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Qeveria - Vlada - Government

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MINISTRY OF ECONOMY AND ENVIRONMENT

AMMK

AGJENCIA PËR MBROJTJEN E MJEDISIT TE KOSOVËS
KOSOVSKA AGENCIJA ZA ZAŠTITU SREDINE
KOSOVO ENVIRONMENTAL PROTECTION AGENCY

KOSOVO ENVIRONMENT 2020

REPORT ON ENVIRONMENTAL INDICATORS

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KOSOVO ENVIRONMENTAL PROTECTION AGENCY

Kosovo Environment 2020
Report of environmental indicators

Prishtina, 2020

Contents

List of abbreviations

EEA	European Environment Agency
KEPA	Kosovo Environmental Protection Agency
KFA	Kosovo Forest Agency
WSSRA	Water and Sewerage Services Regulatory Authority
KAS	Kosovo Agency of Statistics
KVFA	Kosovo Veterinary and Food Agency
WB	World Bank
EU	European Union
GDP	Gross Domestic Product
CLC	Corine Land Cover (CORINE methodology)
CLRTAP	Convention on Long-Range Transboundary Air Pollution (Convention on Transboundary Air Pollution)
CORINE	Coordination of information on the environment
DPSIR	D-Driving Forces. P-Pressures, S-State, I-Impacts, R-Responses (D-Driving Forces, P-Pressures, S-State, I-Impacts and R-Response
EEMMN	European Environmental Monitoring and Monitoring Network
EMEP/EEA	Air Pollutant Emission Inventory Guide (EMEP / EEA air Pollutant Emission Inventory Guidebook)
GHG	Greenhouse gases
KHI	Kosovo Hydro -meteorological Institute
KINP	Kosovo Institute for Nature Protection
KNIPH	Kosovo National Institute of Public Health
IUCN	International Union for Conservation of Nature - International Union for Conservation of Nature
KFW	German Development Bank
SLMC	Sanitary Landfill Management Company
UNFCC	United Nations Framework Convention on Climate
RWC	Regional Waste Companies
KRU	Regional Water Company
MAFRD	Ministry of Agriculture, Forestry and Rural Development
MI	Ministry of Infrastructure
MIA	Ministry of Internal Affairs
MED	Ministry of Economic Development
NMVOC	Non-Methane Volatile Organic Compounds
OECD	Organization for Economic Cooperation and Development
EIS	Environmental Information System
AEI	Average Exposure Indicator
TSP	Total Suspended Particles
AAV	Average Allowed Value

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Preface

The assessment of the state of the environment should be continuous and based on relevant data. It is very important that the state of the environment to be monitored for a longer period of time in order to see the development trends in the environmental sector and the impacts coming from the development sectors.

One of the most acceptable and efficient forms of assessing the state of the environment over a longer period of time is the use of environmental indicators.

Such an assessment highlights the trends of the state of the environment, the pressures placed on the environment, the driving forces that bring the impacts on the environment but also the effectiveness of environmental policies in improving the state of the environment.

So far, the Kosovo Environmental Protection Agency has drafted annual reports on the state of the environment, and specific reports on environmental sectors such as air, water, waste, nature, etc., which have included time periods of 1 to 5 years. Also the data and indicators used in the context of the assessment of the situation in these reports and assessments have mainly included shorter periods of time.

"State of the Environment 2020, Report of Environmental Indicators", is the first publication of its kind to make an assessment of the state of the environment based on the national list of environmental indicators, which includes a longer period of time

For the drafting of the report, are used the standard methodologies by European Union organizations such as the OECD, the European Environment Agency, EUROSTAT or other organizations have been used too. Indicators have also been used, the development and processing of which is based on methodologies that are defined by these organizations.

The selection and development of indicators has been adapted to the general development situation in Kosovo and has been oriented to the accessible data available for the development of certain indicators.

We hope that this publication will be a good basis that will serve policymakers in drafting more effective policies not only in improving the state of the environment, but also in preventing environmental impacts coming from development sectors.

Acknowledgement

Dear readers,

In your hands you have an assessment of the state of the environment that is based on indicators that speak of the state of the environment, but also of environmental impacts. This report has been prepared by the Kosovo Agency for Environmental Protection, within the scope of duties and responsibilities for assessing and reporting on the state of environment.

The preparation of this Report has been supported as well as by other institutions that have responsibilities in the production of data necessary for the compilation of environmental indicators.

We believe that such a format of assessment and reporting of the state of the environment will be a very important tool not only for informing the public but also for orienting policies, strategies and priorities in the field of environmental protection but also in the prevention or mitigation of environmental impacts from other development sectors.

We are aware that in order to make advanced assessments of the state of the environment and to achieve more efficient results in environmental protection, we need the cooperation and commitment of other institutions that monitor the environment or produce relevant data. To this end, we will continue to engage in deepening cooperation with all relevant institutions, in order to establish common systems for the collection and processing of environmental data. Hope that our joint efforts and commitments will also increase the quality of reporting and assessment of the state of the environment.

On this occasion, KEPA expresses special thanks not only to the staff of KEPA, who has worked with dedication for the realization of this report, but also all governmental and non-governmental institutions that have made a contribution by providing the necessary data.

Mentor Sylmeta,
Deputy Executive Director of KEPA

1. Introduction

Drafting of the Report on the State of the Environment in Kosovo through environmental indicators is based on the Law on Environmental Protection. According to article 50 point 4 of this law: "Environmental monitoring is performed through systematic measurements, research and ***evaluation of indicators of state and environmental pollution*** which include monitoring of natural factors, respectively change of state and characteristics of environment, air, water, soil, forests, biological and landscape diversity, flora, fauna, climatological elements, ozone layer, noise, waste, etc."

National list of environmental indicators is determined by the decision of the Minister of MESP no.90 dated 31.01.2018 for the approval of the national list of environmental indicators. According to this decision, the national list of environmental indicators serves to: "carry out reporting on the state of the environment and includes qualitative and quantitative indicators that indicate the state of the environment, environmental pressures, driving forces in the environment, environmental impacts and its components and responses to mitigate or minimize environmental impacts and pressures. The national list of indicators contains: name, code, type, description, methodology, data source and dynamics of data collection."

According to the description of duties and responsibilities of environmental institutions, the institution responsible for drafting the report and assessing the state of the environment based on environmental indicators is the **Kosovo Environmental Protection Agency**. According to Article 60 of the Law on Environmental Protection, KEPA has the duty to: "provide appropriate information to the administration, the Government and the Assembly of Kosovo for the implementation of environmental protection policies and to prepare reports on the general state of the environment in Kosovo, targets, and report on key sectors (air, soil, water, biodiversity, climate change)".

Also according to Article 52 of the Law on Environment which describes the **Environmental Information System**, this activity that is performed within the duties and responsibilities of KEPA is specified that this system does: "*collection, classification, maintenance, presentation and dissemination of numerical data, descriptive and spatial for the state of the environment* ".

1.1. Report drafting methodology

Based on acceptable reporting models based on environmental indicators and existing environmental circumstances in Kosovo, KEPA has collected environmental data from monitoring institutions, companies, operators, various enterprises, publications, reports and other sources. To meet the requirements of the report, the data collected have been processed into qualitative environmental information that is now presented in this report in the form of environmental indicators.

The indicators presented in this report provide data on the driving forces and pressures in the environment, describe the current state of environmental media and the impact of this state. They address to a certain extent the policies pursued for the protection and preservation of the environment as well as the commitment of governmental, non-governmental institutions and society in general to improve the situation. Such a form of reporting is known as the DPSIR Model, and presents concerns for all environmental problems in the country, and is considered as a very convenient way of assessing the state of the environment.

The DPSIR model was first used by the OECD (Organization for Economic Co-operation and Development), then adopted by the European Environment Agency (EEA), which is also used by EUROSTAT to produce environmental statistics.

This analytical model enables the organization of information and the integration of socio-economic and environmental elements, addressing the relationship between the five categories of indicators: driving forces (such as: productive power, population growth, etc.), environmental pressures (such as: emissions in water, air and soil), which affect the state of the environment (e.g., the concentration of heavy metals in the soil, the rise in global average temperatures), which in turn affect living beings and human health by thus imposing a response or reaction of the relevant institutions to take appropriate measures (legislative measures, taxes, environmental programs, research, investment, etc.) (Figure 1).

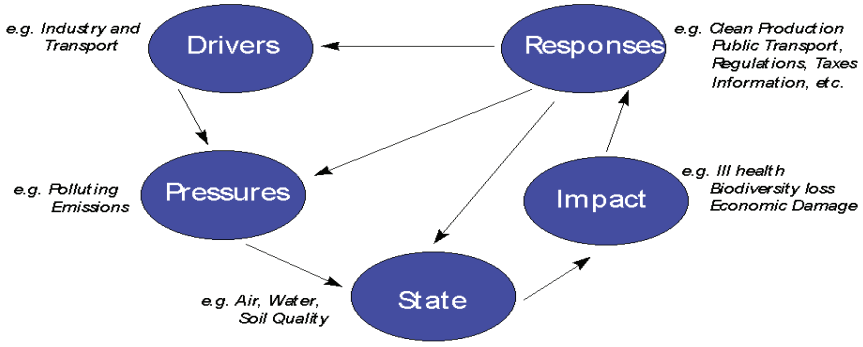

Fig. 1: Analytical framework DPSIR

The indicators presented in the report should be based on relevant data from relevant institutions. The presentation of each indicator is made in an easy and accessible way to be understood by all those who will be served with this report. The lack of data on many important issues is one of the problems that KEPA has faced during its drafting.

A detailed list of indicators used in this report by sectors, by type of indicator based on DPSIR and its correlation with indicators of the European Environment Agency (EEA) and other international organizations is presented in the table 1.

Table 1: Indicators by sector, type and their correlation with EEA indicators

Sector	Indicator code	Indicator name	Indicator type according to DPSIR	Correlation with EEA indicators
Environmental indicators of air	A01	Air quality in urban areas	State indicator	CSI 004
	A02	Emissions of acidifying gases	Pressure indicator	CSI 001 APE 001, APE 003, APE 004, APE 007
	A03	Emissions of precursors (pests) of ozone	Pressure indicator	CSI 002 APE 008
	A04	Suspended primary particle emissions and suspended secondary particle precursors	State indicator	CSI 003 CSI 040 AIR 005
Environmental indicators of climate change	NK01	Annual air temperature	State indicator	CSI 012 CLIM 001
	NK02	Annual rainfall	State indicator	CLIM 02
	NK 03	Use of substances that damage the ozone layer	Pressure indicator	CSI 006 CSI 044
	NK 04	The trend of greenhouse gas emissions	Pressure indicator	CSI 010
	NK 05	Projections of greenhouse gas emissions	Pressure indicator	CSI 011
Environmental indicators of water	U01	Nutrients in surface waters	State indicator	CSI 020
	U02	Biochemical oxygen consumption	State indicator	EEA CSI 019
	U03	Quality Index of surface water	State indicator	SEBI 022

	U04	Drinking water quality	State indicator	WEU 010
	U05	Use of freshwater resources	Pressure indicator	CSI 018
	U06	Water losses	Response indicator	WQ 006
	U07	Access to public water supply	Response indicator	WAT 001 CSI 018
	U08	Access to public sewerage	Response indicator	WAT 005
	U09	Access to wastewater treatment plants	Response indicator	WAT 005
Environmental indicators of biodiversity	B01	The diversity of species	State indicator	SEBI 003 SEBI 002
	B02	Representation and condition of selected species	State indicator	CSI 007 SEBI 002
	B03	Foreign species - allochthone and invasive	State indicator	SEBI 010
	B04	Forest fires	Pressure indicator	CLIM 035
	B05	Protected zones	Response indicator	CSI 008 IRENA 004
Environmental indicators of waste	M01	The amount of municipal waste generated	Pressure indicator	CSI 041
	M02	The amount of industrial waste generated	Pressure indicator	INDP 004 WST 004
	M03	The amount of hazardous waste generated	Pressure indicator	INDP 004 WST 004
	M04	Total amount of municipal waste disposed	Response indicator	WST 006
	M05	Total amount of recycled municipal waste	Response indicator	CSI 052
Environmental indicators of soil / earth	T01	Changing land use destination	Pressure indicator	CSI 014 LSI 001 IRENA 012

	T02	Erosion	State indicator	IRENA 023
Environmental indicators of agriculture	BU01	Areas with organic farming	Response indicator	CSI 026 IRENA 007
	BU02	Use of mineral fertilizers	Pressure indicator	IRENA 008
	BU03	Use of plant protection substances	Pressure indicator	IRENA 009
Environmental indicators of fisheries	PE01	Assessment of fishery fund biomass and permitted fishing quotas	State indicator	CSI 034
Environmental energy indicators	E01	Primary energy consumption according to energy sources	Indicator of driving forces	CSI 029 ENER 026
	E02	Final energy consumption by sectors	Indicator of driving forces	CSI 027
	E03	Dependence on energy imports	Indicator of driving forces	-
	E04	Energy intensity	Response indicator	CSI 028 ENER 017
	E05	Consumption of primary energy from renewable energy sources	Response indicator	ENER 028
Environmental transport indicators	TR01	Passenger traffic	Indicator of driving forces	TERM 039
	TR02	Freight transport	Indicator of driving forces	TERM 039
	TR03	Average age of motor vehicles	Pressure indicator	TERM 032
	TR04	Number of vehicles	Pressure indicator	TERM 032
	TR05	Number of victims of road accidents	Pressure indicator	-
Environmental indicators of tourism	TU01	Tourist visits	Indicator of driving forces	YIR01TO10

	TU02	Tourist overnight stays	Indicator of driving forces	YIR01TO10
	TU03	Tourism intensity (Number of beds and utilization rate of this capacity)	Indicator of driving forces	YIR01TO10
	TU04	Number of tourists (visitors) in National Parks	Indicator of driving forces	-

1.2. Aim of the report

The main purpose of this report is to assess the state of the environment, to assess the trends of the state of the environment and environmental pressures based on indicators, as well as to provide relevant and realistic information based on which the development of adequate environmental policies and responses will be promoted, to adverse environmental changes.

The report provides a good basis for orienting developments, planning and strategic investments in sectors that have an impact on the environment such as: industry, energy, transport, agriculture, etc., but also to take appropriate measures and design projects for improving the state of the environment and its components.

No less important is the purpose of informing on the environmental situation in Kosovo, the general public, donors, researchers and other stakeholders.

1.3. General data for the Republic of Kosovo

Table 2: The basic data for Kosovo

The surface of the territory	10.908 km^2
Total population	1.795.666 residents (Rating ASK 2017)
Population density per km2	167
The average age	About 25 years old
Average life expectancy	76.7 years
Declaration of independence	February 17, 2008
Political Systems	Parliamentary Democracies
Status in the EU integration process	Potential candidate country
Official languages	Albanian, Serbian
The capital city	Prishtina
Number of municipalities	38
Number of settlements	1469
coins	Euro
GDP per capita	3 746 Euro
Average monthly salary	170 Euro
climate	Medium continental
Average annual temperature	11 ^{0}Celsius
Average annual rainfall	790 mm

2. Environmental indicators of air

Air is a very important element for human health and in general for the environment around us. The air is constantly under the influence of pollution from many sources. Although air pollution comes mainly from human activities, it can also be affected by natural phenomena.

2.1. Air quality in urban areas

Indicator name	**Air quality in urban areas**
Indicator code	A01
Indicator type according to DPSIR	State indicator
Description of the indicator	With this indicator is introduced: • Number of days with exceeding of Limit Values (LV) during the year for SO_2, NO_2, PM10 and Ozone in urban areas; • % of population exposed to LV according to air quality areas and • Number of exceedances for pollutants at monitoring stations.
Methodology for determining the indicator	The indicator is calculated based on the results of the annual air quality monitoring program - average values for one hour and 24-hours for SO_2; NO_2 and PM10 as well as maximum ozone concentrations for 8 hours.
Units	• Part of the urban population, which is exposed to pollutants, expressed in%; • Concentrations of pollutants are expressed in μg /m^3.
Data source	Kosovo Environmental Protection Agency - Kosovo Hydro meteorological Institute
Dynamics of data collection	On an annual basis until March 31 of the following year, for the previous year.

The concentration of SO_2, NO_2 and Ozone in any monitoring station is not exceeded by the Allowed Values (VL), therefore this indicator for the mentioned parameters will not be taken into account within this methodology. PM10 had

Limit Values exceedances during 2015-2019 (VL = 40 μg / m3 and 35 days allowed with exceedances) (figure 2). The figure shows the large number of days when PM10 is above Limit Values. Especially the years 2015 and 2018 are characterized by a larger number of days with exceedances.

