Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

Republika e Kosovës
Republika Kosova - Republic of Kosovo
Qeveria – Vlada - Government
MINISTRIA E BUJQËSISË, PYLLTARISË DHE ZHVILLIMIT RURAL
MINISTARSTVO POLJOPRIVREDE, ŠUMARSTVA I RURALNOG RAZVOJA
MINISTRY OF AGRICULTURE, FORESTRY AND RURAL DEVELOPMENT

Regional Fire Monitoring Center - RFMC

LANDSCAPE FIRE MANAGEMENT REPORT FOR KOSOVO



2023

ФАРМАХЕМ
PHARMACHEM

HELVETAS

List of institutions and experts involved in the preparation of the LFM Report for Kosovo

- Central Directorate of the Inspectorate for Forestry and Hunting (CDIFH)
- Cadastral Agency of Kosovo (CAK)
- Directorate for the Administration of NP "Bjeshket e Nemuna" (DANPBN)
- Directorate for the Administration of NP "Sharr" (DANPS)
- Emergency Management Agency (EMA)
- Federation of Hunters of Kosovo (FHK)
- Forestry Department (FD)
- Hydrometeorological Institute of Kosovo (HIK)
- Kosovo Forestry Agency (KFA)
- Kosovo Environment Protection Agency (KEPA)
- Kosovo Statistics Agency (KSA)
- Ministry of Environment, Spatial Planning and Infrastructure (MESPI)
- Ministry of Internal Affair (MIA)
- Ministry of Defence of Kosovo (MDK)
- Ministry of Agriculture, Forestry and Rural Development (MAFRD)
- University of Pristina – Faculty of Mathematical and Natural Sciences (UP-FMNS)

List of institutions and organizations involved in the process of the development of the report

Preparation and compilation of the report:
Arlinda Gashi, LFMWB Country Project staff in Prishtina

National supervisor of the process:
Tahir Ahmeti, LFMWB Country Focal Point, Ministry of Agriculture, Forestry and Rural Development of Kosovo

Expert process support:
Prof. Dr. Nikola Nikolov, Regional expert for landscape fire management, Regional Fire Monitoring Center (RFMC), with support of RFMC staff

Proofreader:
Elena Jankoska

The Landscape Fire Management Report for Kosovo is prepared within the Landscape Fire Management in the Western Balkans (LFMWB) Programme financed by the Swiss Agency for Development and Cooperation (SDC) and coordinated by Farmahem - Skopje with backstopping support of Helvetas Swiss Intercooperation. The process for preparation of this report was coordinated by the Ministry of Agriculture, Forestry and Rural Development of Kosovo with the support of the Regional Fire Monitoring Center (RFMC) for the Southeast Europe/Caucasus Region as partners of the LFMWB Programme.

Table of Contents

List of institutions and experts involved in the preparation of the LFM Report for Kosovo 2
List of institutions and organizations involved in the process of the development of the report 2
Table of Contents 3
Overview of figures, tables and maps 4
List of Abbreviations 6
Introduction 8

I LAND USE 10
1.1 Forests and Forest Lands 10
1.2 National Parks in Kosovo 13
1.3 Use of Agricultural Land 14
1.4 Natural Heritage 16

2. Demographics 18
2.1 General Population Statistics 18
2.2 Vital Statistics (Birth, Mortality, and Migrations) 22
2.3 Density of Population 24

3. Climate Characteristics, Climate Change Scenarios and Nationally Determined Contributions (NDCs) 27
3.1 Climate Characteristics 27
3.2 Standard Precipitation Index (SPI) 31
3.3 Climate change scenarios 32
3.4 Nationally Determined Contributions (NDCs) 38

4. Existing Landscape Fire Management System 40
4.1 Major Stakeholders Within the Existing System 40
4.2 Organizational Set-Up of the System 47
4.3 Legislation regulating this field 50

5. History of Landscape Fires for 2000-2021 57

6. Landscape Fire Risk Assessment 64

7. Existing Projects 66

8. LFM System SWOT Analysis 68
8.1 Prevention 68
8.2 Preparedness 69
8.3 Suppressive 70
8.4 Post-Fire Management 71

9. Landscape Fire Management Guidelines 72

References 75

Annexes (Maps, Tables, Illustrations, Chartics, etc.) 78

Overview of figures, tables and maps

Table 1. *Land use classes and their surface area in Kosovo (comparison 2002-2012)* 10
Chart 1. *Land use classes (%)* 11
Table 2. *Forest surface according to the composition and structure of the stand (ha)* 11
Chart 2. *Forest surface according to the composition and structure of the stand (ha)* 12
Chart 3. *Forest area by ownership (ha)* 12
Chart 4. *The most dominant types of broadleaves and conifers* 13
Table 3. *Total surface of national parks* 14
Table 4. *Agricultural surfaces according to utilization categories* 14
Chart 5. *Agricultural surfaces according to utilization categories (%)* 15
Chart 6. *Population by gender* 18
Chart 7. *Population by age group* 19
Chart 8. *Urban and rural population (%)* 19
Table 5. *Population of Kosovo by ethnicity (%)* 20
Chart 9. *Population of Kosovo by ethnicity* 20
Table 6. *Population by gender in Kosovo* 21
Chart 10. *Population growth according to censuses 1953-2021* 21
Chart 11. *Gender ratio according to registrations 1953-2021* 22
Chart 12. *Births and deaths in Kosovo 2002-2021* 22
Table 7. *Number of Kosovar citizens who have sought asylum in European countries* 23
Chart 13. *Number of Kosovar citizens who have sought asylum in European countries* 23
Table 8. *Population of Kosovo according to KAS municipalities* 24
Chart 14. *Population density by municipalities* 25
Chart 15. *Comparison of the population density from the last census of 2011 and the estimates of the population density in 2021* 25
Chart 16. *Population of Kosovo by gender for 1953, 1981, 2011* 26
Chart 17. *Air temperatures o Celsius for the period 2009-2019* 28
Chart 18. *Average annual air temperature at 0 o C 2001-2019* 28
Table 9. *Minimum and maximum annual air temperature (o C) in Kosovo according to meteorological stations (2009-2013)* 29
Chart 19. *Annual min and max air temperature (° C) in Kosovo according to measuring stations (2009-2013)* 29
Chart 20. *Precipitation in mm for the period 1930-2019* 30
Chart 21. *Annual precipitation in mm for the period 2001 – 2019* 30
Map 1: *Standard Analysis of Precipitation Index for 2015, 2016 and 2017* 31
Map 2: *Standard Analysis of Precipitation Index for 2018, 2019 and 2020* 32
Table 10. *Change in mean annual air temperature (ΔT-ANN) and mean summer maximum (ΔT-JJA) (°C), and change in mean annual (ΔP-ANN) and mean summer accumulated precipitation (ΔP-JJA) (%) for the periods of near future (2016-2035), the mid-century (2046-2065) and the end of the century (2081-2100) relative to the base period (1986-2005), according to stabilisation (RCP4.5) and growth of continuous (RCP8.5) GHG emissions scenarios (IPCC AR5, 2014). Values marked in red represent an increase in temperature, orange - a decrease and green - an increase in precipitation. The intensity of the colours corresponds to the intensity of the change* 33

Map 3: *Maps of the most prominent risks related to climate change in the Western Balkans region, derived from both scenarios (RCP4.5 and RCP8.5) considering the highest values. Two seasons, summer (left panels) and winter (right panels), are selected for two periods, mid-century (top panels) and end of the century (bottom panels). The maps show the areas with the most pronounced changes compared to the current climate. The presented indicators are of great importance for each season: summer – increase of dry and very hot period, winter – increase of very heavy precipitation and decrease/disappearance of snowpack* 34

Map 4: *Air Temperature change (° C) for the near future (top row), mid-century (middle row) and end of the century (bottom row) periods with respect to the baseline period for mean annual values according to RCP4.5 (left), to RCP8.5 (middle) and mean June July August maximum temperature according to RCP8.5 (right); statistical significance is marked with dots* 36

Map 5: *Accumulated precipitation changes (%) for the near future (top row), mid-century (middle row) and end of the century (bottom row) periods with respect to the baseline period for mean annual values according to RCP4.5 (left), to RCP8.5 (middle) and mean June July August according to RCP8.5 (right); statistical significance is marked with dot* 36

Map 6: *Change in average maximum length of very hot and dry spells (in days, left), length of growing season (in days, middle) and change in total accumulated precipitation in days with very heavy precipitation (in %, right) during the near future (top panels), mid-century (middle panels), and end-of-century (bottom panels) periods; all results presented are according to RCP8.5, while RCP4.5 results are presented in the appendix* 38

Scheme 1. *Forest management structure* 47

Scheme 2. *Organizational structure of the KEPA* 48

Scheme 3. *Organogram of the management system of the Agency for Emergency Management* 49

Table 11. *Number of fires and burned area (ha)* 57

Chart 22. *Number of fires and burned area (ha)* 58

Table 12. *Burned Forest area (ha) for the period 2003-2011* 58

Table 13. *Number of fires and burned area (ha)* 59

Chart 23. *Number of fires and burned area (ha)* 60

Chart 24. *Burned area (ha) based on land cover for 2012-2020* 60

Table 14. *Burned area (ha) for the period 2019 - 2021 in NP "Bjeshkët e Nemuna"* 61

Table 15. *Burned area (ha) for the period from NP "Malet e Sharri"* 61

Table 16. *Forest fires damage assessment 2007 – 2021* 62

Table 17. *Forest fires by region* 62

Map 7: *Burnt area from Landscape Fires in Kosovo (2008 to 2023)* 63

Table 18. *Risk levels for forest fires* 65

Annex 1. *Map of minefields* 78

Annex 2. *Map of Population distribution in Kosovo* 79

Annex 3. *Fire risk map in the "Pashtriku" Management Unit* 80

Annex 4. *Kosovo coverage map* 81

Annex 5. *Relief map of Kosovo* 82

Annex 6. *Vegetation of forests and pastures in NP "Sharr"* 83

Annex 7. *Map of National Parks in Kosovo* 84

Annex 8. *Forests and pastures map in NP "Bjeshket e Nemuna"* 85

Annex 9. *Map of agriculture land* 86

Annex 10. *Photographs of some of the meetings of the National LFM Network in Kosovo* 87

List of Abbreviations

AIWS	Alerting, informing, warning and surveillance
APFOK	Association of Private Forest Owners of Kosovo
CAK	Cadastral Agency of Kosovo
CISLK	Cadastral Information System for Land in Kosovo
CDIF	Central Directorate of the Inspectorate for Forestry and Hunting
DEP	Department of Emergency Preparedness
DEP	Department of Emergency Preparedness
DFGS	Department of Finance and General Services
DO	Department of Operations
DANPBN	Directorate for the Administration of NP "Bjeshket e Nemuna"
DANPS	Directorate for the Administration of NP "Sharr"
DRA NDD	Document of Risk Assessment from natural disasters and other Disasters
ECO DRR	Eco Disaster Risk Reduction
EFFIS	European Forest Fire Information System
EMA	Emergency Management Agency
EOC	Emergency Operations Centre
EU	Europe Union
EUFD	EU Floods Directive
ECK	Energy Corporation of Kosovo
FAO	Food Agriculture Organization
FD	Forestry Department
FFRM	Forest Fire Risk Management
FHK	Federation of Hunters of Kosovo
FMNS	Faculty of Mathematical and Natural Sciences
FLES	Faculty of Life, Environmental and Science
FRD	Fire and Rescue Department
GHG	Green House Gases
HIK	Hydrometeorological Institute of Kosovo
IEMS	Integrated Emergency Management System
IPCC	The Intergovernmental Panel on Climate Change
JICA	Japanese International Cooperation Agency
KFA	Kosovo Forestry Agency

KFIS	Kosovo Forest Information System
KSA	Kosovo Statistics Agency
KSF	Kosovo Security Force
LCV	Local Communities of Villages
MAFRD	Ministry of Agriculture, Forestry and Rural Development
MIA	Ministry of Internal Affairs
MESPI	Ministry of Environment, Spatial Planning and Infrastructure
MEST	Ministry of Education, Science and Technology
MDF	Ministry of Defence of Kosovo
MU	Management Unit
NAPFOK	National Association of Private Forest Owners of Kosovo
NDCS	Nationally Determined Contributions
NFFIS	National Forest Fire Information System
NFI	National Forest Inventory
NGO	Non-Governmental Organization
NP	National Park
NPAD	National Park Administration Directorate
NPMSH	National Park Malet e Sharrit
NRP	National Response Plan
RCP	Representative Concentration Pathways
RWC	Regional Waste Company
RWC	Regional Water Company
SFD	Strategy for Forestry Development
SRRNDD	Strategy for Reducing the Risk from Natural Disasters and Other Disasters
SPK	Spatial Plan of Kosovo
SPNP	"Sharri" National Park Spatial Plan
SPNP	Spatial Plan National Park "Bjeshket e Nemuna"
SPI	Standard Precipitation Index
UA	Administrative Instruction
UP	University of Prishtina
UNFCC	United Nations Framework Convention on Climate Change

Introduction

The countries of the Western Balkan (WB) region in the last three decades have gone through a period of societal, economic, and social transformation. A significant period for almost all of the countries and some of the processes of change and transformation are still being developed. In this period, the migration of the population within the countries is particularly pronounced, but the emigration outside of the region is also resolutely ongoing. In addition to these processes, unfortunately, the WB region hasn't been spared from the impacts of climate change either. Therefore, they've caused numerous disasters and catastrophes, such as floods, landslides, periods of extremely high temperatures, etc. All this has had a negative impact on the occurrence of forest fires, as well as landscape fires in the region. This resulted in large-scale forest fires, material damage, and unfortunately also cases of injuries and loss of human life in some instances.

Insufficiently defined forest fire protection systems (prevention, preparedness, suppression, and post-fire management) and inadequate coordination between the stakeholders on the landscape level within that system persist in all WB countries. This was influenced by the ever more frequent occurrence of fires that are not limited to forests but also burn on arable and agricultural areas, pastures, abandoned agricultural areas, and peri-urban landscapes. These types of fires (landscape-level fires) require both an appropriate approach and a concept for protection against them.

This was recognized by the **Swiss Agency for Development and Cooperation (SDC)** which supported the **Landscape Fire Management in Western Balkan (LFMWB) Programme**, coordinated by Farmahem – Skopje, North Macedonia, and Helvetas Swiss Intercooperation as a backstopper. This Programme, through its activities, aims *to increase the resilience of Western Balkans forests and landscapes against uncontrolled landscape fires to the benefit of the people who depend on these landscapes for their livelihoods and socioeconomic development*.

Following a landscape and participative approach the LFMWB Programme contributes to establishing of the Landscape Fire Management (LFM) Network in Kosovo as a science-practice-policy mechanism where different stakeholders have the opportunity to discuss the current situation and propose future guidelines regarding landscape fires. Acting as a Kosovo's sounding board, the members of LFM Network were actively involved in the dynamic feedback process of preparation of the first Landscape Fire Management Report for Kosovo representing a comprehensive, authentic and well-rounded document that elaborates the current situation in the country regarding fires on the landscape level. The process for the preparation of this report was coordinated by the Ministry of Agriculture, Forestry and Rural Development of Kosovo with the support of the Regional Fire Monitoring Center (RFMC) for the Southeast Europe/Caucasus Region as partners of the LFMWB Programme.

Members of the LFM network in Kosovo, in 2023, through several workshops succeeded in developing a common understanding covering different areas from the landscape fires. All data elaborated in the report are provided and confirmed by official institutions of Kosovo, giving more legitimacy to the conclusions derived from the analysis of the results. This report is giving overview of the land use, demography and migration, climate characteristics, climate change and nationally determined contribution, analysis of the existing fire system on the landscape level, recording fires, landscape fire risk assessment, and existing initiatives. Additionally, in this report are presented findings from the members of the LFM network in Kosovo who worked on developing a SWOT analysis elaborating strengths, weaknesses, opportunities, and threats related to the LFM.

In the last chapter of this report, the LFM Guidelines are defined and developed by the members of the LFM Network, which will serve as a fundamental framework to steer future actions and strategies into landscape fire management governance in Kosovo. These guidelines offer essential recommendations,

laying a solid foundation for implementing the landscape fire management approach in all of its phases, especially through stressing prevention and preparedness measures, all in one cohesive fire protection system.

The validation process of the Landscape Fire Management Report was ensured through continuous communication among the LFMWB Country Project Staff in Prishtina seconded to MAFRD as a drafting person of the report as well as the members of the LFM Network of Kosovo with expert support provided by the RFMC. Through ensuring an inclusive and participatory approach, this report has become a valuable resource for promoting and advancing LFM guidelines and principles in making Kosovo's forests and landscapes fire resilient.

This report will serve as a fundamental document for planning measures and activities that will lead to the establishment of a more efficient landscape fire management system that will be able to successfully respond to the challenges resulting from socioeconomic, demographic, natural, and climate change.

LAND USE

Land use changes have continued in recent decades both in our country and in the region, which has a great impact on the occurrence of landscape fires.

The lack of population in rural areas negatively affects the LFM considering that a large part of agricultural land remains uncultivated, which potentially increases the risk of the spread of fires, as does uncultivated land in rural areas and near forests, and the lack of community living close to them, as well as considering that burning materials (legumes, grassy layers, bushes) are among the main causes of the spread of fires in forests and agricultural lands.

The absence of livestock in these areas further amplifies the susceptibility of natural pastures to fire incidents. Detailed insights into land use patterns in Kosovo are provided in the following chapters, presenting insightful data through charts and tables for comprehensive analysis.

1.1 Forests and Forest Lands

According to the National Forest Inventory of 2012, the forest area is 481,000 ha or 44.70% of the total area. In terms of ownership, 62% of the forests are owned by the state, while the remaining of 180,800 ha or 38% are owned by private owners. (Tomter S. M. Dr. B. E., National Forest Inventory, 2012)

The Table 1 and Chart 1 show the land use classes. The table demonstrates that the forest area of Kosovo has increased by 5% or (20,200 ha) since the last inventory in 2012. While the agricultural area has decreased by 2.6%, perhaps explaining the increase in the forest area from the conversion of agricultural land to forest land, and settlements have increased by 0.8%. (Tomter S. M. Dr. B. E., National Forest Inventory, 2012)

Land Use Classes	2002		2012	
	ha	%	ha	%
Forest	460,800	42.1	481,000	44.7
Other forest land	28,200	2.6	29,200	2.7
Agricultural land	342,400	31.3	309,000	28.7
Meadows/Pastures	153,200	14	161,400	15
Places of residence	40,000	3.7	48,000	4.5
Water	4,600	0.4	5,200	0.5
Other wet soil			800	0.1
Another land	23,400	2.1	42,400	3.9
Not classified	41,600	3.8	0	0
Total	**1,094,200**	**100**	**1,077,000**	**100.1**

Table 1. *Land use classes and their surface area in Kosovo (comparison 2002-2012):* ***Source of data:*** *NFI 2012*

The official area of the territory of Kosovo is 1,090,800 ha. The discrepancy between areas is partly due to test areas located outside of Kosovo, which were erroneously included in the National Forest Inventory in 2002. In the 2002 NFI, many test areas near the Serbian border were inaccessible and were classified only by using aerial images to evaluate forest surfaces based on measurements made near piles with the same structure.

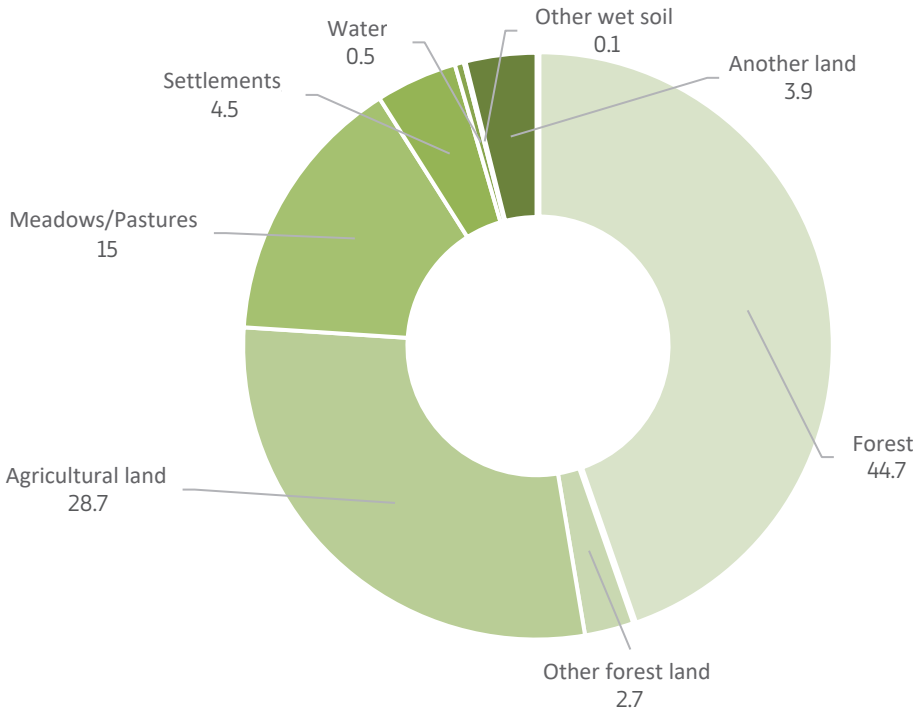


Chart 1. *Land use classes (%):* ***Source of data:*** *NFI 2012*

The forests of Kosovo are dominated by broadleaved forests, covering more than 93% or 449,400 ha, where the dominant types are: oaks *Quercus* spp., *Fagus* sp., ash *Fraxinus* spp., hornbeam *Carpinus* sp. and softwoods such as: birch *Betula pendula*, maple *Acer* sp., sturgeon *Tilia* sp., alder *Alnus* sp., while coniferous forests cover 7% of the forest area or 23,800 ha, dominated by species such as: silver fir (*Abies alba*), spruce (*Picea abies*), pine species (*Pinus* spp.), etc., and are equally distributed among the different classes of the stand structure. The below table no.2 and Chart no. 2 and 3 shows the composition and structure of the stand. (Tomter S. M. Dr. B. E., 2012)

Forest Composition	Stand structure			Total
	Regeneration	Even Age Stands	Uneven Age Stands	
Coniferous	2,200	6,600	15,000	23,800
Mixed	0	400	7,400	7,800
Broadleaved	45,400	236,000	168,000	449,400
Total	**47,600**	**243,000**	**190,400**	**481,000**

Table 2. *Forest surface according to the composition and structure of the stand (ha):* ***Source of data:*** *NFI 2012*

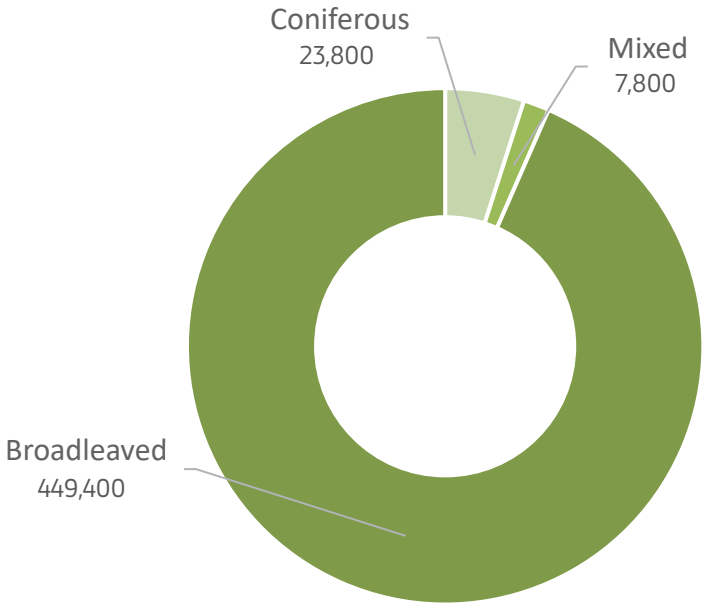


Chart 2. *Forest surface according to the composition and structure of the stand (ha):* ***Source of data:*** *NFI 2012*

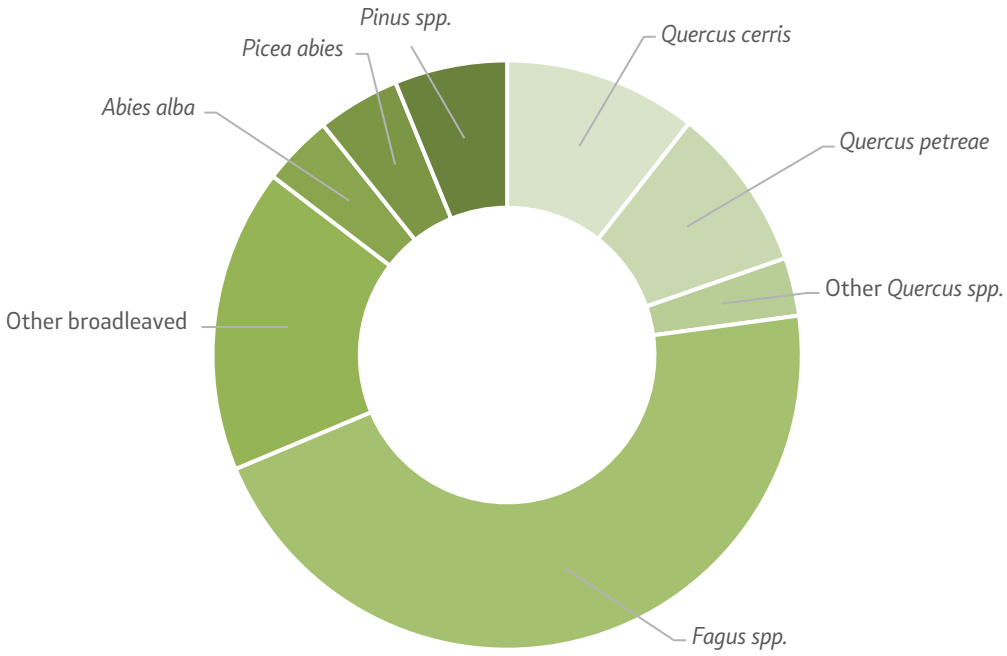


Chart 3. *The most dominant types of broadleaves and conifers:* ***Source of data:*** *NFI 2012*

As shown by the chart no.4 below, out of the total area of 481,000 ha, 180,800 ha or 38% of Kosovo's forests are classified as private property and 295,200 ha or 62% are classified as public forests and 5,000 ha unknown property.

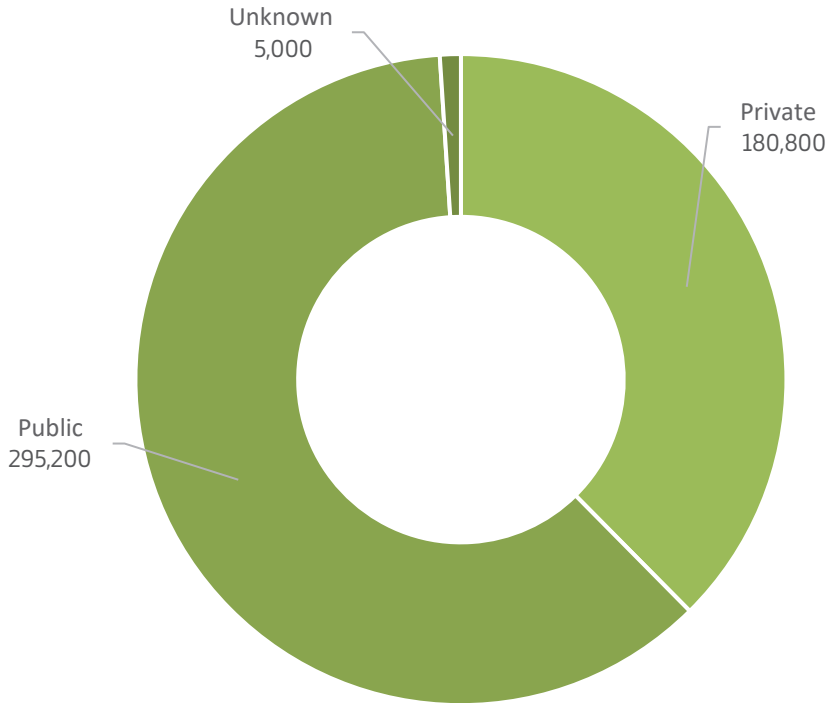


Chart 4. *Forest area by ownership (ha):* ***Source of data:*** *NFI 2012*

1.2 National Parks in Kosovo

National parks in Kosovo cover the total forest area of Kosovo with over 10%. "Sharri" National Park, located in the South and South-West of the country, is part of the Sharri Mountains, which are spread over three countries, Kosovo, Albania, and North Macedonia. It extends to the municipalities of Dragash, Prizren, Suharekë, Shtërrpcë and Kaçanik and covers an area of 53,272 ha. Please see Annex 3 (Vegetation of forests and pastures in NP "Sharr" (Source: Spatial Plan of NP "Sharr") (Ministry of Environment, 2013)

The "Bjeshket e Nemuna" National Park, with its position in the North-West of the country, also extends to three neighbouring states, Kosovo, Albania, and Montenegro. In Kosovo, this park extends to the municipalities of Istog, Pejë, Deçan, Junik and Gjakovë and has an area of 63,028 ha. Please see Annex 5 (National Parks in Kosovo, Source: NP Spatial Plan "Bjeshket e Nemuna" (Spatial Plan of the National Park "Bjeshket e Nemuna", 2022)

Below, in table 3 is presented the area of the two National Parks.

National Park	Total area of parks (ha)	First zone	Second zone	Third zone	Surface of NP in municipality
Sharri	53,272	17.6	75.3	7.1	Dragash (45%) Prizren (22 %) Suharekë (4.7 %) Shterrpcë (24.2%) Kaçanik (4.1%)
Bjeshkët e Nemuna	63,028				Istog (8.1%) Pejë (52.1%) Deçan (26.6%) Junik (8.4%) Gjakovë (4.8%)

Table 3. *Total surface of national parks:* ***Source of data:*** *Spatial Plan for NP "Bjeshket e Nemuna" and NP "Sharri"*

1.3 Use of Agricultural Land

Based on the data of the Kosovo Survey of Agricultural Economies in 2022, the utilized area of agricultural land was 420,482 ha, most of it belonging to meadows and pastures of 216,998 ha or 51.7%, while arable fields are 188,405 ha or 44.8%. (Ministry of Agriculture, Kosovo Green Report, 2022)

The table 4 and chart no. 5 below, provided by the Kosovo Statistics Agency, shows the areas of agricultural land according to categories of use, and it can be concluded that the used area of agricultural land has not had major changes. A trend of approximate usage can be seen for the period 2017 - 2021.

