal Strategy, NbS are not addressed as a specific possibility for climate change and DRR mitigation. Republic of Srpska has adopted the Nature Protection Strategy and Air Protection Strategy, again with no mention of NbS, confirming the novelty of this concept in the B&H legislative framework. Brčko District adopted the Development Strategy of Brčko District of B&H for the period 2008–2017. Within this Strategy, the protection and conservation of the environment has been addressed, stipulating that the environmental

[82] European Commission (2020). *Bosnia and Herzegovina 2020 Report, Communication on EU Enlargement Policy*. Strasbourg, France: European Commission.
[83] Ministry of Foreign Trade and Economic Relations of B&H (2017). *Environmental Approximation Strategy of Bosnia and Herzegovina*. Sarajevo, Bosnia and Herzegovina: Ministry of Foreign Trade and Economic Relations of B&H.

aspects should be considered in the exploitation of resources and project development. However, the Strategy provides no specific reviews of the consequences of climate change or the possible consequences of these phenomena.

The problem remains in the fact that climate change and natural hazards are not particularly highlighted as a risk to the environment, and there is no requirement for special consideration of their possible consequences, i.e., nature-based measures of adaptation to the existing changed situation.

Environmental planning, management and monitoring can only be achieved through cooperation and joint action of all entities with the aim of environmental protection, so that everyone protects the interests of environmental protection within the scope of their competence and responsibility. All laws in B&H emphasise the need for cooperation between entities and BD, with the aim of achieving an optimal approach to resolving environmental issues.

7.4 Gender issues within CC and DRR policies

B&H is a middle income, developing, post-conflict country where women have the lowest economic activity rates, and live a precarious reality.[84] On the other hand, B&H is the first state in South East Europe to develop a countrywide Action Plan which translated the principles of Resolution 1325 into national goals. The Law on Gender Equality in B&H was adopted in 2003 and amended in 2009. In 2010, an official consolidated version of the Law was published, and is currently in force. The main aim of the Law is to regulate, promote and protect substantive gender equality and to guarantee equal opportunities for all citizens, in both public and private life. The Law has a dual function – it prohibits discrimination on the grounds of gender (and sexual orientation), and it establishes legal standards in the area of gender equality. It ensures and promotes equal gender representation in the process of managing, decision-making and representation for all state bodies at all levels of organisations, including political parties, legal entities with public authority, legal entities under state ownership or control, including those related to DRR. The Law defines a minimum 40% threshold for equal participation based on the standard established by the Council of Europe Recommendation Rec (2003)323. Article 20, paragraph 4 of the Law stipulates that the responsible subjects are obliged to adopt temporary special measures as defined in Article 6 that aim to achieve equal gender representation. This approach is deeply rooted in international human rights standards, such

[84] UN Women Europe and Central Asia [website]. Available at: https://eca.unwomen.org/en/where-we-are/bosnia-and-herzegovina. Accessed on June 8, 2020.

as the UN CEDAW, Beijing Declaration and Platform for Action and the Council of Europe.

In November 2018, the Council of Ministers of Bosnia and Herzegovina adopted the Third Gender Action Plan of Bosnia and Herzegovina (GAP B&H) for the period 2018–2022, based on Article 26(d) of the Law on Gender Equality in Bosnia and Herzegovina. The Agency for Gender Equality of Bosnia and Herzegovina and the Ministry of Human Rights and Refugees of Bosnia and Herzegovina, monitors the implementation of GAP B&H. Specifically, GAP B&H contains three strategic goals: 1) Development, implementation and monitoring of programmes of measures for the promotion of gender equality in government institutions, by priority areas; 2) Building and strengthening systems, mechanisms and instruments for achieving gender equality, and 3) Establishing and strengthening cooperation and partnerships. Within each of the stated goals, priority areas of action are defined, i.e., programmes and measures necessary for achieving that goal.

The FIGAP II program (2018–2021) has been established as the Financial Instrument for the Implementation of the Gender Action Plan of Bosnia and Herzegovina. FIGAP II was developed to provide funds for the implementation of activities. The goal of the FIGAP II programme is to provide general financial support to the institutions of B&H, and at the entity level of FB&H and RS, and to non-governmental organisations, in the implementation of activities aimed at improving socioeconomic conditions for men and women, girls and boys in Bosnia and Herzegovina.

Institutional structure related to gender consists of the Agency for Gender Equality of B&H under the Ministry of Human Rights and Refugees of B&H, Gender Centre of the Government of the Republic of Srpska, Gender Centre of Federation of B&H. These three institutions have had an important impact on setting policies and priorities in different areas of equal participation of women and men, including issues related to climate change risk and disaster risk management. This was expected to give them mandate as bodies in charge of coordination in the area of gender equality and they are mandated by the Law on Gender Equality. The participation of women in politics is one of the priorities of the Agency and the entity Gender Centres, and is clearly stated in the current Gender Action Plan 2018–2022 (Strategic priority I.2)[85] and the Action Plan to Implement UNSCR 1325 (Strategic priority 1).[86] Moreover, the Agency and the Gender Centres are active in this area with a stronger focus on

[85] Ministry for Human Rights and Refugees, Gender Equality Agency of Bosnia and Herzegovina (2018). Gender Action Plan of B&H 2018-2022. Sarajevo, Bosnia and Herzegovina: Ministry for Human Rights and Refugees.
[86] Council of Ministers of B&H. Action Plan to Implement UNSCR 1325 "Women, Peace and Security" in B&H for the period 2018-2022. Sarajevo, Bosnia and Herzegovina. Available at https://www.inclusivesecurity.org/wp-content/uploads/2014/12/BiH-NAP-ENG.pdf. Accessed on 1 October 2020.

mainstreaming gender standards in the work of the respective governments. To date, they have advocated inclusion of the principle of equal representation and of the 40% quota in a number of laws and policies at the entity, cantonal and local levels.

However, while gender legislation exists, a series of alternative indicators reveal persisting gaps where additional investment is needed to improve gender equality outputs. While little significant divergence can be noted in the areas of gender equality legislation and education, more prominent gaps can be seen regarding the labour force and political participation. Although 56.7% of men are either employed or actively searching for work, only 33.2% of women participate in the labour force. State and entity plans and budgets are where governments begin to translate commitments to women into practical steps to achieve gender equality. Too often, plans and budgets are inadequately funded and fail to monitor public services to ensure that they respond to women's needs and priorities.

There is still a strong influence of traditional gender roles in Bosnia and Herzegovina, including women's limited access to resources and rights, limited mobility, and lack of a voice in community and household decision-making, which can make women more vulnerable than men to the impacts of climate change. In their traditional roles, women have a major influence in the stewardship and supply of natural resources in households and communities, and women's livelihoods are often most affected through reductions in livelihood assets (energy, water, agricultural products, production changes and marketability). In certain areas, such as coal mining regions which traditionally employ men, restructuring due to climate-related objectives can also have a negative gender-specific impact on men.

Women in general, especially those living in rural areas are affected by climate change related risk and frequent disasters (floods and drought), particularly those dependent on agriculture. Since rural women suffer from a lack of appropriate social services to enable their participation in the labour market, they are more likely to spend time carrying out unpaid activities within the household. The poor and disempowered people are generally more vulnerable to climate change due to limited access to resources needed for adaptation to disruptions in the immediate environment. Women are at a higher risk of poverty and have less political and socio-economic power than men. Although both men and women suffer the negative consequences of climate change, compounded social inequalities put women at a further disadvantage. Women in developing countries such as B&H are particularly vulnerable to climate change and natural disasters, since they are often poor and are usually the primary

users and managers of natural resources.[87]

The Low Carbon Development Strategy of B&H (Strategy) incorporates a gender dimension stating that climate change mitigation and adaptation measures are gender responsive and will incorporate specific measures to ensure that the most vulnerable groups of the population receive adequate support. The strategy recognises the fundamental goal of achieving equal representation of both sexes in the processes of planning, decision-making and implementation of programmes related to sustainable environment and strengthening capacities of government institutions dealing with the environment, so that a gender perspective is systematically introduced into the creation of policy on integrated protection of the environment. Risks associated with climate change threaten to reinforce gender inequalities and have the potential to erode the progress made towards gender equity. In relation to the general lack of data related to climate change, there is also a lack of gender-specific data and indicators for climate change and climate change adaptation, and therefore a lack of gender-specific adaptation policies and strategies.[88]

In general terms, women and men experience climate change differently, and gender inequalities (that can encompass economic disparities, access to productive resources, different levels of education, and limited participation in decision-making) affect their abilities to successfully adapt. Therefore, women can significantly contribute to finding long-term solutions to climate change risk and natural disasters, but their capacities are often unrecognised. This is the reality of B&H where women are underrepresented in formal decision-making at the local, entity and state levels, despite existing legislative framework on gender equality. Equal participation during community dialogue, and in the monitoring and evaluation of climate change adaptation and risk management implementation (with disaggregated indicators where appropriate) is of great importance. Particular priority should be given to appropriate gender involvement in capacity building activities for both adaptation and mitigation, and in activities targeting households.