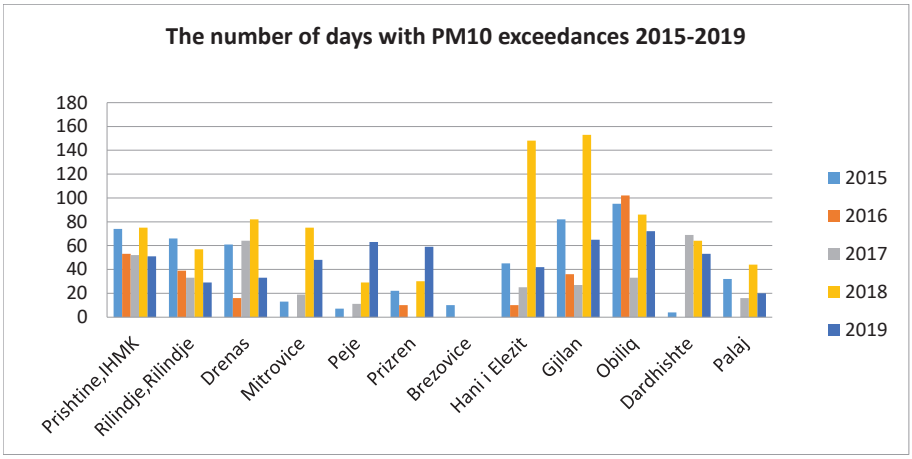

Fig 2: Number of days with PM10 exceedances at monitoring stations 2015-2017

Figure 3, presents the trend of the total number of days with exceedances of PM10 for all metering stations for the period 2015-2019. As can be seen from the figure 2015 and 2018, have the largest total number of days with exceedances, 511 respectively 847.

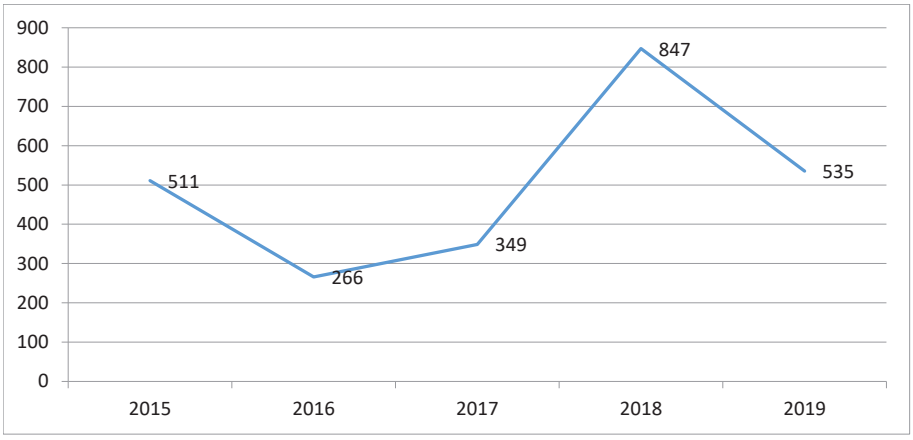

Fig. 3: The trend of the total number of days with exceedances of PM10, 2015-2019

The trend of PM10 concentrations as an annual average for the period 2012-2019 is presented in Figure 4. As can be seen from the figure throughout the period 2013-2019 there were increased annual values of the average concentration of PM10 in all stations, with a concentration most pronounced average in 2015 and 2018.
This indicator is an indicator that guides decision makers at central and local level that measures should be taken to reduce pollution from various sources.. This means identifying sources of air pollution and drafting Environmental Action Plans to reduce air pollution..

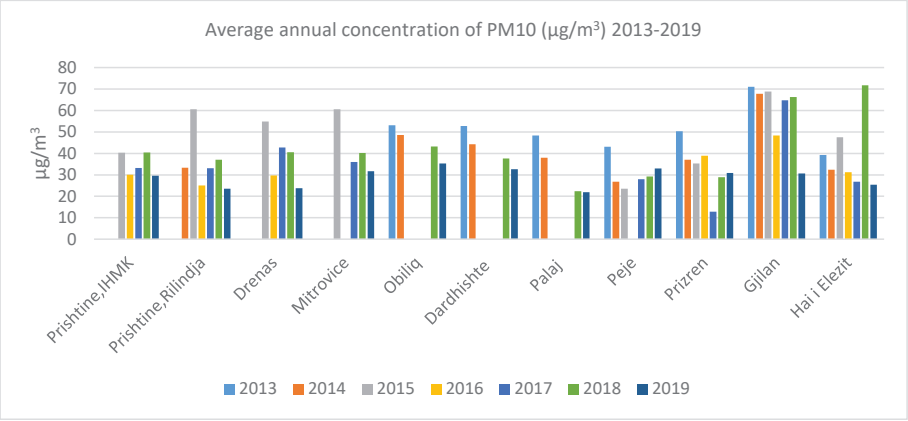

Fig. 4: Trend of PM10 concentrations (µg / m3) as annual average for the period 2012-2019

Percentage (%) of urban population exposed to VL by air quality areas based on data from the 2011 census is presented in the table 3.

Table 3: Urban population exposed to air pollution in Kosovo

2011	**The total number of population**	**The number of population in urban areas**	**% of population in urban areas**
The total resident population of Kosovo	1739825	661,586	38
Agglomeration Prishtina			
Prishtina	198,897	164,296	82.6
Obiliqi	21,549	6,864	31.9
Fushë Kosova	34,827	18,515	53.2
Total of Agglomeration	**255,273**	**189,675**	**74.3**

Agglomeration: The rest parts of Kosovo (urban areas where air quality monitoring is performed)			
Drenasi	58,531	6,143	10.5
Gjilani	90,178	54,239	60.1
Mitrovica	84235	58,458	69.4
Peja	96,450	48,962	50.8
Prizreni	1 77,781	94,517	53.2
Hani i Elezit	9 ,403	2 ,533	26.9
Total of Agglomeration	**516,578**	**264,852**	**51.3**

According to Administrative Instruction 02/2011 on Air Quality Norms (Annex X, Point 1) is provided the Average Exposure Index (AEI) for PM2.5, which is expressed in μg / m3 and represents the average value of PM2.5 for 3 years ago.
This report takes into account the values of PM2.5 for the years 2017, 2018 and 2019. This indicator serves to examine the intended fulfillment of exposure reduction at the national level for all monitoring points where there have been systematic measurements for the mentioned years. The indicator includes average exposure in urban areas for both monitoring areas and agglomerations.

The Limit of Maximal Values for PM2.5 is 20 μg / m3, as a mandatory concentration standard for the Average Exposure Index for the previous 3 years and, which entered into force in January 2015 (Directive 2008/50 EC). This standard sets the target of reducing the national exposure 0-20%, which must be met by 2020.
Figure 5 shows that in 2017 and 2018 for the monitored urban part was exceeded the standard of 20 μg / m3 of AEI, while in 2019 this standard was significantly exceeded. As a result, the AEI at the national level is higher than the standard as a target of 20 /g /m^3.

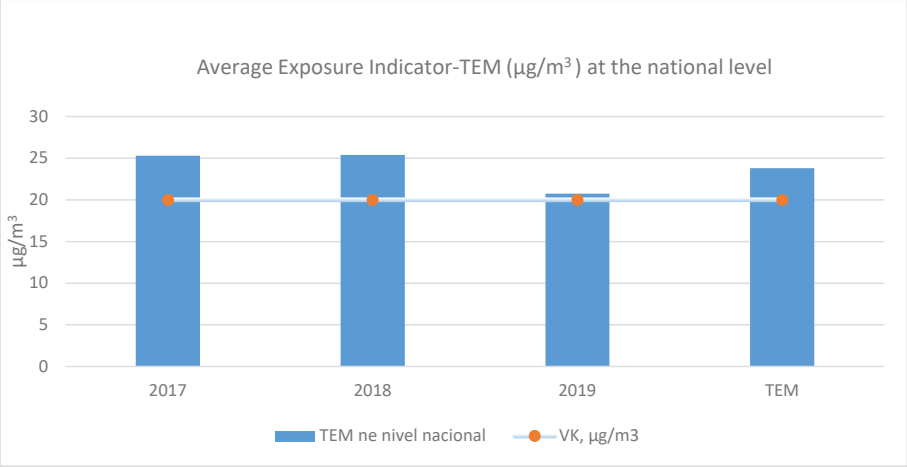

Fig. 5. Average Exposure Index for urban areas 2017-2019

2.2. Emissions of acidifying substances

Indicator name	**Emissions of acidifying substances**
Indicator code	A02
Indicator type according to DPSIR	Pressure indicator
Description of the indicator	This indicator presents the trend of anthropogenic emissions as emissions of acidifying substances such as NOx, and sulfur oxides (SOx expressed as SO2) from 1990 by the sectors that are included in the Inventory of pollutant emissions.
Methodology for determining the indicator	The emitted quantities of acidifying gases are calculated by multiplying the values of the emitted quantities for each pollutant by the corresponding potential of the acidifying factor: E = Ei * ki, where:: • E-total amount of acidifying gas emitted. • i-pollutants (NOx and SO2). • Ei-amount of pollutants emitted. • ki-factor of acidification potential.
Units	• The amount of acidifying gases emitted is expressed in kilotons (1000 tons or kt) • the amount of acidifying gases emitted is expressed through the index based on 1990 (1990 = 100) • the contribution of each sector is expressed in%, • The total and annual emission change for each acidifying gas is expressed as a percentage (%)
Data source	Kosovo Environmental Protection Agency
Dynamics of data collection	On an annual basis

The data for the production of this indicator are used from the reporting made by the Kosovo Environmental Protection Agency in the framework of participation in the work program of the European Environment Agency (EEA) and the European Network for Environmental Monitoring and Observation (EIONET). The reported data include the assessment of air emissions for NOx and SOx parameters, within the Report on the Convention on Long-Range Transboundary Air Pollution (CLRTAP) and are based on emission calculations based on the guide. of the European Environment Agency (EMEP / EEA air pollutant emission inventory Guidebook) based on data from the Energy Balance. As can be seen from Figure 6, emissions of acidifying substances are in a continuous trend that is not manifested by significant increases or decreases in emissions. The average annual SOx emissions are between 90-110 kilotons, while the average annual NOx emissions are around 20 kilotons.

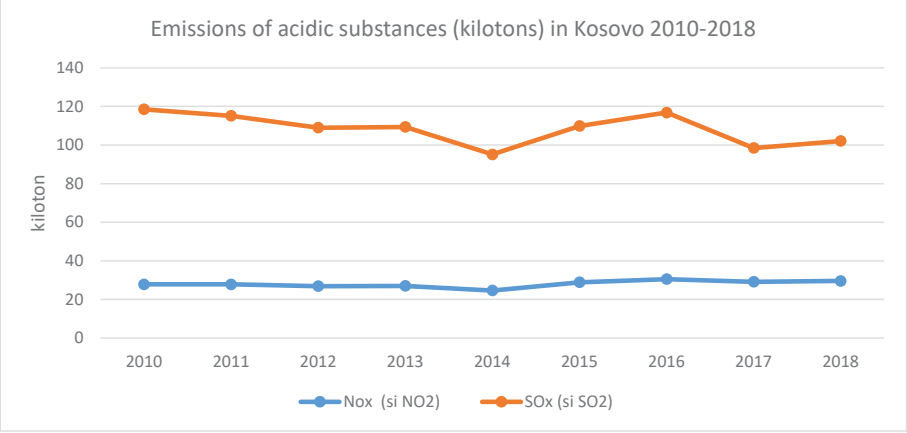

Fig.6: Emissions of acidic substances 2010-2018

2.3. Emissions of precursors of ozone

Indicator name	Emissions of precursors of ozone
Indicator code	A03
Indicator type according to DPSIR	Pressure indicator
Description of the indicator	This indicator presents the trend of anthropogenic emissions of terrestrial ozone precursors: NOx, CO, Methane-CH4 and volatile organic non-methane compounds (NMVOC) from 1990 (or national reference year) according to the sectors included in the Pollutants Inventory. Gaseous emissions are expressed through the estimated potential values for ground-level ozone generation through NMVOC equivalent emissions.
Methodology for determining the indicator	The total quantity for each emitted precursor is calculated by multiplying the emitted values of the quantity of each gas by the corresponding potential factor: E = Ei * ki, where: • E-total amount of acidifying gas emitted. • i-pollutants (NOx and SO2). • Ei-amount of pollutants emitted. • ki-factor of acidification potential.
Units	Tons or kt (1000 tons).
Data source	Kosovo Environmental Protection Agency
Dynamics of data collection	On an annual basis .

Also, the data for the production of this indicator have been used from the reporting carried out by KEPA in the framework of participation in the work program of the European Environment Agency (EEA) and the European Network for Environmental Monitoring and Observation (EIONET). The reported data include the assessment of air emissions for the parameters NOx, NMVOC, CO in the framework of the Report on the Convention on Long-Range Transboundary Air Pollution (CLRTAP) and are based on emission calculations based on the guide of the European Environment Agency (EMEP / EEA air pollutant emission inventory Guidebook) based on data from the Energy Balance. Emissions of ozone depleting substances are

in a continuous trend in terms of NOx and NMVOC (Non-Methane Volatile Organic Compound), while in an upward trend for CO. The minimum annual NMVOC emissions are about 5 kilotons, while the maximum annual emissions are about 9 kilotons. As for CO, the minimum annual emissions are about 46 kilotons, while the maximum emissions are about 64 kilotons.

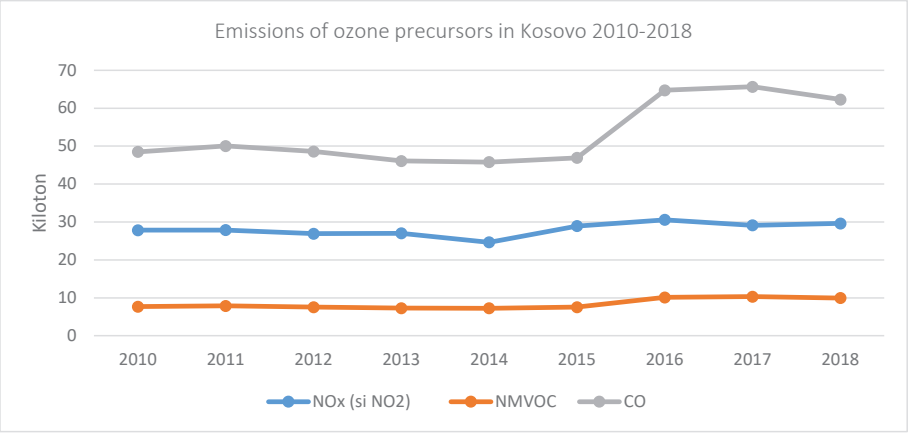

Fig. 7: Ozone precursor emissions 2010-2018

Methane (CH4) emissions also show a trend with increasing trends especially during the last three years. The minimum of annual emissions of CH4 is about 0.46 Gg (Gigagram), while the maximum of annual emissions is about 0.64 Gg. (figure 8).

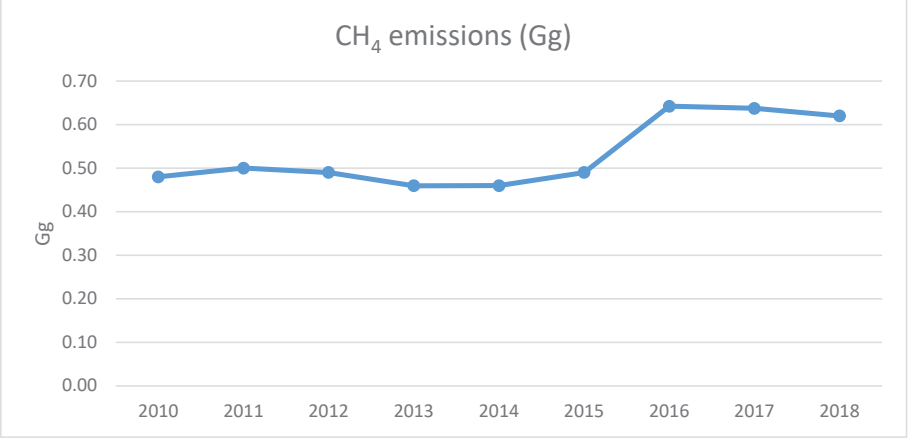

Fig. 8: Methane emissions (CH_4) 2010-2018

2.4. Emissions of primary particles and secondary particulate matter precursors

Indicator name	**Emissions of primary particles and secondary particulate matter precursors**
Indicator code	A04
Indicator type according to DPSIR	State indicator
Description of the indicator	This indicator shows:: • Trend of separate emissions of suspended primary particles smaller than 2.5 (m (PM2.5) and those less than 10 (m (PM10) from 1990 (or national reference year). • The total emissions for each parameter that are expressed by estimating the values of the suspended particle formation potential.
Methodology for determining the indicator	The total amount of suspended primary particle emissions is calculated by multiplying the emission values for each gas by the corresponding potential factor: E = Ei * ki, where: • E-total amount of suspended particles emitted • i-pollutants (PM 2.5, PM10). • Ei-total amount of pollutants emitted • ki -factor of potential
Units	• The emitted amount of primary particles suspended in the air is expressed in kilotons (1000 tons or kt). • The contribution of each sector is expressed in%. • The total and annual change of emissions for each parameter is expressed as a percentage (%).
Data source	Kosovo Environmental Protection Agency
Dynamics of data collection	On an annual basis .