Agricultural land use data	2017	2018	2019	2020	2021	Difference 2020/2021	Participation %
Arable land - fields	186,954	188,359	188,365	188,372	188,375	0	44.80
Garden	1,199	1,003	1,122	1,133	1,089	0.7	0.30
Tree plantations	6,247	7,687	9,244	10,029	10,144	1.1	2.4
Vineyard plantations	3,199	3,272	3,367	3,437	3,471	1.0	0.80
Nursery	159	109	111	137	140	2.4	0
Meadows and Pasture	218,314	218,152	217,932	217,102	217,107	0	51.70
Total	**416,072**	**418,582**	**420,141**	**420,210**	**420,327**	**0.03**	**100**

Table 4. *Agricultural surfaces according to utilization categories:* ***Source of data:*** *Statistical Yearbook of the Republic of Kosovo 2022*

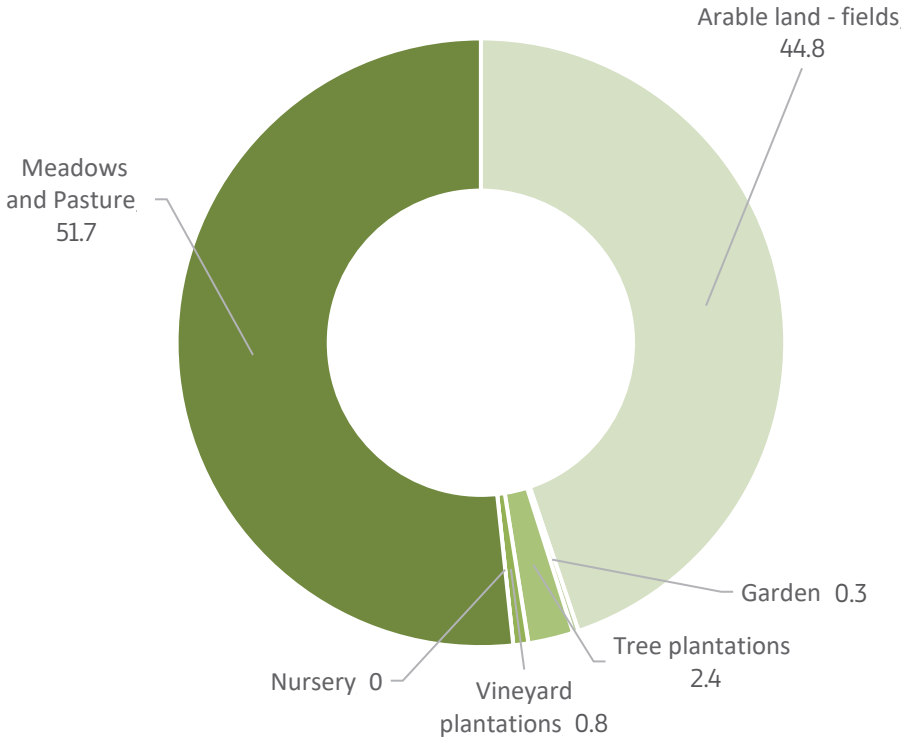


Chart 5. *Agricultural surfaces according to utilization categories (%):* ***Source of data:*** *Statistical Yearbook of the Republic of Kosovo 2022*

Land Mine Contaminated Areas

Even though most of the mined areas have been demined, there are still many forest areas and natural pastures in which it is estimated that there are still mines left over from the last war which pose a risk to the population and access to those areas is limited as this could hinder fire prevention and extinguishing actions if they appear in those areas.

Such a situation is especially evident in the southern and western part of the country. The Kosovo-North Macedonia border zone and the Kosovo-Albania border zone continue to be areas where unexploded ordnance from the last war can be found even today.

In context of landscape fire spread, mined areas were the key factor for burning of a large area of natural landscapes, especially forests. The damage caused by these fires was considerable, both in terms of the environment and the economy.

In the 2000-2007 period, in many rural areas, the local population did not work the agricultural land because of the mined land, and the cattle also left that part, which enabled the increase of dry plant material amount, which in turn has an increased risk potential for spread of fires in these areas.

In the first years after the war of 1999, the local population tried to diminish the agricultural lands and pastures by burning the vegetation and thus ensure access to the agricultural lands and pastures.

These fires, caused for the purpose of demining, mainly did not stop only on land or pastures, but ended up in the forests, too.

The summer of 2000 was the period with the greatest spread of landscape fires. At that time, large areas of pastures near forests with different structures and species were burned. This year's fires have

destroyed many forest crops of different ages, which were mainly located in the lower areas of the hilly belt, and the source of the fire was the burning of fields by the population for the purpose of demining.

Extinguishing these fires was a difficult mission due to the poor organisation of the structures responsible for fighting the fire. Another very important factor to prevent the extension (spread) of the fire was the impossibility firefighters to access the terrains that were considerably mined.

Although maps of mined areas were available, they did not guarantee complete safety due to their inaccuracy and the experiences of people who have moved in those areas have suggested that it is a potential danger for people to move in those areas. Even today, those areas are potentially at risk from fires due to the non-use of the land for agricultural production and as pasture, which is now mostly covered with vegetation. Annex 1. Map of minefields (Source: Ministry of Defence of Kosovo - KSF).

1.4 Natural Heritage

The total number of nature protected areas is 248, with an area of 126,023.2 ha, or 11.5% of Kosovo's area. The classification of Protected Areas is based on the Law on Nature Protection (No. 03/L233) and is partly in harmony with the criteria of the International Union for Conservation of Nature (IUCN). According to this law, protected nature areas in Kosovo are classified into seven (7) categories.

These areas include: 19 Strict Nature Reserves such as: "Arnen Reserve", "Maja e Ropsi", "Rusenica", "Kamilja", 2 National Parks "Sharri" and "Bjeshket e Nemuna", 219 Monuments of Nature among them are: "The source of the White Drin with the Radavci Cave", "The Gadima Cave", "Mirusha Waterfalls", "Rugova Gorge", "The White Drin Canyon and Ura e Fshejte", "Trungu" of Rrap in Marash", a Nature Park "Mali Pashtrik and Lake Vërmica", six Protected Landscapes "Shkugëza" and "Pishat e Deçani", and a Special Protected Area of Birds "Wetlands of Henci-Radeve".

The largest area of the protected areas is made up of the National Parks: "Bjeshket e Nemuna" and "Sharri", the Nature Park "Pashtrik Mountain and the Lake of Vermica", the Nature Monument with special designation "Gadime Cave", natural monument " "Burimi i Drinit dhe Shpella e Radavcit"", Protected Landscape "Germia", MNRV "Waterfalls of Mirusha" and MN "Locality of Boshtra in Golesh area", etc. In addition to the natural heritage areas, there are also many cultural heritage areas.

The Bifurcation of the Nerodime River is considered a natural monument, which represents a unique example in Europe of a river flowing into two seas. The Nerodima River, which originates in the mountains of Jezerci near Ferizaj, irreversibly divides into two branches, which flow into two different seas. The left branch flows into the river Sitnica through Sazli and continues its journey to the river Ibër, Morava and through the Danube it flows into the Black Sea while the right branch flows into the Aegean Sea through the rivers Lepenc and Vardar.

Also, the other protected areas include the "Blinaja" hunting site of special importance. It spreads over three municipalities, that of Lipjan, Drenas and Shtime and has an area of 2,795 ha. This hunting ground is of the closed type and lies at an altitude of 650-850 m above sea level.

The "Duboçaku" hunting place of special importance lies in three municipalities, that of Skenderaj, Zubin Potok and Mitrovica with an area of 6,805.05 ha, of which 2470 ha is state property, and the rest is private property and is of open hunting type. (Report on the state of nature, 2018-2021)

According to the National Forests Inventory, as emphasized in Chart No. 2, about 5,000 ha are forests that have been assessed by taking measurements, but they do not have determined ownership as their owners could not be identified and are categorised as unknown property. (Tomter S. M. Dr. B. E., National Forest Inventory, 2012)

From the analysis of the data mentioned above, the trend of reducing agricultural areas is continuous, where a large part of agricultural land remains uncultivated, which potentially increases the risk of landscape fires spreading.

Due to the specific circumstances of the 90s in Kosovo, like other natural resources, agricultural land has been used irrationally. From 2000 onwards, due to the lack of institutional protection and the large development of construction, a significant part of the agricultural land has, unfortunately, been turned into construction land, thus gradually decreasing cultivable land.

Despite the drafting of strategic documents and policies for the development of agriculture, the loss of agricultural land remains an ongoing problem. The main reason for such loss of land is the lack of urban and municipal development plans, as well as the failure to include LFM approach in strategic documents and policies for the development of agriculture.

The number of fires and the area burned is increasing in some regions as traditional land cultivation is abandoned and people are leaving rural villages and moving to urban centres.

Moreover, due to non-cultivation, many areas of arable land have been turned into wastelands, which needs time to return to their previous state. Where the appearance of bushes has begun and they can potentially turn into possible hotspots for landscape fires, since they are also accessible from settlements, and it is known that 90% of cases, fires are caused by human factor.

2. Demographics

The number of populations, density, spatial distribution, gender, age structure, fertility and mortality, migration, and many other indicators mentioned in this chapter give a clear overview of the development of the country, the impact on the economy, and the environment.

The landscape fire management LFM approach treats the demographic profile of the site as one of the most significant elements affecting land use, and the purpose of creating a population estimate is to obtain data that are necessary for the analysis of natural population trends. These were based on demographic indicators, whose function is to describe the natural movement of the population through rates, indices, and other indicators.

The major changes in economic development between the regions in Kosovo are the main reasons for population movement and migration, especially from rural to urban areas, which creates opportunities for potential occurrence of landscape fires due to the non-cultivation of agricultural land.

2.1 General Population Statistics

According to the data obtained from the 2011 Census of Population, Households and Housing, shown in Chart 6 below, Kosovo has 1,780,021 inhabitants, of which 896,136 are male or 50.30% and 883,885 are female or 49.70%, with a population density of 163.18/km^2 and with an average number of household members of 5.78 inhabitants / family. (Assessment of the population, 2011)

The next Census of Population, Households, and Housing is in the process of preparations and is planned to take place at the end of 2023, or the beginning of 2024.

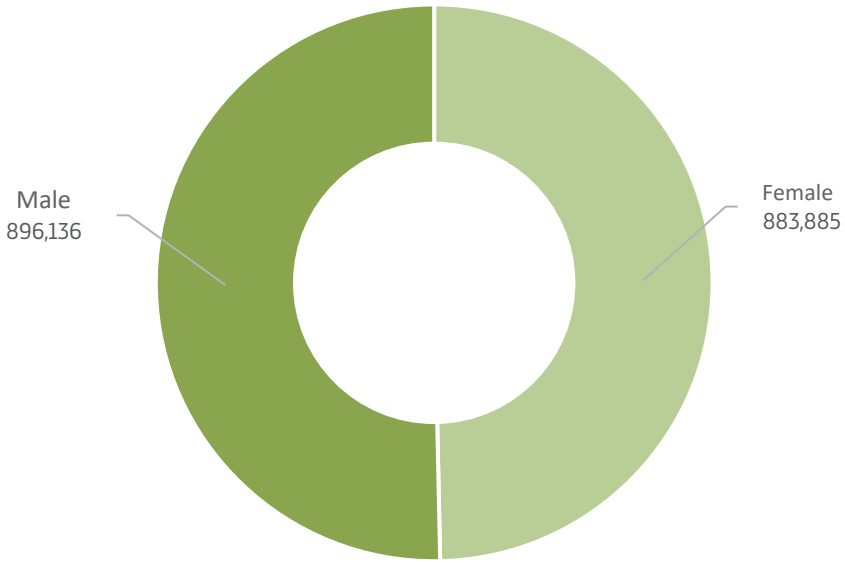


Chart 6. *Population by gender:* ***Source of data:*** *KSA*

According to the current census, the population by age group is 0-14 years – 24%, 15-64 years – 67% and over 65 years – 9%, which is presented in graph 7 below.

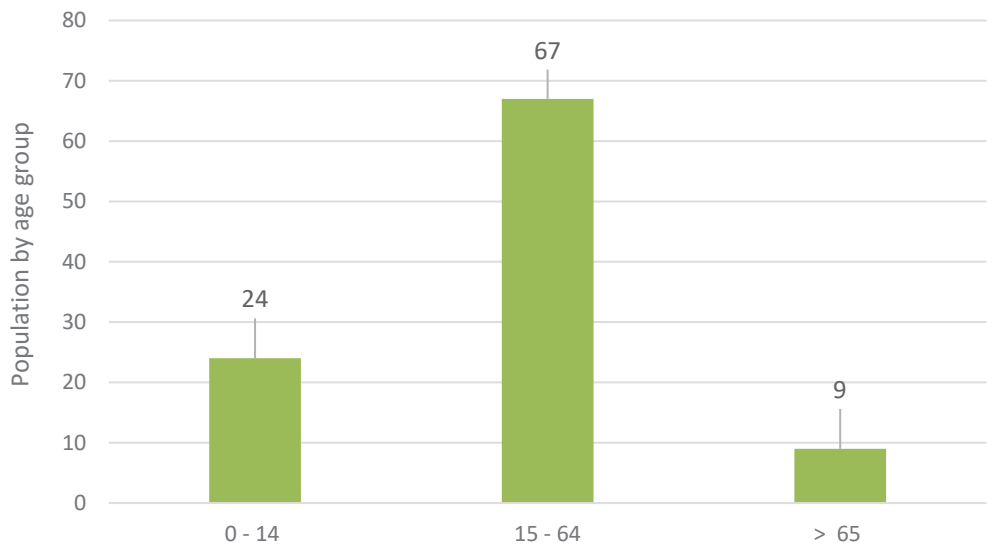


Chart 7. *Population by age group:* ***Source of data:*** *KSA*

The population of Kosovo is characterized by a very young population structure, where the average age is 30.2 years, the average life expectancy for the year 2011 in Kosovo for both sexes was 76.7 years, women had an average life expectancy of 79.4 years while men 74.1 years.

The percentage of the population living in rural areas was 61.7% while in urban areas, it was 38.3%, as per the chart 8 below.

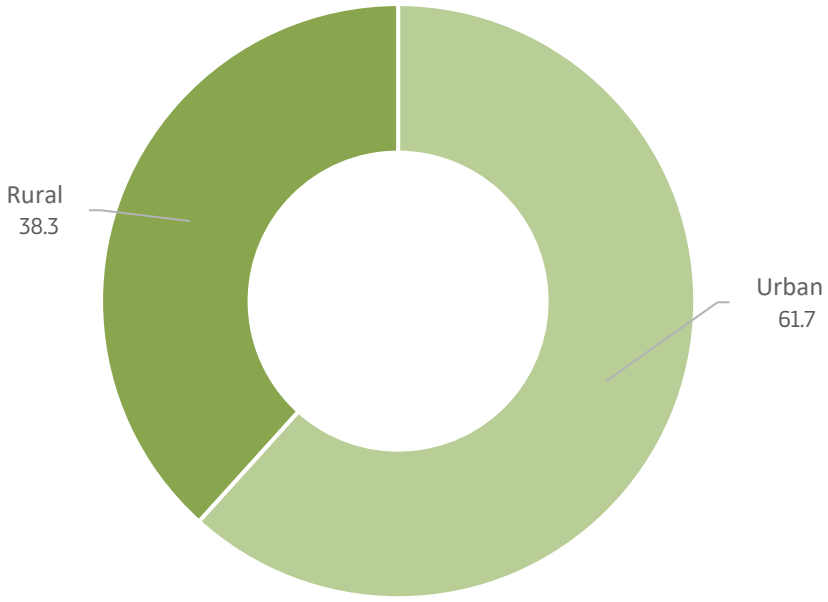


Chart 8. *Urban and rural population (%):* ***Source of data:*** *KSA 2011*

Kosovo currently has 38 municipalities with 1,469 settlements organised according to the laws of the country. Please see attached Annex 2. Map of Population distribution in Kosovo (Source: Kosovo Statistics Agency)

In terms of demographics, as shown in table 5 and chart 9, Kosovo is a compact space where the Albanian nationality makes up about 90%, while other nationalities make up about 10% (Serbians, Montenegrins, Turks, Roma, etc.). (General statistics, Kosovo in numbers, 2021)

In terms of age, the population of Kosovo is young, where the age under 19 dominates with 42.5%. Its capital is Pristina while the other big cities are: Prizren, Mitrovica, Peja, Gjakova, Gjilan and Ferizaj.

Ethnicity	1948	1953	1961	1971	1981	2011
Albanian	68	64.3	67.1	73.7	77.4	91
Serbian	24.1	24.1	24.1	18.4	13.2	3.4
Other	7.9	11.6	9.4	8	9.4	5.6

Table 5. *Population of Kosovo by ethnicity (%):* ***Source of data:*** *Yearbook of statistics of Kosovo 2021, KSA*

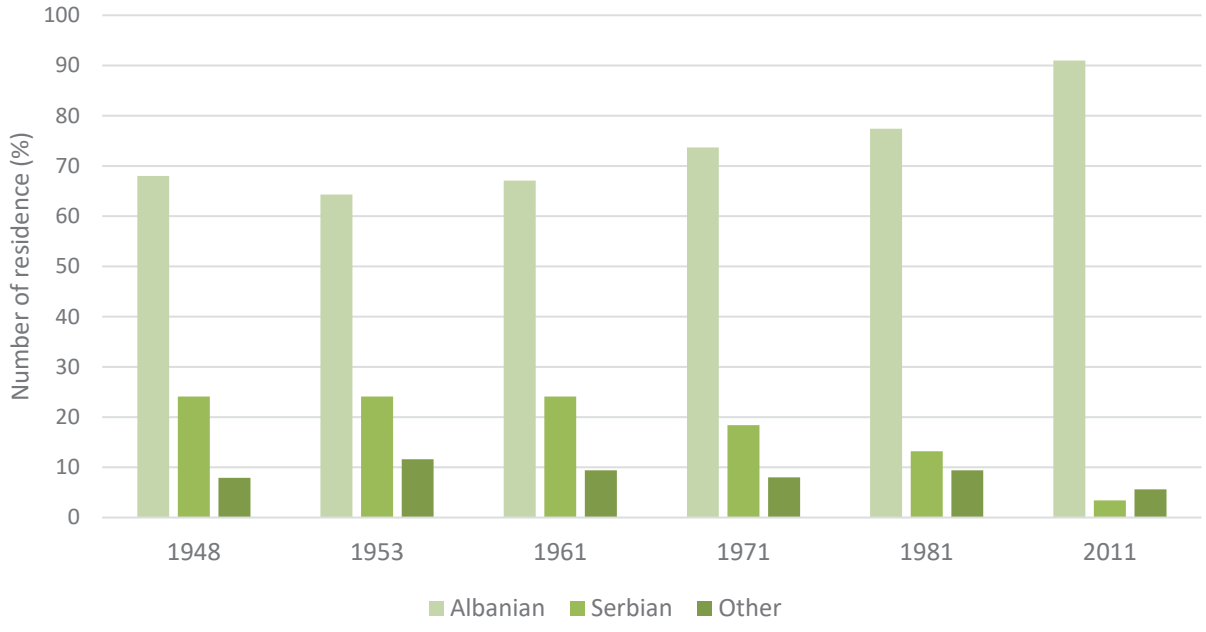


Chart 9. *Population of Kosovo by ethnicity:* ***Source of data:*** *Yearbook of statistics of Kosovo 2021, KSA*

The following table no. 6 shows the population change from 1921 to 2021. It should also be noted that the data for 2012-2021 are estimated data and show the number of the population in the respective year.

Year	Surface km²	Demographics		
		Total	Male	Female
1921	10,908	439,010	220,244	218,766
1931	10,908	552,064	280,856	271,208
1948	10,908	733,034	373,736	359,298
1953	10,908	815,908	416,538	399,370
1961	10,908	963,988	492,630	471,358
1971	10,908	1,243,693	636,958	606,735
1981	10,908	1,584,440	818,392	766,048
2011	10,908	1,780,021	896,136	883,885
2012	10,908	1,815,606	914,051	901,555
2013	10,908	1,820,631	916,581	904,050
2014	10,908	1,804,944	907,887	897,057
2015	10,908	1,771,604	882,076	889,528
2016	10,908	1,783,531	888,198	895,333
2017	10,905	1,798,506	889,635	908,871
2018	10,905	1,795,666	879,876	915,789
2019	10,905	1,782,115	869,800	912,315
2020	10,905	1,798,188	877,645	920,543
2021	10,905	1,773,971	871,729	902,242

Table 6. *Population by gender in Kosovo:* ***Source of data:*** *Yearbook of statistics of Kosovo 2021, KSA*

As demonstrated in the table no. 6 above, the number of the population from 1981 to 2011 had a large increase of up to 12.5%. Whereas the last census of 2011 shows that there was an increase during 2012 to 1.96%, in 2013 there was an increase of 0.27%, and then a decrease is seen from 2013 to 2021 of - 2.63%. In 40 years, the number of the population has increased by 11.95%. (Assessment of the population, 2011)

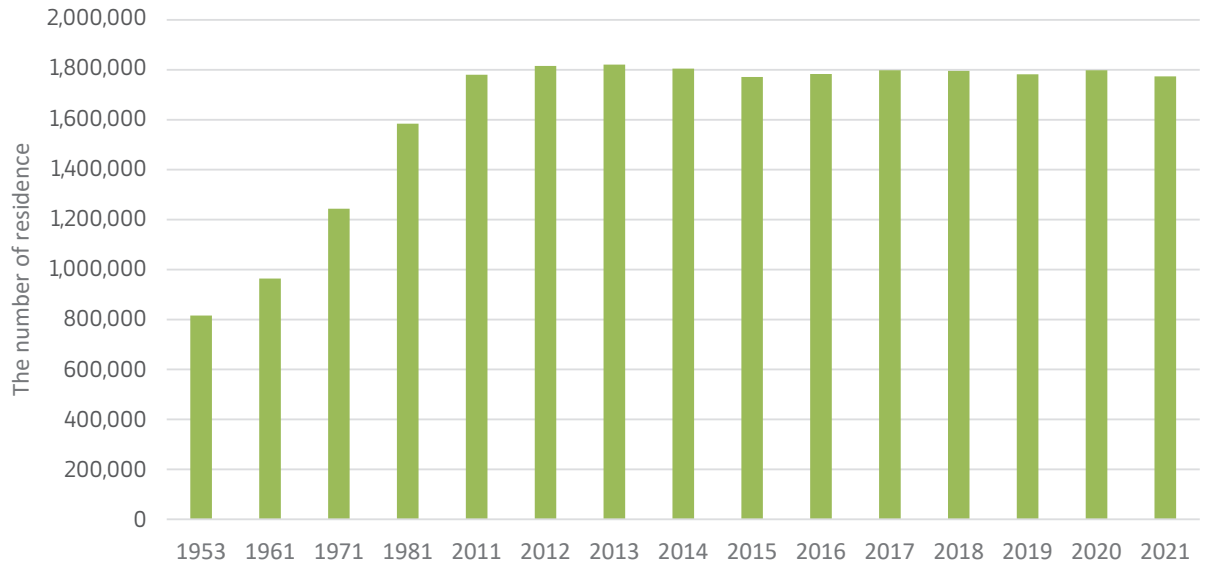


Chart 10. *Population growth according to censuses 1953-2021:* ***Source of data:*** *KSA*

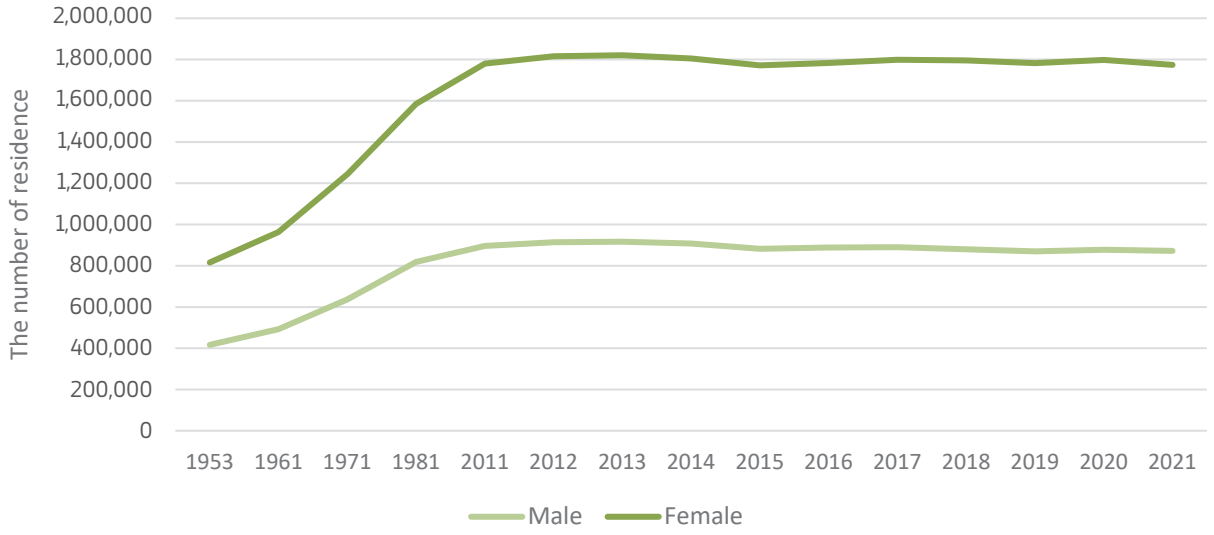


Chart 11. *Gender ratio according to registrations 1953-2021:* ***Source of data:*** *KSA*

2.2 Vital Statistics (Birth, Mortality, and Migrations)

In terms of natural population increase, the population of Kosovo remains one of the populations with the highest increase not only in the region but also wider. This is due to the slow birth rate decrease, and the rapid mortality rate decrease. The natural population rate increase is about 16 ‰ per year. The high rate of natural population increase is the main factor that has affected the population number and density. Also, mortality (deaths) is an important indicator of measuring the country population, where the number of deaths has obviously increased over the years, including deaths from diseases, natural deaths, violent deaths, and deaths from disasters (suicides, murders). The chart no. 12 below shows births and deaths in Kosovo during the years 2002-2021.

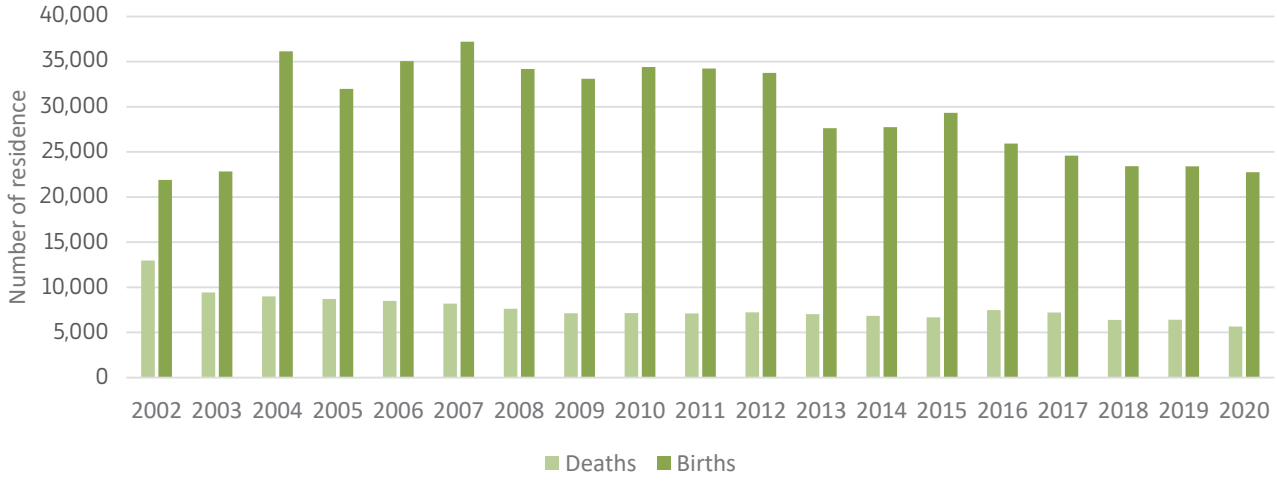


Chart 12. *Births and deaths in Kosovo 2002-2021:* ***Source of data:*** *Yearbook of statistics of Kosovo 2021, KSA*

After the 90s, the population of Kosovo faced the phenomenon of emigration, due to the political situation and circumstances of that time.

The emigration trend in Kosovo had a continuous increase until 2014 when there was a disturbing emigration of about 35,000 emigrants. Emigration for the four-year period 2011 – 2014 was about 80,000 inhabitants, immigration about 19,500 and migration with - 61,474 inhabitants.

According to the population estimate in 2021, the number of Kosovar immigrants is estimated to be a total of 42,728 residents, this is due to family reunification, marriages, employment abroad, permanent migration (mainly to neighbouring countries), etc.

Emigration also affected the population structure, its vitality, which will be evident in the following years since it is estimated that most of the emigration included men, as well as young age groups, mainly 15-49 years old. Also, the balance of international migration in Kosovo for 2021 was -38,606 inhabitants.

Regarding internal or national migration during the year 2021, it is estimated that a significant number of the resident population of Kosovo has changed their place of residence for different reasons, mainly from rural to urban settlements for different reasons such as employment, family reasons (marriages), migrations permanent as well as other socio-economic factors, which is estimated to be a total of 7,353 inhabitants. (Yearbook of statistics of the Republic of Kosovo, 2021)

The table no. 7 and chart no. 13 below show the number of Kosovar citizens who have sought asylum in Europe, and for periods of time, there was a population decrease from 2010, 2011 and 2012.

	Time period												Total
2009/2010	October	November	December	January	February	March	April	May	June	July	August	September	13,935
	1,570	1,375	1,210	885	1,065	1,270	1,110	945	985	960	1,190	1,370	
2010/2011													12,085
	1,545	1,610	1,355	1,000	1,000	1,095	1,020	900	615	545	670	730	
2011/2012													8,700
	695	725	795	670	560	740	505	720	790		755	930	

Table 7. *Number of Kosovar citizens who have sought asylum in European countries:* ***Source of data:*** *KSA*



Chart 13. *Number of Kosovar citizens who have sought asylum in European countries:* ***Source of data:*** *KSA*

2.3 Density of Population

In terms of density, Kosovo ranks among the first countries in Europe, ever since the last census of 2011, showing that 163.18 b/km2 live in Kosovo. The concentration of various economic, health, commercial, cultural, and other functions in the cities of Kosovo has influenced the large population concentration in these centres. The data in the following table and graph are taken from the 2021 population estimate. (Annex 9 Map of Density).

The most densely populated cities are Pristina, Prizren, then Ferizaj, Peja, Gjakova, Mitrovica, Gjilan and Podujeva. The following table no. 8 shows the most densely populated cities in numbers. They are also presented in the chart no. 14.