7.5 Other CC and DRR relevant sectors

7.5.1 Forestry

Bosnia and Herzegovina has the highest share of forests and the largest variety of forest species of all the countries of the Western Balkans (Figure 9). Due to the natural and diverse

[87] Babović, M. and Petrović, J. (2019). *Gender sensitive data and indicators for project: Establishing Transparency Framework for the Republic of Serbia*. Belgrade, Serbia: United Nations Development Programme.
[88] UNDP (2013). *Climate Change Adaptation and Low-Emission Development Strategy for Bosnia and Herzegovina, 2013.* Sarajevo, Bosnia and Herzegovina: United Nations Development Programme.

structure of these forests, and the extensive natural regeneration, they represent important natural resources for the further socioeconomic development. Pursuant to Article III of the Constitution of B&H on Responsibilities of and Relations Between the Institutions of Bosnia and Herzegovina and the Entities, foreign trade activities and international obligations in the field of forestry is the responsibility of the institutions of Bosnia and Herzegovina, namely the Ministry of Foreign Trade and Economic Relations of B&H. The competences for the management of forests and forest land, according to the B&H Constitution, lie with the entities (FB&H and RS) and BD. Institutions in the two entities and BD are responsible for forest management, development and implementation of forestry policies and regulations. In FB&H, these competencies are even more decentralised to the cantonal level. The Constitution of the Federation of Bosnia and Herzegovina in Part III states (Division of Responsibilities between the Federation Government and Cantons) that the Federation (in addition to other responsibilities) has exclusive responsibility for economic policy and land use policy at the federal level, but both levels (Federation and Cantonal Governments) are responsible for the policy of environment protection and the use of natural resources. Where necessary, these responsibilities may be exercised jointly or separately, or by the cantons as coordinated by the Federation Government. At all administrative-political levels, forestry is the responsibility of the Ministries for Agriculture, Water Management and Forestry.

B&H does not have a state level forest policy or legislation framework, due to the decentralised administration of the country. The draft FB&H Law on Forests was submitted to parliamentary procedure in 2016, but the law was not passed at the time of writing due to political deadlock in the entity. Currently, certain cantonal assemblies have adopted laws in cantons where forestry activities are carried out. The Republic of Srpska enacted its Law on Forests in 2008,[89] while BD adopted its Law on Forests in 2010.[90] In BD, which is mainly a lowland and agriculture area, forestry plays a subordinate role due to the small forested area and the small number of harvesting operations. Forests and forest land in RS encompass an area of 1,101,268 ha (44%), of which 801,900 ha (73%) are public owned, and 298,368 ha (27%) are private forests.[91] In FB&H, the total area of forests and forest land is 1,514,960 ha (58%), of which 1,242,267 ha (82%) are public owned, and 272,693 ha (18%) are private forests.[92]

[89] Anon (2008). Law on Forests (Official Gazette of RS 75/08). Banja Luka, Bosnia and Herzegovina: Parliament of the Republic of Srpska.
[90] Anon (2010). Law on Forests (Official Gazette of BD 02/10). Brčko, Bosnia and Herzegovina: Parliament od Brcko District.
[91] Republic of Srpska Institute of Statistics [website] Statistical Yearbook of the Republic of Srpska for 2020 (second, corrected release). Accessed on: 10 November 2020.
[92] Institute for Statistics of FB&H [website] Statistical Yearbooks. Accessed on: 10 November 2020.

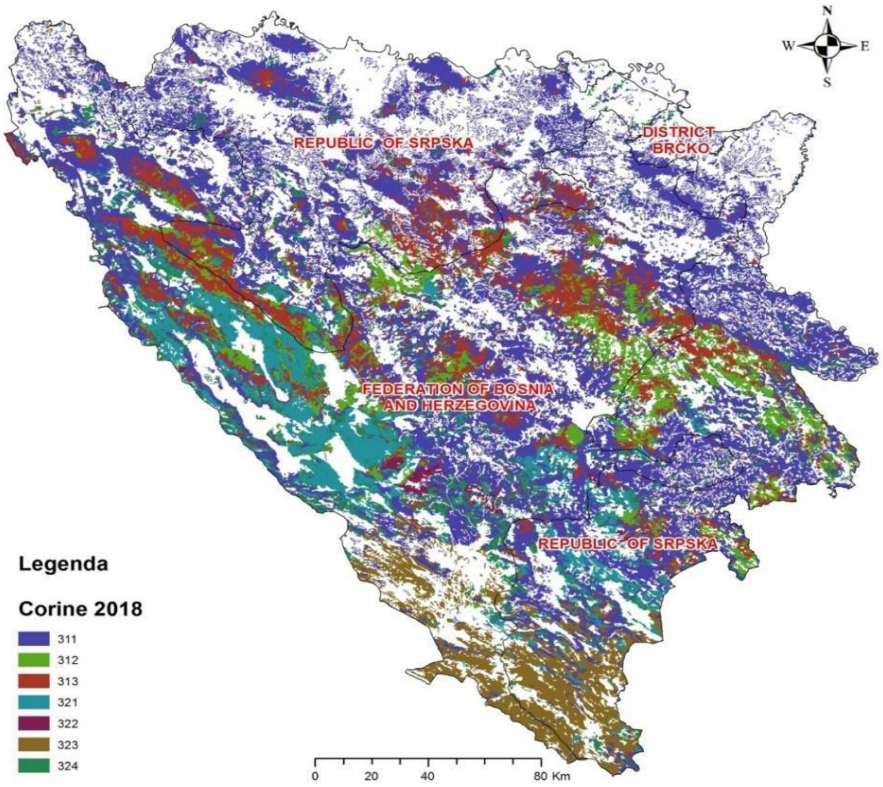


Figure 9. Vegetation in Bosnia and Herzegovina (Corine Land Cover. Source: prepared by Kapović Solomun, 2018).

Meaning of the codes: 3.1.1 Broad-leaved forest 3.1.2 Coniferous forest 3.1.3 Mixed forest 3.2.1 Natural grassland 3.2.2 Moors and heathland 3.2.3 Sclerophyllous vegetation 3.2.4 Transitional woodland/shrub

Forests certified with the Forest Stewardship Certificate (FSC) occupy 1.79 million hectares (2019),[93] in FB&H: 640,822 ha of certified forests (Canton 10: 284,277 ha, Una-Sana Canton: 179,410 ha, Tuzla Canton: 71,512 ha, Sarajevo Canton: 68,750 ha, Central Bosnia Canton: 36,873 ha). Other cantons are in preparation for certification. The Republic of Srpska has total area of 1,011,218 ha of certified state forests, and the certificate has been renewed until 2023.[94] According to the 2015 State of Europe's Forests' Report,[95] Bosnia and Herzegovina has a forest cover of 2.115 million hectares, with a growing stock of 392.3 million square metres. The forest vegetation of Bosnia and Herzegovina is distinguished by the heterogeneity of the plant association and wealth of the floristic composition as a result of the historical development of vegetation in the past, specific ecological conditions and anthropogenic impacts. The forests are characterised by a wide variety of species since the country's geographically position is under diverse climatic influences (Mediterranean, sub-Mediterranean and middle continental climate zones) and is home to over one hundred tree