Also, the data for this indicator are derived from the data within the Report on the Convention on Transboundary Air Pollution (CLRTAP) and are based on emission calculations based on the guideline of the European Environment Agency (EMEP / EEA) taking into account database from the Energy Balance. Reported data include air emission estimation for PM10 Dust Particles parameters, PM2.5 Dust Particles and TPS (Total Suspended Particles). As seen from Figure 9 Suspended primary particle emissions into the air show upward trend. The minimum annual emissions of PM10 are about 8.8 kilotons, while the maximum annual emissions are about 12.6 kilotons. As for PM2.5, the minimum of annual emissions is about 8.3 kilotons, while the maximum of annual emissions is about 12 kilotons. The total emitted particles range between 9.4 and 13.5 kilotons per year.

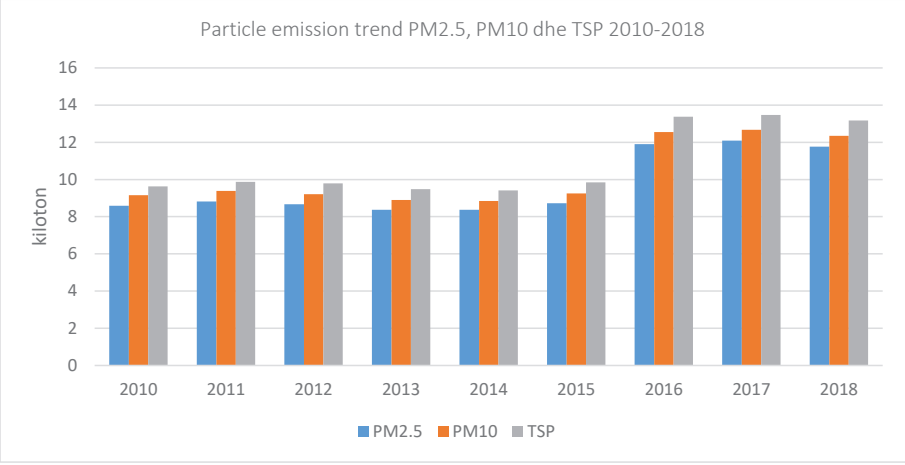

Fig. 9: Emissions of PM2.5, PM10 and TSP (kiloton) 2010-2018

3. Environmental indicators of climate change

Climate change today undoubtedly poses one of humanity's major global challenges in protecting the environment. In order to mitigate and adapt to these changes, action has been taken at the global level and agreements have been reached. Following these are the Rio Declaration (1992) with obligations to implement the concept of sustainable development and the Convention on Climate Change with obligations to reduce greenhouse gas emissions. The Kyoto Protocol is also a very important step in limiting the emissions of CO2, CH4, N2O, HFCs - hydrofluorocarbons and SF6 - sulfur hexafluoride. The latest international climate agreement is the Paris agreement reached in 2017.

3.1. Annual air temperature

Indicator name	**Annual air temperature**
Indicator code	NK 01
Indicator type according to DPSIR	State indicator
Description of the indicator	This indicator presents the trend of average annual temperature as well as minimum and maximum annual air temperatures.
Methodology for determining the indicator	This indicator is determined based on the obtained data of temperature measurements in representative measuring points for a long period of time (20-30 years).
Units	All temperature values are expressed in ^{0}C.
Sources of information	Kosovo Hydro- meteorological Institute .
Dynamics of data collection	On an annual basis .

Data on air temperature in Kosovo that come from the Kosovo Hydro-meteorological Institute and international institutions, show that in Kosovo since 1900 until today there has been movements of average annual temperatures with an increasing trend. Thus the average annual temperature

for the period 1930-1990 was 8.6 degrees Celsius, for the period 1990-2002 it was 9 degrees Celsius, while for the period 2003-2019, over 10 degrees Celsius (figure 10 and 11).

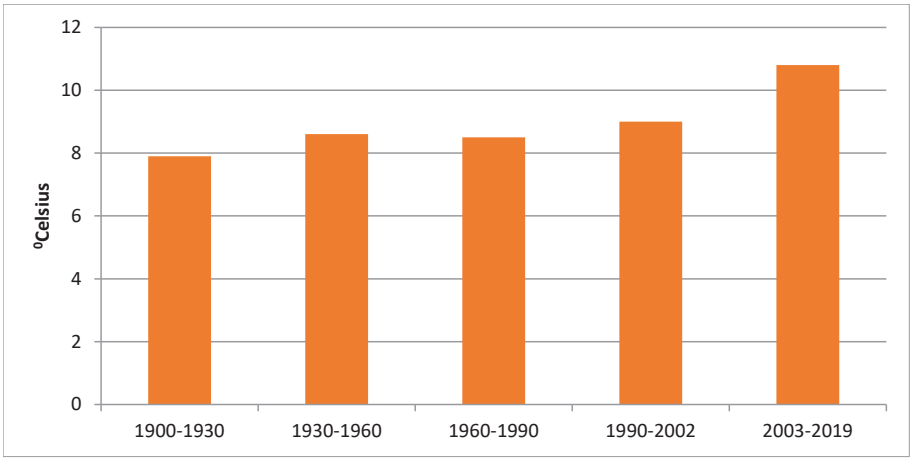

Figure 10: Air temperature 1900-2019[1]

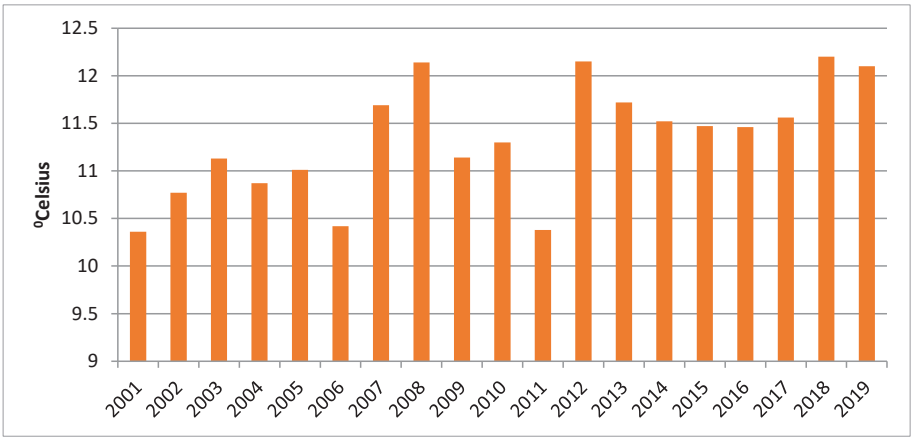

Figure 11: Air temperature 2001-2019[2]

Table 4 presents the data on minimum and maximum temperatures in Kosovo for 3 monitoring stations as well as the average maximum and minimum temperature at the national level for the period 2009-2019. As can be seen

1 Temperature data 1900-2000 from the World Bank (www.worldbank.org/country/kosovo). Data for 2001-2019 from HMIK

2 Temperature data 2001-2019 nga IHMK (http://ihmk-rks.net/uplds/docs/Meteorologji_Vlerat_mesatare_mujore_2001-2019_(1).pdf)

from the table, in Kosovo there are small regional changes in air temperature and there is also a tendency to change the temperature from year to year with an increasing tendency.

Table 4: Minimum and maximum annual temperature of air temperature (^{0}Celsius s) in Kosovo according to measuring stations (2009-2019)[3]

Locations	Prishtinë		Pejë		Ferizaj		Kosovë	
	Max.	Mini.	Max.	Mini.	Max.	Mini.	Max.	Mini.
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	6.0	17.6	6.7
2019	18.8	6.3	17.5	6.8	17.8	5.6	18	6.2

3.2. Annual percipitation

Indicator name	**Annual percipitation**
Indicator code	NK 02
Indicator type according to DPSIR	State indicator
Description of the indicator	This indicator shows the amount of precipitation in the representative stations, but which does not include the total amount of precipitation in the country.
Methodology for determining the indicator	This indicator is determined on the basis of data obtained from precipitation measurements at representative stations .

3 *Data from KHMI based on measurements of meteorological stations in Prishtina, Ferizaj and Peja*

Units	Annual rainfall expressed in mm (l/m^2).
Sources of information	Kosovo Hydro-meteorological Institute .
Dynamics of data collection	On an annual basis .

Climate change can affect in the intensity and frequency of rainfall. For this purpose the Annual rainfall of a country is an important monitoring indicator. Data on the annual rainfall in Kosovo are obtained from the Kosovo Hydro-meteorological Institute and international institutions. These data show that in Kosovo from 1930 until today there has been a change in the amount of rainfall with a tendency to reduce the amount of rainfall. Thus the average annual rainfall temperature for the period 1930-1990 was 820 mm, while for the period 2001-2019, it was 674 mm (figure 12 and 13).

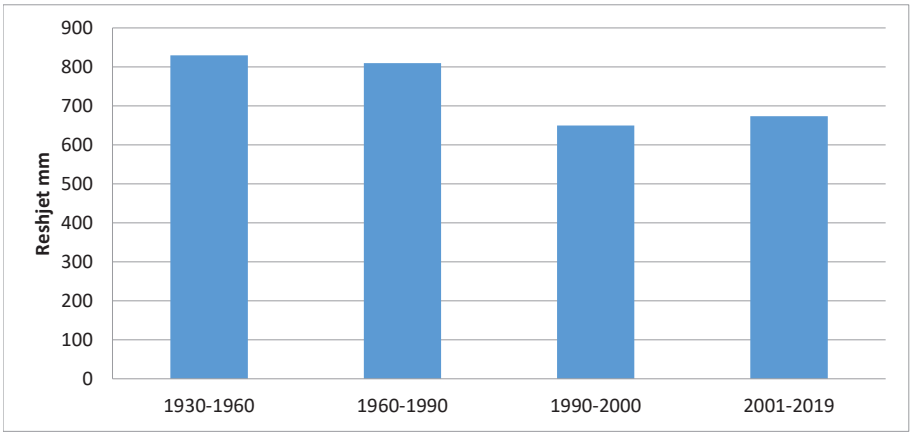

Figure 12: Percipitation 1930-2019[4]

4 *Precipitation data 1930-2000 from the World Bank (www.worldbank.org). Data 2001-2019 from KHMI*

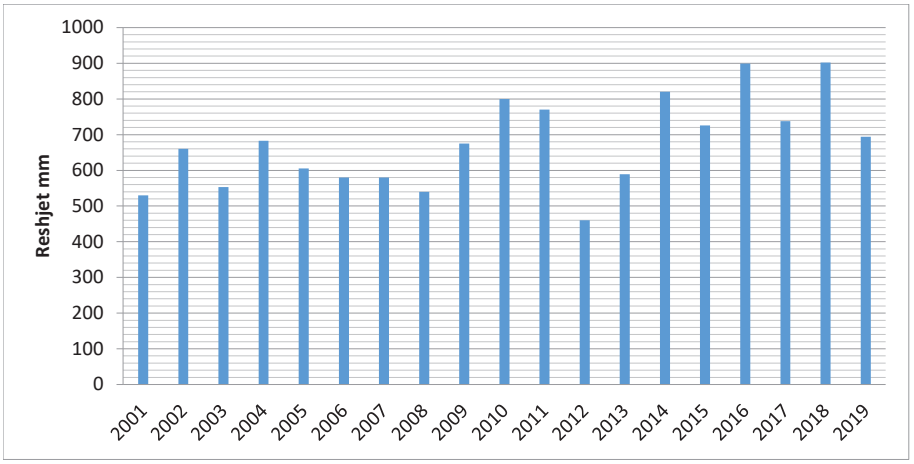

Figure 13: Annual percipitation 2001-2019

Figure 14 presents data on the annual rainfalls in Kosovo for 3 representative monitoring stations and the average annual rainfalls at the national level for the period 2002-2019. As can be seen from the table in Kosovo there are small regional variations of annual rainfalls and there are also oscillations in the total amount of rainfall from year to year.

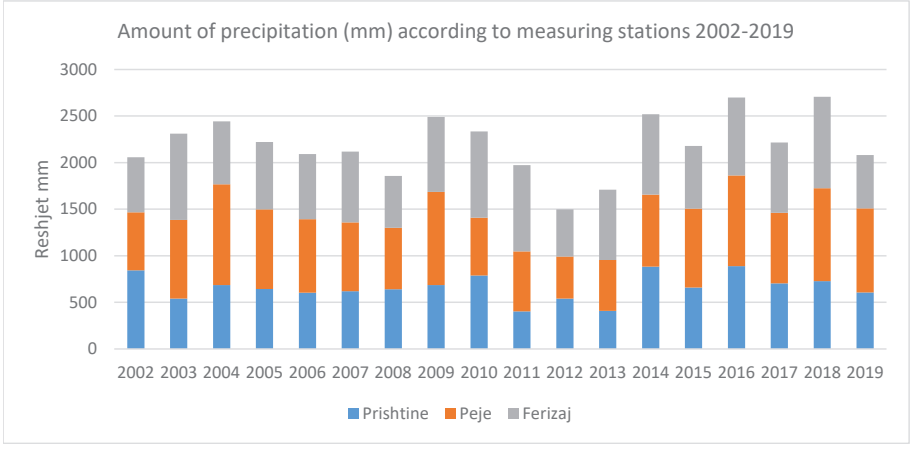

Figure 14: Precipitation (mm) according to measuring stations

3.3. Use of depleting ozone substances

Indicator name	Use of depleting ozone leyer substances
Indicator code	NK03
Indicator type according to DPSIR	Pressure indicator
Description of the indicator	This indicator shows the total amount of substances consumed based on chlorine, fluorine and bromine, which damage the ozone layer.
Methodology for determining the indicator	This indicator is determined on the basis of national data on substances that deplete the ozone layer, ie. differences between imports and exports of quantities of these substances. Consumption of some types of substances is multiplied by the corresponding ozone depletion factor (ODP).
Units	This indicator is expressed in metric tons of the trichlorofluoromethane equivalent - CFC-11 (mT eq CFC 11).
Data sources	Data on the export and import of products that damage the ozone layer by Kosovo Customs. Calculations by the Kosovo Environmental Protection Agency - Greenhouse gas inventory.
Dynamics of data collection	On an annual basis .

It has been found that ozone layer (O3) damage is an environmental problem that arises due to human activities that release pollutants into the atmosphere that damage and alter this coverage. In the first place here is thought about the use of substances that damage the ozone layer.

In the absence of direct data on the use (consumption) of substances that impair ozone depletion, annual data on the import of ozone depleting substances in Kosovo have been used. Taking into account the fact that in Kosovo there are

no producers of these substances and estimating that the imported quantity represents the annual amount of use of these substances, these data are used as indicators to see the trend of use of these substances. As presented in Table 5 and Figure 15, the total amount of ozone depleting substances imported during the period 2008-2016, has differences from year to year, with 2008 with the largest amount of imported substances and in 2012 with the amount smallest of imported substances. In terms of quantity imported by type, the largest quantity belongs to ozone depleting substances such as lubricants and paraffin.