No.	Municipalities	Population Estimate 2021	No.	Municipalities	Population Estimate 2021
1	Deçan	42,490	20	Prishtinë	219,017
2	Gjakovë	92,827	21	Prizren	193,806
3	Gllogoc	60,721	22	Skenderaj	525,86
4	Gjilan	73,518	23	Shtime	269,54
5	Dragash	33,482	24	Shterrpcë	6,503
6	Istog	41,119	25	Suharekë	56,366
7	Kaçanik	34,667	26	Ferizaj	105,663
8	Klinë	40,175	27	Viti	47,473
9	Fushë Kosovë	39,257	28	Vushtrri	61,014
10	Kamenicë	26,166	29	Zubin Potok	6,605
11	Mitrovicë J.	68,238	30	Zveqan	7,192
12	Mitrovicë V.	11,882	31	Malishevë	55,878
13	Leposaviq	12,881	32	Junik	6,359
14	Lipjan	57,457	33	Mamushë	5,810
15	Novobërdë	7,070	34	Hani I Elezit	10,111
16	Obiliq	17,264	35	Graçanicë	12,158
17	Rahovec	55,391	36	Ranillug	3,698
18	Pejë	97,271	37	Partesh	1,675
19	Podujevë	80,522	38	Kllokot	2,705
Total number of residents				1,773,971	

Table 8. *Population of Kosovo according to KAS municipalities:* ***Source of data:*** *Statistical Yearbook of the Republic of Kosovo 2022, KSA*

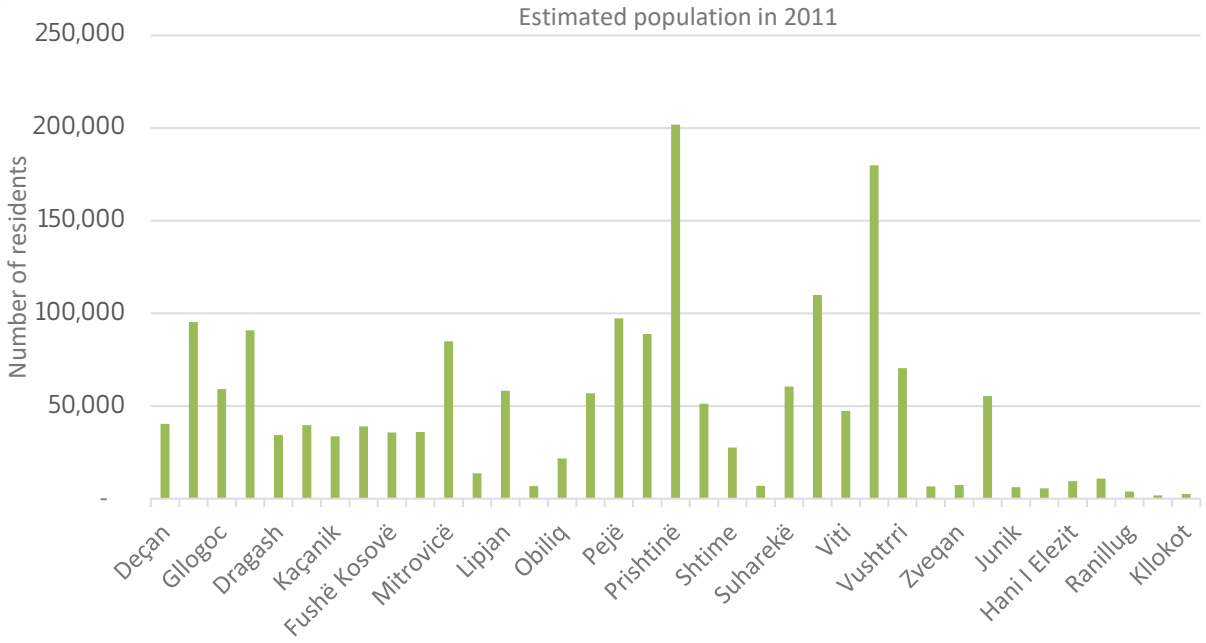


Chart 14. *Population density by municipalities:* ***Source of data:*** *Statistical Yearbook of the Republic of Kosovo 2022, KSA*

The chart no. 15 below shows the comparison of population density from the last census of 2011 and the estimates of population density in 2021, when a slight increase in the cities of Pristina, Prizren and Gjakova can be seen. Other cities have almost the same density trend.

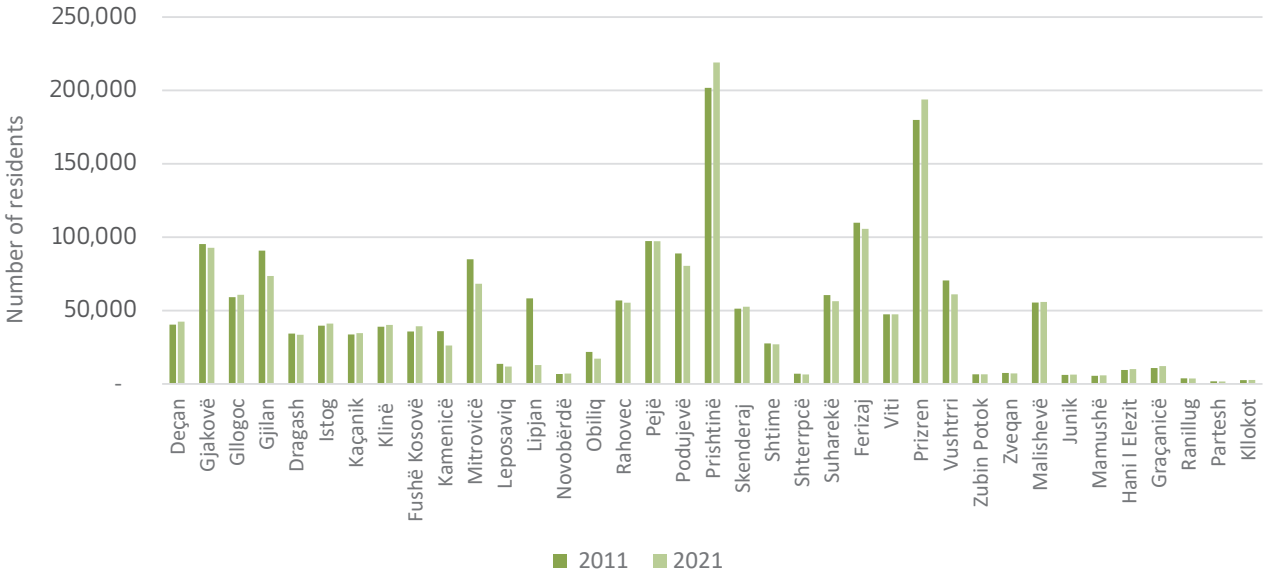


Chart 15. *Comparison of the population density from the last census of 2011 and the estimates of the population density in 2021:* ***Source of data:*** *Statistical yearbook of the Republic of Kosovo 2022, KSA*

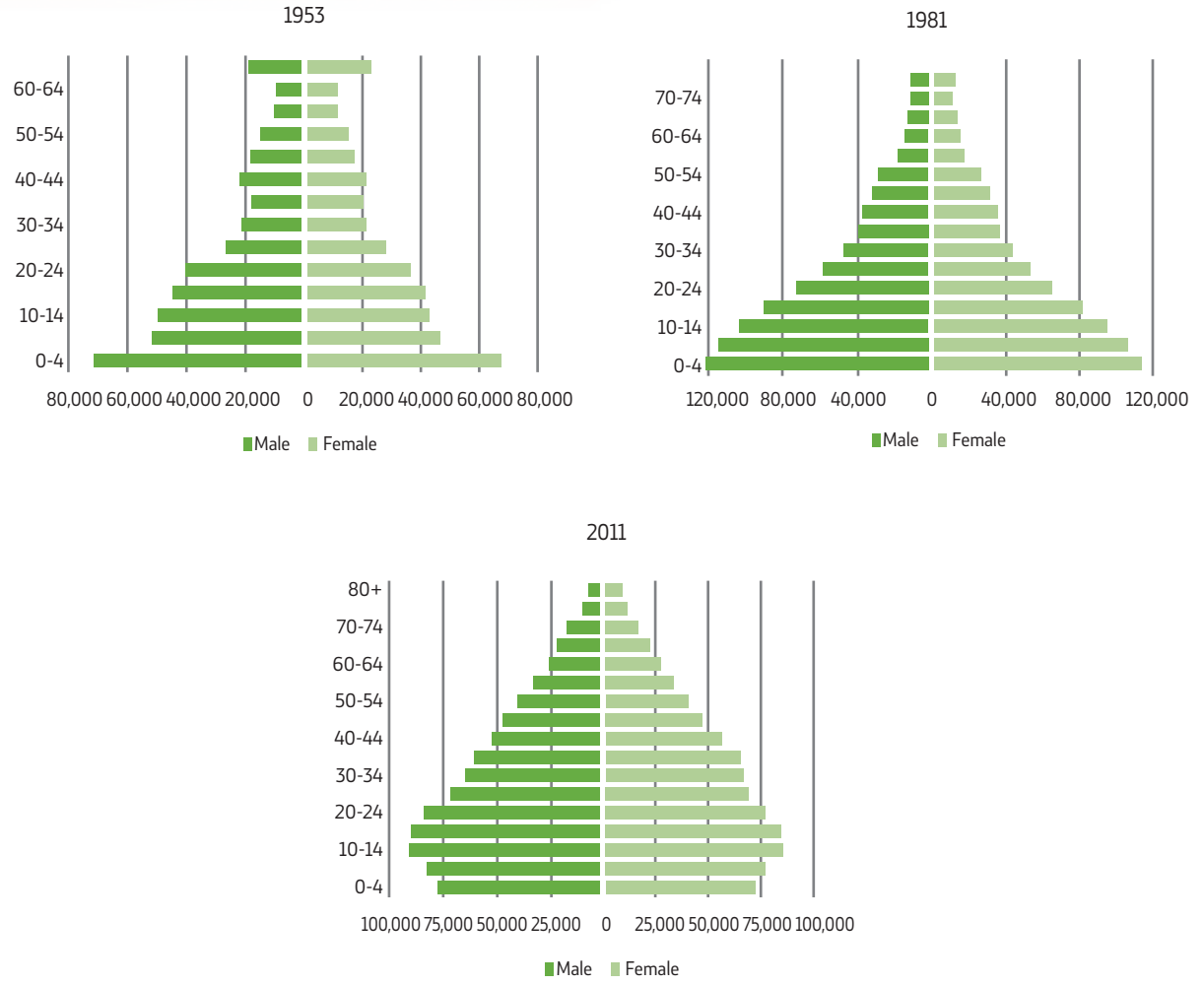


Chart 16. *Population of Kosovo by gender for 1953, 1981, 2011:* ***Source of data:*** *KSA*

The major differences in economic development between regions in Kosovo are the main causes of population movement and migration. A large part of the settlements, especially those that took place in the hilly-mountainous parts, face very low economic development, where most of the population is unemployed and the opportunity to find a job is minimal. In some areas, agriculture is the only possibility of creating income necessary for survival, which is often a hostage to uncertainties and risks accompanying this type of activity.

Population density was also affected by the recent conflict as the destruction of houses mainly took place in villages, families were forced to find shelter elsewhere due to the impossibility to reconstruct their houses, and these families mostly settled in cities.

Due to lack of infrastructure, the large migration from rural to urban areas has also been influenced by the remoteness od educational, health and cultural centres, which presents itself as a dual problem in terms of space use and an urban revolution, which is a current challenge in Kosovo.

The lack of population in rural areas negatively affects landscape fire management due to the fact that: a large part of agricultural land remains uncultivated, potentially increasing the risk of spread of fires; also, uncultivated land in rural areas and near forests in the absence of a community living nearby contributes to this risk, having in mind the presence of burning material (legumes, grassy layers, bushes), constitute some of the main causes for spread of fires in forests and agricultural lands.

Furthermore, the lack of livestock in these areas makes the natural pastures potentially vulnerable to fire.

3. Climate Characteristics, Climate Change Scenarios and Nationally Determined Contributions (NDCs)

Climate is one of the main factors affecting socio-economic development of society as well as the economy and its branches such as: agriculture, industry, energy, etc.

With changing climate conditions, exposure to risks such as droughts, floods and landscape fires will become greater. And they directly and indirectly affect our health. Increases in average annual temperatures create conditions that dramatically elevate the risk and severity of landscape fires.

Rising temperatures and decreasing rainfall, which are two key indicators that can affect the spread of fires in nature and potentially increase the risk to areas most affected by these climate changes, will pose the highest level of danger for landscape fire spread.

3.1 Climate Characteristics

Kosovo lies in the southern part of the middle geographical belt of the northern hemisphere and is subject to Mediterranean-continental and European-continental climatic influences.

The main local factors that influence the climate of Kosovo are relief, water, land, and vegetation. The eastern part of Kosovo, Fushëgropa e Kosova, Llapi, Drenica and Ana-Moravë, is colder than the western part (Dukagjin Plain).

The average annual temperature of Kosovo is 9.5°C, the hottest month is July (19.2°C) and the coldest month is January (-1.3°C). The highest average annual temperature is in Prizren (12°C), while the lowest is in Podujevë (9°C).

All forms of atmospheric precipitation are present in Kosovo. Rainfall in the valleys and snowfall in the high mountain areas are of the greatest importance. In the eastern part, they reach the average annual amount of 600 mm, while in the western part, this amounts to over 700 mm. Snowfall occurs in the lower parts of Kosovo with an average duration of 26 days, while it lasts over 100 days in the mountainous areas.

The average wind speed in Kosovo fluctuates between 1.3 m/s (in Peja) and 2.4 m/s (in Ferizaj). The maximum wind speed reaches 31 m/s and usually occurs in the months of March and April. In many localities in Kosovo, the winds have local names. The annual wind speed is 1.4 m/s.

As for sunshine, based on observations of sunshine from the four metrological stations (Prishtina, Ferizaj, Prizren, Pejë), Kosovo has an average of 2,066 hours of sunshine during the year or an average of 5.7 hours per day. Prishtina has the greatest amount of sunshine with 2,140 hours a year, and Peja the least, with

1,958 hours annually. During the year, July is the month with most sunshine while December sees the least sunshine annually. (National Plan for the Forest Fires Management in Kosovo, 2012)

According to official data from the Hydrometeorological Institute of Kosovo as shown in charts 17 and 18, covering the period 1900-2019, there has been movement of average annual temperatures with an increasing trend, but from 2003 onwards there has been a greater increase in temperatures.

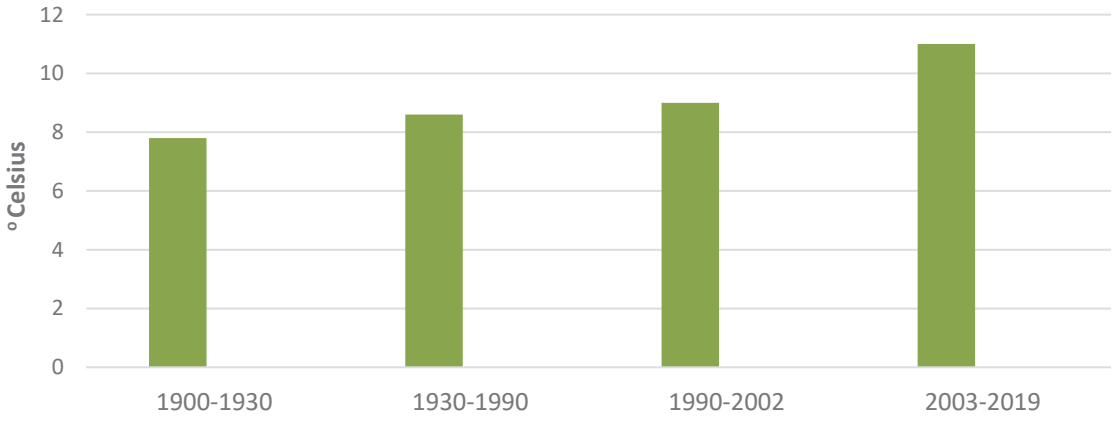


Chart 17. *Air temperatures°Celsius for the period 2009-2019:* ***Source of data:*** *HIK*

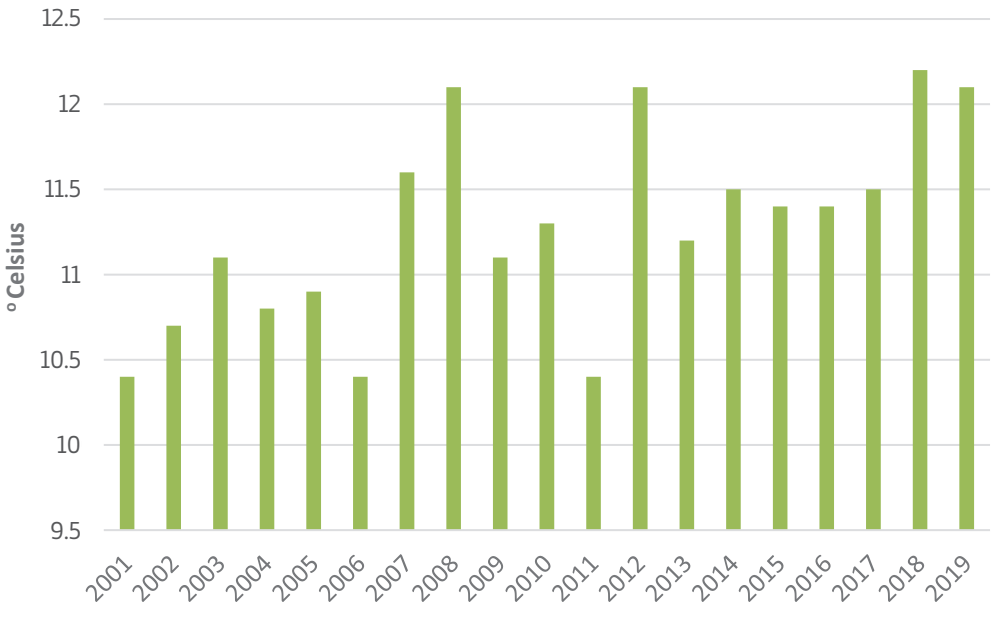


Chart 18. *Average annual air temperature at 0°C 2001-2019:* ***Source of data:*** *HIK*

The table no. 9 and chart 19 below shows data on minimum and maximum temperatures in Kosovo for 3 monitoring stations as well as the average maximum and minimum temperature at country level for the period 2009-2019. Data indicate that there are small regional differences of air temperature in Kosovo, and there is also a trend of temperature change from year to year with an increasing trend. The following data suggest a decrease in temperature from 2009 to 2011 for a maximum of 1.5°C, while the minimum

drop was 1.7°C. There was also an increase of maximum temperature in 2012, when an increase of 1.9°C took place, and a minimum temperature increase of 1.4°C. The period from 2013 to 2017 saw a significant decrease in the max temperature as well as a decrease in the minimal temperature, while 2018 and 2019 faced an increase of 0.4°C. (Hydrometeorological Yearbook, 2020)

LOCATION	Prishtinë		Pejë		Ferizaj		Kosovë	
	Max	Min	Max	Min	Max	Min	Max	Min
2009	17	6	16	7.5	16.5	5.8	16.5	6.5
2010	17.4	6.9	17.2	6.4	16.3	5.7	16.9	6.3
2011	16.9	5	15.1	5	16.2	4.5	16	4.8
2012	17.6	5.7	17.4	6.8	18.6	6	17.9	6.2
2013	17.6	6.3	17.2	8.6	16.7	5.7	17.2	6.9
2014	17.5	6.9	17.3	6.9	16.7	6.3	17.2	6.7
2015	17.9	6.5	16.6	7.6	16.9	5.4	17.1	6.6
2016	17.3	6.2	16.9	6.3	16.9	5.3	17.1	5.9
2017	18.2	5.7	17.1	8.1	16.6	5.2	17.3	6.3
2018	18.4	6.4	17.4	7.8	17.1	6	17.6	6.7
2019	18.8	6.3	17.5	6.8	17.8	5.6	18	6.2

Table 9. *Minimum and maximum annual air temperature (o C) in Kosovo according to meteorological stations (2009-2013):* ***Source of data:*** *HIK*

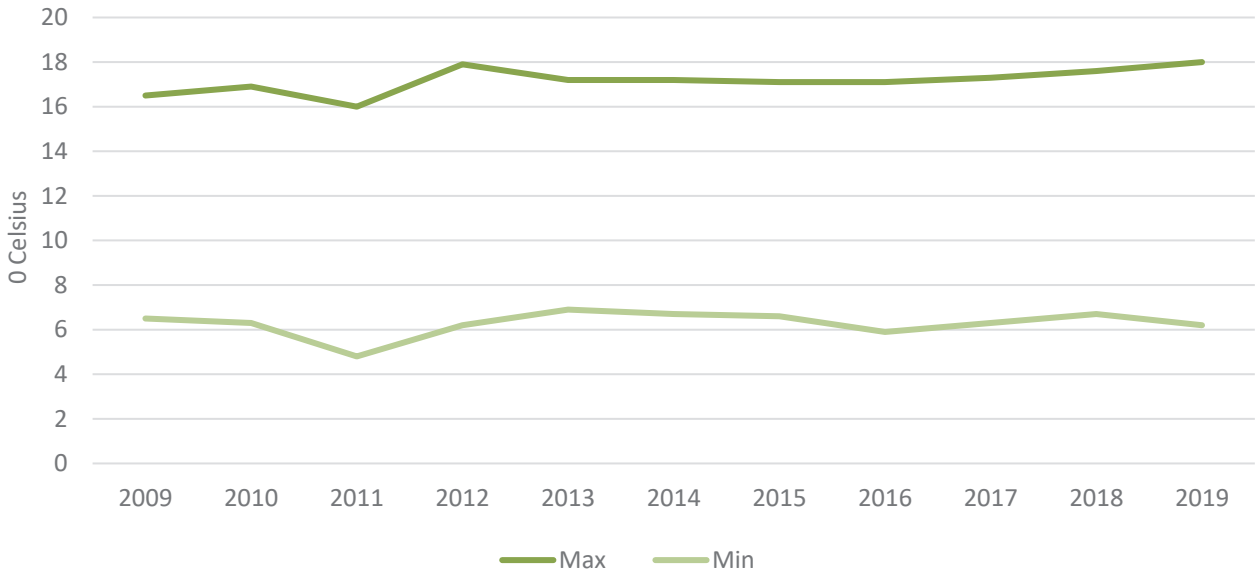


Chart 19. *Annual min and max air temperature (° C) in Kosovo according to measuring stations (2009-2013):* ***Source of data:*** *HIK*

Climate change can affect the intensity and frequency of precipitation and for this purpose the annual amount of precipitation is an important monitoring indicator. The data on the annual amount of precipitation in Kosovo was obtained from the Hydrometeorological Institute of Kosovo and from international institutions. These data show that there has been a change in the amount of precipitation in Kosovo from 1930 until today with a decreasing tendency of precipitation amount in the period from 1990 to 2000 followed by an increase in the amount of precipitation, as shown in the chart no. 20 below.

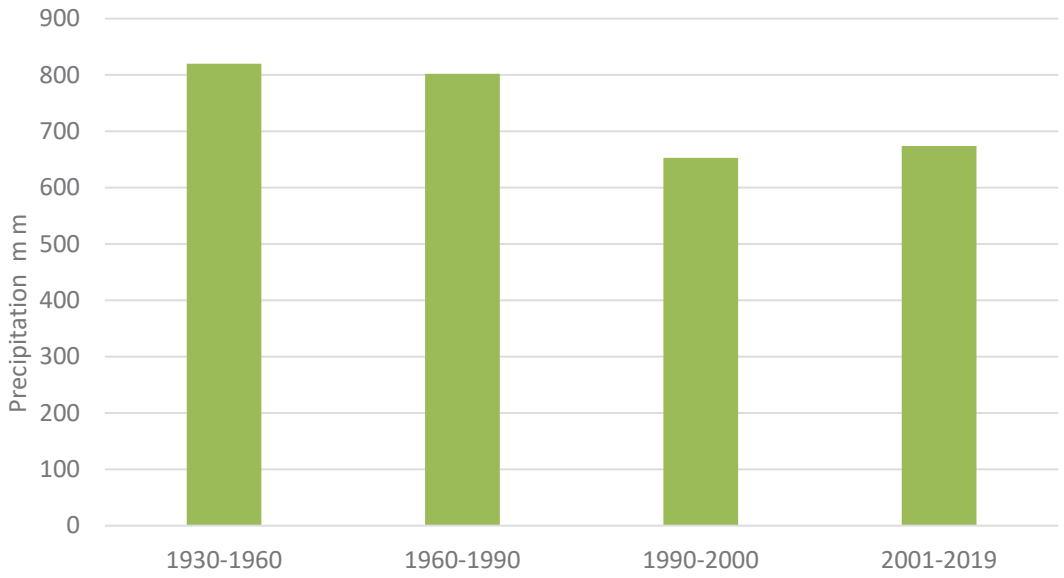


Chart 20. *Precipitation in mm for the period 1930-2019:* ***Source of data:*** *HIK*

According to the data from HIK, the amount of precipitation in Kosovo during the 2018/2019 hydrological year was in deficit, resulting in a decrease of water levels in rivers and reservoirs and causing the country to go into a state of medium dryness and in some locations even in high dryness. Please see the following chart no.21.

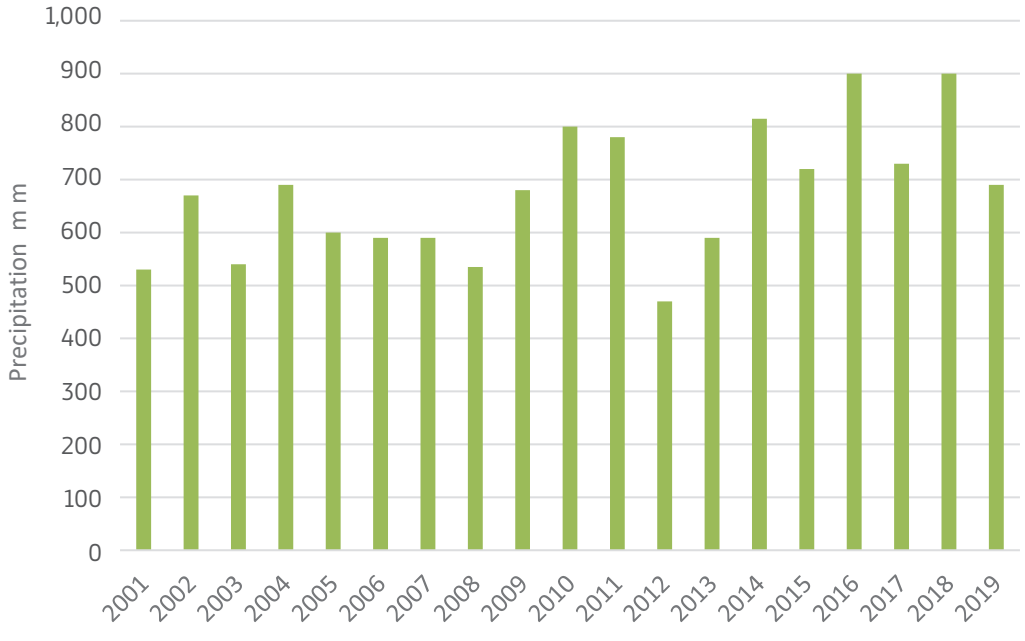


Chart 21. *Annual precipitation in mm for the period 2001 – 2019:* ***Source of data:*** *HIK*

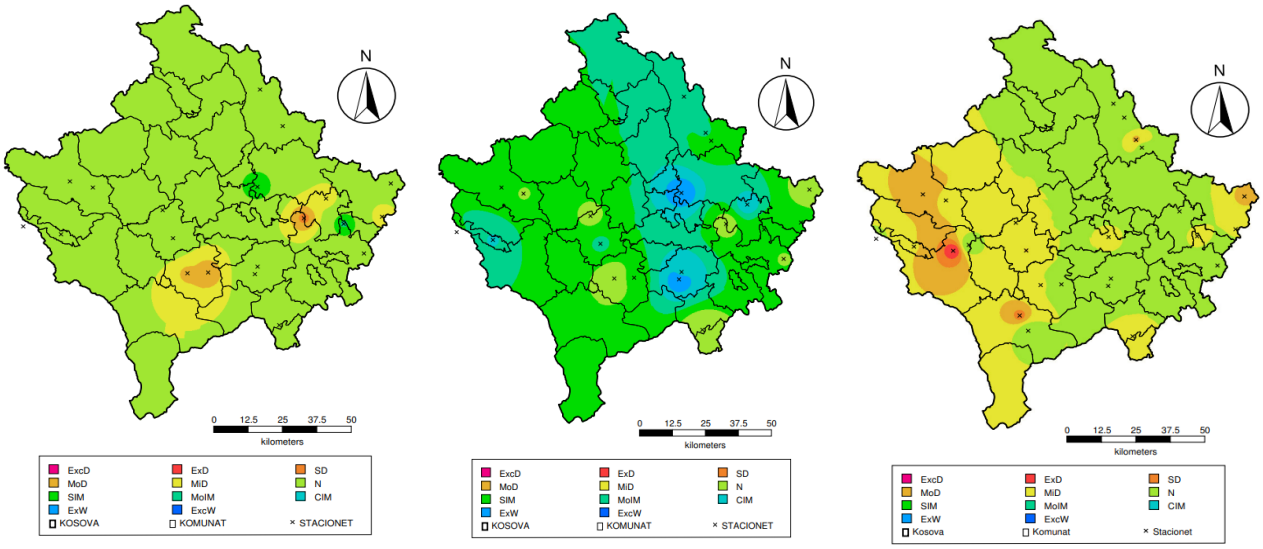
3.2 Standard Precipitation Index (SPI)

The standardised precipitation index (SPI) was recommended at the Sixteenth World Meteorological Congress in June 2011 to all national Meteorological and Hydrological Services around the world as a characterization of meteorological droughts.

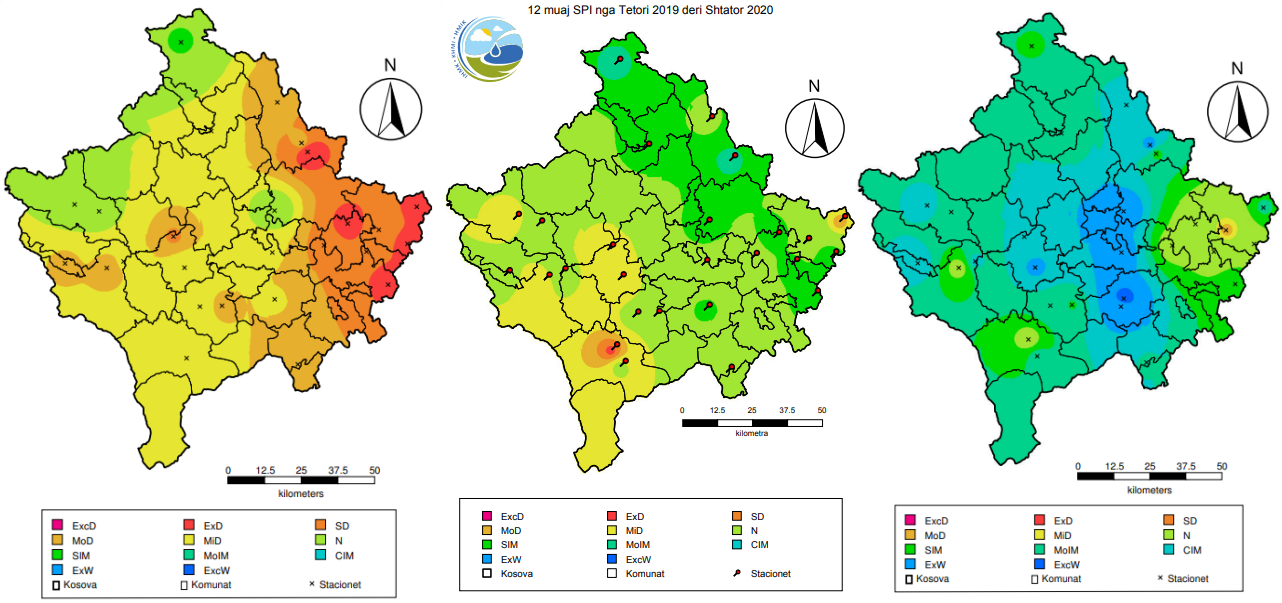
Kosovo is in the drought-prone Balkan region, where major droughts occurred recently in 2008, early 2014 and most recently during the 2018 and 2019 hydrological years. The Kosovo Hydrometeorological Institute has since 2015 set up a drought monitoring program which is based on the standard precipitation index (SPI) calculated from the amount of rain monitored in 26 monitoring locations. Below on the map 1 are presented the standard analysis of the precipitation index for the period 2015 - 2020.

According to official data from HIK, the standard analysis of drought index for 2015 shows that conditions are close to normal in most of Kosovo showing low to moderate drought conditions in the southwest. For 2016, most of Kosovo had low and wetter moisture conditions. The moisture conditions in Kosovo for this period appear to be of low to moderate moisture (over normal).