[93] Forest Stewardship Council [website]. FSC Facts & Figures. Accessed on 10 December 2019.
[94] UNEP and WCMS (2020). *Bosnia and Herzegovina. Country Overview to AID Implementation of the EUTR*. Sarajevo, Bosnia and Herzegovina: UNEP-WCMS.
[95] Forest Europe (2015). State of Europe's Forests 2015. Madrid, Spain: Ministerial Conference on the Protection of Forests in Europe.

species. The main species found are fir, spruce, Scots and European pine, beech, various species of oak, and less significant numbers of noble broadleaves, including maples, elms, ash, together with fruit trees (cherry, apple, pear). Forests in the mountainous parts of Bosnia and Herzegovina are characterised by relatively well-conserved forest ecosystems and their wilderness, which is a comparative advantage of the biodiversity of Bosnia and Herzegovina. Forest species forming old-growth forests are also represented and they have been identified and protected as category I protection area according to IUCN categories, including the largest and most diverse forests reserve in Perućica. Additionally, both entities have implemented Land Degradation Neutrality (LDN) target setting process that prescribes the most important measures for the forestry sector that will help to achieve LDN by 2030. For the Republic of Srpska, one of the targets was to increase land productivity on 7% of the territory, with specific measures related to:

- increasing the productivity of forests and forest lands of the Republic of Srpska to 5.50% of the total territory by 2030 through measures for improvement of forests and forest land;
- increasing productivity of agricultural land by 1.50% of the Republic of Srpska of the total territory by 2030 through measures to combat drought, floods and measures for abandoned land;
- ensuring existing soil erosion remains at zero until 2030;
- increasing the percentage of protected areas in the Republic of Srpska by 2030;
- reducing mined areas by 25% compared to the total mined area in the Republic of Srpska;
- rehabilitating fire-affected sites.

For the Federation of B&H, the main targets that address forestry sector are related to:

- afforestation of bare and damaged land;
- fire protection measures in forest areas;
- water supply for agriculture and population supporting the function of sustainable development in hilly-mountainous areas;
- landmine clearance activities in forests and forest land.

Climate change could affect the forests of Bosnia and Herzegovina in a profound manner, transforming forest ecosystems over time, and altering forest distribution and composition. Some forest reserves are more resilient to climate change, although there are still potential impacts. Many tree species, particularly broadleaf species, suffer from drought-related stress, and this could have a significant impact on many forest species. Introduction of species from

drier and warmer climate regions is an option under consideration in order to adapt forest ecosystems to the adverse effects of climate change. A particular impact that may occur with climate change is 'multiple stresses', where changes in soil humidity, rainfall, temperature and pathogens all contribute to a hostile environment and high levels of tree mortality. Other factors likely to impact the forest ecosystems include: changes in soil structure, severe temperatures and climatic conditions causing frost and heat stress, changes in precipitation amount and distribution (snow versus rain, drought versus flood). Another significant threat to forests is an increase in forest fires: higher temperatures and changes in precipitation levels increases the risk of fires in some areas of the country.

In summary, climate change is likely to affect the most vulnerable forest ecosystems due to multiple stresses on trees and forest environments, including drought, pest and disease attack, increased fire risks and changes in soil. Considering the environmental and economic importance of forests in Bosnia and Herzegovina, these impacts could have serious consequences for the country. Adaptation approaches where Nature-based Solutions play an important role will require improved information for forest management to support changes in the species planted, and management interventions to prevent fire and the spread of disease.[96] High-level genetic diversity of some species, and thus their potential to tolerate climate change effects, make certain species more suitable in terms of their adaptive capacity, and they can be considered for NbS measures. The negative consequences of extreme climate change in forests and forest ecosystems are more difficult to identify. Their detection requires long-term research and monitoring activities. In B&H, there are no permanent measuring stations for monitoring and tracking changes and reactions of the most important forest ecosystems to climate change. In terms of climate change and the consequences for forestry in B&H, it is possible to implement a wide range of practices, such as improvements to the silviculture system, promotion of genetically superior planting material, enlargement of the protected area, substitution of fossil fuels with bio-energy, more efficient protection of forests against fire, diseases and pests, more efficient processing and use of forest products and monitoring of area and growing status of forests, particularly under afforestation practices of bare lands. The most important factor in the field of forestry in terms of the ability to mitigate the effects of climate change is certainly increasing forested areas. Reforestation practices are important to decrease erosion processes and regulate the water regime thus mitigating floods, drought and landslides, and increasing the storage of CO_2. Promoting carbon sequestration through forestry practices should be increased, especially in areas where there

[96] UNDP (2013). *Climate Change Adaptation and Low-Emission Development Strategy for Bosnia and Herzegovina.* Sarajevo, Bosnia and Herzegovina: United Nations Development Programme.

is an extremely low level of carbon in the soil, and where there is the potential for afforestation.

7.5.2 Agriculture

In B&H, agriculture is the sector most vulnerable to climate change and natural disasters, due to its exposure and sensitivity. Indeed, 46% of the total area of B&H is agricultural land. Agriculture is also under the jurisdiction of the entities and BD. From the economic perspective, agriculture is one of the most important sectors as it generates incomes and contributes to food security of a large part of the population. The sector contributes approximately 6% to the country's GDP.[97] On the other hand, more than half (51.8%) of the total population[98] live in rural areas and depend on agriculture for their livelihoods. Land quality is a very important prerequisite for agricultural production, and this is strongly dependent on natural disasters, particularly floods, droughts and wildfires. One of the most important reasons for insufficient production of basic agricultural products in B&H is the insufficient and inadequate use of agricultural land, in addition to the influence of other land degradation drivers. According to statistical sources, the B&H entities have 2.2 million ha of agricultural land, of which 1.6 million ha is arable land and 600,000 ha are pastures. RS has more agricultural land and plough land (1,008,000 ha), in particular, if observed per capita. At the same time, FB&H has more meadows and pastures.[99,100] The availability of the labour force in agriculture is also limited, due to low population growth, migration from rural to urban areas and abroad, but despite this, unemployment is a substantial issue in B&H, with an unemployment rate of 18.44% in 2020.[101] In the agriculture sector, due to the migration from rural to urban areas, the population is ageing, with more and more older people remaining to be engaged in the sector.

Less than 20% of the agricultural land suitable for intensive agriculture is primarily located in the Posavina and Semberija regions. Only 0.65% of B&H is irrigated. There is approximately 0.56 ha agricultural land per capita, of which 0.36 ha is arable land and vegetable gardens. Despite the abundance of water, water supply is a limiting factor for production in many areas. About 10,000 hectares (0.1% of arable land) was irrigated before the war, though this has since drastically decreased. The Third National Communication stated that increasing

[97] World Bank [website]. GDP growth – Bosnia and Herzegovina. Available at: https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=BA. Accessed on: 10 November 2020.
[98] FAOSTAT [website]. Country fact sheets Bosnia and Herzegovina. Available at: https://www.fao.org/aquastat/statistics/query/index.html;jsessionid=D70DEA6ECE044F7D7C37D6B80B344B79 Accessed on 10 July 2020.
[99] Republic of Srpska Institute of Statistics [website] Statistical Yearbook of the Republic of Srpska for 2020 (second, corrected release). Accessed on: 10 November 2020.
[100] Institute for Statistics of FB&H [website] Statistical Yearbooks. Accessed on: 10 November 2020.
[101] ILOSTAT [website]. Country Profiles - Bosnia and Herzegovina. Available at: https://ilostat.ilo.org/data/country-profiles/. Accessed on: 9 August 2020.

droughts, floods and wildfires in the past two decades have caused significant damage to the agricultural sector. Pathogens of plant diseases, pests and weeds represent a very important segment to which the future climate change has an impact. However, a more arid climate will require changes in agricultural technologies, such as the intensification of irrigation. As stated in the Second National Communication, mild winters can contribute to the spread of harmful insects, which requires prevention measures and increased use of pesticides, which in turn can have a negative impact on human health and the environment.