Table 5: Import of ozone depleting substances by type (ton) 2008-2016[5]

Type of imported ozone depleting substance	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Lubrifikant	4397.9	2079.1	1625.3	769.4	720.8	1546.3	1591.8	1608	1816	**16155**
Paraffin	272.1	419	213.4	451.2	172.3	142.8	158.7	167.8	179.1	**2177**
Solvent	101.9	139	101.9	146	126.1	176.5	160	180	190	**1321**
Air conditioning coolers	21.97	23.5	25.2	26.8	28.59	22.8	23.4	23.8	24.6	**221**
Aerosol HFC-152a (CH3CHF2)	6.5	7	7.3	8.5	8.8	9	9.2	8.5	6.5	**71**
Use of N2O in medicine	7.1115	10.313	12.09	12.6	13.9	15.4	15	15.2	15.5	**117**
Total	**4807**	**2678**	**1985**	**1415**	**1071**	**1913**	**1958**	**2003**	**2232**	

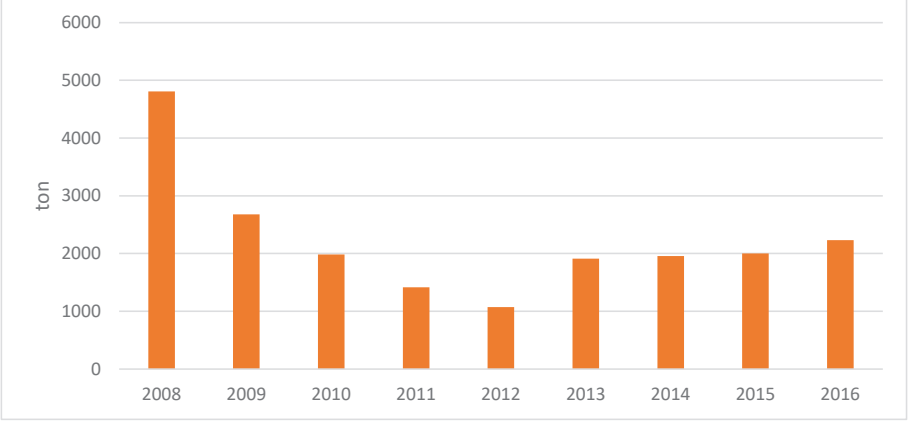

Figure 15: Total quantity (tons) of imported ozone depleting substances 2008-2016

5 *Kosovo Customs*

3.4. The trend of greenhouse gas emissions

Indicator name	The trend of greenhouse gas emissions
Indicator code	NK 04
Indicator type according to DPSIR	Pressure indicator
Description of the indicator	This indicator presents the general anthropogenic emissions and the trend of greenhouse gas emissions. Greenhouse gases included in the Montreal Protocol and substances that deplete the ozone layer are not included in this indicator.
Methodology for determining the indicator	The indicator is determined based on the greenhouse gas inventory by calculating: • Intensity of production of CO2 emissions (eq) per number of inhabitants; • Production intensity of CO2 emissions (eq) per unit of GDP. • The intensity of CO2 production (eq) per capita is calculated by dividing the total quantities of CO2 (eq) by the number of inhabitants for the year under review. • The production intensity of CO2 emissions (eq) per unit of GDP is calculated by dividing the total emissions by GDP.
Units	• Emissions are expressed in millions of tons of CO2 equivalent (Mt CO2-eq) each year. • Global Warming Potential (GWP) expresses the impact of each gas as CO2 equivalent (GWP CO2 = 1). • Production intensity of emissions per capita expressed in tons per capita for the year under review. • Production intensity of emissions per unit of GDP expressed in kg / 1000 EUR. • GDP expressed in permanent prices, in millions of EUR.
Sources of information	Kosovo Environmental Protection Agency
Dynamics of data collection	Annually, until March 31 of the following year, for the previous year

The increase of atmospheric concentrations of greenhouse gases, produces an effect on climate change, respectively on its heating. It is estimated that globally from 1990 until today, the effect of total heating from greenhouse gases emanating from anthropogenic activities has increased to about 40%. In Kosovo, total greenhouse gas emissions vary between 9489 Gg CO2 eq. (2008) and 10164 Gg CO2 eq (2016). Emissions depend largely on energy demand and the activities of the energy sector, which is the main emissions sector at the national level (figures 16 and 17).

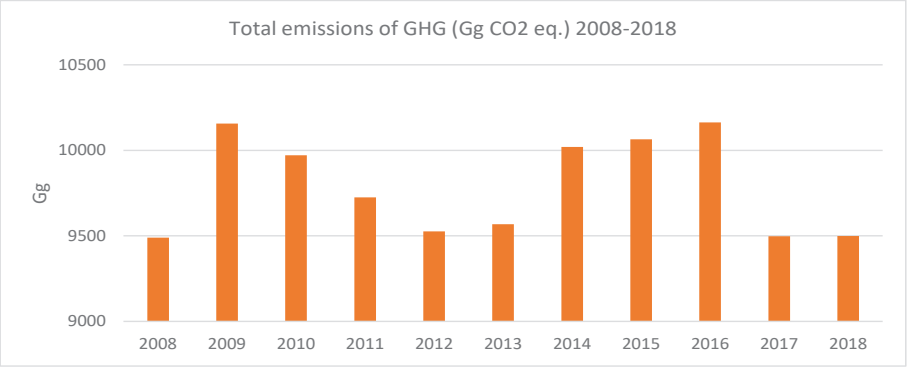

Figure 16: Trend of total GHG emissions in Kosovo 2008-2018 (Gg CO2 eq.*)*[6]

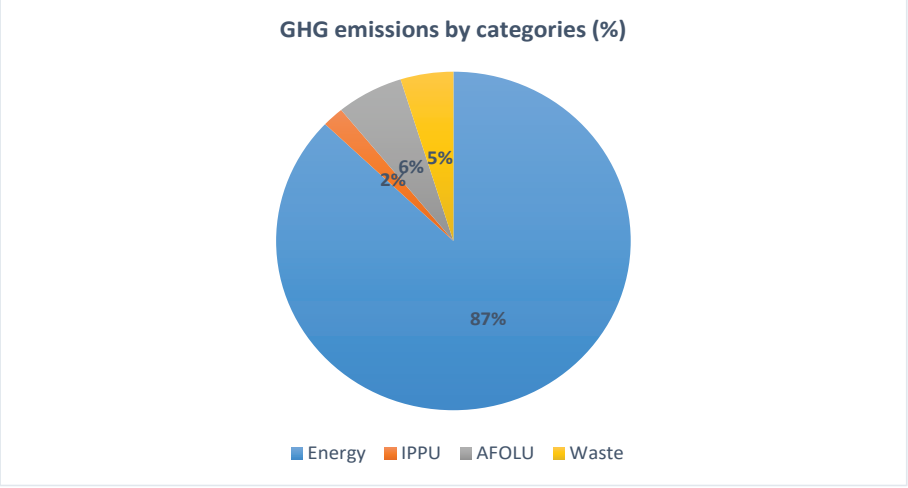

Figure 17: GHG emissions in Kosovo by categories (%)

Compared to other countries in Europe, Kosovo has lower emissions (5 tons of CO2 equivalent) per capita, than the European Union average, but has higher

6 *GHG broadcast inventory, KEPA*

emissions than some of the countries in the region. As for CO2 emissions per unit of GDP (Gross Domestic Product), Kosovo with 0.5 kg of CO2 has higher emissions than the European Union average and higher than other countries in the region except Bosnia and Herzegovina (figure 18 and 19).

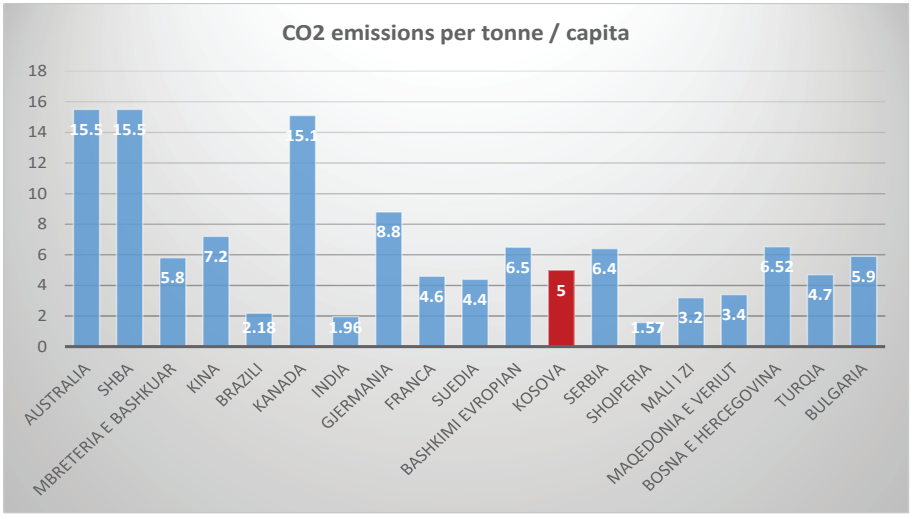

Figure 18: CO2 emissions (tonne eq.) Per capita in Kosovo compared to some countries in the region, Europe, EU and countries around the world[7]

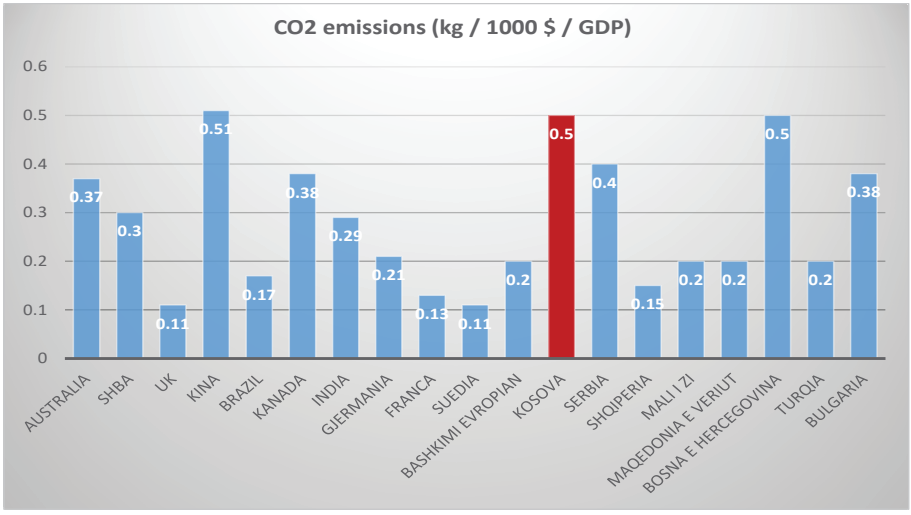

Figure 19: CO2 emissions (kg / 1000 $ / GDP) in Kosovo compared to some countries in the region, Europe, EU and some countries of the world [8]

7 *Source: https://data.worldbank.org/indicator/EN.ATM.CO2E.PC*
8 *Source: https://data.worldbank.org/indicator/EN.ATM.CO2E.PP.GD*

3.5. Projections of greenhouse gas emissions

Indicator name	**Projections of greenhouse gas emissions**
Indicator code	NK 05
Indicator type according to DPSIR	Pressure indicator
Description of the indicator	This indicator presents the projection trends of direct and indirect anthropogenic emissions of greenhouse gases. Gases, which are included in the Montreal Protocol and represent substances that damage the ozone layer, are not treated in this indicator.
Methodology for determining the indicator	Greenhouse gas emission scenarios are determined based on approved international methodologies such as CORINAIR and IPPC, or any other approved international methodology.
Units	Greenhouse gas emissions are expressed in million tons of CO2 equivalent (Mt CO2-eq) on an annual basis.
Sources of information	Institution responsible for drafting policies for greenhouse gas emission projections and their reduction.
Dynamics of data collection	On an annual basis.

Kosovo has not yet developed scenarios and projections for greenhouse gas emissions for several reasons: as it is not yet a signatory to the UNFCC Convention and the Montreal Protocol and has not yet set a reference year for greenhouse gas emissions. Also so far there has been no assessment of Greenhouse Gas projections and setting targets (goals) at the national level for their reduction..

4. Environmental indicators of water

Industrial development, urbanization, and intensive agriculture are just some of the factors influencing water pollution. Despite the ongoing commitment, uncontrolled use of water resources and damage to river beds, it still remains one of the forms of degradation of our water resources.
Water pressures are mainly due to the increase in the volume of discharged water without adequate physical, chemical and biological treatment. All this affects the increase of values of physical, chemical and microbiological parameters in water bodies. Other pressures from rainfall are the runoff of agricultural lands and other polluting surfaces, which leads to the growth of suspended matter, inorganic matter (fertilizers-N, P, K, NH4 +, etc.) and organic matter (PCB, Herbicide etc.). Among the greatest pressures on water bodies are the industrial discharges of various activities.

4.1. Nutrients in surface water

Indicator name	**Nutrients in surface water**
Indicator code	U01
Indicator type according to DPSIR model	State indicator
Description of the indicator	This indicator shows the concentration of orthophosphates and nitrates in rivers, total phosphorus and nitrates in lakes and nitrates in groundwater to enable penetration to the degree of eutrophication which causes the rapid increase of algae and higher plants and the formation of changes in undesirable ecosystem balancing as well as water quality itself.
Methodology for determining the indicator	This indicator is determined on the basis of annual monitoring data by calculating the average annual value for each measuring point so that regular levels are obtained, and we determine the average for the value of the concentration of nitrates (NO3), total phosphorus and orthophosphate ($PO4^{-}$ P).

Measuring Unit	Concentration expressed in milligrams per liter (mg/l).
Data source	Kosovo Hydro-meteorological Institute
Dynamic time of data collection	On an annual basis .

Nutrinets are an important indicator of surface water quality because inorganic nitrogen and phosphorus control the growth of aquatic plants. Inorganic nitrogen, which is water soluble, reaches surface waters during the process of runoff from agricultural lands treated with fertilizer, or indirectly through groundwater. Phosphorus is also used in the form of fertilizer that is dumped on agricultural lands and reaches surface waters as a result of erosion. These nutrients reach surface waters as well as from sewage discharges or wastewater treatment plants..

Figure 20 presents the trend of Nitrate Nitrogen concentration (mg / l) in surface waters (rivers) for the period 2008-2019. The figure shows that the nitrogen concentration of Nitrates during this time period is between 0.658 mg / l, as the lowest value recorded in 2009, and 1,181 mg / l as the highest value recorded in 2018. Year 2019, marks an increase in concentration (1,100 mg / l), compared to the previous year 2018 (0.814 mg / l). In general, the trend of this indicator for the period 2008-2019, is presented to us as linear with some small changes with increasing trend for the years 2008, 2013 and 2019.

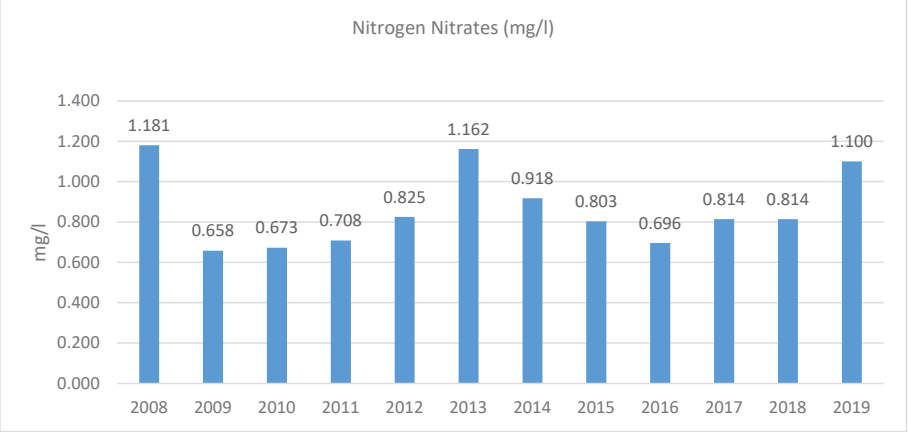

Figure 20: Nitrate nitrogen (mg / l) in surface water (2008-2019)[9]

9 *Data source: Monitoring of surface waters (rivers) by KHMI 2008-2019*

Figure 21 presents the trend of phosphorus orthophosphate concentration (mg / l) in surface waters (rivers) for the period 2008-2019. The figure shows that the Phosphorus orthophosphate concentration during this time period is between 0.118 mg / l, as the lowest value recorded in 2013, and 0.265 mg / l as the highest value recorded in 2019. Year 2019, marks an increase in concentration, compared to the previous year 2018 (0.126 mg / l). In general, the trend of this indicator for the period 2008-2019 is presented with oscillations (ups and downs) and there is no linear flow..

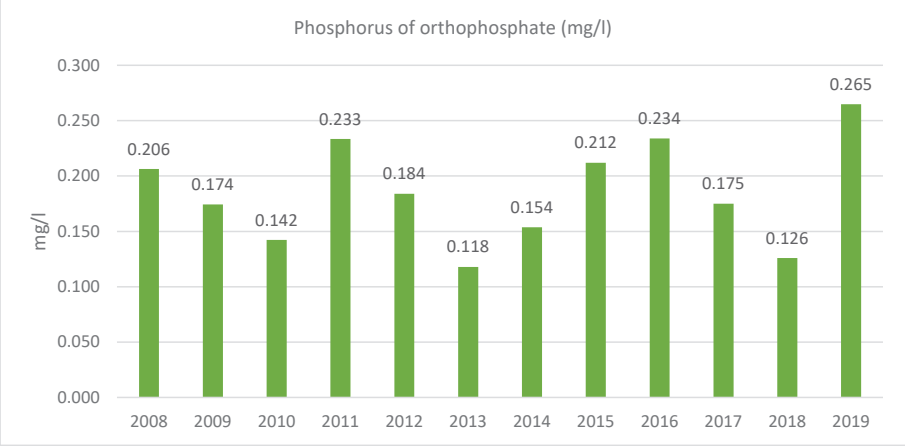

Figure 21: Phosphorus of orthophosphate (mg/l) in surface water (2008-2019)[10]

4.2. Biochemical Oxygen Demand

Indicator name	**Biochemical oxygen consumption**
Indicator code	U02
Indicator type according to DPSIR model	State indicator
Description of the indicator	This indicator shows the consumption of oxygen in rivers, which shows the situation and the trend in terms of concentration of organic matter (pollution) in the form of biological oxygen consumption and total ammonia concentration, where the concentration of ammonium ion (NH4 +) indicates the possibility. of the activity of waste bacteria which through the sewage or washing system reach the surface of the water.