For 2018, there was low to moderate to above normal humidity increases while 2019 saw an increase in extreme drought and severe drought. (Hydrometeorological Yearbook, 2015-2020)



Map 1: *Standard Analysis of Precipitation Index for 2015, 2016 and 2017:* ***Source of data:*** *HIK*



Map 2: *Standard Analysis of Precipitation Index for 2018, 2019 and 2020:* ***Source of data:*** *HIK*

3.3 Climate change scenarios

Climate change has already become a threat to the environment, human health, and the economy in Kosovo as well. The most significant recorded years were 2000, 2004, 2007 and 2012, when large areas of forests were damaged, causing significant losses.

Geographically, Kosovo lies in the south-eastern part of Europe - the Western Balkans, while in terms of climate, it belongs to the mid-latitude belt of the northern hemisphere. Although Kosovo has a relatively small territory, it stands out with its developed terrain and characteristic topography, consisting on one side of high peripheral mountains which differ according to their extent, exposure, shape and on the other side of mountainous hilly areas and plains as well as valleys traversed by water courses which have influenced the formation of the hydrographic network and the development of the plant world.

The information and data at the level of the Western Balkans are also applicable at the level of Kosovo due to its geographical position and its climate. The negative effects from Climate Change are already apparent, the importance of addressing this challenge should be appreciated and certain institutions and organizations have been making every effort to make these initiatives successful.

Basic information on climate change in the Western Balkans shows an alarming increase in temperature in the entire territory with a temperature increase of 1.2°C, which by the end of the century will warm up by 1.7 - 4.0°C, depending on global efforts to reduce Greenhouse Gas emissions.

According to a Study on Climate Change in the Western Balkan Region, basic information on climate change in the Western Balkan region shows an alarming increase in air temperatures throughout the territory, as shown in Table No. 10 below.

During the near future period of 2016-2035, which is already ongoing, the average annual air temperature increase is expected to reach 0.5-1.0°C, but with constant global GHG increase up to 1.5°C; during the mid-century period (2046-2065), average annual air temperature increase is expected to reach 1.0-2.0°C and up to 2.0-3.0°C with continued increase in global GHGs; during the end-of-century period (2081-2100), the average annual air temperature increase behaviour shows that even if global GHG emissions stabilise, it will continue to increase by an additional 0.5-1.0°C since the mid-century (up to 2.0-3.0°C relative to the current climate), and in case of continued global GHG increases, the air temperature increase will reach 4.0-5.0°C across the region relative to the current climate. (Vuković A., 2018)

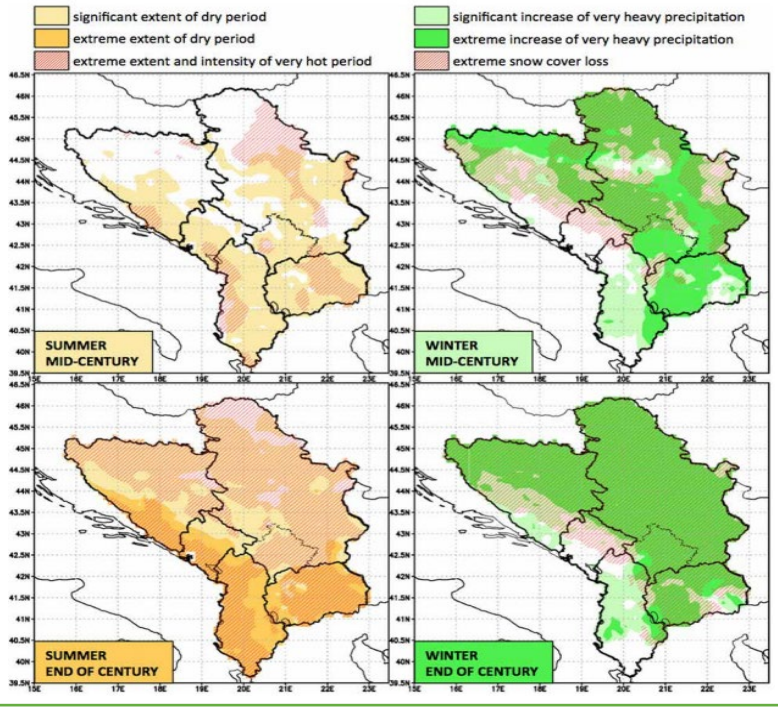
	ΔT (° C)- ANN		ΔTx (° C)- JJA		ΔP (%)-ANN		ΔP (%)-JJA	
	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
Near future	0.5-1	0.5-1.5	1-1.5	1-1.5	-5.0	-5.0	-20,-10	-20,-10
Mid - century	1.5-2	2-3	2-3	2-3	-10, +5	-5,+5	-20,-10	-20,-10
End of century	2-3	4-5	2-3	>5	-5,+5	-20,-10	-30,-10	-30,-20

Table 10. *Change in mean annual air temperature (ΔT-ANN) and mean summer maximum (ΔT-JJA) (°C), and change in mean annual (ΔP-ANN) and mean summer accumulated precipitation (ΔP-JJA) (%) for the periods of near future (2016-2035), the mid-century (2046-2065) and the end of the century (2081-2100) relative to the base period (1986-2005), according to stabilisation (RCP4.5) and growth of continuous (RCP8.5) GHG emissions scenarios (IPCC AR5, 2014). Values marked in red represent an increase in temperature, orange - a decrease and green - an increase in precipitation. The intensity of the colours corresponds to the intensity of the change:* ***Source of data:*** *Study on climate change in the Western Balkans Region, Regional Cooperation Council Secretariat*

The impact of climate change on the climate system and especially on people's livelihoods requires a complex analysis of various climate indices and indicators. The most important impact signals, important for two seasons (summer and winter) that best reflect climate changes in the Western Balkans region are summarized in Map no. 3 and described here. The map of high-risk areas shows as follows.

Summer drying and warming trend, already observed, will continue with increased frequency and duration of heat waves, which threatens the entire Western Balkans region by the end of the century in case of continued global GHG increases, with dry period extension especially in the south and near the coast and coastal areas.

The winter season will see more extreme precipitation as well as more total accumulated precipitation, in temperate, continental climate regions, and an expected alarming snow loss.



Map 3: *Maps of the most prominent risks related to climate change in the Western Balkans region, derived from both scenarios (RCP4.5 and RCP8.5) considering the highest values. Two seasons, summer (left panels) and winter (right panels), are selected for two periods, mid-century (top panels) and end of the century (bottom panels). The maps show the areas with the most pronounced changes compared to the current climate. The presented indicators are of great importance for each season: summer – increase of dry and very hot period, winter – increase of very heavy precipitation and decrease/disappearance of snowpack:* ***Source of data:*** *Study on climate change in the Western Balkans Region, Regional Cooperation Council Secretariat*

The main task in this chapter is to present the future impacts of climate change in accordance with the IPCC (The Intergovernmental Panel on Climate Change) AR5 approach by analysing temperature and precipitation indices and indicators selected according to the highlighted priorities of the region.

The main climate parameters are the average maximum and minimum temperatures and the average accumulated precipitation. Map 2 and Map 3 contain the most important maps of temperature and precipitation changes, while the values obtained for all seasons and all scenarios are presented below.

The climatological periods for the analysis are adopted according to the latest IPCC AR5: 1986-2005 as the base period; 2016-2035 as the near future period; 2046-2065 as the med-century period; and 2081-2100 as the end of the century period. The chosen periods serve the purpose of planning requirements for a variety of activities. For example, agriculture has more use of near-term planning while long-term forecasts are needed for forestry and water resources.

Two Representative Concentration Pathways (RCP) scenarios have been selected for future periods, which find greater use in planning activities, according to current trends: RCP4.5 (stabilisation scenario, with peak GHG emissions around 2040 and then declining) and RCP8.5 (the scenario of continued growth, where GHG concentration continues to increase until the end of the century, known as the business-as-usual scenario).

To adequately prepare for future changes, the RCP4.5 scenario will be considered as the best possible scenario (lower end) and RCP8.5 as the extreme scenario (higher end) in this Study. It should be noted that under current trends, it is more likely to reach the climate disturbance prevailing over the RCP8.5 projections than to stay in the stabilisation scenario, which requires the use of both for proper assessment. A high-resolution multi-model approach was applied using CORDEX model outputs of nine Regional Climate Models (RCMs). This way the most likely future outcome can be assessed, and impact studies, prioritisation and decision-making can be supported by high-confidence data.

During the near future period (2016-2035) under the RCP4.5 scenario: temperature change is significant across the region, with an average increase of 0.8°C and significant seasonal change is expected during the months of June, July, and August while more significant difference in Tn than Tx is expected to be seen in September, October and November; precipitation has no significant change in annual or seasonal values in the region as the average annual change in accumulation is within the range of -5% and +5%, with a decrease in most of the region during June, July, and August. Under the RCP8.5 scenario: temperature changes are significant across the region with regional average increases of 1.0°C reaching the highest growth during June, July, and August.

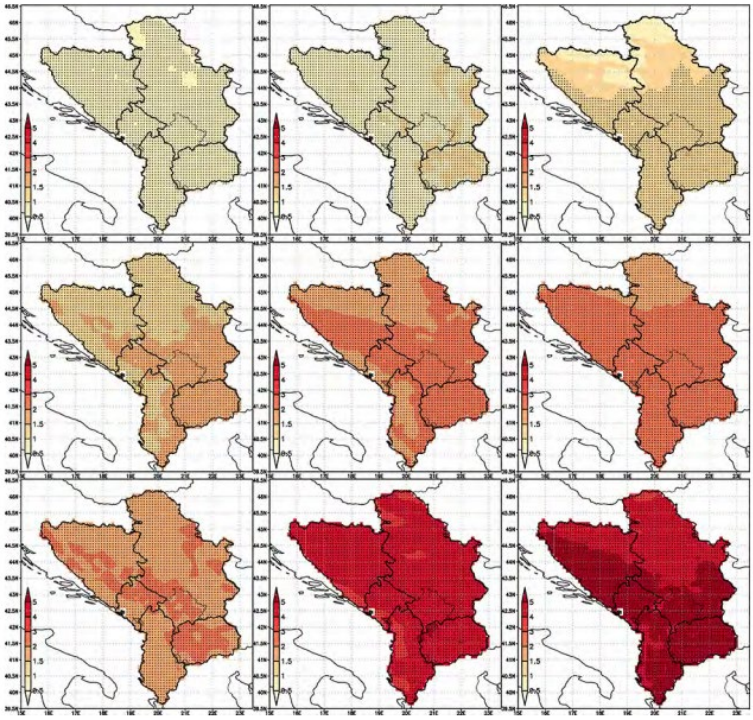
Under the RCP8.5 scenario: Temperature changes are significant throughout the region with regional average increase of 1.0°C, reaching the highest growth during June, July, and August. The change in precipitation shows a similar signal as in the stabilisation scenario, but with different distributions.

During the mid-century period (2046-2065) under the RCP4.5 scenario: the area-averaged increase in temperature is 1.6°C, with the most pronounced change in June, July, and August and in Tx, within values between 2.0°C and 3.0°C in most of the region. The change in rainfall still does not show a statistically significant change in the average annual accumulation, nor in the seasonal values, but the decrease in annual values tends to spread in the region and during June, July, and August when the entire region experiences a decrease.

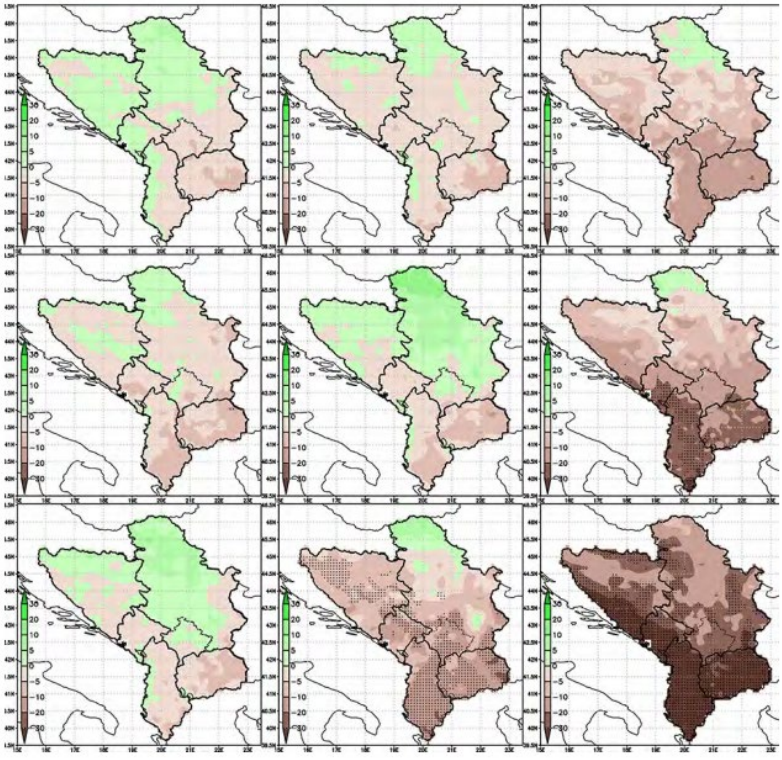
Under the RCP8.5 scenario: the area average temperature change is 2.1°C and the spatial analysis shows over 2.0°C in most of the region during most of the year; the decrease in rainfall changes becomes important during June, July, and August as the values of the decrease are over 20%; other seasons and annual values show no significant difference.

During the last period of the century (2081-2100) under the RCP4.5 scenario: the temperature increase shows stabilisation, and the average increase of the area is 2.0°C, with a more pronounced increase of Tx during June, July, and August and September, October, and November. The change in precipitation is stabilised, as observed in the change in temperature, remaining the same in the southern parts of the region, where the values are over 20%. According to the RCP8.5 scenario, the temperature will not stabilise and will continue to increase significantly, reaching the average value of the area of 4.4°C, with a more pronounced increase during June, July, and August with values above 5.0°C in the largest part in the region.

The decrease in precipitation is significant in annual values due to the significant decrease during June, July, and August season, over 20%, in most of the region and even over 30%, where a significant increase is expected during December, January, and February.



Map 4: *Air Temperature change (° C) for the near future (top row), mid-century (middle row) and end of the century (bottom row) periods with respect to the baseline period for mean annual values according to RCP4.5 (left), to RCP8.5 (middle) and mean June July August maximum temperature according to RCP8.5 (right); statistical significance is marked with dots:* ***Source of data:*** *Study on climate change in the Western Balkans Region, Regional Cooperation Council Secretariat*



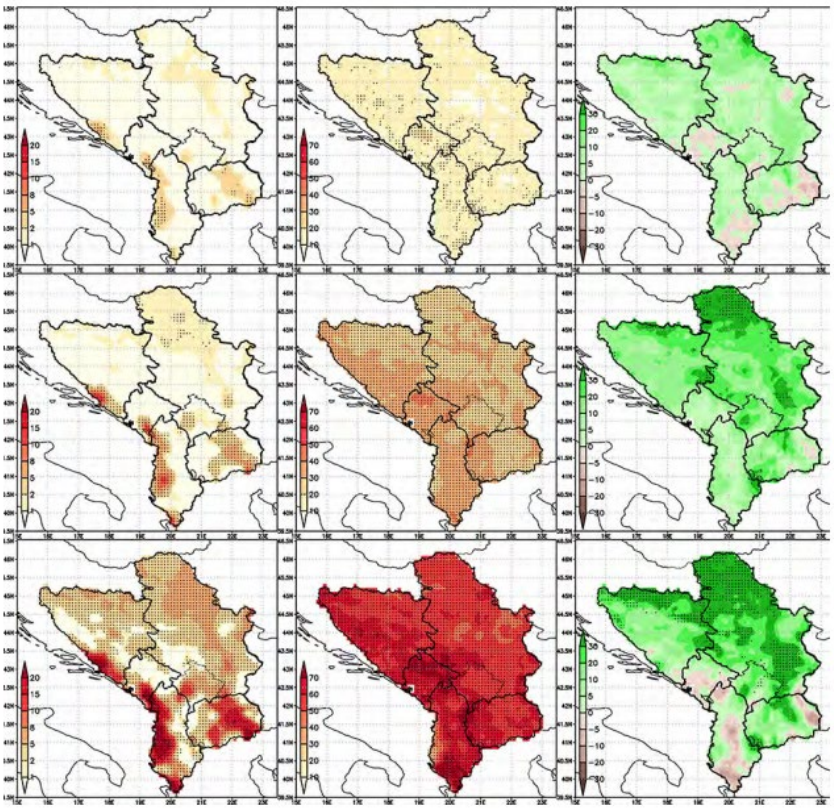
Map 5: *Accumulated precipitation changes (%) for the near future (top row), mid-century (middle row) and end of the century (bottom row) periods with respect to the baseline period for mean annual values according to RCP4.5 (left), to RCP8.5 (middle) and mean June July August according to RCP8.5 (right); statistical significance is marked with dot:* ***Source of data:*** *Study on climate change in the Western Balkans Region, Regional Cooperation Council Secretariat*

According to the Study on Climate Change in the Western Balkan Region, the future change of climate indices and indicators.

During the near future period (2016-2035), the number of days with frost is expected to decrease by 5-10 days under the RCP4.5 scenario, but with a significant decrease (10-20 days) in the southern parts and in the higher altitudes of the region. The number of freezing days tends to decrease by 0-5 days with a possible greater decrease over some mountainous areas in central parts. The number of very hot days will increase by 5-10 days and with significantly higher values in some parts of the region. Average heat wavelength and occurrence frequency are slightly increasing with very likely significant variation in some regions. The change in the number of dry days is not significant, but it is more pronounced during the summer and every year tends to increase by 5-15 days in the region, mainly during June, July, and August.

During the mid-century period (2046-2065) the following changes are expected: a significant decrease in frost days across the region by 10-20 days under RCP4.5 and 20-30 days under RCP8.5 over the largest part of the region; significant reduction of freezing days across the region by 5-10 and 10-20 days under RCP4.5 and RCP8.5 respectively; significant increase of very hot days in the parts of lower altitudes (10-20 days); duration and frequency of heat waves that occur will have increased significantly, reaching heat wave values of +1 every year and with an increased duration of more than 5 days or more; the increase of dry days is 5-10 days in most parts of the territory; the number of days with very heavy rain shows a significant increase in the entire region, even by about 30% during December, January, and February as well as in March, April, and May while a decline is seen in the southern part of the region during June, July, and August.

During the end of the century period (2081-2100) and considering that as per RCP4.5 scenario the end of the century stabilises, more pronounced changes are expected according to the RCP8.5 scenario. Under RCP8.5, the following changes are expected to reduce frost days to over 50 days across the region, making it a rare event, and ice days will appear only in mountainous regions but with a decrease of more than 25 days. The most pronounced increase is in hot days lasting over 35 days. The frequency of heat waves is increasing up to 2 days across the region with extended duration of 5-10 days; the increase in days with very heavy rainfall is significant, reaching values between 5-10 days in some northern parts of the region and in the south.



Map 6: *Change in average maximum length of very hot and dry spells (in days, left), length of growing season (in days, middle) and change in total accumulated precipitation in days with very heavy precipitation (in %, right) during the near future (top panels), mid-century (middle panels), and end-of-century (bottom panels) periods; all results presented are according to RCP8.5, while RCP4.5 results are presented in the appendix:* ***Source of data:*** *Study on climate change in the Western Balkans Region, Regional Cooperation Council Secretariat*

3.4 Nationally Determined Contributions (NDCs)

Although Kosovo is not yet part of the Paris Conference and has not signed the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, it has the responsibility to respond to the requirements as one of the signatories of the Community Treaty of Energy, which also sets clear targets for climate change and for reducing the use of coal-fired power, while requiring an increase in the proportion of renewable energies.

Since Kosovo is not part of the UNFCCC, in 2021, it has started a discussion with international stakeholders to prepare a voluntary NDC and with the support of Japan, Kosovo has re-established the Council for Climate Change, initiating the process of developing a voluntary NDC, which will be based on Kosovo's objective to reduce greenhouse gas emissions by 8.95 Mt CO2 by 2030. This is a reduction of approximately 16.3% compared to 2016 levels.

Although Kosovo's contribution to global greenhouse gas emissions is almost negligible, its commitment to join global efforts to reduce greenhouse gas emissions has been evident. Undoubtedly, one of the most important activities in this regard is the preparation of the national inventory of greenhouse gases, as the main instrument to identify the main sources of emissions to implement measures for their reduction.

Kosovo is planning to increase the share of renewable energy in the energy mix to 32% by 2030. GHG greenhouse gas emissions due to human activities is one of the main causes of these changes.

Annual emissions of greenhouse gases in Kosovo for 2019 are estimated at 9613 Gg (Giga grams) CO2 eq, (equivalent) or about 9.6 million tons of CO2 eq. The main source of greenhouse gas emissions is the energy sector with a participation of 86% of the total emissions. The second sector is that of agriculture, forestry, and land use with 8%. The waste sector represents 5% of the total emissions, while the sector of industrial processes and product use accounts for about 1%.

The trend of total GHG emissions in Kosovo during the period 2014-2019 marks a non-linear trend. The year 2014 has the lowest emissions (8,811 Gg CO2 eq.), while the year 2016 has the highest emissions (10,641 Gg CO2). The year 2019 with 9995 Gg CO2 eq., marks a trend of increased emissions compared to the previous year 2018 (9852 Gg CO2 eq.) The total greenhouse gas emissions in Kosovo are highly dependent on the amount of energy produced from coal which is the main source of greenhouse gas emissions in our country.

The main opportunities for reducing emissions from this sector are increasing the use of renewable energy sources: solar energy, wind energy, water, reducing the use of coal for energy production, implementing measures to reduce fuel consumption in the household sector, the implementation of EURO standards for car registration, use of public transport and promotion of sustainable transport with less motor traffic, cycling, etc.

The sector of agriculture, forestry and land use belongs to the third (3) category of greenhouse gas emissions according to the IPCC and consists of three other sub-sectors (categories). The first sector, 3A, includes emissions from livestock. This mainly includes emissions from enteric fermentation (the digestive process of animals) and emissions from animal manure management. About 545 Gg CO2 eq comes from this sub-sector per year or 77% of the total emissions. The second sub-sector, 3B, deals with the accumulation of CO2 from forest lands and other lands as well as the emissions resulting from the conversion of land from one category to another. It is the only sector that reduced (accumulated) CO2 emissions by about -39 Gg CO2 calculated during 2019. (Inventory of Greenhouse Gas Emissions in Kosovo, 2014-2019,)

Based on the Forestry Development Strategy, the average volume of dry wood is 3.6 m^3 per hectare, which is much lower than the average of European countries. This can be explained by the intensive collection of wood as heating material from the forests of Kosovo. Despite this, the large amount of forest waste caused by legal and illegal cutting and damage to forests by abiotic factors remains unused in forests, which causes the production of large amounts of Carbon (C), diseases and insects, as well as forest fires. The removal of forest residues and their use will influence the production of renewable energy and the gradual removal of fossil fuels and decarbonization of the economy in Kosovo, as well as fulfilment of the EU Commission's goal of carbon removal, but it must be used sustainably. Also, the large percentage of forest cover in Kosovo affects the absorption of large amounts of carbon (C) and the release of oxygen (O2) that affect the preventive measures and mitigation of the impacts of climate change and the greenhouse effect (GHG). A highly functional and sustainable management of natural resources will improve our living conditions and maintain a healthy environment, create jobs, and ensure sustainable energy sources.

The main opportunities for reducing emissions from this sector are the reduction of burnt surfaces according to land categories. (Strategy for the Development of Forestry in Kosovo 2022-2030, 2021)

Even though Kosovo is not part of the UNFCCC, it has pledged to fulfil all the obligations arising from international documents related to the environment, climate change, energy, and natural resource management.

The strategic documents of the sectoral policies and the drafted legislation take into consideration the international documents that have to do with this issue because Kosovo intends to be part of regional and international integrations.

The basic scenario of the climate forecasts foresees a rise in temperature and decrease in rainfall, two key indicators that can affect the spread of wildfires and potentially increase the risk that the areas most affected by these climate changes will be at the highest level of danger from the spread of fires.

4. Existing Landscape Fire Management System

4.1 Major Stakeholders Within the Existing System

The organization of all participating institutions at the level of whole Kosovo, including ministries, agencies, local communities and civil society organisations and NGOs, etc., which (directly or indirectly) impact the creation or conduction of measures of fire prevention, preparedness, suppression and post-fire management activities on the landscape level, all together intersect to build a sustainable fire protection system referred to as the Landscape Fire Management System.

Name of Institution	Acronyms
Association of Private Forest Owners of Kosovo	APFOK
Associations of Alpinists and the Environment	APE
Central Directorate of Forestry and Hunting Inspection	CDFHI
Cadastral Agency of Kosovo	CAK
Directorate for Research, Seedling Production and Design	DRSPD
Directorate for Agriculture - municipalities	DA - M
Directorate for the Administration of the National Park "Bjeshkët e Nemuna"	DANKBN
Directorate for the Administration of the National Park "Malet e Sharrit"	DANKMS
Emergency Management Agency	EMA
Energy Corporation of Kosovo	ECK
Federation of Hunters of Kosovo	FHK
Forestry Department	FD
Firefighting Units - Municipality / EMA	FU – M/EMA
Hydrometeorological Institute of Kosovo	HIK
Kosovo Police	KP
Kosovo Defence Ministry	KDM
Kosovo Forestry Agency	KFA
Kosovo Environmental, Protection Agency	KEPA
Kosovo Statistics Agency	KAS
Local communities of villages	LCV
Ministry of Agriculture Forestry and Rural Development	MAFRD
Ministry of Internal Affairs	
Ministry of Environmental, Spatial Planning and Infrastructure	MESPI
Ministry of Education, Science and Technology	MEST
Media	MEDIA
Regional Waste Company	RWC
Regional Water Company	RWC
Regional Coordinating Directorate of KFA	RCD-KFA
University of Prishtina – Faculty of Mathematical and Natural Sciences	UP-FMNS

Ministry of Internal Affairs

Mission of the Ministry of Internal Affairs is to take care of the rule of law, public safety in the entire territory of Kosovo. As well as in the advancement and modernization of the entire public administration for to serve all citizens, businesses, and the institutions themselves with efficiency, transparency, professionalism, and impartiality. This ministry has an important role in the fire management system in Kosovo through several civil protection mechanisms such as the Emergency Management Agency where the responsibilities and duties are listed below.

Emergency Management Agency - It is an independent agency within the Ministry of Internal Affairs (MIA). It is responsible for the development and supervision of the implementation of emergency management policies, the coordination of disaster/emergency response operations, support of municipalities, communities, the private sector and individuals in the event of disasters, administration and support of the fire and rescue service, processing of Draft national emergency response plans in cooperation with other relevant institutions, providing assistance in terms of setting up and equipping emergency preparedness structures at the local and central level, developing and organizing training and exercises in the field of emergency management, etc.

There are five departments within the Emergency Management Agency:

- Prevention Department (PD)
- Department of Emergency Preparedness (DEP)
- Department of Operations (DO)
- Fire and Rescue Department (FRD)
- Department of Finance and General Services (DFGS)

Emergency Management Agency (EMA) is responsible for the necessary additions and changes, drafting and approval of the Risk Assessment Document for Protection from Natural Disasters and Other Disasters (FNFT), the Integrated Emergency System (SIME), the National Plan of Reaction (PRE), etc. Through training programs and plans in coordination with AKSP, EMA organizes, prepares, and conducts basic and professional training in the field of emergency management and is responsible for organising the monitoring, notification, and early warning system as well as communication systems.

Department of Prevention (DP) - its primary task is to identify, prevent and reduce permanent risks to people, material goods and the environment, assess weaknesses, undertake certain measures for protection from natural disasters and other disasters, defined by law, draft technical regulations and measures for reducing disasters as well as to establish strategies for managing the risks of natural disasters and other disasters (FNFT);

Department of Emergency Preparedness (DEP) – its scope includes, among other things, the direction of planning policies for emergency preparedness, construction and implementation of the general preparedness programme against all kinds of risks, strengthening of the capacities of central and local level institutions and the private sector in the field of defence, response and recovery from disasters, drafting of national preparedness and response plans for the protection of infrastructure and vital resources, continuity of governance in coordination with the relevant institutions, as well as development, management and coordination of all programs for exercises and increase of capacities in the field of emergency management;

Department of Operations (DO) is responsible for coordinating emergency response activities, coordinating the effective and efficient delivery of immediate emergency assistance to persons and communities affected and overwhelmed by natural and other disasters, coordinating response and recovery operations short-term, collection, analysis and exchange of information, coordination of emergencies and establishment of cooperation with the relevant structures, at the highest possible level, and coordinate all emergency management and response operations in the country, through the Emergency Operations

Centres (EOC112), which is organized at regional level, such as: Pristina, Mitrovica, North Mitrovica, Pejë, Prizren and Gjilan (EOC112 in Ferizaj in the process of establishment).

The duties and responsibilities of the Emergency Operations Centre 112 is to serve as the main structure of the EMA for collection, analysis, distribution and exchange of information, coordination of emergencies and raising coordination at the highest possible level with central, regional, local and sectoral partners while exercising all leadership responsibilities for coordination of actions between response and emergency support structures, providing support to authorities for emergency management and implementing actions according to certain priorities, providing a real overview of the situation, monitoring the situation, coordinating emergency operations and response activities, recommending specific protective measures in the face of threats and risks that threaten the country, ensuring communication links at the central and local level, ensuring the application of standard operating procedures (SOPs) and risk management principles for all activities coordinator of EOC-112.

Department of Fire and Rescue establishes firefighting and rescue programmes and standards at the country level, supports and coordinates firefighting and rescue operations outside the municipal jurisdiction with the aim of professional support from the central level for the challenges faced by the professional firefighting community, industrial and voluntary, develops and implements fire protection and public awareness programmes, builds partnerships with the public and private sector, helps professional development, operational capacity and training to increase the readiness of the firefighting community and emergency response of the central sector structures, the local and industry sector.

The Professional Fire and Rescue Units (PFRUs), which are staff of the ministry and are managed by EMA in cooperation and coordination at local level. The organisational structure of the PFRU is determined by a sub-legal act sponsored by EMA with consent at local level and approved by the Government, while as a result of the Kosovo-Serbia agreements under the arbitrariness of the EU, the organization of the PFRU has duality in terms of legal responsibility, with the PFRU at the central level located in 4 municipalities of Kosovo: North Mitrovica, Leposavič, Zubin Potok and Zveqan. Their number is 69 and are budgeted from the EMA budget line while for other municipalities, the budget comes from local lines (in the respective municipalities).

Department for Finance and General Services (FGS) manages and maintains information on the human resources of EMA, assists management in internal organization, provides administrative, logistical, medical and information technology services support; ensures the implementation of procedures for the selection and employment of qualified personnel, in accordance with the legislation in force, coordinates the preparation, implementation, reporting and evaluation of the budget of EMA and also maintains IT equipment and provides IT services.

Voluntary Firefighting and Rescue Associations, according to Law no. 04/L-049 on Firefighting and Rescue, municipalities are responsible for encouraging the establishment of one or more voluntary firefighting and rescue associations, as well as implementing the structure, organization, classification and manner of the operation of volunteer firefighting and rescue association units in accordance with the agency's requirements and determines the tasks and number of volunteer firefighting staff, tools and equipment necessary for the volunteer firefighting and rescue association units, in accordance with the municipal assessment of risk and the central fire protection plan by taking measures for the establishment of voluntary firefighting units if they lack a sufficient number of firefighting and rescue units in their territory.

The means for financing voluntary firefighting and rescue associations are provided by donations and the municipality's budget, in cases where their commitment is required, while the supply of firefighting tools and equipment for voluntary firefighting associations is provided by the municipality's budget in accordance with the plan and special measures for fire protection when the municipality establishes them.