B&H is generally very vulnerable to various natural hazards, such as floods, droughts, earthquakes, landslides and wildfires. Each has significant adverse impacts on the agriculture sector, but floods and drought are of particular importance. Besides the influence on land productivity, floods move unexploded landmine devices remaining from the war to unknown locations, which exposes people to serious risk. According to Bosnia and Herzegovina Mine Action Centre (BH MAC) data for 2020, the total landmine suspected area in B&H covers 965 km^2 (1.97% of the country area) with the largest area falling within the category of agricultural land.

Drought has been identified as a very important driver of land degradation in the country.[102,103] Despite this, irrigation infrastructure is very limited, for example, only 0.65% of arable land is irrigated (before the war this was 1.0%, but this has decreased remarkably due to war damage, landmines and lack of maintenance). The main period of drought occurs from June to September, especially in the Herzegovina and Semberija regions. Dry episodes have increased in recent decades, due to climate change particularly in the last decade, which mostly affects agriculture production in Posavina and Semberija, but also in Herzegovina where frequent wildfires are underpinned by drought. Severe droughts caused enormous damage to agriculture in 2000, 2003, 2007, 2011 and 2017. For example, drought in 2012 in RS caused significant adverse effects on all crops, but particularly on maize. Corn crops, which were sown on 140,000 ha, were completely damaged on the shallow and skeletal soils of Lijevče Polje, and yield was reduced by 50–60% throughout RS, amounting about 2.5 t/ha. Damage caused by drought on maize alone in 2012 compared to production from earlier years (2004, 2005 and 2006) was 350,000–400,000 tonnes of grain. During that year, crop and grain yields were reduced by 40 to 50%, meadow and pasture yields were also reduced by about 60%. More hot days, reduced rainfall and higher aridity will increase the probability of

[102] UNEP (2017). Action Programme to Combat Land Degradation and Mitigate Drought Effects. Sarajevo, Bosnia and Herzegovina: United Nations Environment Programme.
[103] Kapović Solomun (2020). Drought Management Plan of the Republic of Srpska. Banja Luka, Bosnia and Herzegovina. Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska.

drought.[104] Considering the current infrastructural restraints, these problems cannot be resolved with a reliable irrigation system alone. The risks facing the agricultural sector – due primarily to the combination of increasing drought probability and lack of irrigation options – are not uniform. Additional risks include an increased fire risk for cereal crops due to reduced moisture content. Livestock is also affected by higher peak and average temperatures, potentially leading to overheating, and the spread of disease vectors. This has serious implications for the poor and vulnerable population, as it negatively impacts households in rural areas.

On the other hand, the extensive impact of the recent floods, such as the 2014 flood, have raised awareness on the importance of DRR. B&H has adopted international DRR frameworks, including the Hyogo Framework for Action 2005–2015 and successor the Sendai Framework for Disaster Risk Reduction 2015–2030. This shows the country's commitment to reducing disaster risks and enhancing the resilience of communities to natural hazards. Unfortunately, NbS are not recognised as an opportunity for disaster risk prevention in agriculture. At present, there are some efforts towards shifting from a reactive emergency response towards a proactive disaster risk reduction approach. To conclude, the predicted rises in temperature, coupled with changes in rainfall and evaporation, are likely to significantly negatively impact the farming systems in Bosnia and Herzegovina, particularly in the Mediterranean areas and in the Posavina and Semberija regions. In addition, it is necessary to strengthen systematic research on climate change and agriculture, as well as to ensure capacity building in terms of early warning for extreme events, such as: drought, floods and heatwaves. Moreover, it is necessary to raise public awareness of the harmful consequences of climate change and natural disasters introducing possibilities of adequate adaptation and mitigation using NBS where possible. Continuous training and capacity building is necessary for farmers. Professional advisory services should play a key role in promoting sustainable agricultural practices and NBS and sharing knowledge and skills concerning adaptation measures. To this end, the capacities of the professional advisory services should be strengthened. These changes will require a strong institutional, policy and legislative framework for risk management and adaptation to climate change introducing NBSs and financial mechanisms for their implementation.

7.5.3 Hydrology and water resources

B&H is among the countries that is not limited by water for development; on the contrary, water resources are among the most abundant natural resources in B&H. Water resources include

[104] Ibid.

two major river basins: the Black Sea Basin, with the Sava River watershed and the Una, Vrbas, Bosna and Drina catchment areas in the north, and the Adriatic Sea basin, with the Trebišnjica and Neretva River basins in the south (Figure 10). These resources provide an estimated average flow of 1,555 m^3/s. However, the water sector suffers from poor and degraded infrastructure due to the war and lack of investment. It is estimated that 57% of water resources in the country are unused.[105] Hydrogeological characteristics directly condition the runoff from basins of Bosnia and Herzegovina. This area mainly belongs to the geotectonic unit of the Dinarides mountain range, and based on the physical-geographical, geological and hydrogeological conditions to the hydrogeological inner region (which is morphologically distinct with heterogeneous litho-stratigraphic composition and complex structural pattern), and to the Pannonian region (lowland terrains south of the Sava River) and karst region.



Figure 10. Black Sea and Adriatic Sea Basins with their river catchments in B&H *(Source: Map designed by the report author)*

The Third National Communication analysed annual precipitation data supplemented with the values for the period 2011–2014, both for the Black Sea Basin and the Adriatic Sea Basin, and the main conclusion was that the mean value has not changed significantly. However, the

[105] UNDP (2016). Third National Communication and Second Biennial Update Report on Greenhouse Gas Emissions of Bosnia and Herzegovina under the United Nations Framework Convention on Climate Change. Sarajevo, Bosnia and Herzegovina: United Nations Development Programme.

value range (distribution) has significantly increased for both basins. In relation to the reference period 1961–1990, in the period 1991–2014 annual precipitation in the Black Sea Basin was 44 mm higher than in the reference period 1961–1990, though this increase was somewhat lower than in the period 1991–2010. The range has significantly increased (769 mm compared to 407 mm) and the minimum value is 100 mm lower, whereas the maximum value is 262 mm higher. Accordingly, the variance was significantly higher in the period 1991–2014. Water resources are very vulnerable and over time, the threat will increase. There is also a lack of spatial and temporal uniformity in the availability of water resources. The multi-annual average precipitation in B&H is about 1250 mm/year, which given the surface area of B&H is 51,209 km^2, amounts to a total quantity of precipitation of approximately 64 billion m^3 per year, or 2,000 m^3/s. As such, the annual average precipitation in B&H is around 350 mm higher than in the neighbouring countries.[106]

Bosnia and Herzegovina possess considerable water resources that, if correctly managed, could support economic development and a green economy. The predicted changes in precipitation and air temperature will negatively impact the current water management system in Bosnia and Herzegovina, which will result in an increased incidence of floods, landslides and drought. Although there is watershed level information available on water flows, which has been used for determining the total water availability, there is very limited state or entity-level data available on hydrological resources. Consequently, there has been no assessment of climate change impacts on these systems, even though those systems are expected to experience climate-related impacts. Reduced rainfall in spring and summer, linked to the regional reduction in annual precipitation levels and increase in air temperatures, will contribute to the increased frequency of droughts. Conversely, in autumn and winter, an increased frequency of floods is expected. These more extreme weather conditions are expected to occur on average every 5 to 10 years. River flows will be lowered, particularly during summer and early autumn, impacting water quality.[107] Low flows and droughts will occur in the summer months, impacting drinking water supply (particularly affecting rural communities), and tourism. The predicted changes in rainfall volumes and distribution (both spatial and seasonal), combined with rises in temperature and evaporation, are likely to cause more extreme events (floods and droughts), and lead to less water being available during the summer months, particularly in the Mediterranean area and Herzegovina (most severely in the limestone karst areas). Adaptation approaches are currently restrained by a lack of reliable

[106] UNEP (2017). Action Programme to Combat Land Degradation and Mitigate Drought Effects. Sarajevo, Bosnia and Herzegovina: United Nations Environment Programme.
[107] UNDP (2013). Climate Change Adaptation and Low-Emission Development Strategy for Bosnia and Herzegovina. Sarajevo, Bosnia and Herzegovina: United Nations Development Programme.

data, and this needs to be addressed urgently.