10 *Data source: Monitoring of surface waters (rivers) by KHMI 2008-2019*

Methodology for determining the indicator	This indicator is set based on the annual monitoring data calculated with the average annual value for each measuring point so that regular levels are obtained and determines the average (median) for the values of biological oxygen consumption, chemical oxygen consumption and concentration of ammonium ion ($NH4^{+}$).
Measuring Unit	Biological and chemical consumption of oxygen expressed in mg / l, while the concentration of ammonium ion is expressed in mg / l.
Data source	Institution responsible for surface water monitoring (Kosovo Hydro -meteorological Institute)
Dynamic time of data collection	On an annual basis .

The biological breakdown of organic matter by micro-organisms requires oxygen from water. Based on this indicator SHBO5 is an assessment of biodegradable matter in water. Bacteria use organic matter in water as a food source. During this process the organic material is oxidized to stable and final products such as CO2 and H2O. The amount of O2 needed in this process is called the biochemical expenditure of oxygen and is considered the mass of organic compounds as pollutants.

The trend of concentration for the indicator Biochemical oxygen consumption SHBO5 (mg- / l) in surface waters (rivers) for the period 2008-2019 is presented in Figure 22. From the presented data it can be seen that the concentration of SHBO5 during this time period has been almost a progressive increase over the years 2008-2017, with a significant decline in the last two years. The average concentration values recorded were between 3,934 mg / l, as the lowest value recorded in 2011, and 17,590 mg / l as the highest value recorded in 2017. Year 2019 (14,740 mg / l), marks an increase in concentration, compared to the previous year 2018 (12.425 mg/l).

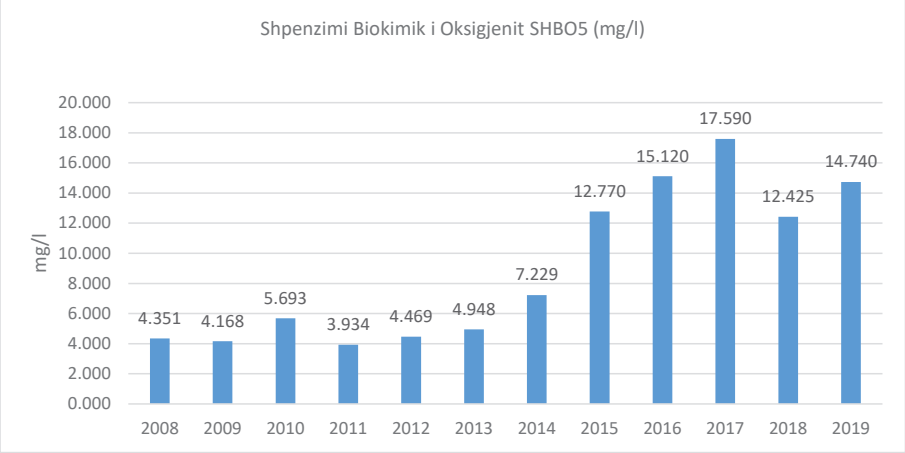

Figure 22: BOD_5 (mg/l) in surface waters 2008-2019

4.3. Quality Index of surface water

Indicator name	**Quality Index of surface water**
Indicator code	U03
Indicator type according to DPSIR model	State indicator
Description of the indicator	This indicator is based on the calculated method of water quality index according to which ten physic-chemical parameters and microbiological quality are aggregated in the summary of surface water indicators.
Methodology for determining the indicator	Water quality index (WQI) method of ten selected parameters (oxygen saturation, SHBO5, ammonium ion, pH value, total nitrogen, orthophosphate, suspended solids, temperature, electrical conductivity and coliform bacteria) with its quality (qi) represents the properties of surface water by reducing it to an index number. The share of each of the ten parameters in the total water quality do not have the same relative significance, so that each of them gains its own weight index (wi) and the number of points according to the division and risk of quality. By summing the output (qi x wi) the index 100 is obtained as the ideal sum of the quality division of all parameters. In case the quality data for any parameter is missing then the value of the WQI arithmetic measurement is corrected by multiplying the index by the value 1 / x, where x is the arithmetic sum of the measured index of the weight of the available parameters.

Measuring Unit	The indicators are expressed as follows, based on the calculation of water quality WQI: • WQI=0-38 very poor quality; • WQI=39-71 poor quality; • WQI=72-83 good quality; • WQI=84-89 very good quality; • WQI=90-100 excellent quality.
Data source	Kosovo Hydro-meteorological Institute , data from annual surface water monitoring.
Dynamic time of data collection	On an annual basis .

The Quality Index of surface water was not developed in the absence of official data on biological monitoring of surface water, which is not currently performed in the framework of regular monitoring by the Kosovo Hydro-meteorological Institute, or any other relevant institution..

4.4. Drinking water quality

Indicator name	**Drinking water quality**
Indicator code	U04
Indicator type according to DPSIR model	State indicator
Description of the indicator	This indicator presents the quality of drinking water from the water supply system by following the samples of drinking water which do not meet the described quality criteria.
Methodology for determining the indicator	This indicator is determined based on the number of irregular samples and the total number of samples where physic-chemical and microbiological indicators are tested. Indicators are presented together or separately for certain spending groups.
Measuring Unit	Percentage (%) of irregular (unsuitable) samples on an annual basis.

Data source	Kosovo National Institute of Public Health
Dynamic time of data collection	On an annual basis .

This indicator is important because the quality of drinking water is directly related to public health. The quality of drinking water provided by public water companies has increased during the period 2008-2018. While in 2008, 94.9% of the samples analyzed for physic-chemical and microbiological quality were suitable according to drinking water standards, in 2017, this suitability reached 99.8%, with a progress of 3.9%. The year 2018 marked a significant decrease in suitability according to drinking water standards, with a decrease of 0.4%, compared to the previous year (figure 23).

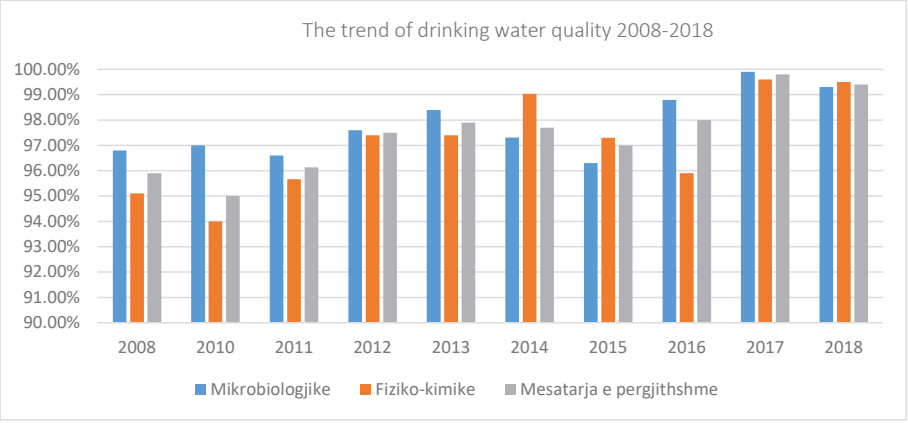

Figure 23: The trend of drinking water quality 2008-2018[11]

11 *Source of information: ARRU, Performance reports 2008-2018*

4.5. Use of freshwater resources

Indicator name	**Use of freshwater resources**
Indicator code	U05
Indicator type according to DPSIR model	Pressure indicator
Description of the indicator	This indicator presents the total amount of water extracted from freshwater sources, where it is used for the use of water supplier, in agriculture, industrial production and for the use of refrigeration in the energy industry as well as obtaining the amount of water for use by each sector mentioned.
Methodology for determining the indicator	Total freshwater use is calculated on the basis of data on the amount of extracted water for use in water supply, agriculture, the processing industry and the energy industry. The trend of the total amount of extracted water and the trend by sectors is expressed over the years for the data that are available.
Measuring Unit	The total amount of water extracted and the amount of water extracted by sectors, express in million cubic meters per year (106 m3 / year).
Data source	Kosovo Agency of Statistics Water Services Regulatory Authority. Regional Water Companies
Dynamic time of data collection	On an annual basis .

One of the forms of direct impact on the environment is the use of water resources. The data show that most of the water is used by public water companies for drinking water supply, for households and for the needs of other customers of public water companies. Agriculture is the second development sector of water use, mainly for irrigation of agricultural lands. In the energy sector water is used for cooling while in industry for production and cooling

equipment. The general trend of water use is increasing and the annual amount of use ranges between 200-270 million m3 of water per year (figure 24).

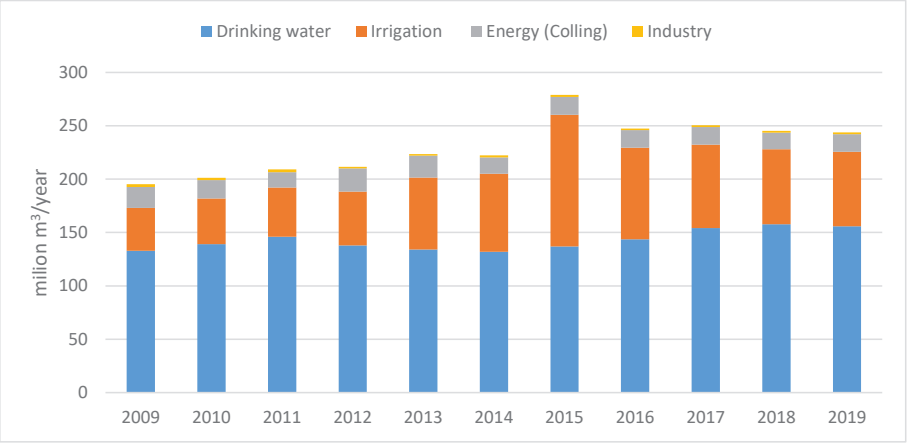

Figure 24. The amount of water use million m³/ year by sectors 2009-2019[12]

4.6. Water losses

Indicator name	**Water losses**
Indicator code	U06
Indicator type according to DPSIR model	Respons indicator
Description of the indicator	This indicator shows the water loss which occurs / is generated by leakage or evaporation during distribution between the water extracted and the delivery site to indicate the efficiency of the water supply regulation.
Methodology for determining the indicator	Water losses are estimated based on the absolute and relative difference between the amount of water extracted and the amount sent to customers.

12 *Data on water use from public water supply are obtained from WRA performance reports, data on irrigation from the Kosovo Agency of Statistics, and data on water use in Energy and Industry from annual reports of operators: KEK, SharCem and NewCoFeronikel.*

Measuring Unit	Water losses are expressed in million cubic meters per year (106 m3 / year), presented as a percentage (%) of the amount of water extracted.
Data source	Kosovo Agency of Statistics-KAS, Water and Sewerage Regulatory Authority - WSRA
Dynamic time of data collection	On an annual basis .

Based on estimates by the Water and Sewerage Regulatory Authority, Water losses in 2019 were about 90 million m^3 of water. Compared to the previous year, the losses mark a significant decrease, while compared to 2012 mark an increase of about 9 million m3 of water (figure 25).

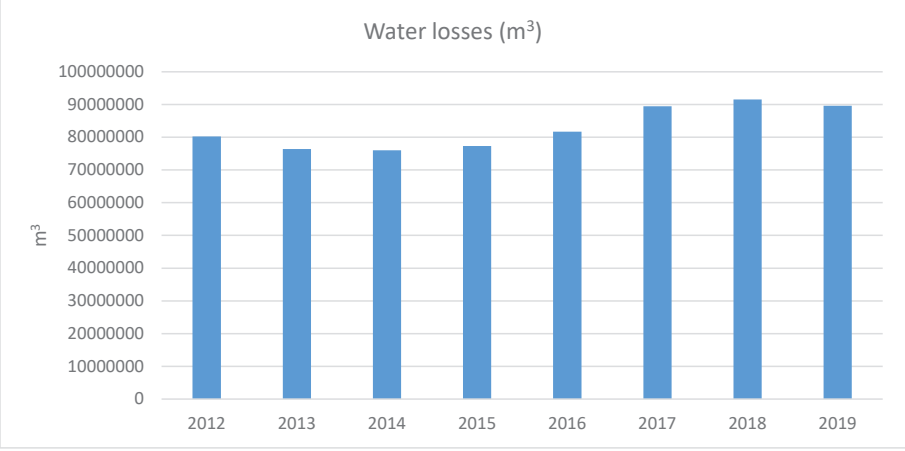

Figure 25: Water losses (m^3/year) 2008-2019

4.7. Access to public water supply

Indicator name	**Access to public water supply**
Indicator code	U07
Indicator type according to DPSIR model	Respons indicator
Description of the indicator	This indicator shows the percentage of the population with access to the public water supply system.
Methodology for determining the indicator	This indicator represents the inclusion of the total population with access to the water supply system.
Measuring Unit	The indicator is presented in percentage (%).
Data source	Water and Sewerage Regulatory Authority, Kosovo Agency of Statistics.
Dynamic time of data collection	On an annual basis .

According to the performance reports of the Water and Sewerage Companies, in the service area of these companies the coverage with the water service in 2018 was 97%, which marks an increase of 3% more than in the previous year and by 29% compared to year 2002 (figure 26). The increase of access to the public water service has been influenced by the investments that have been made in this sector from the budget of the Republic of Kosovo and from various donors. In 2019, WRA has changed the methodology of calculating this indicator, including in the assessment the new water supply systems in rural areas and the population of those areas, therefore there is a change in% of coverage with water service in the service area of RWC.

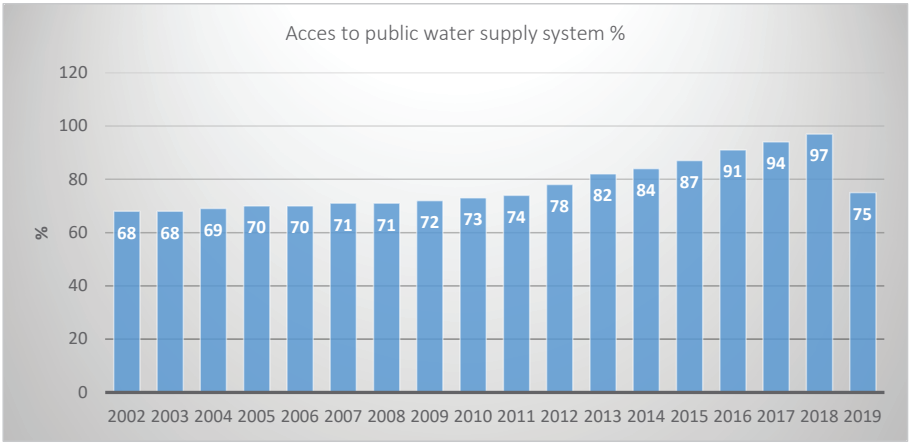

Figure 26: Acces to public water supply system (%), 2002-2019[13]

4.8. Access to public sewage system

Indicator name	**Access to public sewage system**
Indicator code	U08
Indicator type according to DPSIR model	Respons indicator
Description of the indicator	This indicator shows the percentage of the population with access to the public sewerage system.
Methodology for determining the indicator	This indicator represents the inclusion of the total population with access to the sewerage system.
Measuring Unit	The indicator is presented in percentage (%).
Data source	Water supply and Sewerage Regulatory Authority, Kosovo Agency of Statistics
Dynamic time of data collection	On an annual basis .

According to the performance report of Water and Sewerage Companies, in the service area of these companies the coverage with wastewater services (sewerage) in 2018 was 77% which marks an increase of 3% more than in the previous year and 34% more than in 2002, (figure 27). The increase of access to the public sewerage service has been influenced by the investments that have

13 *Source of information: WRA, Performance reports 2002-2018*

been made in this sector from the budget of the Republic of Kosovo and from various donors. In 2019, WRA has changed the methodology of calculating this indicator including in the assessment the new systems from rural areas and the population of those areas, therefore there is a change in the% of coverage with wastewater service in the service area of RWC.

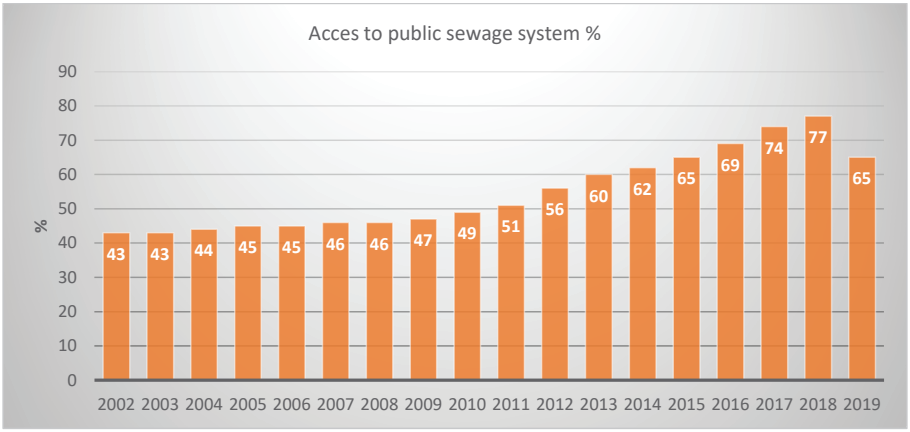

Figure 27: Acces to public sewage system(%) 2002-2019[14]

4.9. Access to wastewater treatment plants

Indicator name	**Access to wastewater treatment plants**
Indicator code	U09
Indicator type according to DPSIR model	Response indicator
Description of the indicator	This indicator presents the percentage of residents who have access to wastewater treatment plants with primary, secondary and / or tertiary treatment, in relation to the total number of residents, cumulative and according to the degree of wastewater treatment (including settlements with the equivalent population number (p.e.) greater than 2000).