The Kosovo Red Cross carries out humanitarian activities and promotes knowledge about the Red Cross and Red Crescent Movement, health education of the population, social protection, respect for international humanitarian law, protection of human rights and humanitarian values. The Kosovo Red Cross, with

special activities, engages in situations of natural, ecological, and other large-scale disasters, epidemics, and armed conflicts.

The Ministry of Defence is one of the ministries of Kosovo which deals with the management of the Armed Forces of Kosovo, its assets, and missions abroad. The Ministry is competent for the drafting of strategic defence documents; drafting of draft laws and by-laws within the scope of the Ministry of Defence and the KSF; development, coordination and drafting of policies for integration and membership in international defence and security structures, in cooperation with relevant institutions of Kosovo; drafting of policies for the development, modernisation and standardisation of the KSF; drafting policies for education and training for all personnel of the Ministry of Defence and the KSF; drafting cooperation programmes with state institutions in matters of defence and security; drafting of policies, systems, plans and strategies for the management of human resources of military and civilian personnel in the Ministry of Defence and the KSF; planning, programming, budgeting and execution of projects for the needs of protection; cooperation with competent institutions for judicial representation in defence of the interests of the Ministry of Defence and the KSF; supervision and management of all intelligence activities and classified information in the field of defence and security; development of policies, plans and programmes in the field of civil military cooperation; supervision and inspection of the KSF; management of infrastructure and equipment, which have been allocated; development of policies, plans and programmes for logistics and infrastructure; development of policies, plans and programmes for management, maintenance and organisation of communication systems; development and monitoring of medical policies, plans and programmes and health care for the personnel of the Ministry of Defence and the KSF; development of policies, plans and programmes related to public relations and protocol; drafting of policies for human rights, gender equality and community issues, within the Ministry of Defence and the Kosovo Security Force.

The Ministry of Agriculture, Forestry and Rural Development is the highest institution for the administration and management of forests in Kosovo. MAFRD administers forests through the Department of Forestry and the Forestry Agency of Kosovo.

The Department of Forestry operates within the MAFRD, has a regulatory function and is responsible for: drafting of legislation, development of national policies and strategies for forestry, wild animals, hunting and ecotourism, drafting of education and training policies for forestry, coordination of international cooperation in the forestry sector, licensing of professional and economic entities in the forestry sector. DF is divided into three divisions: Division for forestry policy, education and research, Division for management and forest infrastructure and Division for forest economy, protected areas, and hunting.

The Forestry Agency of Kosovo operates within the framework of the MAFRD. It is responsible for the execution of functions and thus manages forests and state forest lands, including pastures and forests in national parks as well as assets and other supporting infrastructure, administers, manages and takes care of the assets of former enterprises, provides professional technical services for privately owned forests, provides professional, technical, administrative and informational services for all forests, preserves and protects state forests, cultivation and protection of wild animals. The preservation of state forests and forest lands, including private ones, is under the responsibility of KFA, which is obliged to organise the Service of Forest Protection, with the responsibilities for supervision and protection of forests from pests, diseases, and other causes that damage state forests, protection, prevention, detection and coordination in extinguishing forest fires, prevention, detection, prohibition, and monitoring of illegal activities in forests and state forest lands, including illegal hunting.

The Forestry Inspection operates within the MAFRD and has supervisory and inspection responsibilities in the field of forestry. It also inspects the implementation of forest legislation by all natural and legal persons throughout the territory of Kosovo, supervises all activities in forestry, including the implementation of forest and hunting management plans, controls work facilities, transport vehicles, tools and all places where the cutting, storage, processing and circulation of wood products as well as hunting activities are carried out, controls the marking, marking and origin documentation of forest products, seizes the wood mass, the tools with which the cutting of the wood is done, motor vehicles and transport vehicles with which the offense is committed, supervises the implementation of measures for the protection of forests

from fire and other damage as well as for their restoration, and orders and supervises the finalization of the works defined by the forest management plan for state forests and works defined in the permit for cutting private forests.

The Institute of Forestry operates within the framework of the Ministry of Education and Culture and carries out research, educational activities and advancement of human resources, and the design of plans, projects, programmes and studies in the field of forestry and hunting. They carry out professional monitoring of forest damage, including the monitoring of the Programme for International cooperation, orientation, reporting and diagnosis of activities for forest protection, determination of professional standards for carrying out work in forests, research on diseases and pests in forests and the proposal of taking measures, issuance of certificates for forest seeds and seedlings, phytosanitary inspections of seeds, seedlings and forests, management of forest seed piles and production of forest seeds, standardisation and production of forest seedlings and conservation of genetic resources of forest species.

The Department of Agricultural Policies and Markets, which designs and implements agricultural policies and legislation in the field of agriculture, prepares the programme for Indirect Payments (subsidies); also designs and implements the procedures for plant and livestock production as well as the quality standards of agricultural products, in accordance with the relevant legislation. It offers support in the promotion of local products, through organisation of field days, fairs as well as other traditional manifestations, licensing of subjects for agricultural inputs.

Department of Rural Development Policies – The main mandate of this department is drafting of rural development policies as well as the preparation and implementation of the programme, including selection of measures and their publicity, coordination, evaluation, and monitoring.

It also drafts national legislation in the field of rural development, organises meetings and public discussions with social and economic partners, NGOs representing the rural population, farmers' associations, other ministries related to the rural development sector.

The Ministry of Environment, Spatial Planning and Infrastructure has the following institutions within it:

The Kosovo Environmental Protection Agency (KEPA) is a government institution that is committed to maintaining the quality of air, water, soil and biodiversity through integrated environmental monitoring, an efficient environmental information system and continuous reporting on the state of the environment, to promote the use of renewable energy sources and the sustainable use of natural resources to ensure a healthy environment for current and future generations in harmony with the progress of economic and social developments.

The Kosovo Institute for Nature Protection's tasks and responsibilities are collecting and processing the collected notes related to nature protection; designing a long-term database for types of plants, fungi and animals, types of settlements, ecosystems, and landscapes; monitoring the condition of biological and landscape diversity and proposes measures for their protection. It prepares the professional basis for the protection and preservation of parts of nature, namely the values of nature; designs the professional basis for determining the conditions for protection of nature, management of protected areas and use of natural resources; performs statistical analyses, unification of results and drawing up reports on the state and protection of nature; participates in the implementation of international acts pertaining to the protection of nature.

The Cadastral Agency of Kosovo CAK

This is the central authority for the maintenance of the cadastral database, for maintenance of property registers, for cartography and GIS, for the unified address system, for the national spatial information infrastructure and for administration of the Information Technology Infrastructure (IT), the first and second data centre, respectively. As a central level institution, CAK has powers to issue guidelines and work frameworks related to all cadastral activities. It is responsible for training and certification of officials in Municipal Cadastral Offices for operation in the Cadastral Information System for Land in Kosovo (SIKTK)

and for the training, certification and licensing of surveyors and surveyor companies for provision of cadastral services.

Hydrometeorological Institute of Kosovo – HIK Its main tasks and responsibilities are the construction and maintenance of the basic network of hydrological and meteorological stations and organisation of measurements and observations of elements and phenomena including hydrological, meteorological, biometeorological and hydrobiological phenomena. It is also involved in the study, processing, storage, exchange, and publication of hydrometeorological data and results and research results in the monitoring network; organisation, maintenance, and development of the calculation system, monitoring database and forecasting the performance of hydrometeorological works; conducting measurements, meteorological observations with radar as well as conducting systematic hydrometeorological measurements and observations of river flows under normal circumstances and in cases of disturbances, of the state of groundwater in the saturated zone and in direct contact with the ground and subsoil; systematic monitoring and ascertainment of air pollution, atmospheric precipitation, surface water and underground water of the first source and soil, study and forecasting of hydrometeorological conditions of environmental pollution as well as warning of appearance of elementary hydrometeorological disasters; providing reports, forecasts, and warnings to the competent central and local bodies on hydrometeorological phenomena and the study of weather, climate, surface, and underground waters as well as their impact on the biosphere; research of changes in weather, climate, water caused by artificial means as well as the study of methods for artificial actions on weather, climate, and waters.

Directorate for the Administration of the National Park "Bjeshkët e Nemuna"

This directorate is within the Ministry of Environment, Spatial Planning, and Infrastructure and under the management of the Environmental Protection Agency of Kosovo. DANK "Bjeshket e Nemuna" has two sectors: the Sector for Professional and Administrative Services and the Sector for Supervision and Control. A total of 36 workers are employed.

Directorate for the Administration of the "Sharri" National Park

This directorate is within the Ministry of Environment, Spatial Planning, and Infrastructure and under the management of the Environmental Protection Agency of Kosovo. DANK "Sharri" National Park has two sectors: the Sector for Professional and Administrative Services, and the Sector for Supervision and Control.

Directorate for the Administration of Natural Monuments of Special Importance

This directorate is within the Ministry of Environment, Spatial Planning, and Infrastructure and under the management of the Environmental Protection Agency of Kosovo and it is comprised of two sectors, the Sector for the Most Important Natural Monument "Gadime Cave" and the Sector for the Most Important Natural Monument "Mirusha Waterfalls". It administers the Most Important Natural Monuments "Gadime Cave" and "Mirusha Waterfalls" and other similar monuments; draws up the professional rationale and defines the conditions for the Natural Monuments of Special Importance "Gadima Cave" and "Mirusha

Waterfalls"; coordinates activities and cooperates with local, governmental and non-governmental institutions in the protection and development of the natural values of these Natural Monuments of Special Importance, monitors the activities in the protected area and the space around the Natural Monuments of Special Importance," promotes the natural and touristic values of the Natural Monuments of Special Importance and creates good conditions for visitors to the Natural Monuments of Special Importance and participates in the implementation of international acts pertaining to the protection of nature.

University of Prishtina - Faculty of Mathematical Sciences

The University of Pristina is an institution of higher education, globally recognized for professionalism, integrity, quality teaching and research. In harmony with the needs of the economy and the market, it establishes and maintains quality standards, supporting the mobility and development of academic careers for staff and students, increasing the number of partners, and joining the European higher education network. The University is an autonomous institution of higher education, which develops academic education, scientific research, artistic creativity, professional counselling, and other areas of academic activities. The Faculty of Mathematical-Natural Sciences (FMNS) is a faculty with tradition. Its establishment dates from 1971 (with the decision of the Assembly of Kosovo, Official Gazette of KSA of Kosovo no. 37/71). It is worth mentioning the fact that the studies of natural sciences and mathematics (biology, physics, chemistry, and mathematics) started eleven years earlier within the Faculty of Philosophy, founded in 1960.

University of Prizren - Faculty of Life and Environmental Sciences

"Ukshin Hoti" University, based in Prizren, was established by decision no. 01/87 of the Government of Kosovo on 09.10.2009 as the second public University in Kosovo which started with the first generation of students in 2010.

"Ukshin Hoti" University, with its six academic units, currently offers studies in the Bachelor's and Master's cycle, while based on the statute, it can also organize doctoral studies. In addition to studies in Albanian language of instruction, the University also offers studies in Turkish and Bosnian languages of instruction. The University inherits the experience of the former Pedagogical High School, a separate parallel of Prishtina, which has been operating since October 1961, later as a branch the Faculty of Education in Prizren, now "Ukshin Hoti" University Prizren. The basic mission of the Faculty of Life and Environmental Sciences (FLES) is to provide undergraduate and postgraduate education as well as to deal with scientific research and consultative work related to Life Sciences, Environment and Agribusiness. Within the framework of its orientation towards the study of natural resources and their sustainable management, the faculty is one of the institutes that every state needs to form and maintain its identity.

The protection of relief and nature, protection of natural heritage, sustainable and friendly use of natural resources, production, and processing of quality food, together with modern technology, present a global challenge that can be positively addressed by implementing the most advanced research.

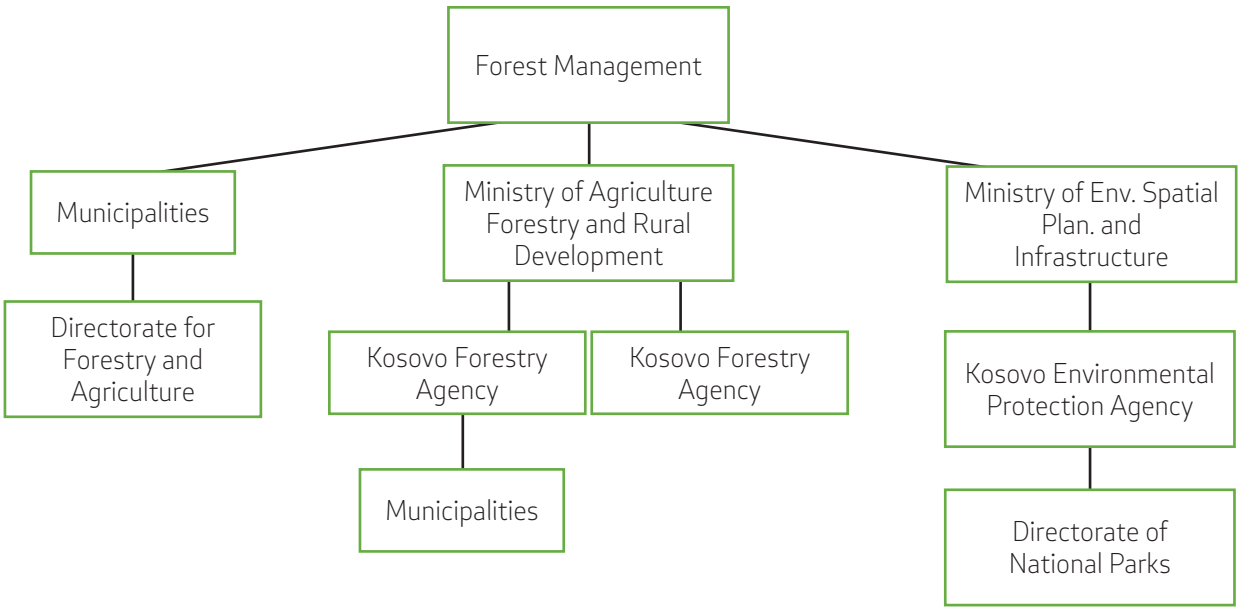
Association of Private Forest Owners of Kosovo (APFOK)

The National Association of Private Forest Owners of Kosovo is established in accordance with Law No. 06/L-043 on Freedom of Association in Non-Governmental Organizations in Kosovo. The organization is a non-profit association, according to the definition given in article 16 and 20 of Law No. 06/L-043 on Freedom of Association in Non-Governmental Organizations in Kosovo. The organization was established

with the aim of updating private forests, cooperation, coordination, and improvement of the management conditions of private forests. In total, it has 10,800 members, 23 associations and 11 production groups, whose purpose is to protect and promote the sustainable management of these forests.

4.2 Organizational Set-Up of the System

Below is the organizational sheme no. 1 of the stakeholders with the main responsibilities and the overlap of institutional responsibilities in LFM in Kosovo. (Forest fire country studies, 2015)



Scheme 1. *Forest management structure:* ***Source of data:*** *Forest Fires Country Study Kosovo, Regional Fire Monitoring Centre*

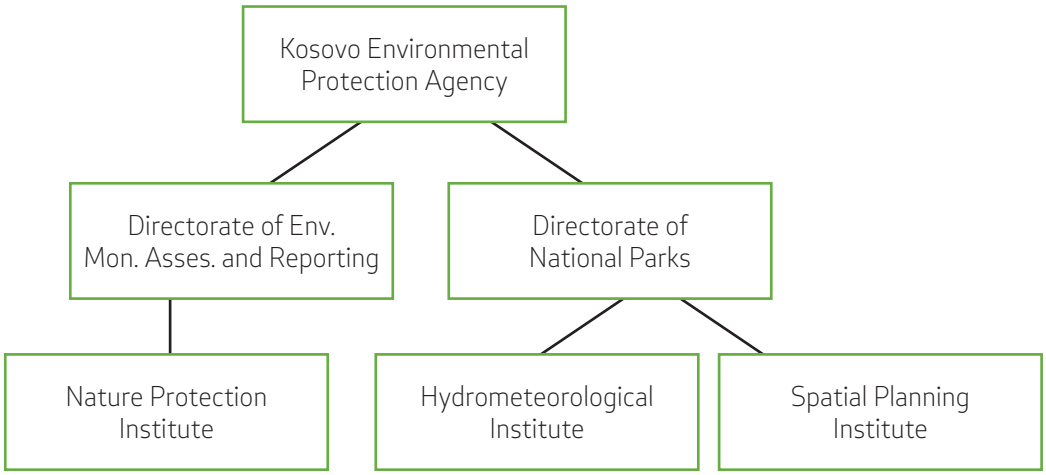
Scheme 1. shows the institutions that deal with forest management, within the framework of the Ministry of Agriculture, Forestry and Forestry, which is the highest institution for administration and management of forests in Kosovo. MAFRD administers forests through the Department of Forests and Forestry Agency of Kosovo, and the forestry inspection. The Forestry Agency of Kosovo operates within the framework of the MAFRD. It is responsible for the execution of functions such as managing forests and state forest lands, including pastures and forests in national parks. APK, has an obligation to provide forest conservation services as well as forest protection from pests, diseases, and other causes.

Also, protection, prevention, detection, and coordination in extinguishing forest fires, monitoring of illegal activities in forests and forest lands, including illegal hunting.

The Forestry Inspection has supervisory and inspection responsibilities in the field of forestry, it inspects the implementation of forest legislation by all natural and legal persons in the entire territory of Kosovo as well as the implementation of forest and hunting management plans. It supervises the implementation of measures for the protection of forests from fire and other damages.

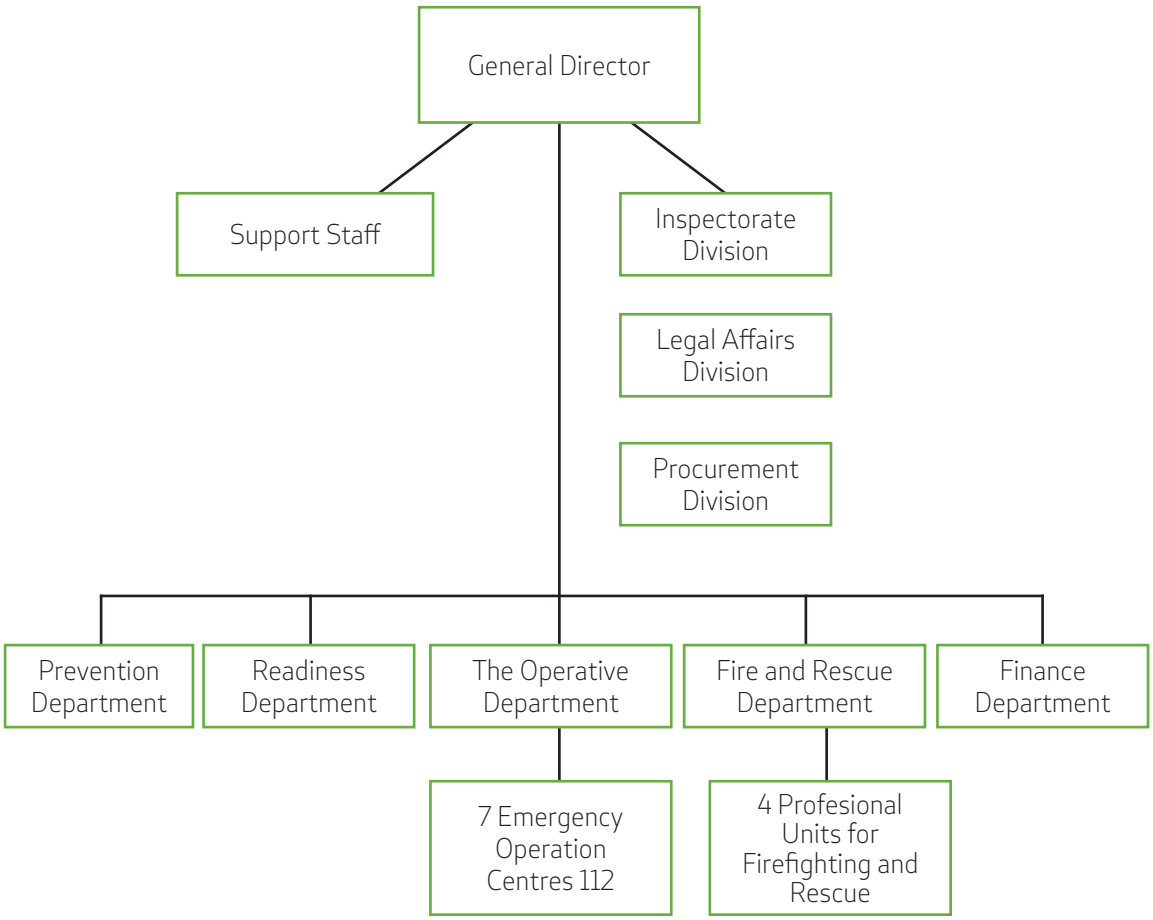
The Ministry of Environment, Spatial Planning and Infrastructure has the following institutions within it: The Kosovo Environmental Protection Agency (KEPA) is a government institution that is committed to

maintaining the quality of the air through integrated monitoring of the environment, efficient environmental information system, water, land, and biodiversity, to promote the use of renewable energy sources and the sustainable use of natural resources. Within the framework of KEPA there are also two directorates for the administration of national parks such as: NP "Sharr" and NP "Bjeshket e Nemuna".



Scheme 2. *Organizational structure of the KEPA:* ***Source of data:*** *Forest Fires Country Study Kosovo, Regional Fire Monitoring Centre*

As per Scheme no. 2, the Ministry of Environment, Spatial Planning and Infrastructure includes the following institutions: the Kosovo Environmental Protection Agency, the Directorate for Environmental Assessment, under which is the Nature Protection Institute and has the responsibilities to collect and process the collected notes related to the protection of nature, it also monitors the state of biological and landscape diversity and proposes measures for their protection, participates in the implementation of international acts on the protection of nature. It also includes the directorates for management of national parks as well as the Hydrometeorological Institute of Kosovo responsible for construction and maintenance of the basic network of hydrological and meteorological stations and organization of measurements and observations of elements and phenomena including hydrological, meteorological, biometeorological and hydrobiological phenomena as well as research of changes in weather, climate, waters caused by artificial influence and study of methods of artificial actions on weather, climate, and waters.



Scheme 3. *Organogram of the management system of the Agency for Emergency Management:* ***Source of data:*** *EMA*

Emergency Management Agency it is responsible for the development and supervision of the implementation of emergency management policies, coordination of disaster/emergency response operations, support of municipalities, communities, the private sector and individuals in the event of disasters, administration and support of the fire and rescue service, processing draft national emergency response plans in cooperation with other relevant institutions, providing assistance in terms of setting up and equipping emergency preparedness structures at the local and central level, developing and organizing training and exercises in the field of emergency management.

The duties and responsibilities of the Emergency Operations Centre 112 are: serving as a central point for information exchange, emergency coordination and raising inter-municipal coordination at the highest possible level with regional partners, non-governmental organisations and the private sector, exercise I of all management responsibilities for the coordination of actions between the response and emergency support structures, providing support to the authorities within the emergency management and the implementation of actions according to certain priorities, ensuring the proper development of coordination between the structures participating in the scene and the functions within the EOC 112, maintaining close ties with emergency managers and local elected officials, ensuring the application of risk management procedures and principles for all activities of EOC112. The number of employees in these local EMA bodies is 71, in 7 cities of Kosovo.

The Fire and Rescue Department also includes the professional firefighting and rescue units, which are staff of the ministry and are managed by the agency in cooperation and coordination with the municipal-

ities. The organisational structure of the professional firefighting and rescue units is defined by a by-law proposed by the Agency with the consent of the Municipalities, which is approved by the Government.

The agency operates within the framework of the MAFRD, has an executive role and manages forests and state forest lands, including pastures and forests in national parks as well as assets and other supporting infrastructure, administers, manages, and takes care of the assets of former enterprises, provides professional technical services for privately owned forests, provides professional, technical, administrative and informational services for all forests, preserves and protects state forests.

The preservation of state forests and forest lands, including private ones, is under the responsibility of KFA, which is obliged to organise the service of Forest Protection, with the responsibilities of supervision and protection of forests from pests, diseases, and other causes that damage state forests, protection, prevention, detection, and coordination in extinguishing forest fires.

Solving these shortcomings and strengthening cross-sectoral cooperation between all stakeholders is of vital importance for increasing the efficiency of landscape fires, both at the national and regional levels.

4.3 Legislation regulating this field

In Kosovo, the regulation of landscape fires is primarily governed by a series of legislative acts, including laws, strategies, administrative instructions, and diverse regulations. These instruments play a crucial role in delineating the responsibilities and obligations of each institution involved in Land Fire Management system.

Laws, strategies, administrative instructions, and regulations form the cornerstone of the legal framework, providing a structured approach to addressing landscape fire issues. Through these legislative documents, specific mandates and duties assigned to each institution within the LFM framework have been outlined. Furthermore, these legislative acts serve as foundational pillars for the development and implementation of comprehensive fire management policies. They not only establish guidelines for prevention and mitigation strategies but also provide mechanisms for enforcement and accountability.

Below is an enumeration of key legislative documents including laws, policies, administrative instructions, and regulations, essential for understanding and effectively managing landscape fires in Kosovo.

Laws

Law no. 08/L-137 on Forests

Law no. 03/L-025 on Environmental Protection

Law no. 04/L-086 on the "Bjeshket e Nemuna" National Park

LAW no. 04-L-087 on the "Sharri" National Park

Law no. 02/l-26 on Agricultural Land

Law no. 03-L-039 on Special Protected Areas

Law no. 04/L-012 on Fire Protection

Law no. 04/L-027 on Protection from Natural Disasters and Other Disasters

Law no. 04-L-049 on Firefighting and Rescue

Climate Change Law

Law no. 04/L-049 on Firefighting and Rescue

Law no. 03/L-233 on Protection of Nature

Strategies

Disaster Risk Reduction Strategy and Action Plan 2023-2028

Strategy for the Development of Forestry 2021-2030

Climate Change Strategy 2019-2028 and Climate Change Action Plan 2019-2021

State Water Strategy and Action Plan

Strategy for the Environment

Strategy for Biodiversity

Strategy for Energy and Climate

Administrative instructions and regulations

Administrative Instruction no. 22/2007 on the Protection of Forests from Fire

Regulation no. 25/2020 on the Methodology for Risk Assessment Development

Regulation no. 17/2015 on the Methodology of Damage Assessment from Natural Disasters and Other Misfortunes

Law no. 08/ L - 137 on Forests (Ministry of Agriculture, Official gazette of the Republic of Kosova, 2023)

The purpose of this law is to create a legal basis for the sustainable management of forests and forest lands as a resource of general interest. This law is based on the principles of sustainable development, the conservation of biological diversity, the affirmation of precautionary and preventive measures for the protection of forests and the preservation of the environment. This law regulates planning, protection, silviculture, use of wood and non-wood products, ownership, expropriation, organizational responsibility and duties of forestry institutions, public funding, forestry research, supervision, inspection, and sanctions. The provisions of this law apply to all forests and forest lands in the territory of Kosovo.

Protection of forests from fire - It is prohibited to light open fire in forests, forest land, agricultural land and other open places located closer than five hundred (500) metres from the forest. Within the forest and forest land, the lighting of fire is allowed only in special places of the forest that are intended for outdoor picnics. The agency draws up the plan for the protection of forests from fire at the level of the management unit or the municipality, for the period of ten (10) years. Fire protection plans can be changed through a Plan Annex in case of changes in the state of the forest during the plan's validity period.

The assessment of fire damage is done by the professional commission formed by the Agency based on a special Regulation or Decision. The methodology for drawing up the plan according to paragraph 3 of this article, the reporting and evaluation procedures are determined by a sub-legal act from the Ministry.

The implementation of the system for the protection of forests from fire is governed by KFA, which in cooperation with the competent institutions for fire protection ensures the prevention and monitoring of forest fires.

The Agency provides the Service for forest surveillance in forests which are classified as highly endangered by fire. APK maintains a database on forest fires and provides information in accordance with the European Forest Fire Information System. The most detailed conditions and ways of protecting forests from fire, as well as the methodologies for classifying the risk of forest fires and for observing and monitoring forest fires, are determined by a by-law by the Ministry, with the consent of the Ministry of Internal Affairs.

Law no. 03/L-233 on the Protection of Nature (Ministry of environmental, 2010)

This law regulates the protection of nature, its sustainable use and especially the protection, preservation, renewal and sustainable use of natural resources, in a state of natural balance; renewal of nature in damaged areas or their parts and compensation for the damage caused; establishing the network of protected areas, the system for planning, management, inventory, monitoring, information and financing

for the purpose of nature protection; prevention of over-exploitation, endangerment of flora and fauna species, especially those of special importance, rare and endangered, as well as their habitats; ensuring the public's right to information about the state of nature and participation in decision-making for the protection of nature; ensuring the exercise of citizens' right to a healthy lifestyle, rest and recreation in nature; prevention of harmful actions of legal and natural persons in nature as a result of economic activities; maintaining or rehabilitating natural habitats and species of interest to Kosovo in favourable conservation status according to EU standards; conservation of all types of birds that naturally live in the wild (birds, their eggs, nurseries and their habitats).

Law no. 03/L-025 on Environmental Protection (Ministry of Environmental, Spatial Planning and Infrastructure, 2009)

With this law, economic development and social welfare are harmonized with the basic principles for environmental protection according to the concept of sustainable development. The purpose of this law is to promote the creation of a healthy environment for the people of Kosovo with the gradual adoption of the European Union's environmental standards. This law regulates the integrated system for environmental protection, reducing the risk of environmental pollution, human life, and health according to the concept of sustainable development; rational use of natural resources and limitation of emissions and discharges of environmental pollution; prevention of damage, rehabilitation and improvement of the damaged environment, improvement of environmental conditions related to the quality of life and the protection of human health, preservation and maintenance of resources including natural, renewable and non-renewable resources as well as their sustainable management; coordination of state activities to meet the requirements for environmental protection, regional and international cooperation in the field of the environment, promotion and participation of the public in the activities for the protection of the environment to ensure that the development in Kosovo is sustainable so that the soil, air, water and living resources in Kosovo are protected and preserved for the benefit of future generations; promote regional and international measures for the preservation, protection and improvement of the quality of the environment, and to harmonise laws, by-laws, procedures and institutions of Kosovo with the legislation of the European Union.

Law no. 04/L-086 on the "Bjeshket e Nemuna" National Park (Ministry of Environmental, Spatial Planning and Infrastructure, 2013)

The part of the territory of Bjeshke i Nemuna as a spatial whole which is distinguished by natural values and rarities, with a large number of important forest ecosystems and other preserved ecosystems, with a significant number of endemic and relict species, with rich geomorphological characteristics, hydrological and landscape that have scientific, educational, cultural - historical, recreational - touristic importance and activities that contribute to economic development according to environmental criteria, is declared a National Park under the name: "Bjeshket e Nemuna" National Park.

National Park "Bješkët e Nemuna" - covers an area of 62,488 ha and extends to the territory of the municipalities Gjakovë, Junik, Deçan, Pejë and Istog within the limits defined by this law.

In the territory of the "Bješkët e Nemuna" National Park, protective regimes are established according to zones:

The first zone - includes the parts of the territory of KP "Bjeshkët e Nemuna" with exceptional natural features, with rare, endangered species of plants and animals and types of settlements in conditions of wild nature. This area enjoys the character of strict protection.

The second zone - active management - includes the parts of the territory of KP "Bješkët e Nemuna" that are characterized by ecosystems, landscape values and other natural values where ecotourism, traditional agriculture and activities that are not in conflict with the protection goals can be practiced.