8. Main challenges for NbS application in B&H

Nature-based Solutions are quite a new concept focused on different environmental issues, where climate change adaptation, mitigation, natural disasters and ecosystem services are among the most important ones. This term is still not widely used in B&H, though it has been promoted and implemented by different international organisations and activities supported mainly through different projects. This approach requires a "case by case" detailed analysis of the natural characteristics of specific location, identification of the main degradation drivers, in order to project potential NbS opportunities with a clear picture of costs and benefits for each one. The IUCN Global Standard for NbS™ provides the comprehensive framework for NbS, allowing users to design, assess and scale up interventions.[108]

Implementation of NbS, besides the economic aspects of a particular measure, requires appropriate policy and strategic frameworks, but in B&H this represents a great challenge. The complex administrative structure of the country raises additional constraints for mainstreaming of NbS into the existing climate and natural disaster policy framework. Another challenge is that climate change issues and natural disasters in B&H are mostly related to agriculture, forestry and water management, while environment and biodiversity are concerns of other institutions, which complicates institutional horizontal and vertical communication among the state, entity and cantonal levels, also including BD.

Existing legislative and strategic frameworks in B&H do not integrate climate change and there is no budget for activities that will mitigate climate change explicitly. These activities rely mostly on the international donors and projects (GEF, GCF, etc.). On the other hand, the main manifestations of climate change like floods, droughts, landslides and wildfires are natural disasters that entities are trying to address through different projects and investments (irrigation, flood protection, afforestation, etc.), and some of these could be considered NbS. Existing planning systems related to climate change adaptation and mitigation, and disaster risk reduction do not provide structured and integrated data at the state, entity or cantonal level in FB&H that would show how vulnerable B&H is to climate change and disaster risk and what damages the country has suffered. There are certain annual reports (that are not publicly available) in the ministries at the entity and cantonal levels that show economic damages caused by floods and drought, though these data are not available publicly and there is no information exchange system between the entities in this regard.

[108] IUCN (2020). *Global Standard for Nature-based Solutions. A user-friendly framework for the verification, design and scaling up of NbS.* First edition. Gland, Switzerland: IUCN.

The formal policy competencies for NbS application lie at different levels of decision-making. The coordination role is at the state level, while all operational competencies and jurisdictions are at the entity level: Republic of Srpska and FB&H, jointly with BD. Furthermore, FB&H entity is decentralised and each of its 10 cantons is responsible for their own NbS applications.

At the entity level, competencies related to NbS application are divided among different departments under the same ministry, and among different ministries, presenting a great challenge and requiring close and functional cooperation among institutions in the same entity. For example, the Ministry for Spatial Planning, Construction and Ecology of the Republic of Srpska is competent for environmental protection, biodiversity, climate change, nature protection and protected areas, while the Ministry of Agriculture, Forestry and Water Management is the main institution for the implementation of NbS in agriculture, forestry or water management. Institutional structure and competencies on NbS in the entity FB&H are even more complicated due to cantonal level of decision-making.

The various ministries at the state, entity and cantonal levels, including local governments, have limited capacities and formal competencies to integrate climate change adaptation or DRR into their policies and plans. The complex institutional structure and weak political communication between entities draws attention to the importance of coordination and collaboration among different sectors and between various administration and governance levels in B&H. Another challenge is the absence of a comprehensive database and information related to the vulnerability of the regions in B&H, types of natural disasters and their frequency and economic costs, which will serve as a baseline for overview and planning possible NbS across the country. Existing reports and data related to natural disasters underpinned by climate change, distributed mainly among different organisations and institutions are frequently not available to the public. Information exchange between entities and the state level is not sufficient.

Identification of existing case studies that consider NbS was not an easy task, due to the above stated data unavailability and absence of a database that would gather this kind of information. On the other hand, many ongoing activities and the projects at the local, cantonal or entity level include measures that could be considered NbS, but the terminology is different and the term is not used in the reports.

To summarise, the main challenges related to NbS mainstreaming are:

- complex administrative structure of the country and competencies over NBS that are spread over many institutions,
- weak exchange of existing information among sectors within and between entities and the state,
- existing policy framework that does not recognise NbS,
- climate change adaptation is not mainstreamed into policy framework and there is no budget allocated for these purposes,
- disaster risk reduction is not part of the existing sectoral policy framework,
- reactive instead proactive approach in DRR,
- shortage of early warning systems related to the main natural disasters,
- limited institutional capacities for NbS mainstreaming and absence of a participative approach of stakeholders,
- weak awareness and promotion of NbS concepts among decision-makers and other stakeholders.

Recommendations:

- Developing disaster risk management planning should be integral to overall watershed management planning and should be more than just an emergency response.
- Fostering integrated, cross-sectoral approaches is required for many NbS to be successful.
- Participatory processes that support stakeholder empowerment facilitate the sustained success of projects.
- Convincing decision-makers of the value of investing in NbS is beneficial in the long-term.
- Fostering public-private partnerships may be needed in order to finance NbS at larger scales.
- Using elements of traditional nature-based practices may offer more appropriate and accepted solutions and be more successful than approaches that rely solely on bringing ‘new’ interventions in from outside.
- Biodiversity and social impacts can be achieved together and increase the overall success of a NbS.
- Valuing ecosystem services is important in making a business case for investment in ecosystems.

9. Recommendations and next steps in NbS application

The institutional structure of the country for sectors relevant for NbS is complex due to the decentralised state of B&H. Existing policy frameworks of B&H at the state, entity or cantonal levels do not recognise NbS explicitly, even though this concept appears in some strategies as associated actions or a possible tool that can be used, but without a broader overview of the possible benefits and advantages for climate change adaptation or DRR. Many documents and reports developed for different ratified conventions should pay particular attention to NbS and include this concept as a potential solution for climate change adaptation and disaster risk in B&H. At the entity and BD level, there are many important sectoral documents in agriculture, forestry, water management, nature protection and biodiversity that would profit from recognition of the potential of NbS, but unfortunately, this concept has not yet been included. Therefore, some important recommendations are given below:

- The **NbS concept has to be integrated into the existing entity and BD policy framework** related to forestry, agriculture, water management, climate change, biodiversity, environment protection, as well as urban development, land use, spatial planning, etc. The country's sectoral legislation, however, still has limited focus on climate change and NbS. Therefore, the country has a rather reactive emergency response instead of taking a proactive approach. The main proposed shift is to move away from disaster response and recovery and to focus on prevention and mitigation of disaster risks through the introduction of NbS. Disaster risk assessments need to be developed first and they should include spatial and socioeconomic analyses, and an understanding of climate change in order to explain vulnerability of different regions as a basis for proactive interventions. This is hampered by unsynchronised policies among the entities and BD, sometimes even among cantons with the same entity.

- Close **cooperation is required among ministries** relevant for DRR and climate change under each entity but also between entities, particularly in terms of water and forest management. The state level should have a coordinating role, specifically for international commitments and reports that B&H submits periodically, and those reports have to incorporate NbS as an important segment that provides new opportunities.

- Since the majority of NbS actions is to be applied at the local level, the ongoing process of the development of **local development strategies** is an excellent opportunity for the recognition and reinforcement of NbS concepts in local planning. These strategies

on land use and local development are an unavoidable starting point for the implementation of NbS at the local level. However, many local communities do not have strategic documents adopted due to the weak economic situation.

- On the other hand, B&H is a developing country with inconsistent implementation of the existing policy framework that would certainly contribute to disaster risk mitigation. For example, **consistent implementation of the legislation relevant for LDD** and preparation and implementation of compulsory spatial planning documents (required by law), aimed at sustainable use of space, would certainly reduce the risk posed by floods and landslides in B&H.