14 *Source of information: WRA, Performance reports 2002-2018*

Methodology for determining the indicator	This indicator is determined by calculating the share of the population with access to wastewater treatment plants, in addition to the total number of inhabitants, so that the number of inhabitants with access to the public sewerage system, with access to the water treatment plant waste, is divided by the total number of inhabitants and multiplied by 100. This indicator can also be calculated for each separate level of wastewater treatment (primary, secondary and tertiary).
Measuring Unit	Indicator expressed in percentage (%).
Data source	Water and Sewerage Regulatory Authority, Kosovo Agency of Statistics
Dynamic time of data collection	On an annual basis .

This indicator has not been developed yet as Kosovo is in the construction phase of wastewater treatment plants.
The wastewater treatment plant for the Prizren region is under construction, while feasibility studies have been conducted for the Gjakova, Peja, Gjilan, Prishtina, Ferizaj and Mitrovica regions. The feasibility study and project for Prizren, Gjakova and Peja is funded by KFW (German Development Bank) and the Government of Kosovo, while the feasibility study for urban water treatment for Gjilan, Ferizaj and Mitrovica is funded by the European Union.
Currently functional plants for wastewater treatment are the wastewater treatment plant in Skenderaj with an annual capacity of about 734,421 m3, managed by RWC "Mitrovica", and 2 plants for wastewater treatment (Harilaq and Badovc) with small capacity (104,750 m3 / year) and managed by RWC "Prishtina". Expressed in the percentage of the total number of inhabitants who have access to wastewater treatment plants with treatment these capacities are negligible and represent less than 1% of the population.

5 Environmental indicators of biodiversity

5.1. The diversity of species

Indicator name	The diversity of species
Indicator code	B01
Indicator type according to DPSIR model	State indicator
Description of the indicator	The indicator represents an overview of the diversity of flora and fauna species in Kosovo.
Methodology for determining the indicator	The indicator is determined based on the number of species as well as those protected flora and fauna according to the taxonomic group.
Measuring Unit	Number of species of flora and fauna
Data source	Kosovo Institute for Nature Protection
Dynamic time of data collection	On a ten-year basis

There are no detailed data on the total number of species by category of living world, since the entire territory of Kosovo is not covered by research and the fact that new research constantly discovers new species of plants and animals. An approximate overview of the species by category and the number of respective species included in the IUCN Red List is presented in the table 6.

Table 6: Total number of species by main categories and number of species participating in the IUCN Red List

The group of species	Number of species	Number of species on the IUCN Red List
Algae	> 400	There is no rating
Fungi	> 380	40
Vascular plants	> 2000	237
Insects	> 130	140
Fish	> 30	15
Amphibians	> 20	13
Reptile	> 25	20
Birds	> 200	24
Mammals	> 100	39

Figure 28 presents the number of species of Kosovo Vascular Flora, according to IUCN risk categories. The figure shows that the largest number of species belong to the category "endangered" (EN) and that critically endangered" (CR).

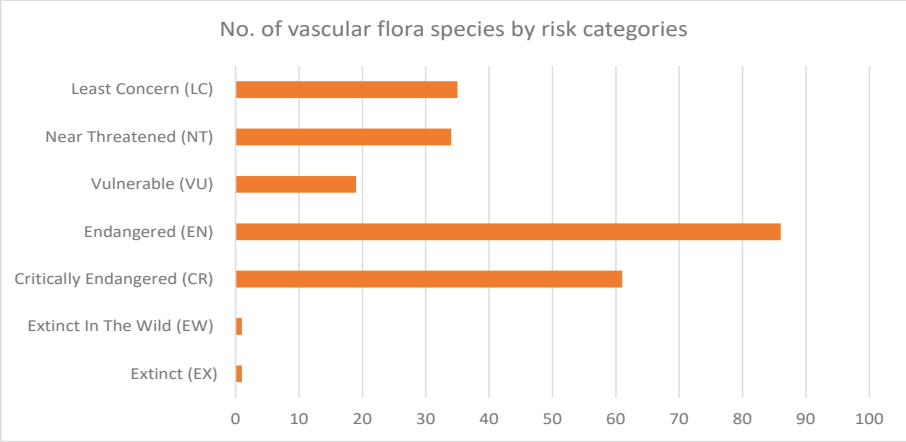

Figure 28. Number of vascular flora species by risk categories [15]

Figure 29 shows the number of fungal species by hazard status. According to the data available in Kosovo (Sharr Mountain) there is also a rare extreme species of mushroom (*Zeus Olympius*) that in addition to Kosovo, has spread also in the Mount Olympus in Greece and Mount Prin in Bulgaria.

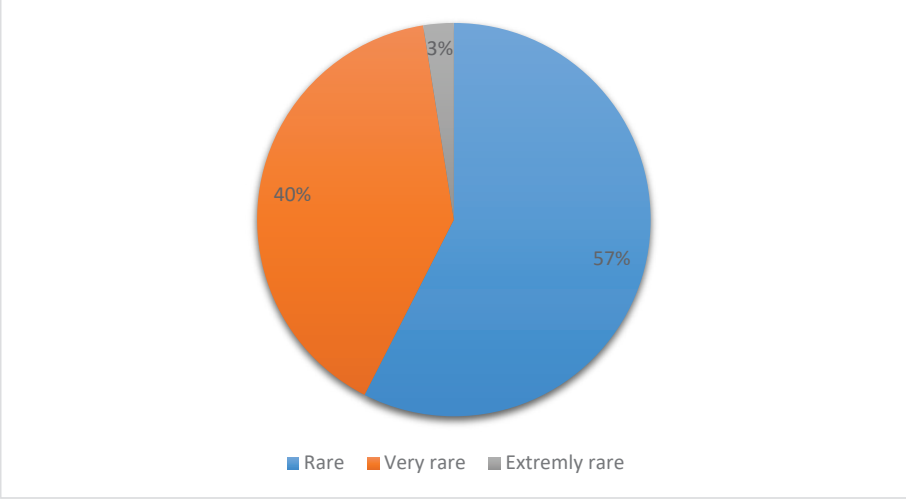

Figure 29. Types of fungis according to risk status [16]

15 *Red Book of Vascular Flora of the Republic of Kosovo, KEPA / MESP 2015*
16 *Macedonian Mycological Society https://macfungi.webs.com*

Figure 30 presents the species that have protected status in the territory of Kosovo according to current legislation, while Table 7 presents data on the distribution of species included in the Red Book of Fauna of the Republic of Kosovo according to IUCN categories. The presented data show that the largest number of species included in the categories of endangered species belong to the group of insects (140 species), fish are represented by 15 species while in vertebrates, mammals (39 species), reptiles (20 species) , amphibians (13 species) and birds (24 species).

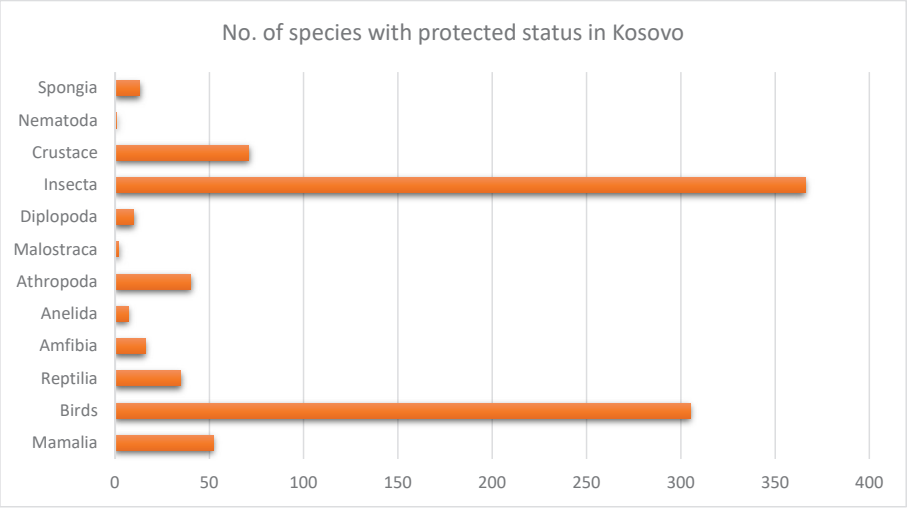

Figure 30: Number of species of fauna, with protected status in the territory of Kosovo by categories [17]

17 *Administrative Instruction no. 18/2012 on the Proclamation of Protected and Strictly Protected Species, Prishtina: MESP, 2012.*

Table 7. Distribution of species included in the Red Book of Fauna of the Republic of Kosovo according to IUCN categories [18]

Groups / Categories	Extremely Endangered CR	Endangered EN	I vulnerable VU	Almost Threatened NT	Less Concern LC	Insufficient Data DD	Total
Gastropoda			10	10			**20**
Bivalvia		1					**1**
Oligochaeta		1		2	2	7	**12**
Hirudinea						2	**2**
Arachnida					1	8	**9**
Araneae					1	7	**8**
Mesostigmata						1	**1**
Malacostraca			1			1	**2**
Diplopoda			3			6	**9**
Insecta	20	11	19	42	13	35	**140**
Ephemeroptera		4		4	2	2	**12**
Plecoptera	5	1					**6**
Odonata				4	1	7	**12**
Coleoptera			3	2	4	17	**26**
Mecoptera						1	**1**
Diptera						2	**2**
Trichoptera	15	1	7	20	1	2	**46**
Lepidoptera		5	9	12	5	4	**35**
Cyclostomata				1			**1**
Actinopterygii	1	1	1	4	2	5	**14**
Amphibia		2	1		3	7	**13**
Reptilia			1	8	8	3	**20**
Aves	3	6	4	4		7	**24**
Mammalia	1	2	1	9	17	9	**39**
Total	**25**	**24**	**41**	**80**	**46**	**90**	**306**

18 *Kosovo Red Fauna Book, KEPA / MESP 2019*

5.2. Representation and condition of selected species

Indicator name	Representation and condition of selected species
Indicator code	B02
Indicator type according to DPSIR model	State indicator
Description of the indicator	The indicator shows the number of ordinary population, special species and / or indicator species, especially in settlements under strong pressure.
Methodology for determining the indicator	The indicator is determined based on the trend of population change and estimation of the distribution and population density of the selected species. Data are obtained by counting and estimating the approximate number of individuals, estimating the distribution and density of the population in a given area, typical or otherwise important to the population of certain species on the basis of which is drawn the conclusion on the population dynamics of selected species.
Measuring Unit	Population density expressed in the number of individuals per unit area (m2) or descriptive.
Data source	Institution responsible for monitoring the condition of selected species (Kosovo Institute for Nature Protection)
Dynamic time of data collection	On a five-year basis.

There is no specific activity for the realization of this indicator, although some species of fauna such as the Balkan Lynx (*Lynx lynx balcanicus*), special monitoring programs are being implemented with support from international wildlife organizations. There are also some activities for monitoring bird fauna through monitoring of some migratory species or through conducting annual bird censuses, which are conducted on an annual basis by the Kosovo Institute for Nature Protection and bird associations. Also within the territory of the National Parks, the qualitative monitoring of the species of wild fauna is done through the trap cameras that are placed and controlled by the Institute for

Nature Protection and the respective Directorates of the parks. Monitoring results show stable number of populations of species of wild mammals.

A more specific assessment of the condition and density of populations of wild mammal species in the forest ecosystems of Kosovo, through the methodology of trap cameras was made within the project: *Development of a method for measuring the national distribution and density of wild mammals by Using Trap Cameras: A Case Study of Kosovo.*

Table 8 presents data on the average density of some wild mammal populations in Kosovo, based on the results of measurements from 10 monitoring points of the abovementioned project.

Table 8: Average population density for some species of wild mammals [19]

Types	The density / density (Individual / km)		Size of forest populations	
	Average	Extent	Average	Verse
Red fox (*Vulpes vulpes*)	1.03	0.58-1.55	4935	2778-7433
Gray wolf (*Canis lupus*)	0.08	0.04-0.12	374	202-584
Wild boar (*Sus scrofa*)	1.34	0.78-1.97	6469	3754-9460
Roe deer (*Capreolus capreolus*)	3.19	1.90-5.00	15334	9126-24059
Badger (*Meles meles*)	0.08	0.03-0.14	364	146-656
Wild rabbit (*Lepus europeus*)	1.81	0.94-2.82	8728	4524-13572
Sqarthi (*Martes foina*)	0.36	0.16-0.59	1720	789-2831
Wild cat (*Felis sylvestris*)	0.08	0.03-0.13	381	152-648
Brown bear (*Ursus arctos*)	0.25	0.12-0.41	1190	596-1966

Regarding the types of vascular flora of special importance for the country are

19 Developing methods for measuring national distributions and densities of wild mammals using camera traps: A Kosovo study; Sarah E. Beatham et al, 2020.

the species with endemic character. Kosovo has over 100 species of vascular flora with endemic character, some of which (16 species) are also sub -endemic (local endemic).
An assessment of the condition of these species and their endangered status was made in the framework of the Red Book of Vascular Flora of Kosovo, but also in the framework of specific research by the Faculty of Natural Sciences of UP.

Table 9: Trend of qualitative and quantitative degradation of habitats of some selected species and factors that have influenced the degradation [20]

Types	The current trend of quantitative habitat degradation	Quantitative habitat change for the past 15 years (%) compared to the current trend	Type of degradation for the quantitative indicator	The current trend of qualitative habitat degradation	The main factors affecting habitat loss and degradation
Achillea alexandri-regis	Decress	1% decress	Not biotic , Biotic	Decress	Succession and fires
Aristolochia merx-muelleri	Decress	2% decress	Not biotic , Biotic	Decress	Human activities
Cerastium neoscardicum	Decress	3% decress	Not biotic , Biotic	Decress	Succession, fire
Crepis bertiscea	Decress	1% decress	Not biotic , Biotic	Decress	Climate change and successive processes
Crepis macedonica	Decress	3% decress	Not biotic , Biotic	Decress	Human activities
Fritillaria macedonica	Decress	3% decress	Biotic	Decress	Succession

20 *Evaluation of conservation of endemic plants in Kosovo, Millaku et al., Hacquetia 2017 (Conservation assessment of the endemic plants from Kosovo)*

Gentiana pneumonanthe subsp. nopcsae	Decress	3% decress	Not biotic	Decress	Water regime change
Linum elegans	Decress	1% decress	Biotic	Decress	Human activities
Senecio scopolii	Decress	1% decress	Biotic	Stabile	Human activities
Sideritisscardica	Decress	3% decress	Not biotic , Biotic	Decress	Human activities
Silene pusilla subsp. candavica	Decress	1% decress	Not biotic , Biotic	Decress	Human activities
Silene retzorffiana subsp. nicolicii	Decress	1% decress	Not biotic , Biotic	Decress	Human activities
Solenanthus krasniqii	Decress	10% decress	Not biotic , Biotic	Decress	Human activities , invasion of alien species, fires
Stachys serbica	Decress	30% decress	Not biotic , Biotic	Decress	Human activities
Tulipa gesneriana *(Syn.:Tulipa scardica)*	Decress	3% decress	Not biotic , Biotic	Decress	Human activities
Tulipa serbica	Stabile	0.5% decress	Biotic	Stabile	Human activities

5.3. Invasive species

Indicator name	**Invasive species**
Indicator code	B03
Indicator type according to DPSIR model	State indicator
Description of the indicator	The indicator presents the trend of introduction of foreign species in nature - allochthone respectively invasive foreign species in the territory of Kosovo, which shows the increasing risk of biodiversity loss.
Methodology for determining the indicator	The indicator is determined based on the analysis of the presence of foreign and invasive species individually for terrestrial and aquatic ecosystems as well as through taxonomic groups. Their number should also be taken into account.

Measuring Unit	List and description of species
Data source	Studies and information from scientific research institutions (FMNS - Department of Biology) and the Kosovo Institute for Nature Protection.
Dynamic time of data collection	On a ten-year basis .

In Kosovo, no complete study or inventory of allochthon and invasive foreign species has been conducted yet and there has been no analysis regarding the trend of introduction of allochthon and invasive species in the territory of Kosovo and their impact on natural biodiversity loss.
Some partial and preliminary research has been done on the presence of invasive species in natural ecosystems for some plant species and some species of fish which indicate the presence of some invasive species in terrestrial and water ecosystems (Table 10).