The third zone - of sustainable use includes the parts of the territory of NP "Bješkët e Nemuna" where there is a permission for construction, reconstruction, protection of traditional objects and recreation, tourism and the needs of the inhabitants in the territory of KP as well as the use of pastures and economic

exploitation of natural resources according to the Law on Nature Protection as well as in harmony with the relevant laws and the Spatial Plan of the National Park.

The area of impact - includes the space of fifty (50) meters from the border of KP "Bješkët e Nemuna" that serves to prevent harmful impacts on the National Park. 2. The determination of the protection regimes is done with the Spatial Plan of KP "Bjeshket e Nemuna", while the activities are developed according to the Management Plan of KP and the legislation in force.

The definition of the protection regimes is done with the Spatial Plan of the National Park "Bjeshket e Nemuna", while the activities are developed according to the Management Plan of the National Park and the legislation in force.

Law no. 04/L-87 on "Sharri" National Park (Ministry of Environmental S. P., Official gazette of the Republic of Kosova, 2013)

The part of the territory of the Sharr mountains as a spatial whole that is distinguished by natural values and rarities, with preserved forests, with a large number of important forest ecosystems and other ecosystems, with a significant number of preserved endemic and relict species, with rich geomorphological, hydrological characteristics, as well as with scientific, cultural, historical, landscape, sports, recreational - touristic values and activities that contribute to economic development according to environmental criteria, is declared a national park with the name: "Sharri" National Park.

"Sharri" National Park covers an area of 53,469 ha and extends to the territory of the municipalities Kaçanik, Shtërpcë, Suharekë, Prizren and Dragash, in the limits defined by this law. In the territory of the "Sharri" National Park, the protection regimes are established according to the zones. The determination of the protection regimes is done with the Spatial Plan of the "Sharri" National Park, while the activities are developed according to the National Park Management Plan and the legislation in force.

In the territory of NP "Sharri" protective regimes are established according to zones:

The first zone - includes the parts of the territory of NP "Sharri" with exceptional natural features, with rare, endangered species of plants and animals and types of settlements in wild nature conditions. This area enjoys the character of strict protection.

The second zone - active management includes the parts of the territory of KP "Sharri" that are characterized by ecosystems, landscape values and other natural values where ecotourism, traditional agriculture and activities that are not in conflict with the protection goals can be practiced.

The third zone - of sustainable use includes the parts of the territory of KP "Sharri" where there is a permission for construction, reconstruction, protection of traditional objects and recreation, tourism and the needs of residents in the territory of KP, as well as the use of pastures and exploitation economic benefit of nature according to the Law on the Protection of Nature as well as in harmony with the relevant laws and the Spatial Plan of the National Park.

The impact zone - includes the space of fifty (50) meters from the border of KP "Sharri" that serves to prevent harmful impacts on the National Park.

Law No. 02/L-26 on Agricultural Land (Ministry of Agriculture, Forestry and Rural Development, 2022)

This law defines the use, protection, regulation, and leasing of agricultural land, with the aim of preserving and protecting the agricultural potential permanently, based on the principles of sustainable development. Agricultural land, as a natural asset of general interest, has special protection and must be used for agricultural production and cannot be used for other purposes except in the cases defined in this law and with other provisions issued based on it.

Law no. 03/L-039 on Special Protected Areas (Ministry of Environmental, Spatial Planning and Infrastructure, 2008)

This law ensures the protection of Serbian orthodox monasteries, churches, other religious places, as well as historical and cultural places of special importance for the Serbian community and other communities

in Kosovo through the establishment of Special Areas of Protection. The objectives of the Special Protected Areas are:

a) to ensure the existence and peaceful functioning of the places to be protected and preserve the monastic way of life of the clergy.

b) to preserve the character and appearance of the places to be protected in historical, cultural, architectural, and archaeological context, the natural environment, and the visual aesthetic framework.

c) to prevent unfavourable developments around the places to be protected while ensuring the best possible conditions for the harmonious and sustainable development of the communities living in the areas around these places by regulating development and other activities.

Law no. 04 / L-012 on Fire Protection (Ministry of Internal Affairs, 2011)

The purpose of this law is to define protective mechanisms for preventing the causes and spread of fire, including explosions, to protect people, property, and the environment. Within the scope of this law is the undertaking of measures for fire protection, which are implemented by the relevant state institutions as well as natural and legal persons. Organisation of fire protection - The Ministry of Internal Affairs is responsible for analysing the fire protection situation and taking measures to improve it, drafting of the annual program for fire protection which is approved by the Government of Kosovo, drafting of the state plan for fire protection, supervising the executive functions of AME and municipalities in the field of fire protection, drafting of training and training programmes for professional staff for fire protection.

The municipality is responsible for issuing the fire protection plan at the municipal level based on the fire risk assessment in accordance with the state plan for fire protection, implementation and improvement of fire protection measures and their advancement, reviewing the content of the fire protection plan at least once a year and assessing the compatibility of this plan with the Municipal Development Plan, the Urban Development Plan of the municipality, and Urban Regulatory Plans, with the construction changes that may have occurred.

Law no. 04/L-027 on Protection from Natural Disasters and Other Disasters (Ministry of Internal Affairs, 2011)

This law aims to protect and save people, animals, property, cultural heritage and the environment from natural disasters and other disasters. The scope of this law is the management of natural disasters and other disasters, reducing the number of disasters, preventing, and reducing the number of victims and other consequences from such disasters. The state is responsible for organizing protection from natural disasters and other disasters as a unique and integral state system.

The protection system from paragraph 2. of this article contains the programming, planning, organisation, management, implementation, supervision, coordination and financing of measures and activities for protection from natural disasters and other disasters.

Law no. 04/-L-049 on Firefighting and Rescue (Ministry of Internal Affairs, 2011)

The purpose of this law is to ensure effective response mechanisms for firefighting, to save people, property, and the environment in emergency situations. Within the scope of this law is the determination of the tasks that must be fulfilled by the firefighting and rescue units established by this law. The Ministry of Internal Affairs is responsible for creating an efficient firefighting and rescue mechanism, establishing professional firefighting units, authorizing the establishment of firefighting units in industry, supervising the exercise of agency duties and firefighting and rescue units operating in municipalities.

The Emergency Management Agency is responsible for restructuring, classifying and operating the professional firefighting and rescue units, and professional staff, encouraging the establishment of voluntary firefighting and rescue associations, in accordance with the risk assessment and fire protection plan, establishment of professional firefighting and rescue units in the territories of municipalities that lack a sufficient number of firefighting and rescue units; for the implementation of this paragraph, the ministry will issue a sub-legal act.

Municipalities are responsible for encouraging the establishment of one or more volunteer firefighting and rescue associations, implementing the structure, organisation, classification and mode of operation of units of voluntary firefighting and rescue associations in accordance with the agency's requirements, as defined in paragraph 2., and sub-paragraph 2.1 of this article, determining the tasks and the number of volunteer firefighting staff, tools and equipment necessary for units of voluntary firefighting and rescue associations, in accordance with the municipal risk assessment and the central protection plan from fire, as well as taking measures for the establishment of voluntary firefighting units if they lack a sufficient number of firefighting and rescue units in their territory.

Disaster Risk Reduction Strategy and Action Plan 2023- 2028 (Emergency Management Agency, 2023)

Disaster Risk Reduction Strategy (DRR) – The strategies aim to reduce the risk of disasters and serve as a framework for reducing the risk of disasters at the country level through activities that will be planned and implemented by the Institutions of Kosovo; achieving sustainable development and poverty alleviation through facilitating the integration of disaster risk reduction in development and efficient and effective decision-making, reducing existing risks and preventing new risks, strengthening resilience, including the primary responsibility of the state to prevent and reduce the risk of disasters, ensuring the commitment of the whole society and state institutions. Natural and technological disasters are increasing in frequency and intensity, significantly hindering progress towards sustainable development by generating new risks, increasing losses related to disasters, which have an economic, social, health, cultural and environmental.

Climate Change Strategy 2019 – 2028, Climate Change Action Plan 2019 – 2021 (Ministry of Environmental, Spatial Planning and Infrastructure)

The Strategy for Climate Change is following the strategic priorities of the Government of Kosovo, with the Programme of the Government of Kosovo 2017-2021, and the National Development Strategy (SKZH) 2016-2021. The programme of the Government of Kosovo 2017-2021 deals with the protection of the environment as a priority, the aim of which is to improve the state of the environment; administration and sustainable management of water resources and rehabilitation of riverbeds; strengthening the management of national parks and other protected areas of nature; and strengthening spatial planning, construction, housing, land administration and cadastral development.

Strategy for Agriculture and Rural Development 2022-2030 (Ministry of Agriculture, Forestry and Rural Development)

The Strategy for Agriculture and Rural Development for the period 2022-2028 is a step towards alignment with the Common Agricultural Policy (CAP) of the EU. The Strategy for Agriculture and Rural Development 2022-28 is related to the implementation of the Government's programme 2021-2025, and both documents are aimed at the development of the agro-rural sector and in particular deal with the increase of competition in the agro-food sector, management of sustainable natural resources, business support in the development of rural areas, food security and administration of reforms.

Strategy for Forestry Development and Action Plan 2021-2030, (Ministry of Agriculture, Forestry and Rural Development)

Structured and prepared according to the European approach, the SFD represents an effort to protect forest resources and promote their sustainable management in Kosovo. The insights provided by this SFD have been developed based on the common views of stakeholders who actively participated in the drafting process. Low technical and institutional capacities, inadequate infrastructure, unsuccessful coordination, and cooperation between relevant institutions as well as improper implementation of the law are the main causes of forest degradation, further aggravated by poverty and insufficient access to energy sources in rural areas. The primary objective of the SFD is to preserve, expand and ensure the sustainable management of Kosovo's forest resources to contribute to the national economy. This will be done by maintaining the balance between the economic, ecological, and social functions of forests.

All strategic objectives are defined in such a way as to help towards the fulfilment of this general goal in the ten-year period. The action plan has been prepared for the first three-year period. The results and im-

plementation of the action plan will serve as guidelines for the preparation of action plans for subsequent periods. The strategy has five strategic objectives, as follows: Improving the condition of forest resources; Protection of forest resources; Sustainable and highly functional use of forest resources; Development of the capacities of the forestry sector; Digitization and improvement of communication.

Strategy for Biodiversity 2011 – 2020, (Ministry of Environmental, Spatial Planning and Infrastructure)

The Strategy and Action Plan for Biodiversity is a basic document for the protection of nature, which defines the long-term goals of preserving biodiversity and landscape diversity, the protected values of nature as well as the way of implementation in harmony with the comprehensive economic, social, and cultural life of Kosovo. The purpose of this strategy is not to list all open issues related to biodiversity in Kosovo, but to create a framework of goals and activities and a better coordination, prioritising programmes and providing strategic approaches for development of future initiatives. The purposes of this strategy are preservation (conservation) of biodiversity; sustainable development based on the sustainable use of natural resources; revenue generation and sharing the benefits of using biodiversity equitably.

Regulation no. 25/2020 on the Methodology for Risk Assessment Development, (Emergency Management Agency)

This regulation defines the methodology for drafting the assessment of the population's risk of material goods and cultures from natural disasters and other disasters, the stakeholders and participants for its drafting and approval.

Regulation no. 17/2015 on the Methodology of Damage Assessment from Natural Disasters and Other Disasters, (Emergency Management Agency)

This regulation defines the methodology for the assessment of damage caused to material goods and other goods because of natural disasters and other disasters, the authorities that make the damage assessment, the composition of the commissions as well as other issues important for the organisation and implementation of damage assessment in the territory of Kosovo.

Administrative Instruction no. 22/2007 on the Protection of Forests from Fire, (Ministry of Agriculture, Forestry and Rural Development)

This Administrative Instruction defines the technical, preventive, and other measures for the protection of forests from fire, which must be implemented by the owners and users of forests and forest land to reduce the risk of the occurrence and rapid spread of forest fires, detection and notification of forest fires, prevention and extinguishing of forest fires.

The legal basis regarding LFM is well covered and well-structured with laws, administrative instructions as well as other support mechanisms. The applicability of the legislation in this field remains to be complete for it to be at a satisfactory level.After the drafting of the new forest law, the Ministry of Agriculture, Forestry and Forestry is in the process of drafting an administrative instruction that regulates the management of fires in forests and forest lands. This administrative instruction will be based on both the conclusions and the project to increase the efficiency of LFM by addressing the guidelines of LFM.

The existing laws and legal acts that regulate forest fire protection need to be harmonised. The issue of forest fires is currently regulated by different laws implemented by different institutions, thus there are some overlapping competencies, uncertainties in procedures and a lack of tools coordinating activities between institutions.

5. History of Landscape Fires for 2000-2021

Kosovo, like the states of the region during the last two decades, is also threatened by forest fires, which is turning into a global ecological problem with serious consequences for the environment, damage to the fauna, damage caused from ecological aspect, but also social and economic aspects.

This chapter includes all the data available for the territory of Kosovo from various sources that have been analysed and includes the number of fires, affected surface, damages, and causes. (Kosovo Forestry Agency, 2007-2021)

According to data from the Forestry Agency of Kosovo, the number of forest fires and burnt areas for the period 2010-2022 is shown in Table no. 11 and chart no. 22 below.

Year	Burnt area Private owner	Burnt area Public owner	No. of fires
2000	3,980		-
2007	10,954.18		227
2008	252.20		65
2009	163.20		4
2010	-	191	40
2011	-	2426	129
2012	340	5264.5	159
2013	-	373	99
2014	142	254	101
2015	444	800	134
2016	149	435	88
2017	1024	1031	238
2018	634	315	83
2019	793	2340	218
2020	676	1728	170
2021	574	2080	87
2022	629	976	476
Total area	**34,988.08**		**2022**

Table 11. *Number of fires and burned area (ha):* ***Source of data:*** *KFA*

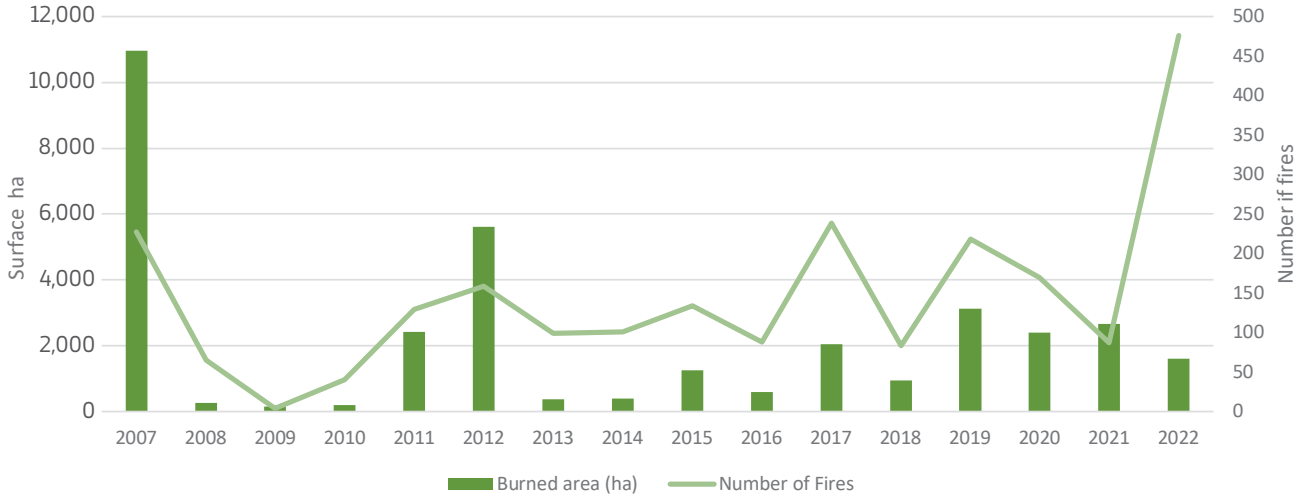


Chart 22. *Number of fires and burned area (ha):* ***Source of data:*** *KFA*

It is also worth noting that there are big differences in the data, depending on the source of the data, so the data are mainly forest and pasture fires, in privately owned, public forests and in the National Park "Bjeshket e Nemuna".

Based on the data obtained from the Climate Protection Strategy in the Forestry Sector in Kosovo, the areas burned in forests and forest lands for the period from 2003 to 2011 can be found in the table no. 12 below.

Region	2003	2004	2005	2006	2007	2008	2009	2010	2011
Pejë	1,034	862	728	639	2,883	60	0	60	190
Prizren	1,360	1,134	947	881	3,795	41	6	11	554
Ferizaj	78	68	58	93	162	10	16	7	272
Gjilan	492	410	344	369	1,336	0	0	15	494
Prishtine	759	656	563	557	1,954	63	142	98	530
Mitrovice	335	279	233	258	825	80	0		386
Total	**4,058**	**3,409**	**2,873**	**2,797**	**10,955**	**254**	**164**	**191**	**2426**

Table 12. *Burned Forest area (ha) for the period 2003-2011:* ***Source of data:*** *Climate Protection Strategy in the Forestry Sector in Kosovo*

From the documents issued by the EU Twinning Project 'Further Support to Sustainable Management' of forests in Kosovo, in the year 2000 according to data from UNMIK, an area of 3,980 ha of forests was burned with high intensity, where the economic damages are significantly and 117 people were injured but there were no casualties.

It is worth noting that since 2007, the process of recording fires has gradually started to improve, and data on fires from 2007 onwards exist, but there is still a lack of damage assessment data in terms of timber and monetary value, and the work for improve this gap is ongoing.

The biggest fires were in 2007, in the management unit "Radusha" in the region of Peja, where there was great environmental and economic damage, 234 ha of the hormoq *Picea Abies* type were burned.

While in 2012, in the Prizren region, in the "Koritnik II" management unit, 1,564 ha of the pine species *Pinus Heldreichii* were burned, and the fire caused great environmental and economic damage. (National Plan for the Forest Fires Management, 2012)

According to the JRC report - Report on forest fires in Europe, the Middle East, and North Africa (EFFIS) for the period 2011 - 2021, the number of forest fires and areas burned during the period is presented in Table 13 and In chart no. 23 and 24.

Year	Burned Area ha	Number of fires
2011	494.3	129
2012	8376.49	49
2013	347.22	4
2014	0	0
2015	386	4
2016	403.44	6
2017	4059	34
2018	1394	12
2019	10890	89
2020	7016	58
2021	7580	92
Total	**40,946.45**	**477**

Table 13. *Number of fires and burned area (ha):* ***Source of data:*** *Forest fires in Europe, the Middle East, and North Africa for the period 2011 - 2021*

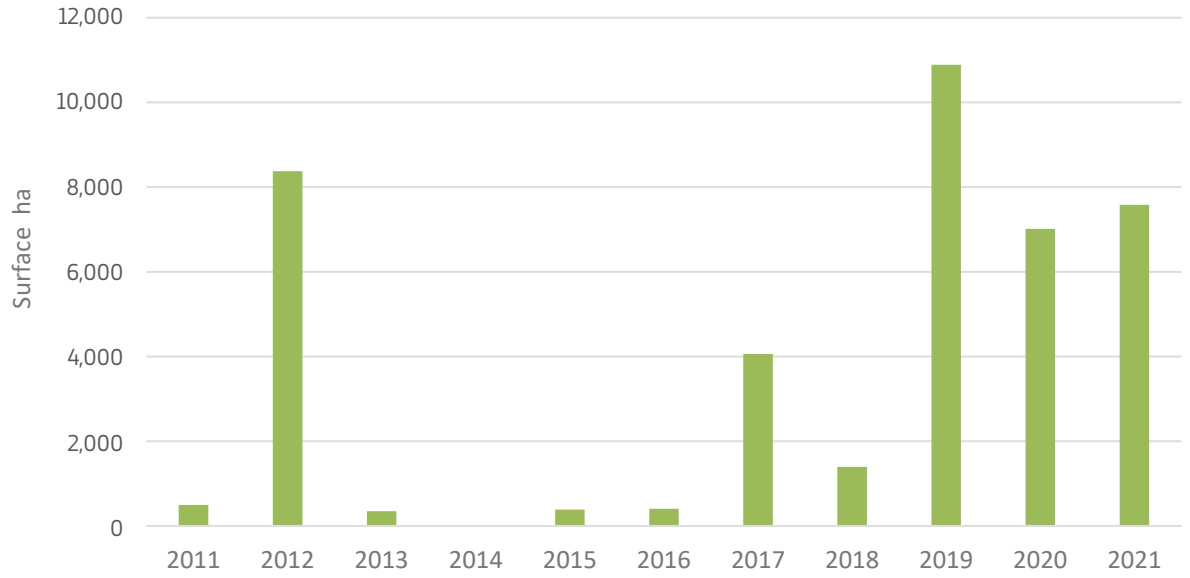


Chart 23. *Number of fires and burned area (ha):* ***Source of data:*** *Forest fires in Europe, the Middle East, and North Africa for 2011-2021*

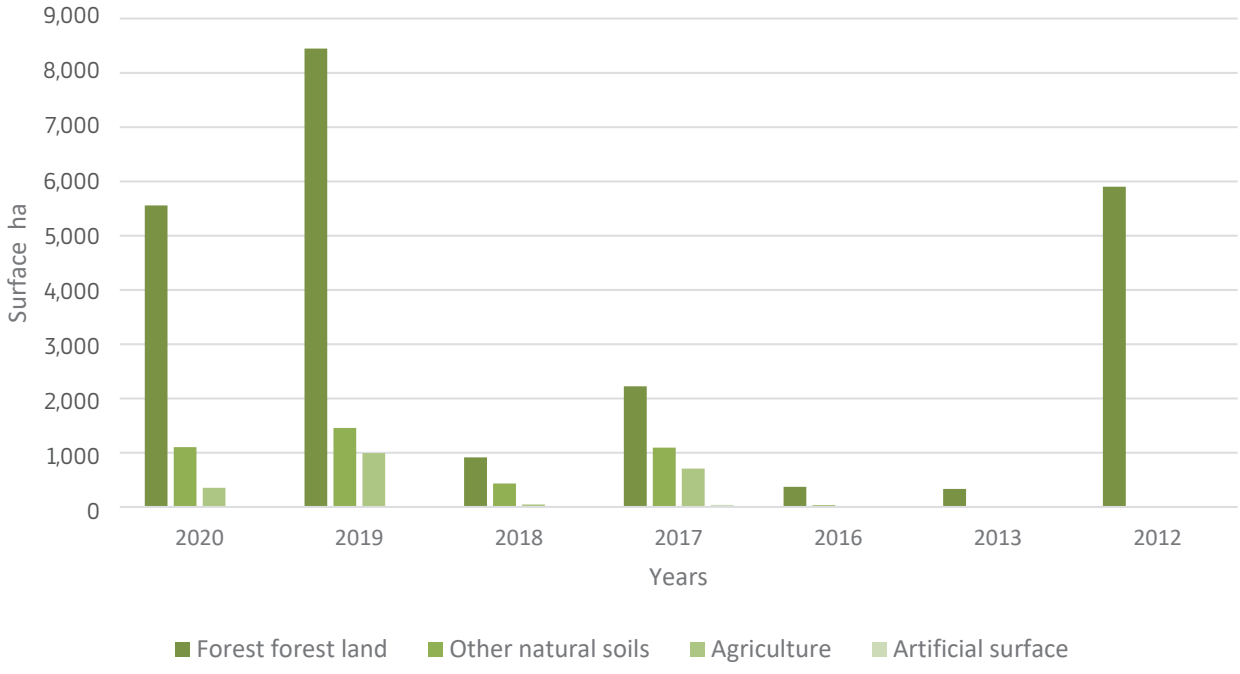


Chart 24. *Burned area (ha) based on land cover for 2012-2020:* ***Source of data:*** *Forest fires in Europe, the Middle East, and North Africa for the period*

According to data from the Environmental Protection Agency - Directorate of KP "Bjeshket e Nemuna", the number of forest fires and burned areas for the period 2018-2021 presented in the following table no. 14. (Ministry of Environmental, spatial Planning and Infrastructure, 2018-2021)

Year	Economic Units	Surface (ha)
2019	Kozhnjer Roshkodol	10
2019	Kozhnjer Roshkolod	15
2020	Hajla - Stankaj	12
2020	Ruselia-Zhleb	17
2020	Kopranik	2
2020	Lloqani I	6
2021	Hajla - Shtupeq I madhe	150
2021	Hajla - Shtupeq I madhe	6
	Total	**218**

Table 14. *Burned area (ha) for the period 2019 - 2021 in NP "Bjeshkët e Nemuna": **Source of data:** Report on the state of nature 2018-2021*

According to data from the Environmental Protection Agency – Directorate of NP "Malet e Sharri", the number of forest fires and burned areas for the period 2017-2021 are presented in the table 15 below, which were mainly surface fires without damage to woody mass.

Year	Location	Surface (ha)
2017	Koritnik Bjeshka e Kabashit Oshlak Konjushe Kobolice Vrtop	3
2018	Bjeshka e Dollcit Kobilice Konjushke Koxha ballkan Gotovushe	2
2019	Brod Firaje Restelice Krushë	100
2020	Manastircë	2
2021		23
	Total	**200**

Table 15. *Burned area (ha) for the period from NP "Malet e Sharri": **Source of data:** NPMSH Directorate*

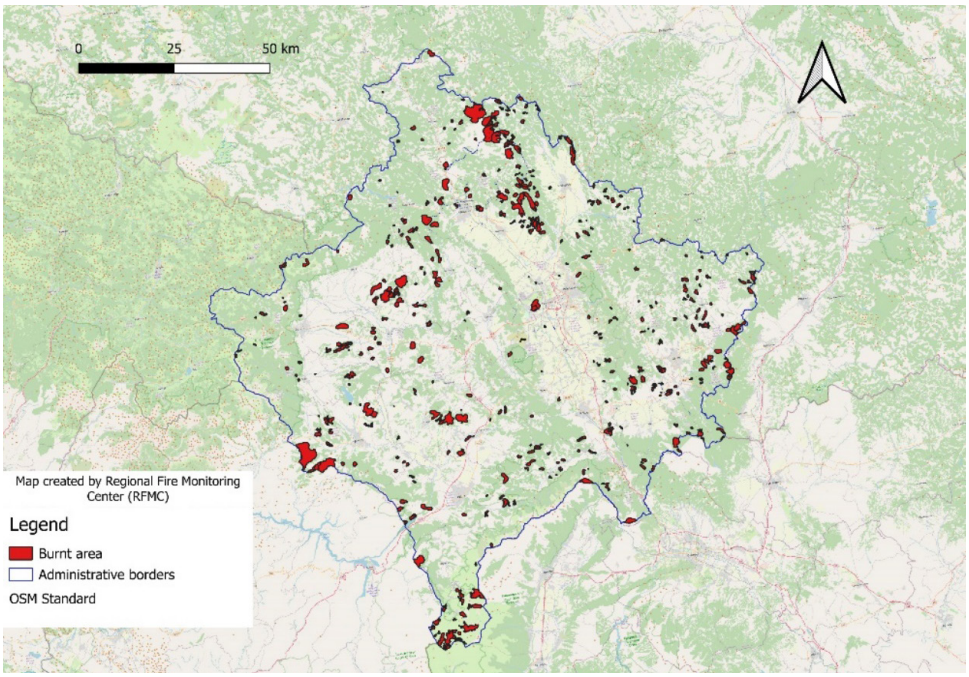
From the data in the table no.16, the largest forest fires were in 2007, where the total burnt area was 10,954 ha with significant damages in monetary value. Similarly, during 2011 and 2012, as shown in the table, there have been large fires with considerable loss of timber and monetary value. This data was obtained from the Kosovo Forestry Agency, and it is worth noting that the data on the evaluation of damages in terms of timber and monetary value are missing.

	Year														
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Burned Area (ha)	10,954	252	163	191	2,426	5,605	373	396	1,243	585	2,055	949	3,133	2,404	2,832
Damage EUR	45,653,028	49,607	880	81	1,878,112	8,867,620									
Damage – wood mass m^3					31,155	223,891									

Table 16. *Forest fires damage assessment 2007 – 2021:* ***Source of data:*** *KFA*

Regions	Burned area (ha)	Number of fires	Damages (EUR)	Damages (m^3)
Prishtina	529.70	16	990,805.00	75,286.00
Mitrovica	386.00	20	30,350.00	
Peja	190.00	11	1,292,756.00	11,646.00
Prizren	554.10		231,705.00	
Ferizaj	272.00	17	1,961.00	218.00
Gjilan	494.30	65	-	
Total	**2,426.10**	**129**	**2,547,577.00**	**87,150.00**

Table 17. *Forest fires by region:* ***Source of data:*** *Forest fires in Europe, the Middle East, and North Africa for 2011*



Map 7: *Burnt area from Landscape Fires in Kosovo (2008 to 2023):* ***Source of data:*** *Regional Fire Monitoring Center*

The data used for the purposes of creation of this map was provided by the European Forest Fire Information System – EFFIS (https://effis.jrc.ec.europa.eu) of the EC JRC and prepared by the Regional Fire Monitoring Center (RFMC) in Skopje. Besides the image formatted (.tiff) representation of the map shown above, the digital/interactive map (.qgis format – QGIS software must be installed) offers the following information (and more):

Date and geo-referenced location.

- Timeframe: beginning and end of fire
- Comparison of fires in the same location but different time periods
- Total burnt area (per fire or overall) expressed in hectares (ha)

Structure of the burnt area: land use and vegetation type, expressed in percentage (%) of the total burnt area, and more.

Based on the Forest Development Strategy data from the last NFI, a total of 58,200 ha are negatively affected by biotic and abiotic factors, where 5.8 million m^3 are damaged as a result of diseases, insects, forest fires, damage from animal grazing, drought and frost and other abiotic factors, including illegal logging for commercial purposes as well as damage to the surrounding villages damaging the forest for survival in deep rural areas.

The part of the wood left in the forest after felling creates conditions for the development of diseases and insects as well as becoming a potential source for the spread of landscape fires.

The surfaces covered by fire in Kosovo in recent years are mainly affected by surface fires which are caused by use of agricultural land mainly in the early spring during cleaning or late autumn after the harvest, when the fire is also attacking forest surfaces in the belt with agricultural lands, and carelessness of nature goers during camping and picnics is another important cause of landscape fires.

As found in this chapter, it is worth noting that there is no database with data on burned surfaces for damages caused over the years in terms of timber, monetary value and environmental damages and the cartographic part. In the meantime, the Fire Early Warning System (NFFIS) and the Kosovo Forest Information System (KFIS) are being created, and the legal basis for the operationalisation of the KFIS is in the process of being drafted.

6. Landscape Fire Risk Assessment

The Assessment of Risks from Natural Disasters and Other Disasters in Kosovo is a document that identifies threats from risks and assesses the degree of their dangerousness. Also, opportunities and needs for prevention, risk reduction, response, recovery, and avoidance of consequences from natural disasters and other disasters are identified. This assessment serves as the basis for the National Response Plan (NRP) at the central level, as well as the Drafting of the Risk Assessment at the local level, including human and technical, state, private and NGO resources, to protect and save the lives of the citizens of Kosovo from natural, technical-technological disasters and the human factor.

Kosovo currently lacks a comprehensive landscape-fire risk map, posing a significant challenge to effectively manage and mitigate fire risks across the region. The absence of such a map underscores the urgent need for its development. Once established, this fire risk map will facilitate the identification of high-risk areas. Its creation plays a pivotal role in enhancing fire management efforts by serving as preventive and presupressive measures. Moreover, the creation of such a product should contribute to raising community awareness and fostering engagement in fulfilling these measures.