- Geographic analysis should be conducted to understand the spatial dimensions of risk and identify where hazards occur and where people are most exposed and how. For these purposes, **new platforms** need to be developed at the state, entity and cantonal levels and properly connected to better understand the risks and level of exposure, jointly with identification of locations where the implementation of NbS will improve disaster occurrence. Online platforms at different levels will facilitate DRR, which will enhance the existing institutional DRR systems introducing early warning systems for the most frequent natural disasters. Actors using risk assessments and applying mitigation measures using NbS should be able to learn from science, case studies and other advanced examples. Good practice in risk reduction needs to be adapted and shared with stakeholders and communities at risk in the country.

- **Shortage of knowledge on NbS and weak awareness** might be overcome through dedication of sufficient time and efforts to mobilise local community actors and stakeholders, to ensure two-way communication with the public and to educate and promote concepts and approaches to be applied along with the benefits that will be gained through the application of NbS. Another positive practice is holding round tables, workshops and seminars for local stakeholders (by agriculture advisory service and academia), and active promotion of NbS as a new opportunity for disaster risk reduction and climate change mitigation at the local level, with a focus on remote sensing techniques and software.

CURRENT OPPORTUNITIES

- **New climate change laws should be drafted at the entity level**, and these should consider NbS as a possibility to mitigate climate change and DRR;

- **The Environmental Strategy of B&H** is currently under development; in the future, this policy document will establish the environmental policy goals and key activities up to 2032 in Bosnia and Herzegovina. It should strengthen the environmental frameworks within B&H and it represents an important step for B&H to align with EU directives and procedures, and hence to increase the chances for European Union accession in the future. The policy document will be comprised of four jurisdiction strategies and action plans (B&H level, and the entity level: FB&H and RS, with BD. It will provide an overview of the current environmental situation and challenges, with a 10-year plan on how to address these challenges. The content of the B&H ESAP 2030+ will cover the following seven EU environmental policy areas: water, waste, biodiversity and nature conservation, air quality, climate and energy, chemical safety and noise, resource management and environmental management (as horizontal policy).

- **The Forestry Strategy of RS needs to clearly recognise the potential for NbS**, incorporating NbS approaches through envisaging the contribution of the forestry sector to economic, environmental and social development through the synergistic effects of carbon storage, conservation of biodiversity and economic benefits; coppice conversion, i.e., carbon storage through conversion of coppice to high-forest, and promotion of multifunctional sustainable forest management (biodiversity, carbon storage, ecosystem services in economically sustainable areas).

- The ongoing programme entitled "**Reducing Disaster Risk for Sustainable Development in Bosnia and Herzegovina**" supports citizens, especially the most vulnerable categories and high-risk local communities in B&H, to prepare and adapt to the risks of disasters and strikes in different sectors of development. This programme represents another opportunity for NbS mainstreaming at the local level.

10. Nature-based Solutions experiences in B&H

10.1 Potential case studies

In accordance with the methodology, a desk-analysis was performed to identify acting and potential NbS interventions in B&H. At the time of this scoping study, the gaps in data proved to be a barrier to identifying all potential or NbS complementary projects. Some examples of potential or complementary NbS projects that are worthy of further attention can be found in Table 6. More projects were identified that either had a strong biodiversity emphasis but mentioning climate and DRR benefits or the opposite, a strong climate and/or DRR focus but limited mention of the biodiversity benefits. It is thus likely with further examination and consultation that this list could grow. It is important to note that some of the potential examples identified in Table 6 are also lacking in terms of accessible documentation or further consultation. This means that there is currently not a strong link identifiable for either biodiversity or CCA or DRR (although they likely contribute towards these via added benefits) and that no clear links have yet been identified to the principles of NbS. These would need to be screened using the IUCN Global Standard for NbS to assess their complementarity to NbS.

Table 6. Potential and complementary NbS projects *(Source: Data compiled by the report author)*

Project title	Implementers	Description	Biodiversity link	CCA and/or DRR link
Sustainable forest management for better ecosystem services in vulnerable regions	Ministry of Agriculture, Forestry and Water Management of the Federation of Bosnia and Herzegovina; Ministry of Agriculture, Forestry and Water management of the Republic of Srpska	This nature-based approach has been aimed to improve existing forest management of bare land and it was implemented through the project entitled "Sustainable Forest and Landscape Management (SFLM) Project for Bosnia and Herzegovina" supported by the Global Environment Facility (GEF) and World Bank. The main aim of this nature-based approach is to improve forest management in B&H, using modern techniques which will reduce future vulnerability of forests to drought and wildfires across the country. This measure is aimed to ensure that forests and associated natural landscapes, which are important for the country's economic development, are managed sustainably, with particular focus on the most vulnerable areas such as bare land. Additionally, a specific target are landscapes vulnerable to ongoing degradation or to escalated impacts from climate change, such as fire risks. Finally, this project has a scaling-out component, where all of the country's forests (some 2 million hectares) will benefit as this approach and techniques can be used by forest companies and communities to stave off future climate change threats. The social component of this project is related to the protection of future jobs in the forestry sector by maintaining a sound resource base for local manufacturing and exports to a global market, encouraging development of rural economy. Afforestation of bare land using special techniques has been implemented across the country at more than 100 micro-locations where 560 ha have been planted in five cantons in FB&H, while 373.5 ha in mostly unfavourable site conditions on bare land in RS.	Restoration of degraded, bare land; restoration of deforested landscapes	Incorporating climate change information into already existing FMIS, climate-resilient sustainable forest management

Sustainable land management for flood mitigation and protection	UNDP in cooperation with Ministry of Foreign Trade and Economic Relations of BiH; Ministry of Spatial Planning, Construction, and Ecology of Republic of Srpska; Federal Ministry of Agriculture, Water-Management and Forestry, Ministry of Agriculture, Forestry, and Water Resources of Republic of Srpska; Federal Ministry of Environment and Tourism FB&H	The approach realised through the project will enable government of both entities and local communities that belong to the Vrbas basin to adapt to flood risk through the transfer of adaptation technologies for climate resilient flood management, and to embark on climate resilient economic activities. The effective revitalisation of the Vrbas River basin includes a number of measures depending on the main land degradation driver at the particular area in the watershed as follows: technical (different construction works in the watershed), biological (afforestation of targeted areas upstream, introduction of new erosion resistant species, riparian buffers, vegetation belts, etc), agricultural (sustainable agriculture measures, contour strips, minimum tillage, grassing), agroforestry, water retention objects, minimum grazing and administrative measures at the local and entity levels. Besides concrete measures applied on the ground, state, entity and local governments will adopt strategic management of flood risk through the legislative and policy framework and appropriate sectoral policies and plans that incorporate climate change considerations. Main activities taken under this project are focused on development flood risks and flood hazard maps, flood risk management plan for the Vrbas River basin, watershed, jointly with a flood forecasting system and early warning system and emergency response plans. Another important aspect of this nature-based approach is related to the inclusion of local communities and people in the preparation and implementation of municipal-level flood response and preparedness plans. The practical aspect has been focused on the projection and implementation of nature-based non-structural interventions in 13 municipalities of the Vrbas watershed and implementation of agroforestry schemes. Also, the Flood Forecasting and Early Warning System was established and is in the testing phase for the Vrbas basin. As a component of the project, the Vrbas GeoPortal was established and activated at http://vrb.pmfbl.org/. It offers flood hazard and risk maps, flash floods sensitivity model, landslide cadastre and torrential stream cadastre, hydrometric measurements in real time and a Participatory GIS (PGIS) tool for flood risk management at the local level. This nature-based approach is a good example for other regions in Bosnia and Herzegovina of how floods (and landslides as a natural disaster) can be managed through a sustainable nature-based participative approach, with equal contribution of all stakeholders.	Addressing afforestation, agroforestry measures, conservation measures in agriculture	Climate resilient economic activities. Improving human health, reducing disaster risk of flooding, restoration of erosion/landslide prone areas,