Table 10. Preliminary list of invasive species in Kosovo [21]

Types	Family
Types of plants	
Ambrosia artemisiifolia L.	Asteraceae
Datura stramonium L.	Solanaceae
Robinia pseudoacacia L	Fabaceae
Amorpha fruticosa	Fabaceae
Fallopia japonica	Polygonaceae
Helianthus tuberosus	Asteraceae
Types of fish	
Oncorhynchus mykiss (Walbaum,1792)	Salmonidae
Carassius gibelio (Bloch, 1782)	Cyprinidae
Pseudorasbora parva (Temminck & Schlegel, 1842)	Cyprinidae
Ctenopharyngodon idella (Valenciennes, 1844)	Cyprinidae
Lepomis gibossus (Linnaeus, 1758)	Centrarchidae

21 *State of Nature Report 2010-2014, KEPA / KINP 2015*

5.4. Forest fires

Indicator name	Forest fires
Indicator code	B04
Indicator type according to DPSIR model	Pressure indicator
Description of the indicator	The indicator shows the number of fires and the size of the affected zone in order to assess the negative consequences on the environment.
Methodology for determining the indicator	The indicator is determined based on estimates of the number of fires and affected areas on the basis of field inspections and data on fires in private and state forests, in all municipalities in the territory of Kosovo..
Measuring Unit	• number of fires. • the size of the affected zone expressed in hectares (ha).
Data source	Kosovo Forest Agency
Dynamic time of data collection	On an annual basis .

Fires are a factor that affects not only the damage of forests and biodiversity, but also the increase in greenhouse gas emissions from this sector. Usually forest fires, in addition to damaging the vitality of forests, are associated with the appearance of other forest diseases and also with economic losses. According to data from the Kosovo Forest Agency during the period 2008 to 2018 an area of 14,144 ha of private and public forests was burned. The largest number of burned forest areas occurred in 2012 with 5604 thousand ha. The general trend of forest fires in Kosovo is falling. In 2018, only 949 ha of burned forests were registered. The annual average of forest fire cases during the period 2015-2018 was 136 cases (2015 with 83 cases, 2016 with 238 cases, 2017 with 88 cases and 2018 with 134 cases).

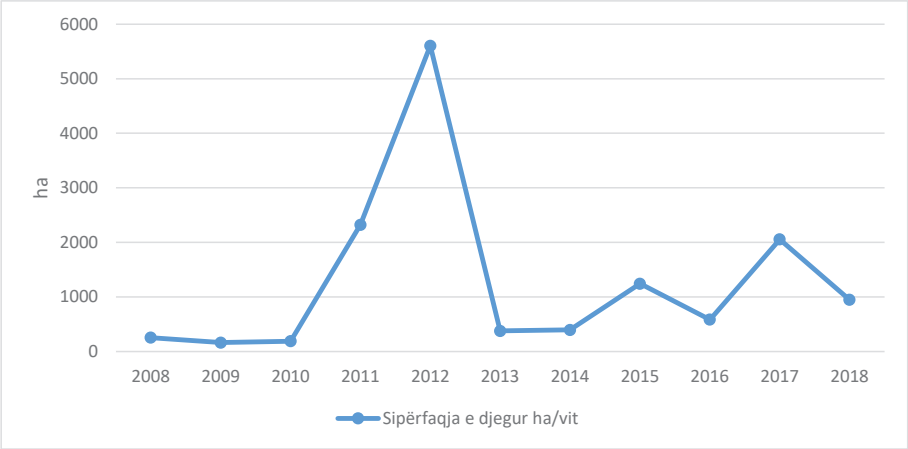

Figure 31: Forest fires ha/year 2008-2018[22]

5.5. Protected areas

Indicator name	**Protected areas**
Indicator code	B05
Indicator type according to DPSIR model	Response indicator
Description of the indicator	The indicator shows the change in the number of protected zones and their surface, for all protection categories.
Methodology for determining the indicator	The indicator is determined based on the number of protected zones according to the categories of protection, the determination of their total surface and the calculation of the percentage of the surfaces of protected zones in the total area of the national territory.
Measuring Unit	• number of protected zones; • surface of protected zones in hectares (ha) per year; • percentage of the surfaces of protected zones in relation to the surface of the national territory.
Data source	Kosovo Institute for Nature Protection
Dynamic time of data collection	On an annual basis .

22 *Kosovo Forest Agency*

In the chronology of the declaration of nature protected zones in Kosovo, three time periods can be distinguished which are related to the general developments in Kosovo (figure 32). The period 1950 - 1970, represents the initial phase of nature protection and the proclamation of nature protected zones in Kosovo, which begins with the proclamation of the first zone in 1950, which was "Gazimestani". Until the beginning of the '70s the number of protected zones reached 19. In this period under protection were placed: Gadime Cave and some other monuments of botanical importance such as: Rrapi in Marash, Trungjet in Isniq, etc..

The period 1970 - 1988, represents a period which is characterized by the proclamation of a considerable number of nature zones. The reason for this increase is related to the establishment of the Kosovo Office for Nature Protection in 1974, by the Assembly of Kosovo. During this period, a total of 36 nature zones were protected, of which should be mentioned: the reserve "Bifurcation of the Nerodime River", the first National Park "Sharr Mountain" (1986), the source of the White Drin with the Cave and Waterfall in Radavc (1983) as well as some other natural monuments.

During the period 2000-2018, over 100 nature zones were taken under legal protection and many more were proposed for protection. Among the protected zones should be singled out: National Park "Bjeshket e Nemuna" (2013), Wetland of Henc - Radeva, etc., while the other majority are natural monuments of botanic.

During the period 2015-2019, a total of 72 new nature protected zones were added to the total number of protected zones, of which: 18 strict reserves, 51 nature monuments, 1 nature park and 2 protected landscapes.

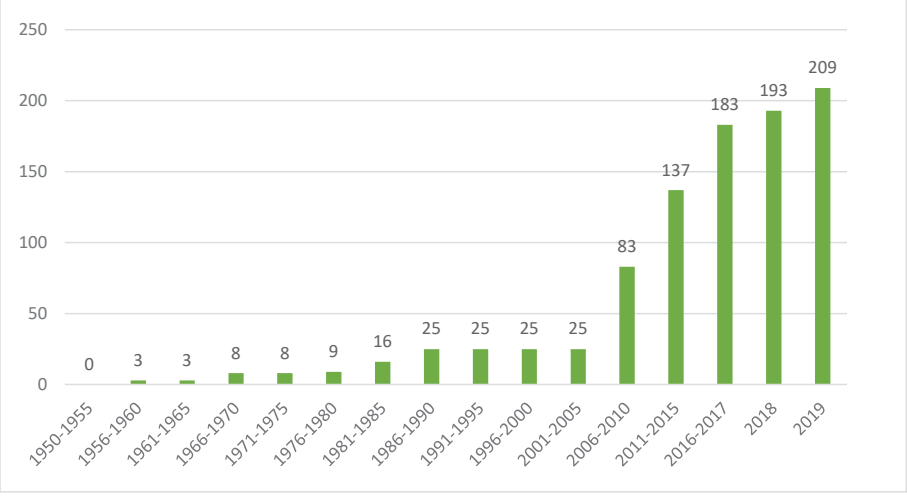

Figure 32: The number of protected areas 1950-2019[23]

23 *Institute of Nature Protection*

Figure 33 shows the trend of increasing the surface of protected zones for the period 1980-2018, which shows a constant increase in the surfaces of protected zones with a significant increase in 2012.
While in table 9, is presented a summary of the number of protected zones by categories and their surfaces.

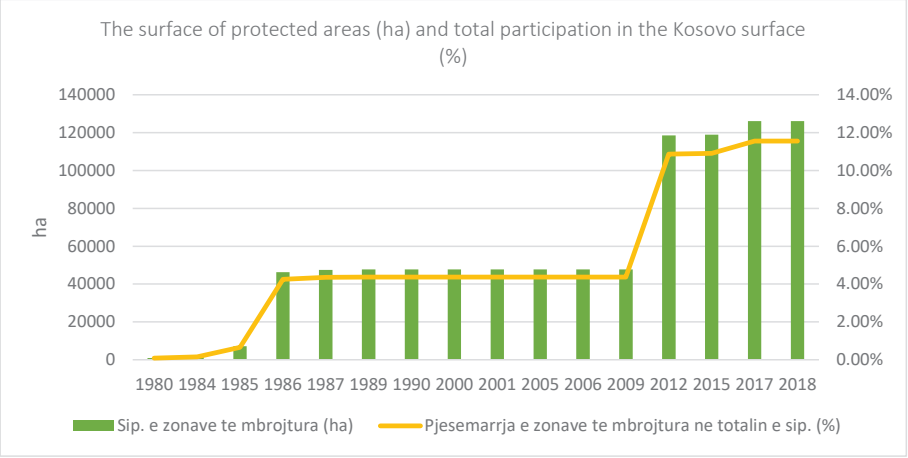

Figure 33: Surface of protected areas in Kosovo 1980-2018

Table 11. Protected areas by categories (2020)

IUCN category	Nomination	No.	*Surface/ha*	*Participation of PZ in%*
I	Strict Nature Reserves	19	10,885.82	0.99
II	National Parks	2	115,957	10.6
III	Natural Monuments	182	6,039	0.56
V	Nature Park	1	5,934	0.5
V	Protected Landscape	5	2.152	0.2
V	Special Protected Zones of Birds	1	109.5	0.01
	Total	210	125814.1[24]	11.53 %

24 *Clarification: this surface of protected zones does not include protected zones located within the National Parks "Sharri" and "Bjeshkët e Nemuna".*

6. Environmental indicators of waste

Wastes are substances that are created during daily activities. The development of technology has resulted in the creation of different types of packaged and wrapped goods and with different materials where after their use, packaging or wrapping goes to waste. Municipal waste generation per capita in Kosovo is increasing. The amount of waste disposed of in sanitary landfills in Kosovo is increasing every year. In Kosovo there is still hazardous waste inherited from industrial and technological activities.

6.1. The amount of waste generation

Indicator name	**The amount of municipal waste generation**
Indicator code	M01
Indicator type according to DPSIR model	Pressure indicator
Description of the indicator	The indicator represents the amount of municipal waste generated (produced) per capita at the national level.
Methodology for determining the indicator	Indicator is calculated / determined based on the data on the amount of municipal waste collected (in tons) by the municipality or the relevant company and data on the number of inhabitants per municipality or the relevant area.
Measuring Unit	Amount of municipal waste generated expressed in kilograms per inhabitant for one year (kg / inhabitant / year)
Data source	Body responsible for waste statistics (Kosovo Agency of Statistics)
Dynamic time of data collection	On an annual basis .

Total waste generation as well as waste generation per capita in Kosovo is increasing. From 2014 to 2018 there is a constant increase in waste generation per capita, from 140 kg / inhabitant (2014) to 284 kg / inhabitant (2018). While the total waste at the national level has increased from 247 thousand tons (2014) to 284 thousand tons (2018) (figure 34 and 35).

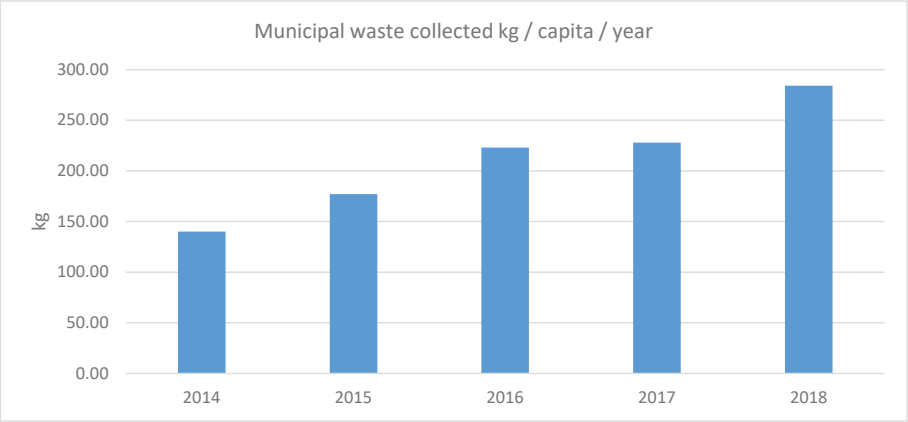

Figure 34: Municipal waste generation per capita 2014-2018[25]

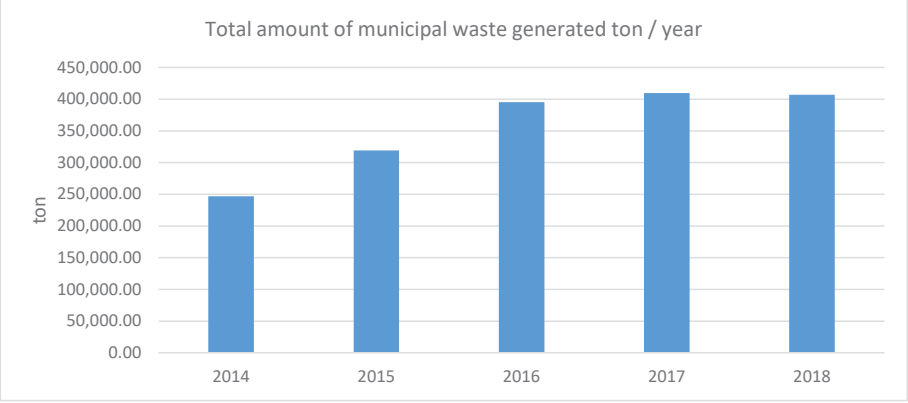

Figure 35: Total amount of waste generated in Kosovo 2014-2018[26]

25 *KAS-Municipal Waste Survey 2004-2018*
26 *KAS - Municipal Waste Survey 2004-2018*

6.2. The amount of industrial waste generation

Indicator name	The amount of industrial waste generation
Indicator code	M02
Indicator type according to DPSIR model	Pressure indicator
Description of the indicator	The indicator represents the total amount of industrial waste generated (produced) at the national level and the intensity of production / generation of industrial waste per unit of GDP.
Methodology for determining the indicator	The indicator is calculated / determined based on annual data on the amount of industrial waste produced / generated. To calculate / determine the intensity of industrial waste generation / production, the total amount of industrial waste production / generation must be divided by the unit of GDP.
Measuring Unit	• Total amount of industrial waste produced / generated, expressed in tons. • Gross Domestic Product (GDP), expressed in million Euros of permanent price / value • Intensity of production / generation of industrial waste expressed in kg / Euro.
Data source	Kosovo Agency of Statistics
Dynamic time of data collection	On an annual basis .

According to surveys conducted by the Kosovo Agency of Statistics, the amount of industrial waste generated in Kosovo in 2010 and 2011 was almost the same, while from 2012 to 2015 the generation was falling, while in 2016, 2017 and 2018 marks an increase in industrial waste generation. While in 2010 in Kosovo were generated 580,154.00 tons of industrial waste, in 2018 the amount of industrial waste generated was 2,554,308.00 tons (figure 36). While the intensity of industrial waste generation for 2018 was 0.38 kg / Euro 2018.

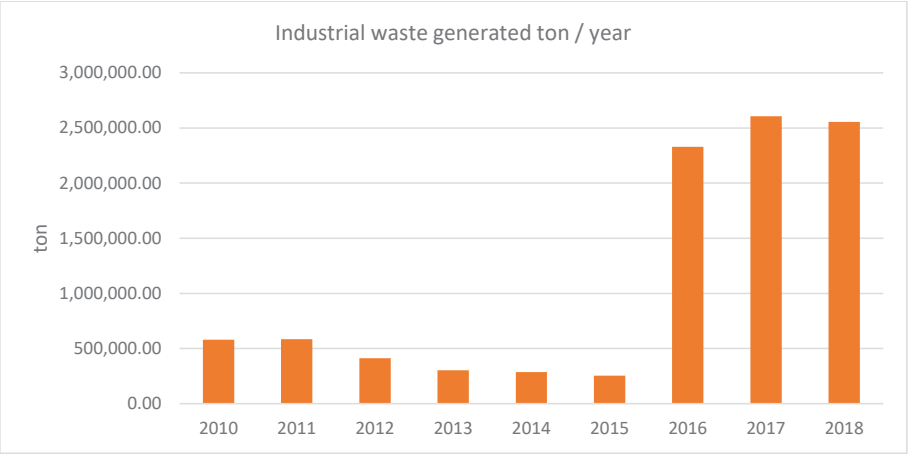

Figure 36: Industrial waste generated 2010-2016[27]

6.3. The amount of hazardous waste generation

Indicator name	**Generated amount of hazardous waste**
Indicator code	M03
Indicator type according to DPSIR model	Pressure indicator
Description of the indicator	The indicator represents the total amount of hazardous waste (produced) at national level and the intensity of hazardous waste production/generation per unit of GDP per capita.
Methodology for determining the indicator	The indicator is calculated/determined based on the annual data on the amount of hazardous waste produced/generated. To calculate/determine the intensity of production/generation, the total amount of hazardous waste production/generation with the GDP unit should be subdivided.
Measuring Unit	• The total amount of hazardous waste produced/generated is expressed in tons • The intensity of hazardous waste production/generation is expressed in kg/Euro.

27 *ASK, Industrial Waste Survey 2010-2016*

Data source	Kosovo Agency of Statistics
Dynamic time of data collection	On an annual basis.