Based on the Administrative Instruction 22/07 for the protection of forests from forest fires in Kosovo, measures are presented for assessing the risk of fires, including the following parameters: Vegetative layer, Anthropogenic factors, Climate, Country (mother substrate and soil type), Orography and Forest Order.

All these factors can be found in the forest-administrative bases of administrative units, regions and in the forest management programmes of administrative persons who manage forests and forest lands.

According to statistics, the largest percentage of causes of forest fires are directly related to human activity (anthropogenic factors), so this parameter is also divided into three categories, with a certain number of points. The climate factor consists of three parameters: average annual climate temperature, amount of atmospheric precipitation and air humidity.

The parent substrate and the type of soil are taken as special parameters that affect the degree of vulnerability, from forest fire. The degree of danger from a forest fire depends a lot on the moisture content of the material that burns on the ground (halves, leaves, branches, roots, etc.), while the degree of moisture varies from different soils, respectively in the mother substrate. Orography with its own factors has a great influence on the risk of forest fire. The intensity and duration of the sunshine affects the acceleration of the drying of the material for burning, and this is different and depends on the exposure of the slope.

The altitude at which the compound is found is taken as a correction of the average annual temperature. Maintaining forest order also affects the degree of danger from forest fire. In the forests where the forest order is not maintained, the amount of material for burning increases, and with this increases load for fires, too.

The impact of all factors involved is expressed by the number of points whose value is at least 115 and at most 580 points. Depending on the number of points, all the forests of Kosovo are classified in four degrees according to the danger of fire in the forests:

Level	Risk	Number of points
I	Very large	More than 480
II	Large	381-480
III	Average	281-380
IV	Small up	under 280

Table 18. *Risk levels for forest fires:* ***Source of data:*** *National plan for the management of forest fires in Kosovo*

However, during the drafting of the 10-year Forest Management Plan, a map of the risk of forest fires was created for the "Pashtriku" management unit (Annex 3. Fire risk map in the "Pashtriku" Management Unit (Source: KFA) and the degrees of danger from forest fires were determined.

7. Existing Projects

In the last 10 years, several projects related to LFM have been implemented. Some of them are regional projects which imply regional cooperation and exchange of good practices related to emergency management, resilience to disaster risk and improving prevention, preparedness, and capacity to respond to forest fires.

EU Twinning Project

An EU-funded project managed by the European Union Office in Kosovo, Further support for sustainable forest management in Kosovo in 2012. From this project, two documents were drawn up, as follows:

- National plan for the management of forest fires in Kosovo
- Guidelines for creating a communication strategy for preventing and fighting forest fires

Donator: European Union

Implementers: Bulgaria, Austria, and Italy

Beneficiary: Ministry of Agriculture, Forestry and Rural Development

Duration of the project: 2011-2012

IPA Floods and Fires

The IPA FF 3-year Floods and Fires Program, an EU-funded programme, aims to improve capacities for flood and forest fire risk management in Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, Serbia, and Turkey.

Fostering regional cooperation and the exchange of good practices, the IPA flood and fire project implementation consortium collaborates with local civil protection authorities and other local institutions and agencies involved in flood and forest fire risk management. Together they contribute to the improvement of the legal and institutional framework related to the EU Floods Directive (EUFD) and the institutional coordination between all actors involved in the implementation of the EUFD and the strengthening of prevention, preparedness, and capacities to respond forest fires at local, regional and EU level. More about the IPA Flood and Fires project (https://www.ipaff.eu/).

Assessment of Risk Mapping skills (assessment of legal/institutional framework and good practices development of regional guidelines for Forest Fires Risk Mapping (FFRM-Forest Fires Risk Management).

Donor: European Union

Implementer: Beneficiary: Ministry of Internal Affairs - Emergency Management Agency

Project duration: 2018-

Japanese International Cooperation Agency JICA

The project for capacity building for disaster risk reduction through the National Forest Information System and Eco DRR. The aim of the project is to strengthen the capacities of government officials in preventing and mitigating forest fires and other natural disasters through the creation of NFFIS and Eco DRR.

The project is developing the National Forestry Information System in Kosovo and Montenegro. Kosovo has developed the NFFIS software. The training of government officials who will use the system has been done. The NFFIS system will contribute to the reduction of the risk of disasters by mitigating forest fires.

Donor: Japanese International Cooperation Agency

Beneficiary: Ministry of Internal Affairs - Emergency Management Agency

Duration of the project: 2021 – 2026

Food Agriculture Organization FAO

The project "Support in strengthening sustainable and multi-purpose forest management to improve livelihoods in rural areas and address climate change in Kosovo" is being currently implemented/

One of the 3 components of the project is:

Introducing multi-purpose forest management and inclusive forest value chains for poverty alleviation of rural men and women, which supports:

- Presentation and implementation of plans for multipurpose forest management.
- Developing gender-responsive forestry-based value chains to reduce illegal logging and to alleviate poverty.
- Forest fire prevention and capacity building and their integration into planning of forest management.

The project is funded by Sweden/EU and implemented by FAO

Beneficiary: Ministry of Agriculture, Forestry and Rural Development

Duration of the project: 2020-2024

8. LFM System SWOT Analysis

Analysing the strengths and weaknesses in the field of wildfire risk reduction. In order to achieve a more efficient management of wildfires, cooperation between government agencies, local communities and environmental protection organisations is necessary.

Together they can design and implement comprehensive fire prevention and preparedness plans, including community engagement, awareness campaigns and capacity building initiatives.

About 90% of the cases of fires in nature are caused by the human factor, due to the negligence of citizens when burning crop residues or other waste.

8.1 Prevention

Preventive activities aim at predicting and reducing the causes of fire, enabling interventions to mitigate the effects of fire. According to the Law on Fire Protection, the owners or users of buildings and the environment are obliged to take measures for fire protection, defined by this law and by-laws issued based on this law, as well as in accordance with the fire protection plan, which must be harmonized with the municipal fire protection plan.

Based on the Law on Forests, the Kosovo Forestry Agency (KFA), in cooperation with competent institutions for fire protection, ensures the prevention and monitoring of forest fires. The forest owner must prevent and extinguish the fire when it appears in their forest and is obliged to inform the competent authorities. In the periods declared as high risk of fire periods, KFA provides the Service for forest surveillance in the forests which are classified as highly endangered by fire.

The most detailed conditions and ways of protecting forests from fire, as well as the methodologies for classifying the risk of forest fires and for observing and monitoring forest fires, are determined by a sub-legal act from MAFRD, with the consent of the Ministry of Internal Affairs. The agency draws up the plan for the protection of forests from fire at the level of the management unit or the municipality, for the period of ten (10) years.

Also, the Law on Forests determines the prohibition of lighting open fires in forests, forest lands, agricultural lands and other open places located closer than five hundred (500) metres from the forest. Within the forest and forest land, the lighting of fire is allowed only in special places of the forest that are intended for outdoor picnics.

The Administrative Instruction for the protection of forests from fire, defines the technical, preventive, and other measures, which must be implemented by the owners and users of forests and forest land with the aim of reducing the danger from the appearance and rapid spread of fires in forests, detection and notification of forest fires, prevention and extinguishing of forest fires.

Natural and legal persons who administer and manage forests and forest lands, to reduce the risk of possible damage from fire, must plan and implement preventive-cultivation works and other fire protection measures in forests. By preventive works we mean forest order, timely thinning of forest stand; pruning and cleaning of dry branches; opening and maintenance of paths and roads; opening and maintenance of paths against fire with forest road elements; cleaning and maintenance of hiking trails; maintenance and regulation of existing sources of water flows for the needs of fire extinguishing, opening of belts against

fire in conifers. All these preventive measures mentioned above should be carried out at the beginning of the summer season when forest fires can potentially be caused.

To increase awareness as much as possible in the whole society, it is necessary to organise different awareness activities using various forms that are most suitable for the community. This involves raising awareness through meetings, close discussions with citizens, through promotional and sensitisation tools such as brochures, posters, and other means suitable for visibility, as well as through media such as social media, written media and television.

From the findings of the second workshop on Landscape Fire Management in Kosovo, the known weaknesses, and advantages in the LFM system in Kosovo are as follows:

STRENGTH	WEAKNESSES
Existing fire management system	Inadequate Fire management system
Strategies and basic, strategic documents (central and local)	Insufficient implementation of the legislation
Human and technical capacities for LFM	Insufficient capacities (human, technical, professional)
Notification, information, alarm/observation system	Notification, information, alarm/observation system has shortcomings.
Harmonised legislation	Increasing inter-institutional cooperation / reporting
Operation of Kosovo Forest Information System	Lack of fire protection plan
Increasing regional and NGO cooperation	Frequent changes of government
Setting up the NFFIS – Eco DRR system	Low awareness
NRP - National Response Plan, IEMS - Integrated emergency management system, DVR from FNFT (Document of assessment of risks from natural disasters and other disasters,	Low media interest
Implementation of various projects - donations	Reduction of the number of farmers
Development of fire prevention campaigns	Population migrations
Rapid urban development (density)	

8.2 Preparedness

Preparedness activities aim to identify areas and periods at risk of forest fires through risk indices, prepared based on climatic and vegetation variables, the implementation of which is essential for planning preventive and firefighting actions. After the natural disasters with fires in 2007, the Emergency Management Agency found it necessary to create The Integrated Emergency Management System (IEMS), which provides a systematic, proactive approach to directing departments and agencies of all levels of government, non-governmental organisations and the private sector to work together and with focused attention in the area of prevention, protection, response, recovery and mitigation of the effects of incidents, regardless of cause, size, their location or complexity, in order to reduce losses in life and material goods, as well as harmful effects on the environment.

The Integrated Emergency Management System (IEMS) provides the framework for incident management, while the National Response Plan (NRP) provides the structure and mechanism for national incident/emergency management policies. Readiness is achieved and maintained through the continuous emergency cycle of planning, organising, training, exercising, evaluating, and taking corrective action. Continuous preparedness efforts of all those involved in emergency management and incident response activities ensure effective coordination during times of crisis.

The preparedness organizations, among others, can undertake the following actions:

- Creating and coordinating emergency operational plans, protocols, and procedures, including communication and public awareness.
- Integration and coordination of activities and functions within their scope.
- Establishing standards, guidelines, and protocols necessary to support interoperability and consideration of the safety aspect for responders.
- Implementation of standards, guidelines and procedures for the search and provision of resources.
- Identification of resources and other needs as well as setting priorities for their use.
- Designing programmes and encouraging staff for training, exercises, evaluations, and corrective actions.
- Reaching and maintaining agreements for mutual aid and aid and distribution agreements with NGOs and the private sector
- Planning of scientific operational support

The number 112 is a unique emergency number, free of charge in Kosovo, used since 2002. It is possible to dial 112 from landlines and mobile phones for any emergency need, such as: emergency medical assistance, assistance in extinguishing fires and the rescue of endangered persons and the separate services of the Kosovo Police. When you call 112, you will be answered by an operator trained to receive emergency calls, who, depending on your emergency, will also take the necessary steps for you to receive help as quickly as possible. At the same time, the operator in question will guide you to the services that will help you to reach the scene as quickly as possible, in accordance with European standards.

STRENGTH	WEAKNESSES
Creation of a forest monitoring centre	Insufficient budget
Budget increase	Inadequate infrastructure (not maintained, difficult access)
Road infrastructure and the like	Lack of a map for the location of the fire
Creating a map of risk areas	Lack of fire prevention equipment

8.3 Suppressive

The Fire and Rescue Department also includes the professional firefighting and rescue units, which are staff of EMA/MIA. The mission of the Professional Fire and Rescue Unit (PFRU) as a minimal organisational and operational structure is to respond and simultaneously participate in firefighting and rescue operations in emergency situations. The readiness of the PFRU enables the units at any moment and in the shortest possible time to act with all available forces. Professional firefighting units are equipped with vehicles and technical equipment and depending on the nature of the fire, the Response Team is activated, and the intervention is carried out, considering the standard created in the country.

Also, considering the location of the UPU (all UPU Stations are in cities), having them reach the place of intervention in the jurisdiction, or up to the outskirts, is a challenge and leaves much to be desired.

The mission of the Firefighting and Rescue Group as a minimum organisational, operational structure is to respond and simultaneously participate in firefighting and rescue operations in emergency situations. The readiness of the Professional Fire and Rescue Unit (PFRU) enables the units to act at any moment and in the shortest possible time with all available forces. Based on the law on firefighting and rescue, (PFRU)

responds to emergency cases with the aim of extinguishing fire and rescuing people, using all means for the purpose of extinguishing fire. Volunteer fire brigades are also engaged in extinguishing the fire and participate voluntarily in actions. From the practices so far, the owners of private forests participate as a community in extinguishing fires, even if the fire has passed into public property, but always under the leadership of the firefighting unit or other actors who participate in extinguishing fires in nature.

Based on the Forest Law, the forest owner must prevent and extinguish fires when it appears in their forest and at the same time is obliged to inform the competent authorities.

STRENGTH	WEAKNESSES
Coordination on central and local level in accordance with the laws in force Good cooperation with communities and local population Opening corridors against fires	Lack of funds Inadequate infrastructure (not maintained, difficult access) Lack of fire extinguishing equipment Water diversion Low mobility for access Poor management

8.4 Post-Fire Management

Large-scale fires were recorded in 2000, 2004, 2007 and 2012, where large areas of forests were damaged, causing significant loss of wood mass both economically and environmentally. The surfaces that have been involved in the fire are first remedied by removing the burned remains of the wood mass from the burned location to avoid the spread of diseases and pests that can find shelter to develop and became the centre of infection for the vital forest.

Then the rehabilitation plan and planning for the installation of species that are resistant to fire is made, through afforestation by installing cultures of different types, giving preference to indigenous species to create a forest stand resistant to fires in nature, which can be adapted to easy.

As found in this chapter, there is a lack of a system for early prevention of fires, and a database and assessment of the damage caused by fire, as well as detailed plans for the management of areas after wildfires. From the practices so far, we should put the management of surfaces after fires in greater focus.

STRENGTH	Weaknesses
Human and technical capacities for wildfire management	Lack of extinguishing equipment There are no regulations for post-fire management. Non-implementation of existing regulations and measures provided for in the planning documents. Inadequate training of existing staff

9. Landscape Fire Management Guidelines

In this chapter, a series of guidelines and recommendations meticulously curated to not only enhance the efficacy of existing documents, laws, strategies etc. but also to chart a course for the future development of fire management strategies at the landscape level. Crucially, this framework represents the collaboration of stakeholders across the spectrum of science, practice, and policy, recognizing the indispensable synergy that arises from their collective expertise and perspectives.

The goal of LFM is to create resilient landscapes that can withstand and adapt to fires, while minimizing negative impacts on both people and the environment, as well as the communities that depend on these landscapes as their livelihoods. Resilient landscapes, in this context, are those that not only limit the possibility for a fire to occur but also possess the inherent capacity to endure fires and make them less intensive when they do develop as well as exhibit a capacity for successful recovery and regeneration in their aftermath. Achieving this delicate equilibrium requires a strategic blend of preventative measures, active management strategies, and community engagement efforts, all tailored to the unique characteristics and vulnerabilities of each landscape. Furthermore, the aspiration of landscape fire management extends beyond the mere preservation of natural habitats; it encompasses a broader commitment to safeguarding the well-being of both human and non-human inhabitants of these landscapes. Minimizing the negative impacts of fires necessitates a holistic approach that considers not only the immediate environmental consequences but also the socio-economic ramifications for nearby communities. By mitigating the risk of fire-related hazards such as property damage, loss of livelihoods, and adverse health effects, landscape fire management endeavours to cultivate a harmonious coexistence between people and the environment. Ultimately, the success of landscape fire management lies in its ability to strike a delicate balance between ecological conservation and human welfare, ensuring that both thrive in tandem within the dynamic framework of fire-prone landscapes.

The fire management system has an important role in protecting forests and landscapes from the consequences of fires. However, in the current fire management system, there are various obstacles, where initially there is a lack of inter-institutional coordination, insufficient awareness, lack of infrastructure, etc.

Central to this endeavour is the acknowledgement of climate change as one of the primary drivers, amplifying the frequency and intensity of landscape fires through rising temperatures, prolonged droughts, and altered precipitation patterns ultimately resulting in prolonged fire seasons. Furthermore, the abandonment of agricultural lands, a consequence of shifting socio-economic dynamics, compounds the problem by fostering the proliferation of dry vegetation and combustible materials (wildland fuels), effectively creating favourable conditions for ignition and an overall higher degree of vulnerability.

The guidelines and recommendations which were derived from the work of the Landscape Fire Management Network of Kosovo are presented below, with aims to improve the current Landscape fire management.

- **Development of the national fire early warning system** as an integrated web-GIS system for fire prevention and early warning, that shares information with the relevant institutions that are part of the fire management system, enabling the receiving of information on the occurrence of fires in real-time.

- **Drafting a state plan for fire prevention** by responsible institutions as a prevention plan that is based on the guidelines for land management conducting fire risk assessments and implementing effective emergency response strategies.
- **Creation of a fire risk map on the landscape level** determining the most vulnerable areas to fires. To create that, it is needed historical data on the spread of fires in entire Kosovo, as well as orographic data such as the slope of the terrain, altitude, exposure of the terrain, etc., as well as land cover, as well as the other important elements that are part of the content of the LFM report in Kosovo such as demography, climate changes, etc.
- **Determining structural and non-structural measures for fire protection** based on the National Emergency Response Plan.
- **Increasing public and private capacities (campaign, education, awareness)** with involvement of subjects related to the protection of the environment from natural disasters, such as landscape fires etc. within educational curricula. Also, raising awareness in public and private institutions through various campaigns such as media, social networks, etc., because awareness activities play an important role in mitigating wildfires as well. Launching a media campaign can effectively educate citizens on ways to prevent fires.
- **Increasing cooperation/communication/coordination between institutions and organisations in the science, practice and policy interface** that are included in the LFM network in Kosovo, based on their responsibilities and duties, respectfully. Also, the creation of a cooperation approach with the neighbouring countries of the region, where the LFM program is being developed at the same time, and to strengthen the strategic documents at the regional level.
- **Provide training for personnel dealing with forest management** in the fire protection sector, by organizing regular training sessions, because of Insufficient budgets within institutions, as well as equip them with the latest firefighting techniques.
- **The implementation of the legislation and measures** deriving from the existing laws should also be within the principle of the LFM with the possibility of introducing the LFM in the administrative instructions and strategic documents.
- **Training of the the fire department staff** by upholding the latest International standards and experiences, following contemporary trends, knowledge and technologies of advanced developments both theoretically and practically.
- **Evaluation and database upgrades** – Sendai - Desiventar - needs improvements in the methodology of historical records of data and coordination between them.
- **Post-fire management and rehabilitation of burnt areas and ecosystems** following the stages of rehabilitation through natural regeneration, as well as the preparation of the terrain for afforestation preserving the existing species in accordance with the areal and preventing the spread of invasive species.

The current fire management system in Kosovo is not yet at the stage to reduce the increasing trend of landscape fire risk. The existing system, along with the strategic documents, should include very important components such as prevention and preparedness measures, which increase the resilience of the environment, society - community and economy, following the principles of LFM.

To effectively tackle these challenges, it is imperative to establish robust cooperation frameworks and mechanisms at both national and regional levels. This involves developing collaborative strategies, policies, communication channels, knowledge exchange, and capacity-building initiatives aimed at mitigating the adverse effects of fires on the environment. This is crucial in addressing one of the most significant challenges confronting humanity today, given the far-reaching impacts on the environment, economy, and sustainable societal development. The Landscape Fire Management Regional Network in the Western Balkans serves as a vital platform to facilitate and foster these efforts.

In conclusion, these comprehensive guidelines should outline and pave the way for the development of a robust system for landscape fire management in Kosovo, emphasizing the importance of prevention, preparedness measures, establishing communication, cooperation, and capacity building between relevant institutions and organizations from the science-practice-policy interface within the current and future fire protection and landscape management system, to successfully enhance fire-resilience of the landscapes and mitigate the impact the fires may pose on the environment, society, and economy. By integrating these guidelines and fostering institutional, multisectoral and regional collaboration of the relevant stakeholders, Kosovo can work towards building a sustainable and adaptive landscape fire management system that aligns with the principles of the Landscape Fire Management approach.

References

(2011). *Assessment of the population.* Prishtina: Kosovo Statistics Agency.

Eeropean Commision. (2012). *Forest Fires in Europe, Middle East, and North Africa, JRC technical report.*

Emergency Management Agency. (n.d.). Retrieved from https://ame.rks-gov.net/

EU Twinning Project. (2013). *National Plan for the Management of Forest Fires in Kosovo.*

EU Twinning Project, F. s. (2012). *Defence Strategy of Climate in the Forestry Sector in Kosovo.* Prishtina.

EU Twinning Project, Further support to suistainable forestry management in Kosovo. (2012). *Guidelines for creating a communication strategy for preventing and fighting forest fires in Kosovo.* Prishtina.

European Commision. (2011). *Forest Fires in Europe, Middle East, and North Africa, JRC technical report.*

European Commision. (2013). *Forest Fires in Europe, Middle East, and North Africa, JRC technical report.*

European Commision. (2014). *Forest Fires in Europe, Middle East, and North Africa, JRC technical report.*

European Commision. (2015). *Forest Fires in Europe, Middle East, and North Africa, JRC technical report.*

European Commision. (2016). *Forest Fires in Europe, Middle East, and North Africa, JRC technical report.*

European Commision. (2017). *Forest Fires in Europe, Middle East, and North Africa, JRC technical report.*

European Commision. (2018). *Forest Fires in Europe, Middle East, and North Africa, JRC technical report.*

European commision. (2019). *Forest Fires in Europe, Middle East, and North Africa, JRC technical report.*

European Commision. (2020). *Forest Fires in Europe, Middle East, and North Africa, JRC technical report.*

European Commision. (2021). *Forest Fires in Europe, Middle East, and North Africa, JRC technical report.*

(2015). *Forest fire country studies.* Regional Fire Monitoring Centre.

(2021). *General statistics, Kosovo in numbers.* Prishtina: Kosovo Statistics Agency.

Hydrometeorological Yearbook. (2015-2020). Hydrometeorological Institute of Kosovo.

(2020). *Hydrometeorological Yearbook.* Hydrometeorological Institute of Kosovo .

(2014-2019,). *Inventory of Greenhouse Gas Emissions in Kosovo.* Prishtina: Ministry of Environmental, Spatial Planning and Infrastructure, Kosovo Environmental Protection Agency.

Kosovo, O. g. (n.d.). *Administrative instruction 22-2007 for protection of forests from fire.*

Kosovo Forestry Agency. (2007-2021). *Annual reports on forest fires in Kosovo.*

Kosovo Statistics Agency. (2021). *Kosovo Population Estimate, social statistics.*

Kosovo Statistics Agency. (2022). *Statistical Yearbook of Republic of Kosovo.*

Kosovo Statistics Agency. (2023). *Statistical Yearbook of Republic of Kosovo.*

Ministry of Agriculture, F. a. (2022). *Kosovo Green Report.*

Ministry of Agriculture, F. a. (2023, April). Retrieved from Official gazette of the Republic of Kosova: https://gzk.rks-gov.net/ActDetail.aspx?ActID=71815

Ministry of Agriculture, Forestry and Rural Development. (n.d.). Retrieved from https://www.mbpzhr-ks.net/: https://www.mbpzhr-ks.net/repository/docs/STRATEGJIA_20222028_FINAL_ENG_Web_Noprint_final_PDF.pdf

Ministry of Agriculture, Forestry and Rural Development. (n.d.). Retrieved from https://www.mbpzhr-ks.net/sq/legjislacioni: https://mbpzhr-ks.net/repository/docs/A._Planit_i_Veprimit_per_SZHP__2022_2024_Final_ENG.pdf

Ministry of Agriculture, Forestry and Rural Development. (n.d.). Retrieved from https://www.mbpzhr-ks.net/sq/legjislacioni

Ministry of Agriculture, Forestry and Rural Development. (2022, August). Retrieved from Official gazette of the Republic of Kosova: https://gzk.rks-gov.net/ActDetail.aspx?ActID=62056

Ministry of Defense of Kosovo, C. c. (2023). *Map of Mined fields.*

Ministry of Environment, S. P. (2013). *Spatial Plan of the National Park "Sharr".* Prishtina: Ministry of Environment, Spatial Planning and Infrastructure .

Ministry of Environment, Spatial Planning and Infrastructure, Kosovo Environmental Protection Agency. (n.d.). *Annual report on the state of the environment.*

Ministry of environmental, s. p. (2010, November). Retrieved from Official gazette of the Republic of Kosova: https://gzk.rks-gov.net/ActDocumentDetail.aspx?ActID=2716

Ministry of Environmental, S. P. (2013, January). Retrieved from Official gazette of the Republic of Kosova: https://gzk.rks-gov.net/ActDetail.aspx?ActID=2866

Ministry of Environmental, S. P. (n.d.). *Spatial Plan of the National Park " Sharr".*

Ministry of Environmental, S. P. (n.d.). *The spatial Plan of Kosovo, the spatial development strategy 2010-2020+.*

Ministry of Environmental, Spatial Planning and Infrastructure. (n.d.). Retrieved from https://kryeministri.rks-gov.net/: https://kryeministri.rks-gov.net/wp-content/uploads/2022/08/Eng-SAPB-2016-2020.pdf

Ministry of Environmental, Spatial Planning and Infrastructure. (2008, June). Retrieved from Official gazette of the Republic of Kosova: https://gzk.rks-gov.net/ActDocumentDetail.aspx?ActID=2529

Ministry of Environmental, Spatial Planning and Infrastructure. (2009, April). Retrieved from Official gazette of the Republic of Kosova): https://gzk.rks-gov.net/ActDocumentDetail.aspx?ActID=2631

Ministry of Environmental, Spatial Planning and Infrastructure. (2013, January). Retrieved from Official gazette of the Republic of Kosova: https://gzk.rks-gov.net/ActDocumentDetail.aspx?ActID=2865

Ministry of Environmental, spatial Planning and Infrastructure. (2018-2021). *Anual report on the state of nature.* Kosovo Environmental Protection Agency.

Ministry of environmental, Spatial Planning and Infrastructure. (n.d.). *Climate Change Strategy of the Republic of Kosovo 2019-2028, and Climate Change Action Plan 2019-2021.*

Ministry of Internal Affairs. (2011, August). Retrieved from Official gazette of the Republic of Kosova: https://gzk.rks-gov.net/ActDocumentDetail.aspx?ActID=2750

Ministry of Internal Affairs. (2011, October). Retrieved from Official gazette of the Republic of Kosova): https://gzk.rks-gov.net/ActDocumentDetail.aspx?ActID=2775

Ministry of Internal Affairs, E. m. (n.d.). *Regulation no. 16/2012 on the organizational structure of professional firefighting and rescue units.*

Agency, M. o.-E. (2023-2028). *Strategy for reducing the risk from natural disasters and other disasters and action plan .*

Official gazette of the Republic of Kosova. (n.d.). *Law no 04/L-087 For NP "Sharr".*

Official gazette of the Republic of Kosova. (n.d.). *Law no. 04/L-012 on Fire protection .*

Official gazette of the Republic of Kosova. (n.d.). *Law no. 04/L-049 For firefighting and rescue.*

Official gazette of the Republic of Kosova. (n.d.). *Law no. 04/L-086 for NP "Bjeshkët e Nemuna".*

Official gazette of the Republic of Kosova. (n.d.). *Law no. 08/L-137 on Forests.*

Spatial Plan of the National Park "Bjeshket e Nemuna". (2022). Prishtina: Ministry of Environment, Spatial Planning and Infrastructure.

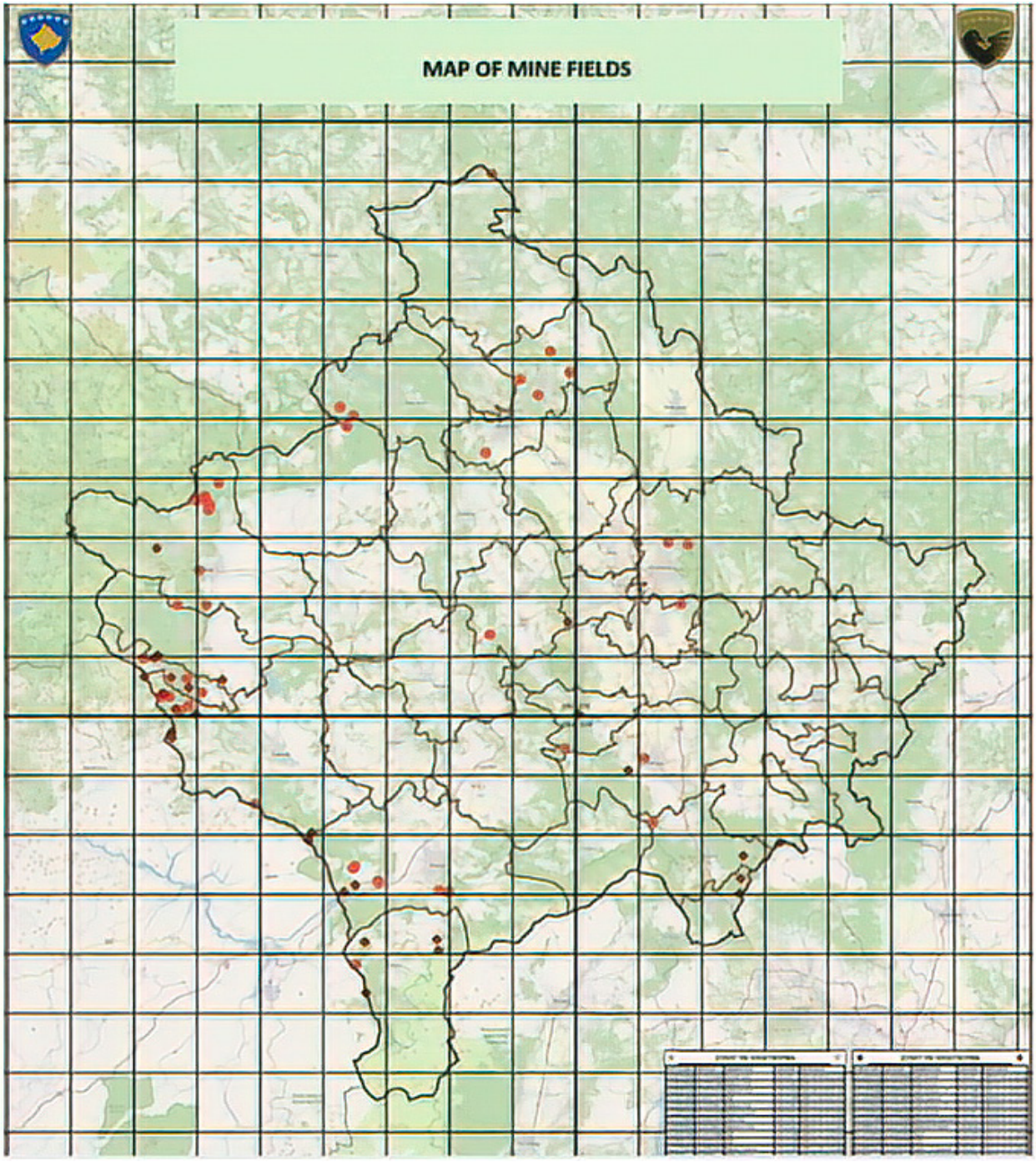
Strategy for the Development of Forestry in Kosovo 2022-2030. (2021). Prishtina: Ministry of Agriculture, Forestry and Rural Development.

Tomter S. M. Dr., B. E. (2012). *National Forest Inventory.* Prishtina: Ministry of Agriculture, Forestry and Rural Development.