Social inclusion in local sustainable land management	City of Banja Luka	The project “Urban gardens development” in Banja Luka started in 2019, and continued in 2020 under the COVID-19 situation. The City Government of Banja Luka recognised need for active civil engagement in sustainable public land use aimed to improve household income, and encourage people to actively participate in local initiatives. The City of Banja Luka allocated public agricultural land located in Rakovačke Bare for the project “Urban gardens development”. The main purpose is to encourage people to produce their own food, cultivate agricultural land and develop urban agriculture that would benefit the local population, particularly people with disabilities. This project is socially responsible and was well accepted by the local population, with 56 gardens are already cultivated on 0.5 ha of the 1 ha of total area provided for this purpose.	Sustainable land management of abandoned fertile land in urban areas. Benefits for ecosystem functions and services.	Climate resilient livelihoods. Usage of abandoned and unused public land in the territory of the City of Banja Luka aimed to provide local people with an opportunity for healthy food production, and introduce sustainable ecosystem-based management practices.
Improving disaster, climate and urban resilience through urban regeneration	Sarajevo Economic Region Development Agency (SERDA)	Together with 11 European cities, Sarajevo is part of a project entitled “Connecting Nature” funded by European Commission through the Horizon 2020 project that demonstrates how Nature-based Solutions can contribute to addressing urban challenges such as climate change and water management. The project is aimed at forming a community of cities fostering peer-to-peer learning and capacity building among front runner cities that are experienced in delivering large scale Nature-based Solutions and fast follower cities (Sarajevo in this case) that have the desire to implement large scale Nature-based Solutions but lack the expertise. At the same time, Sarajevo as project partner will develop policy and practices necessary to scale up urban resilience, innovation and governance using Nature-based Solutions. The project will be focused on several important aspects starting from the development of the urban planning process that will enrich and nurture social, business and governance innovations and focus on the scaling-up of Nature-based Solutions in cities. Development of a guiding process for identifying funding and financial mechanisms that establish Nature-based Solutions as evidenced valid solutions for sustainable and resilient cities that are climate prepared, will provide a baseline and create the prerequisites for scaling out and integration of NbS in other cities in B&H. Sarajevo will develop and implement city-wide masterplans for Nature-based Solutions driven by a curatorial planning approach, which will include communication of adaptive governance through	Provide sustainable water management in urban areas	Urban resilience, flood prevention, landslide risk reduction

		learning-by-doing experiences. Each front-runner city will implement strategies and funding pathways to unlock the Nature-based Solution masterplan exemplars and transfer this experience and expertise to fast-follower cities, such as Sarajevo. Another important activity that will benefit the local community is the development of the masterplan and applications for funding for its implementation, for rolling-out Nature-based Solutions in the Sarajevo. Awareness raising among policy and decision-makers particularly those involved in urban planning process and support in the development of evidence-based policies and plans for Sarajevo will bring stakeholders together to understand, accept and implement Nature-based Solutions in Sarajevo, that will support disaster, climate and urban resilience.		
Livno cheese production	WWF Adria, Municipality of Livno, Cincar Association	The production of traditional cheese in Livno has been ongoing since the 19th century though in recent decades the industry was under dire threat and danger of disappearing. Traditional agriculture, the traditional raising of sheep and cattle, and the production of Livno Cheese from their milk, has always supported the sustainability of these exceptionally valuable natural habitats on Livanjsko Polje. Intensive grazing has helped sustain the natural ecosystems. That is why the protection of Livanjsko Polje as a whole is important, as it is also listed as an important wetland habitat of international significance under the Ramsar Convention. The quality of the cheese depends on this method of grazing, and synergy is key to preserving the diverse and unique habitats of this karst field. Fifteen years ago, producers came together to form the Cincar association with the aim of protecting traditional Livno Cheese as a specific product and working together to solve their common problems.	Prevents the overgrowth of grasslands and revives neglected pastures. Maintains natural ecosystems.	Climate-resilient livelihoods. Over 200 people make a living from this type of cheese production
ECO KARST (Ecosystem services of karst protected areas – driving force of local sustainable development)	Canton Sarajevo – Ministry of Physical Planning, Construction and Environmental Protection; CENER 21 - Centre for Energy, Environment and Resources	The ECO KARST project aims to contribute to the protection and sustainable development of karst bio-regions in the Danube region based on their valued ecosystem services. The project addresses seven nature protected karst areas in seven different countries with common features and similar problems.	Protection of the most vulnerable karst region.	Resilient livelihoods. Increase pro-biodiversity business (PBB) opportunities.

10.2 Potential sites for NbS

Considering potential sites for the implementation of NbS in B&H, it is important to look into existing documents that reveal potential hot spots in term of the most frequent natural disasters underpinned with ongoing climate changes:

- **Posavina and Semberia regions** (main natural disasters affecting these regions are floods, drought and heatwaves). These regions are already recognised as vulnerable through the LDN Reports, Action Program to Combat Land Degradation and Mitigate Drought Effects in BiH, Drought Management Plan of the RS. These areas represent the potential for the application of NBS in context of flood and drought prevention and improvement of flood and drought management.

- **Tuzla Canton** (main natural disasters are floods, drought, landslides). The main natural disasters have been identified by LDN reports and the Action Programme to Combat Land Degradation and Mitigate Drought Effects in BiH. This region represents the potential for application of NbS in the context of landslides, flood and drought prevention and improvement of the flood and drought management.

- **Herzegovina region** (main natural disasters are wildfires, heatwaves, drought). This region has been targeted as vulnerable due to frequent wildfires and drought, and addressing these two natural disasters would give benefits to agriculture, forestry and particularly water management of the Herzegovina region.

Characteristics of each potential pilot area for NbS implementation should be given in the second phase, where for each region the conditions should be analysed carefully, local communities consulted with an aim to find the most suitable location that will benefit from the application of NbS and contribute to climate change mitigation and disaster risk reduction. Another important aspect is that each entity and BD should have one pilot plot to satisfy the administrative and political structure of B&H.

ANNEXES

Annex I: Key terms and definitions

THE KEY TERMS AND DEFINITIONS

Natural hazards: events such as cyclones, earthquakes, tsunamis that occur in the physical environment and that can potentially cause harm to people

Disasters: UNISDR defines a disaster as "a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources" (UNISDR, 2009)

Disaster risk reduction (DRR) to "reduce disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events" (UNISDR, 2009)

Ecosystem-based Disaster Risk Reduction (Eco-DRR): "Sustainable management, conservation and restoration of ecosystems to provide services that reduce disaster risk by mitigating hazards and by increasing livelihood resilience." PEDRR

Ecosystem-based Adaptation (to Climate Change) (EbA): IUCN defines EbA as the conservation, sustainable management, and restoration of ecosystems to help people adapt to the impacts of climate change. It includes for example, sustainable agriculture, integrated water resource management, and sustainable forest management interventions that use nature to reduce vulnerability to climate change.

Climate Change Adaptation: Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (IPCC 2001)

Nature-based Solutions (NbS): Actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits. (IUCN, 2016)

Annex II: Nature-based Solutions for disasters risk reduction (DRR) and climate change adaptation (CCA)

Nature can provide solutions that are cost-effective, and can contribute to the community resilience beyond their capacity to absorb and recover from a single disaster, such as a flood or drought. At the 2016 World Conservation Congress and members' assembly, IUCN's members adopted a resolution (WCC-2016-Res-069)[109] which, for the first time, defined the use of nature for simultaneous benefits to biodiversity and human well-being. According to the resolution, Nature-based Solutions (NbS) are *"actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits*."[110]

While still an emerging concept, NbS have clearly demonstrated their value in providing multiple benefits to societies, e.g., in mitigating and adapting to climate change impacts, reducing disaster risks, improving community resilience and livelihoods, and safeguarding ecosystems and biodiversity. There is growing evidence of the value and importance of NbS and steady progress with documenting, communicating and mainstreaming NbS into climate change and sustainable development policy and disaster risk management.

Nature-based Solutions are considered an umbrella framework for ecosystem-based approaches that are used to address major societal challenges.

NbS actions can contribute to flood prevention and protection, managing risks of natural disasters, improving forest management, ensuring food and water security, combating climate change and contributing to the global improvement of the social, economic and health conditions, by strengthening the local communities' resilience to natural disasters.

NbS are a powerful mechanism for climate change mitigation due to their capacity to prevent degradation and loss of natural ecosystems, for example through sustainable forest management or improved conservation and land management actions. Moreover, natural and modified ecosystems can also effectively contribute to combating climate change thanks to their function of a 'natural carbon sink', i.e., absorption and insulation of CO_2 emissions.