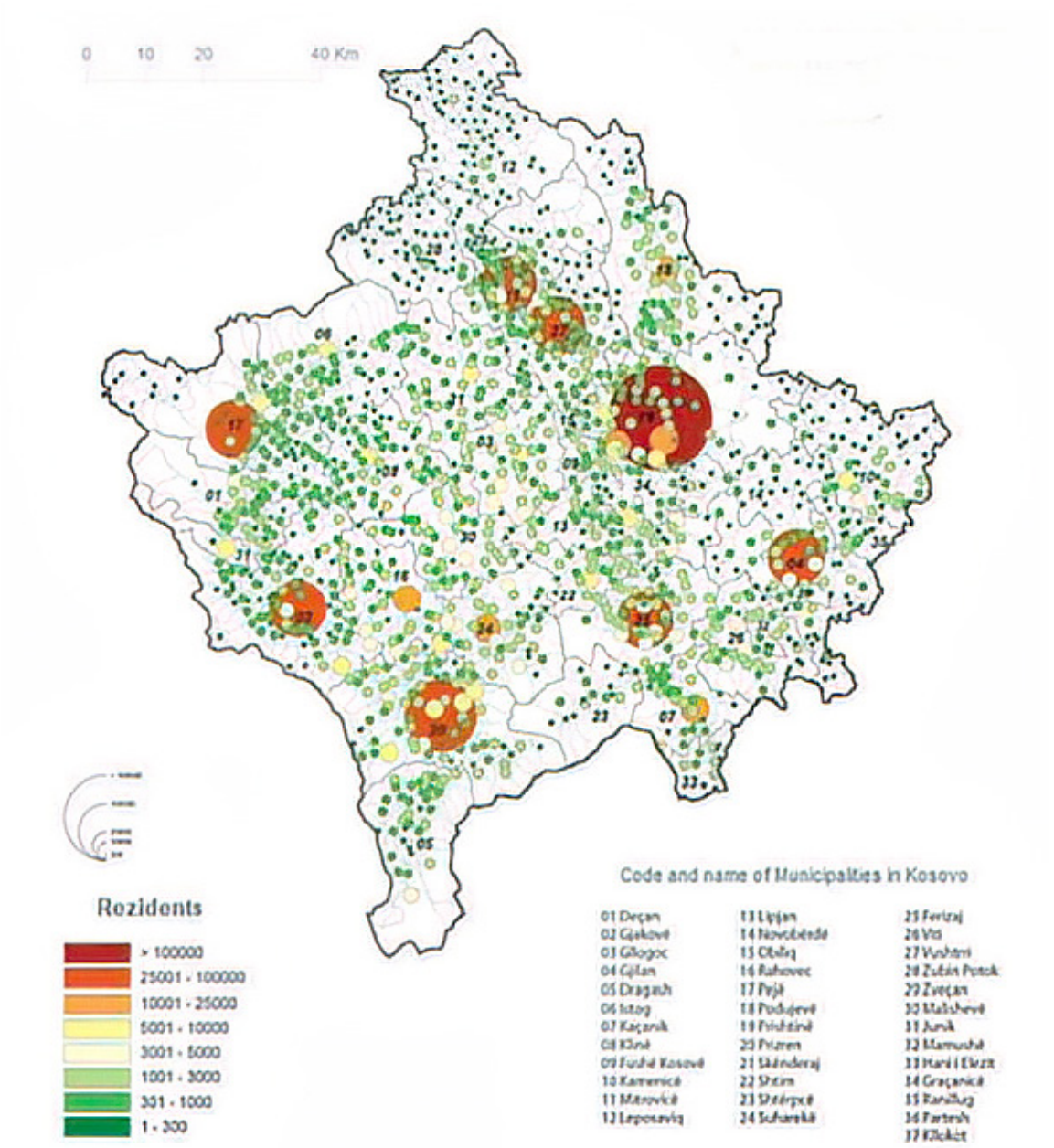
Vuković A., D. a. (2018). *Study on climate change in the Western Balkans region.* Regional Cooperation Council Secretariat.

(2021). *Yearbook of statistics of the Republic of Kosovo.* Prishtina: Kosovo Statistics Agency.

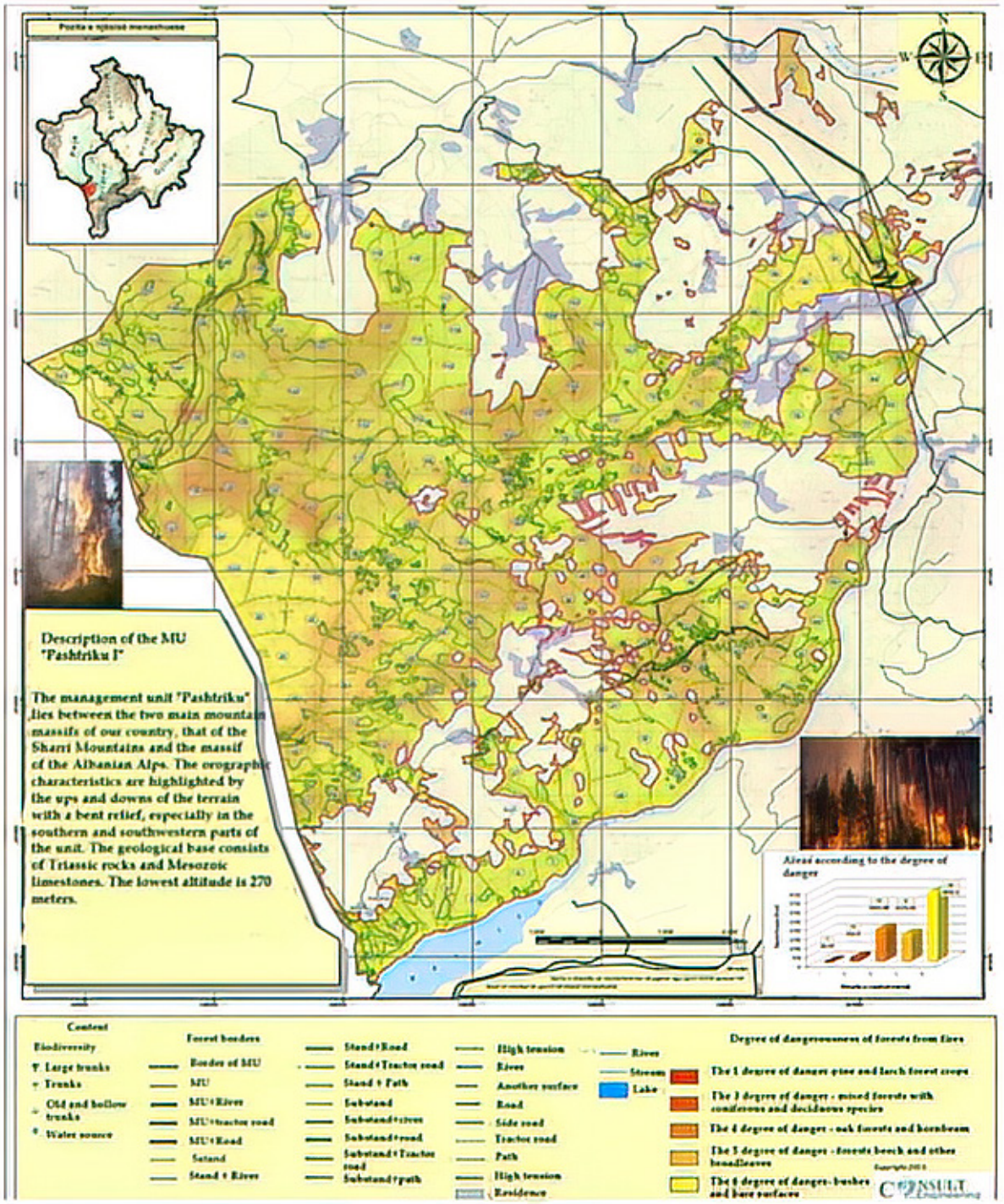
Annexes (Maps, Tables, Illustrations, Chartics, etc.)



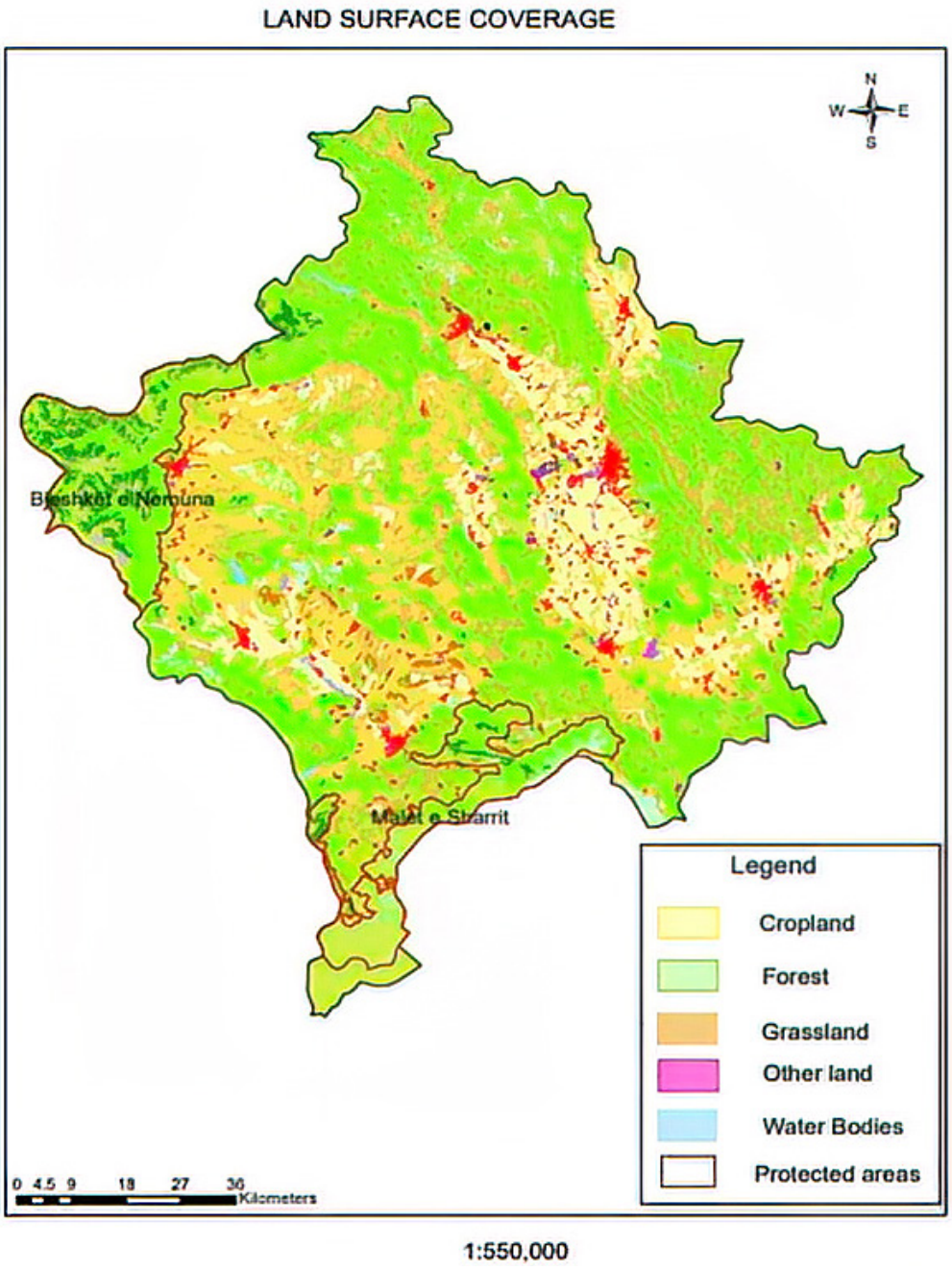
Annex 1. *Map of minefields:* ***Source of data****: Ministry of Defence of Kosovo - KSF*



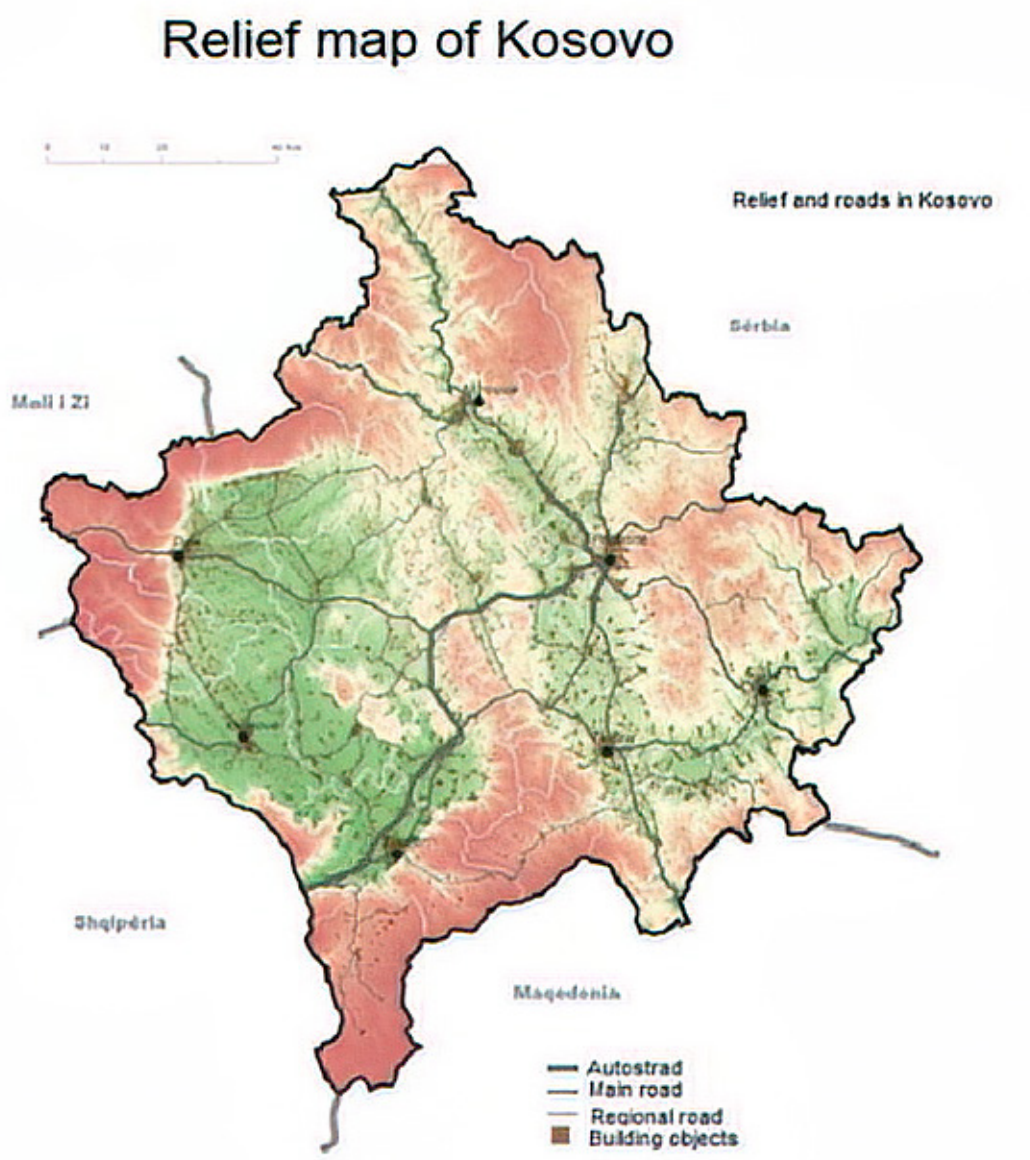
Annex 2. *Map of Population distribution in Kosovo:* ***Source of data****: Kosovo Statistics Agency*



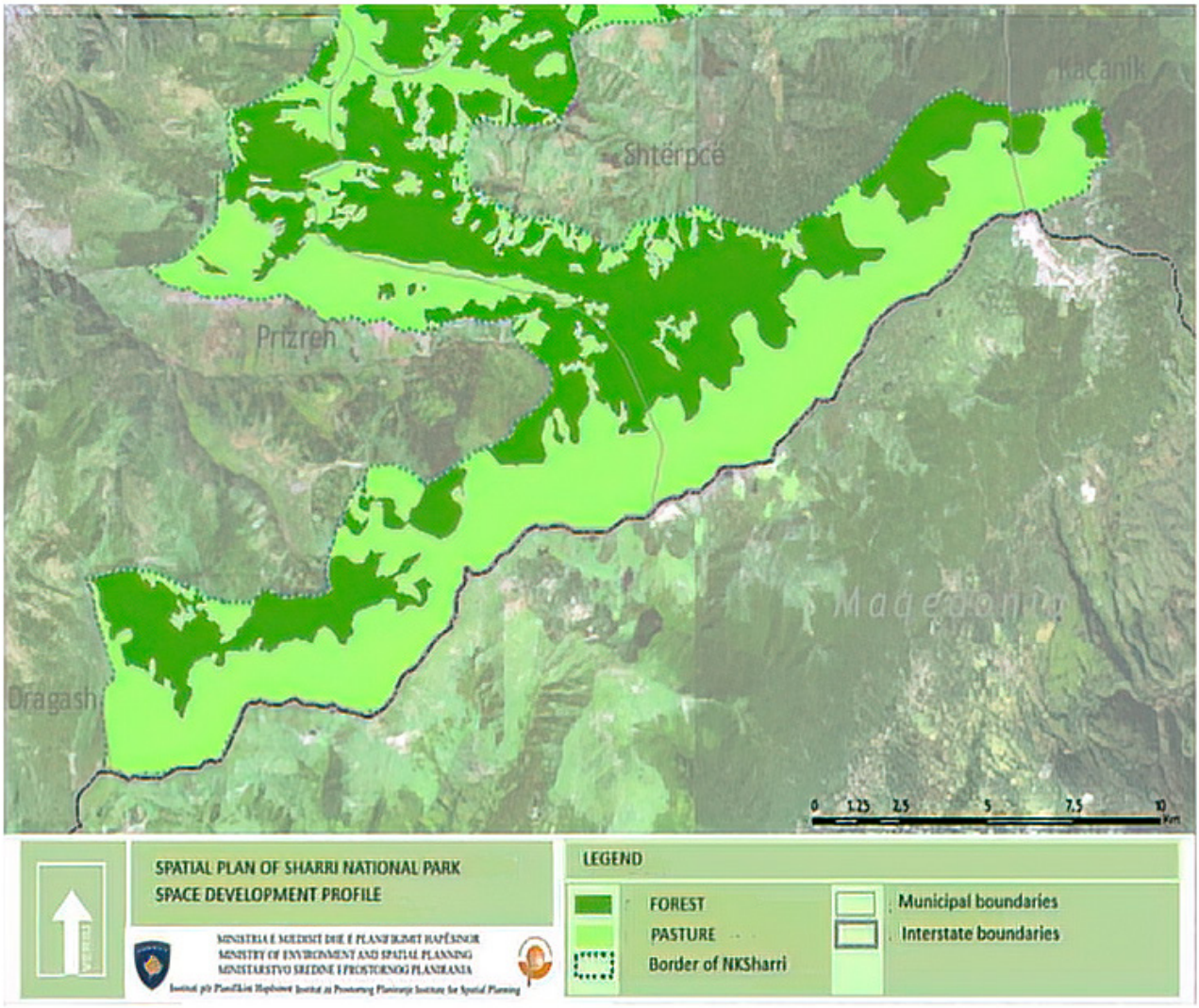
Annex 3. *Fire risk map in the "Pashtriku" Management Unit:* ***Source of data****: KFA*



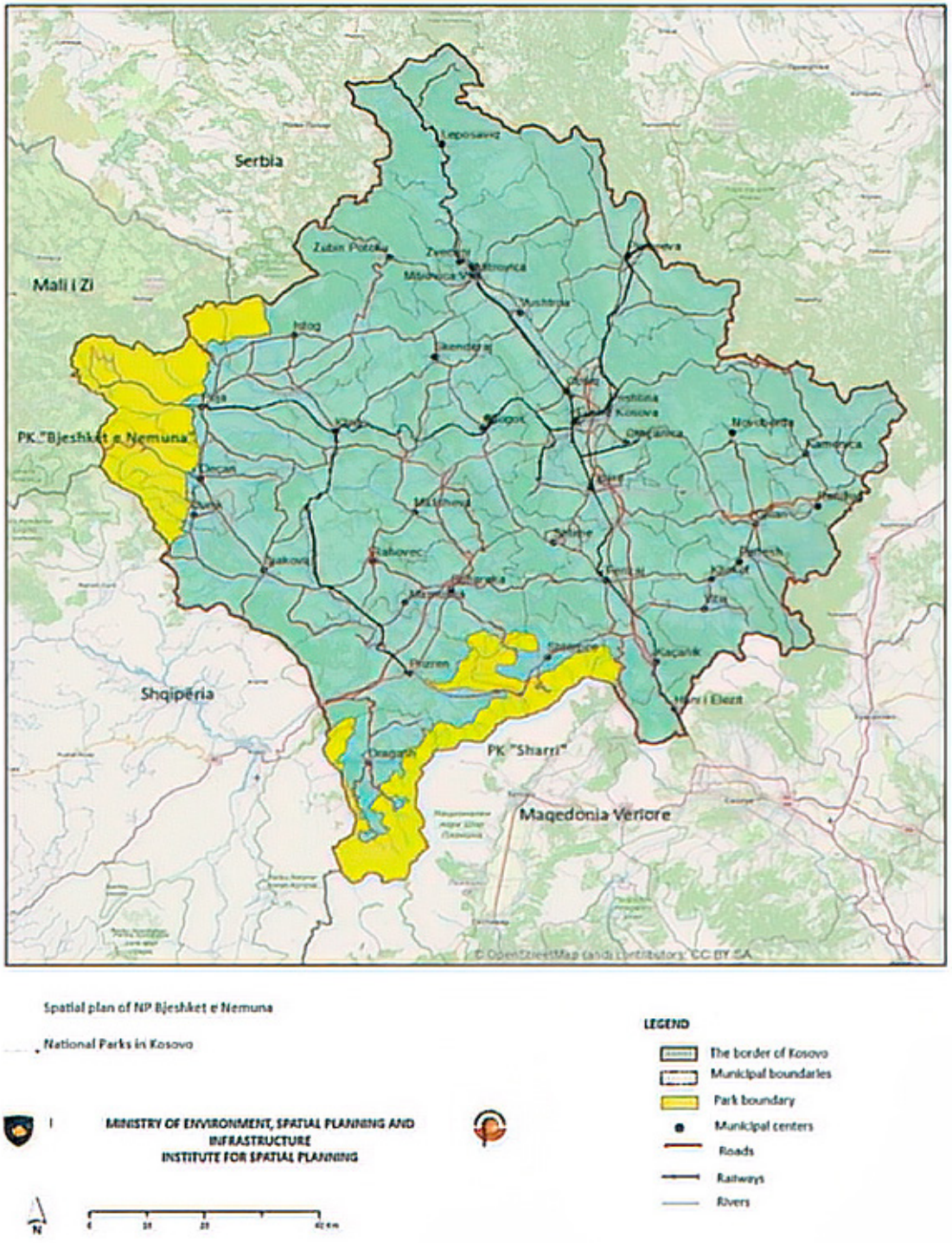
Annex 4. *Kosovo coverage map:* ***Source of data****: Geoportal*



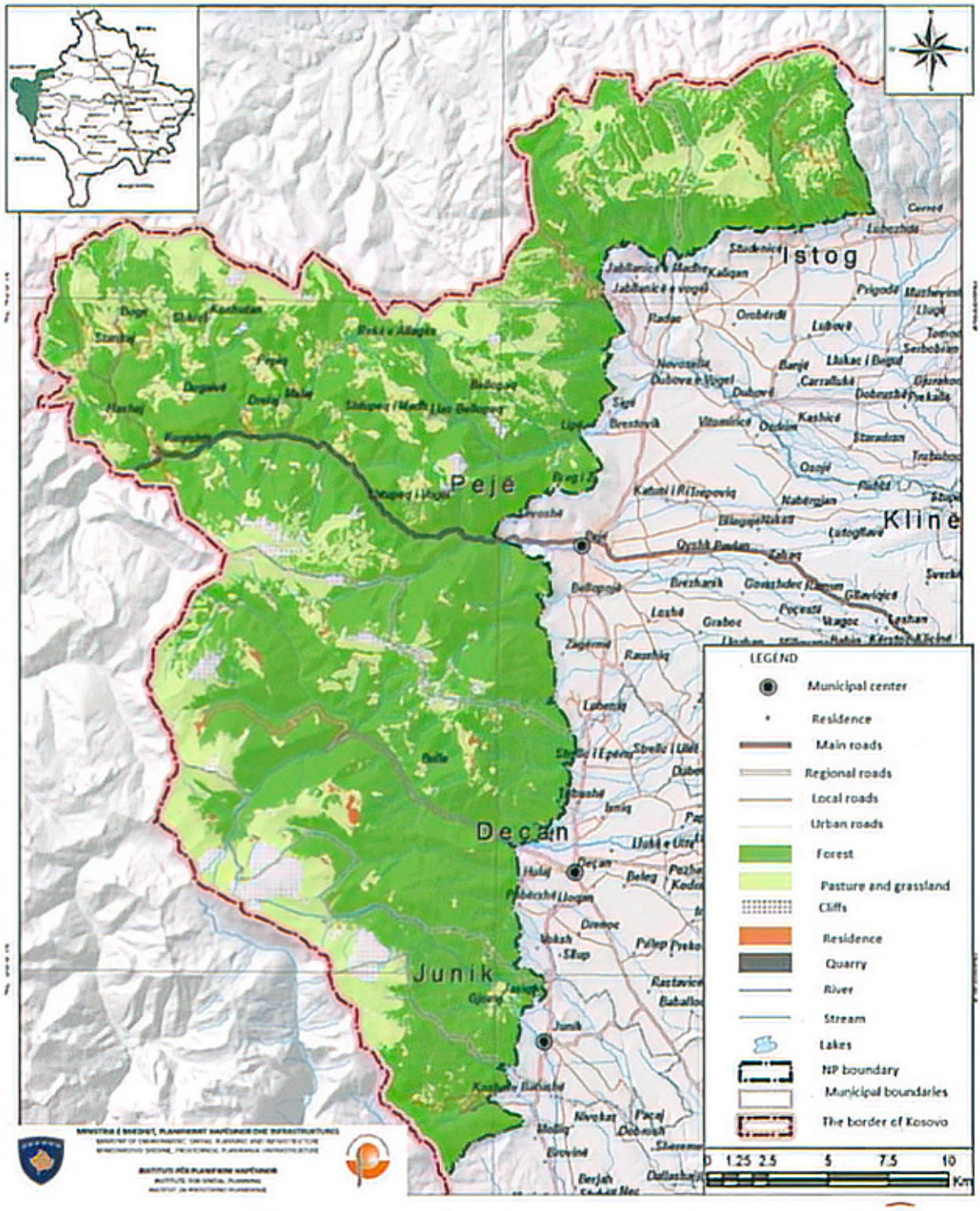
Annex 5. *Relief map of Kosovo:* ***Source of data****: Statistical Yearbook of the Republic of Kosovo 2022*



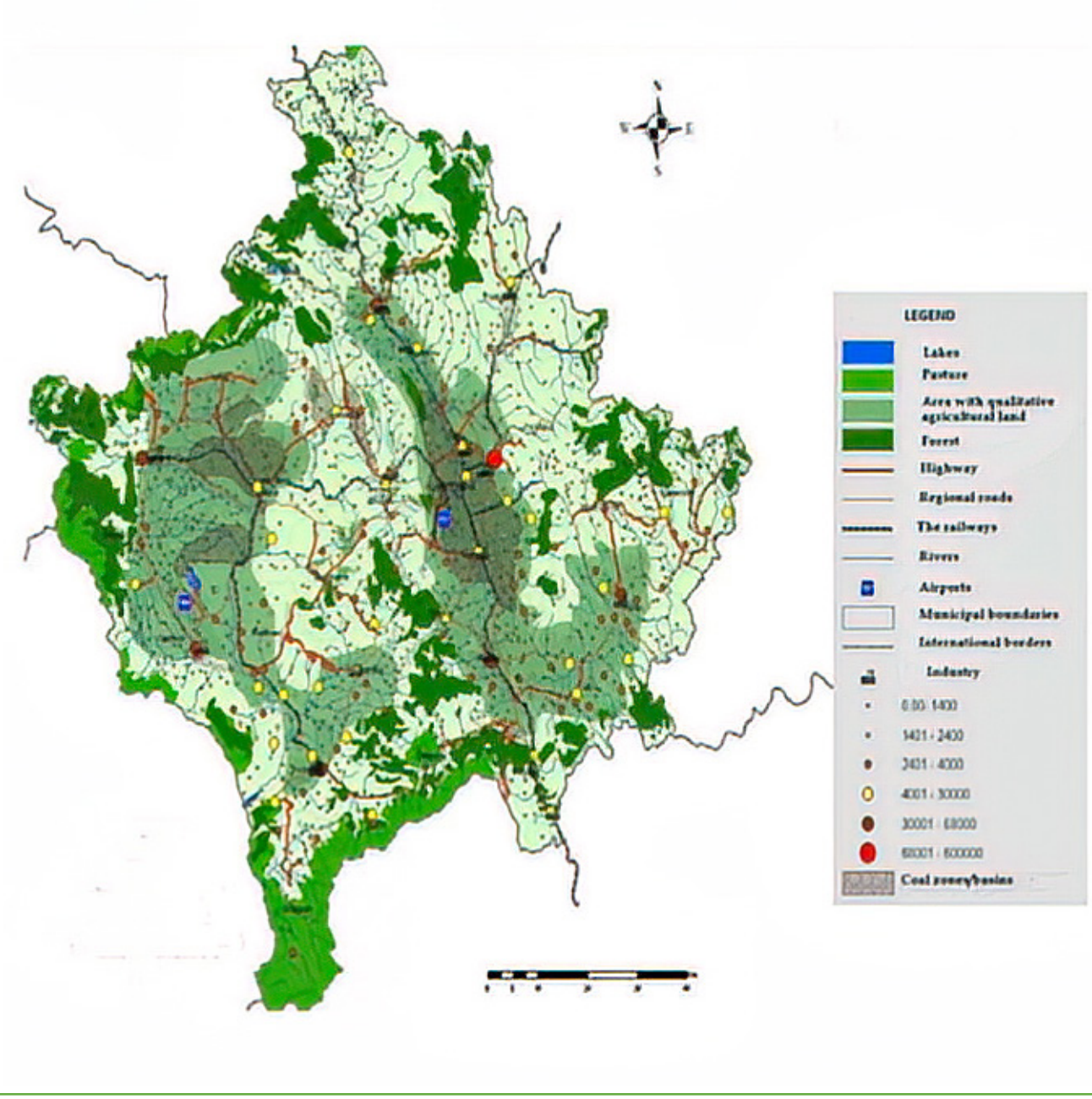
Annex 6. *Vegetation of forests and pastures in NP "Sharr": **Source of data**: Spatial Plan of NP "Sharr"*



Annex 7. *Map of National Parks in Kosovo:* ***Source of data****: NP Spatial Plan "Bjeshket e Nemuna*



Annex 8. *Forests and pastures map in NP "Bjeshket e Nemuna": **Source of data**: Spatial Plan of NP "Sharr"*



Annex 9. *Map of agriculture land:* ***Source of data****: Spatial Plan of Kosovo*



Annex 10. *Photographs of some of the meetings of the National LFM Network in Kosovo*