Nature-based Solutions to disaster risk reduction (DRR) and climate change adaptation (CCA) are a good strategy for the integrated management of land, water and biodiversity. They can

[109] IUCN (2016). Resolution 69. Adopted at the World Conservation Congress, Hawaii, USA. 1-10 September 2016
[110] IUCN (2016). *Defining Nature-based Solutions.* Gland, Switzerland: IUCN.

provide low risk, low maintenance and low-cost solutions to many climate change related disasters and impacts. They prioritise nature conservation and sustainable land use practices that can be implemented in harmony with more traditional methods. The central role of ecosystems and biodiversity to address DRR and CCA challenges is endorsed in major risk related agendas, including the Sendai Framework on Disaster Risk Reduction (SFDRR), the Paris Agreement on Climate Change (COP21) and the Sustainable Development Goals (SDGs).

Specifically, SFDRR mentions ecosystems as being vulnerable to natural and human activity induced hazard impacts, and therefore need to be adequately protected.[111]

Various approaches can be used to apply NbS, including green infrastructure (GI) projects or ecosystem-based approaches (EbA), in different fields. Measures facilitating the practical implementation of NBS through policy development and enforcement, stakeholder involvement and building the capacity of the national institutions and/or local communities are equally important.[112]

Nature-based Solutions can be implemented alone or in an integrated manner with other solutions to societal challenges (e.g., technological and engineering solutions); they have been applied in a wide variety of sectors to address a plethora of societal issues. Some the NbS interventions examples are found in Section 9.[113]

[111] Ilieva, L., McQuistan C., Rodriguez A.V., Guevara O., Cordero D., Podvin, K., Renaud F. (2018). "Adopting nature-based solutions for Latin America". Working Paper of the Latin America Regional Workshop, "Towards nature-based solutions: Green infrastructure for flood risk reduction", Lima, Peru, 11-12 December 2017.
[112] Popovicki, T. (2019). *Study of nature-based climate solutions in Serbia.* Belgrade, Serbia: United Nations Development Programme.
[113] IUCN (2016). *Nature-based solutions to address global societal challenges.* Gland, Switzerland: IUCN.

Annex III: Global agreements relevant to NbS

- **Paris Agreement** (Official Gazette of Bosnia and Herzegovina 01/17), recognises protecting the integrity of ecosystems and biodiversity for both climate change mitigation and adaptation actions. It also calls for integrating adaptation into relevant environmental policies and actions, where appropriate, as well as for building resilience of ecosystems through sustainable management of natural resources.
- **UN Convention on Biological Diversity, UNCBD** (Official Gazette of Bosnia and Herzegovina 12/02). This Convention covers all ecosystems, species and genetic diversity, where conservation of biological diversity is a universal and global concern. Ecosystem-based approaches for adaptation are encouraged in decisions X/33, XII/20 and XIII/4 of the UNCBD and are also referred to in other recent decisions, XI/15, XI/19, XI/21);
- **United Nations Convention to Combat Desertification, UNCCD** (Official Gazette of Bosnia and Herzegovina 12/02), the focus is on sustainable land management to improve human living conditions. It draws attention to important land degradation drivers such are floods, drought, wildfire and landslides which are also disaster agents;
- **Convention on International Trade in Endangered Species of Wild Fauna and Flora**, CITES (Official Gazette of Bosnia and Herzegovina 11/08) recognises the importance of endangered species in biodiversity protection;
- **Kyoto Protocol** (Official Gazette of Bosnia and Herzegovina 03/08);
- **Cartagena Protocol** on Biosafety of the Convention on Biological Diversity (29.01.2000), Taken by succession (Official Gazette of Bosnia and Herzegovina 12/08);
- **Stockholm Convention** on Persistent Organic Pollutants (Official Gazette of Bosnia and Herzegovina 01/10) supports environmentally sound management of persistent organic pollutants;
- **Vienna Convention** for the Protection of the Ozone Layer, Taken by succession (Official Gazette SFRJ 01/90 and Official Gazette of Bosnia and Herzegovina 13/94);
- **Montreal Protocol** on Substances that Deplete Ozone Layer, Taken by succession (Official Gazette SFRJ 16/90);
- In September 2015, the UN General Assembly adopted the **Sustainable Development Goals** (SDGs) are related to disaster risk reduction, including SDG 13 on urgent action to combat climate change and its impacts and SDG 11 to make cities and human settlement inclusive, safe, resilient and sustainable, in addition to SDGs 1 (End Poverty), 2 (End Hunger), 3 (Ensure Healthy Lives and Well-being), 6 (Access to Water and Sanitation), 14 (Conserve Oceans), and 15 (Sustainably Manage Forests and Halt Biodiversity Loss);

- **Land Degradation Neutrality** targets and synergies identified between desertification, climate change and biodiversity under the United Nations Convention to Combat Desertification, implemented in B&H by each B&H Entity in 2018.

Annex IV: Global conventions relevant to NbS

- **Convention on Environmental Impact Assessment in a Transboundary Context** (Espoo Convention) (Official Gazette of Bosnia and Herzegovina 08/09). This Convention sets out obligation for countries to assess the environmental impact of certain activities at an early stage of planning to avoid adverse environmental impact and prevent natural disasters;
- **Protocol on Strategic Environmental Assessment, SEA** (Official Gazette of Bosnia and Herzegovina 03/17). This Protocol requires its Parties to evaluate the environmental consequences of their official draft plans and programmes, to provide sustainable development. The Protocol also provides for extensive public participation in government decision-making in numerous development sectors including disaster risk management;
- **Basel Convention** on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Official Gazette of Bosnia and Herzegovina 31/00) is also devoted to Disaster Waste Management, focusing on prevention, preparedness and the emergency mechanism under the Basel Convention;
- **Convention on Wetlands** of International Importance Especially as Waterfowl Habitat (Ramsar Convention) Taken by succession in 2001. Notification on succession from 2001. The Ramsar Convention Resolution XII.13 on Wetlands and Disaster Risk Reduction encourages Parties to integrate wetland-based disaster risk management and climate change adaptation into development policies and planning at all levels of government, including integration in vulnerability analysis, poverty reduction strategies and natural resource management plans and sectors, and in multi-sector policies and plans.
- **Nitrates Directive 91/676/EEC** aims to prevent and protect the quality of water through avoiding the pollution of ground and surface waters by nitrates from agricultural sources. The aims are to promote good farming practices as a part of the Water Framework Directive.
- **Drinking Water Directive 98/83/EC** relates to the quality of water intended for human consumption to protect human health. Based on this legislation, 48 microbiological, chemical and indicator parameters are monitored and tested on a regular basis. Member States and candidate countries are obliged to put in place more severe requirements (if they want), but not to adopt lower standards.
- **Urban Wastewater Council Directive 91/271/EEC** was adopted in the early 1990s to protect the environment from urban waste water discharges and discharges from certain industrial sectors. It regulates the collection, treatment and discharge of

domestic wastewater, the mixture of wastewater and the wastewater from certain industrial sectors included in the Annex III of the Directive.

Annex V: Relevant laws to NbS

- Law on the Council of Ministers of Bosnia and Herzegovina (Official Gazette of B&H 30/03, 42/03, 81/06, 76/07, 81/07, 24/08)
- Law on the Procedure for Concluding and Executing International Agreements (Official Gazette of B&H 29/00 and 32/13),
- Authentic Interpretation of the Law on Amendments to the Law on the Council of Ministers (Official Gazette of B&H 94/07), and
- Decision on Ratification of the Treaty Establishing the Energy Community, (Official Gazette of B&H - International Agreements 09/06)



INTERNATIONAL UNION
FOR CONSERVATION OF NATURE

Regional Office for Eastern Europe and Central Asia (ECARO)
Dr. Ivana Ribara 91
11073 Belgrade, Serbia
Tel +381 11 2272 411
www.iucn.org/regions/eastern-europe-and-central-asia
www.iucn.org/resources/publications