During industrial activities from the general generation of industrial waste, a quantity of them turn out to be hazardous waste. Hazardous waste is also generated by other productive activities. There is no specific data on hazardous waste, but considering that most industrial waste is hazardous then the data presented in the industrial waste indicator are somewhat relevant to this indicator (figure 36).

6.4. Total amount of the municipal waste disposed

Name of the indicator	**Total amount of municipal waste disposed**
Indicator Code	M04
Type of indicator according to DPSIR model	Response indicator
Description of the indicator	The indicator represents the total amount of municipal waste disposed at the national level and the amount of waste disposed per capita.
Methodology for determining the indicator	The indicator is calculated/determined based on the data on the amount of municipal waste disposed in sanitary landfills (in tons) by the respective municipalities/companies and the data on the number of inhabitants per municipality respectively the respective zone.
Measuring unit	The quantity of municipal waste disposed is expressed in tons per one year (ton/year). The quantity of municipal waste disposed per capita is expressed in inhabitant/kg/year.
Source of data	Company for the Management of Sanitary Landfills and Regional Waste Companies
Dynamics of data collection	On annual basis

If we compare the amount of municipal waste disposed in sanitary landfills[28] from 2009 to 2019, there is a constant increase over the years. Exceptions are the years 2012 and 2014 when the amount of waste disposed in sanitary landfills in Kosovo by waste collection companies has decreased from the previous year. Thus, while in 2009 there were disposed 24720665 tonnes of waste, in 2019 the amount of waste disposed was 44988181 tonnes, or almost double that of 2009 (figure 37).

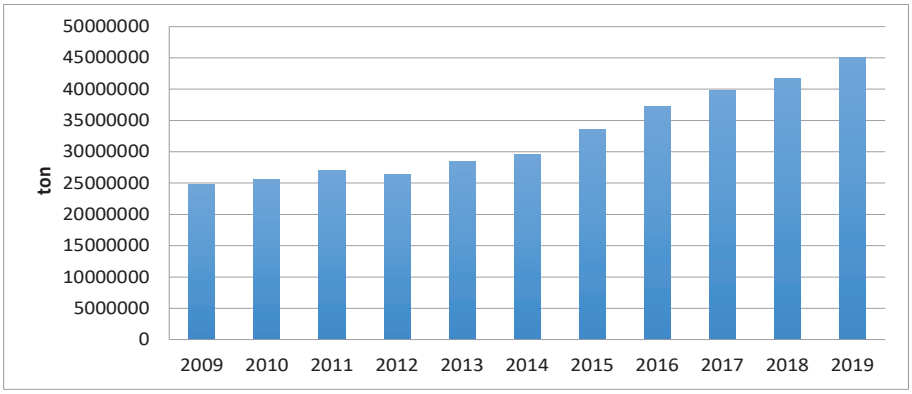

Figure 37. Total amount of municipal waste disposed in sanitary landfills ton/ year in Kosovo 2011-2019[29]

The amount of waste disposed per capita / year also has an increasing trend. Thus, while in 2011 155.6 kg / b / year of waste were deposited, in 2019 252.4 kg / b / year were deposited (figure 38).

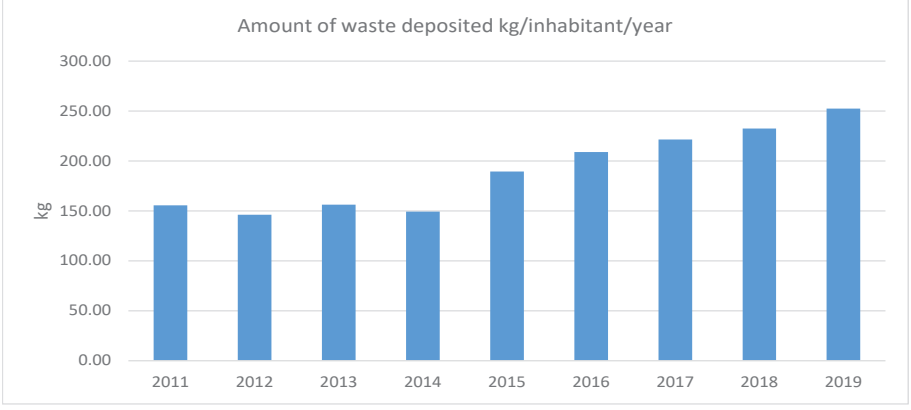

Figure 38. Amount of waste disposal per capita/inhabitant/year in sanitary landfills in Kosovo 2011-2019[30]

28 *No data were reported on waste disposed in the northern municipalities of Kosovo*
29 *KLMC and Regional Waste Companies*
30 *KLMC and Regional Waste Companies*

6.5. Total amount of municipal waste recycled

Indicator name	Total amount of municipal waste recycled
Indicator code	M05
Indicator type according to DPSIR model	Response indicator
Description of the indicator	The indicator represents the total amount of recycled municipal waste per capita at the national level.
Methodology for determining the indicator	The indicator is calculated/determined based on the data on the amount of the recycled municipal waste (in tonnes) and the data on the number of inhabitants per municipality respectively the respective zone.
Measuring Unit	The amount of municipal recycled waste is expressed in kilograms per capita for one year (kg/inhabitant/year).
Data source	Kosovo Agency of Statistics
Dynamic time of data collection	On an annual basis

There is no organized waste recycling system in Kosovo, although in some municipalities there are initiatives for waste separation at source. There are several licensed companies that deal with the activity of waste treatment and recycling. According to the data of the Agency of Statistics, in 2018 3193 tonnes of waste were treated, while 2016 was the year with the largest amount of waste treated (10674 tonnes) (figure 39).

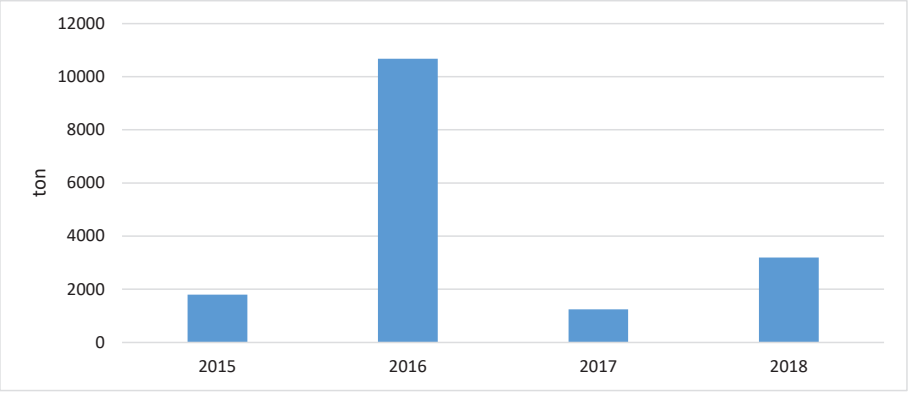

Figure 39. Amount of the waste treated in Kosovo 2015-2018

In terms of the composition of waste that is recycled, 69% of it is waste from ferrous metals and other metals, 13% plastic waste and 14% waste from paper and cardboard. In 2019, several initiatives for the recycling of glass waste have started. The amount of recycled waste represents only about 5% of the total amount of waste generated at the country level (figure 40).

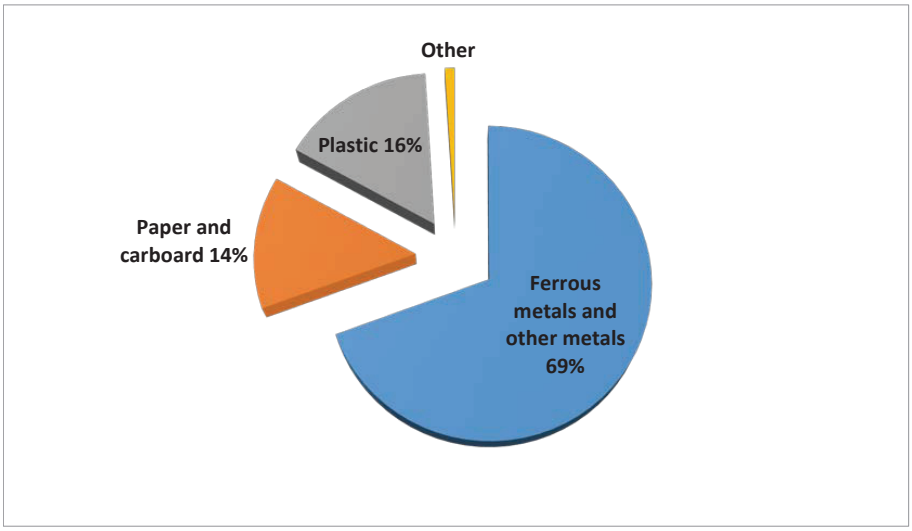

Figure 40: Types of recycled waste

A considerable amount of recyclable waste (waste that can be subjected to the recycling process) is also exported abroad. Figure 41 presents data on the amount of waste exported for recycling abroad for the period 2010-2016.

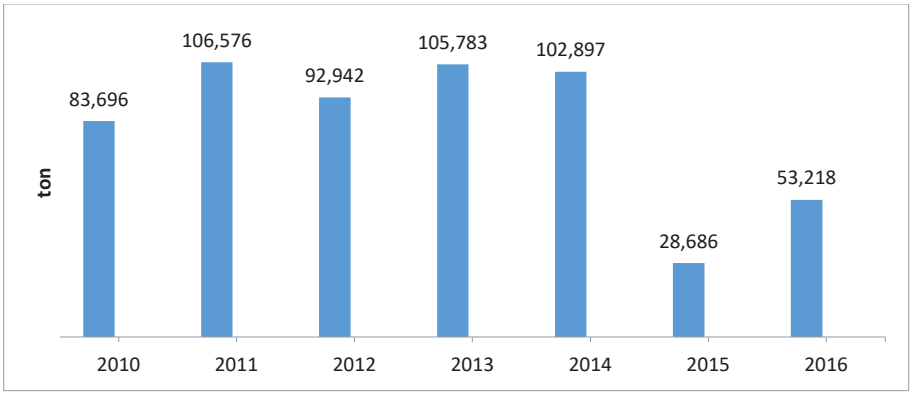

Figure 41: Quantity (tonne/year) of waste exported for recycling 2010-2016

7. Environmental Indicators of the land

The continuous impact of human activities leads to the degradation of land surfaces, causing harmful environmental and socio-economic consequences. The challenge is to prevent land degradation and pollution through specific land protection measures and policies.

7.1. Land Use Changes

Indicator name	**Land Use Changes**
Indicator code	T 01
Indicator type according to DPSIR model	Pressure indicator
Description of the indicator	This indicator shows the expansion of urban areas in account of agricultural lands, forest lands and other categories of natural and semi-natural lands. This indicator analyzes areas occupied by constructions and other urban infrastructure, including sports and recreation facilities. The indicator also shows the origin of urban land expressed as part of the different categories on the basis of which the change was made.
Methodology for determining the indicator	The indicator is calculated by analyzing maps based on satellite images and the data obtained from the CORINE Land Cover (CLC) methodology analysis from 2000, 2006, 2012, 2018, or by taking into account the trend of increasing surface areas for constructions for a certain period of time (5-10 years). The indicator shows the change of the land surface area on an annual basis by type. Namely, changes in agricultural, forestry, natural and semi-natural areas (CLC2-CLC5) and urban land (CLC1), depending on the methodology used to calculate the change of the covered land.

Measuring Unit	The surface of the designated land is expressed in ha or km^2, while the part of the changed land is expressed in (%).
Data source	Responsible institution for agriculture and forestry land (Ministry of Agriculture, Forestry and Rural Development); Institution responsible for assessing land change according to methodology Corine Land Cover-CLC (Kosovo Environmental Protection Agency); or Institution responsible for national statistics (Kosovo Agency of Statistics).
Dynamic time of data collection	For the period of 5-10 years, depending on the data available.

Based on the main results of the National Forest Inventory for 2012, it was found that forests and forest lands represent the main category of land use with about 47%, agricultural land with about 29%, meadows and pastures with 15%, settlements with about 4.5 %, water and wetlands by about 0.6% and other lands by about 3.9%. Compared to the inventory conducted for 2002, it is found that the areas of lands used as forests, lands used as meadows and pastures and lands used as settlements have increased, while the areas of land used as agricultural land and other land areas have been reduced (figure 42).

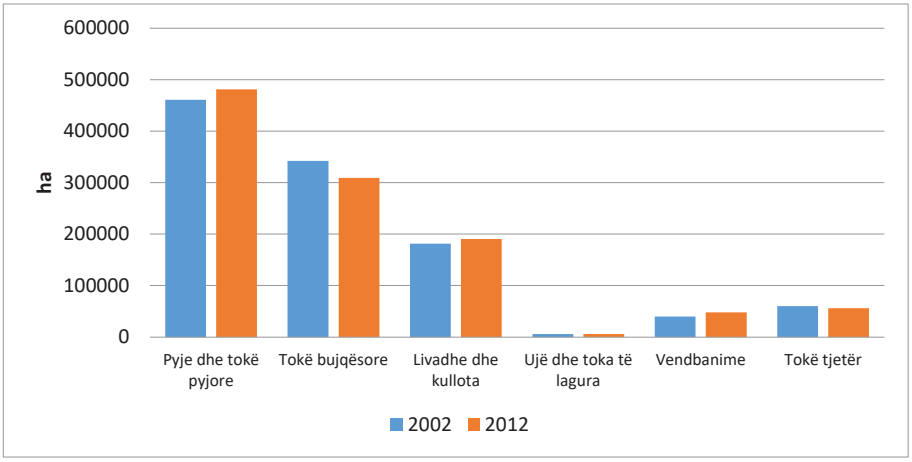

Figure 42: Land use (ha) according to categories 2002 and 2012[31]

31 *Kosovo Forest Inventory 2012/KFA*

According to the data from satellite images of 2018, which have been processed by the Kosovo Environmental Protection Agency within the project Implementation of CLC [32], 2018 in the Western Balkans, supported by the European Environment Agency, in Kosovo have been identified 30 land coverage classes from 44 to the total CORINE nomenclature [33].
These classes are grouped into 5 main classes where forests and semi-natural areas dominate with about 57% and agricultural lands with about 38%, while artificial areas are represented with over 4.6% of the total. About 0.3% of the covered lands are classified in the class of water bodies and wetlands (boggy lands)[34]. These land classes used in ha during the years 2000-2018 are presented in table 12. From the data presented in the table it is noticed that during the period 2000-2018 there has been a continuous increase of artificial areas (construction areas), while there has been a reduction in agricultural land.

Table 12: Land Cover (ha) according to the categories 2000, 2006, 2012 and 2018[35]

Type	ha 2000	ha 2006	ha 2012	ha 2018
Artificial surfaces (construction areas)	24978.47	32919.39	50597.97	51057.52
Agricultural areas	444320.72	439971.2	416336.95	416168.22
Forests and semi-natural fields	618895.06	614290.59	621110.61	620819.78
Wet lands	0	985.101	131.348	131.348
Water bodies	2323.47	2351.43	2340.84	2340.84
Total	1090517.7	1090517.7	1090517.7	1090517.7

32 *CLC- Corine Land Cover (Land cover according to the CORINE methodology)*
33 *Coordination of information on the environment*
34 *Implementation of CLC2012 in the West Balkan Countries/EEA 2014*
35 *Kosovo Forest Inventory 2012/KFA*

7.2. Erosion

Indicator name	Erosion
Indicator code	T 02
Indicator type according to DPSIR model	State indicator
Description of the indicator	Through this indicator the intensity of the erosive processes is presented, as well as the representation of the real and potential risk classes for soil erosion.
Methodology for determining the indicator	The indicator is calculated by determining the riskiness of soil surfaces from erosion. In order to calculate the indicator, data modeling based on land use, climatic and topographic aspects based on internationally accepted methodologies (for example the European Pattern for soil erosion assessment, the PESERA model or the USLE model).
Measuring Unit	The indicator is expressed in surface units (ha) per year, the surface of the eroded land in relation to the total surface area of the monitored land.
Data source	MAFRD and the Hydrometeorological Institute (KHMI)
Dynamic time of data collection	On an annual basis .

There are currently no data on annual basis for the production of this environmental indicator. However, based on some data conducted from previous researches, KEPA has made an assessment in GIS on the spatial extent of very strong erosive soil surfaces and other surfaces with strong, medium and weak erosive intensity as well as soil surfaces without erosion. As presented in the following table, 7.35% of land surfaces in Kosovo have very strong erosive intensity, 16.1% strong, 35.4% medium, 24.55% weak, 10.1% very weak and 6.5% without erosion (Table 13). Areas with very strong and strong erosive potential lie mainly in mountainous areas while those with low erosive potential and without erosion lie mainly in valleys and flat land surfaces (figure 43).

Table 13: Types of erosion in Kosovo (%)

No.	Types of erosion	% of land surface
1	Very strong	7.35
2	Strong	16.1
3	Medium	35.4
4	Weak	24.55
5	Very weak	10.1
6	Without erosion	6.5

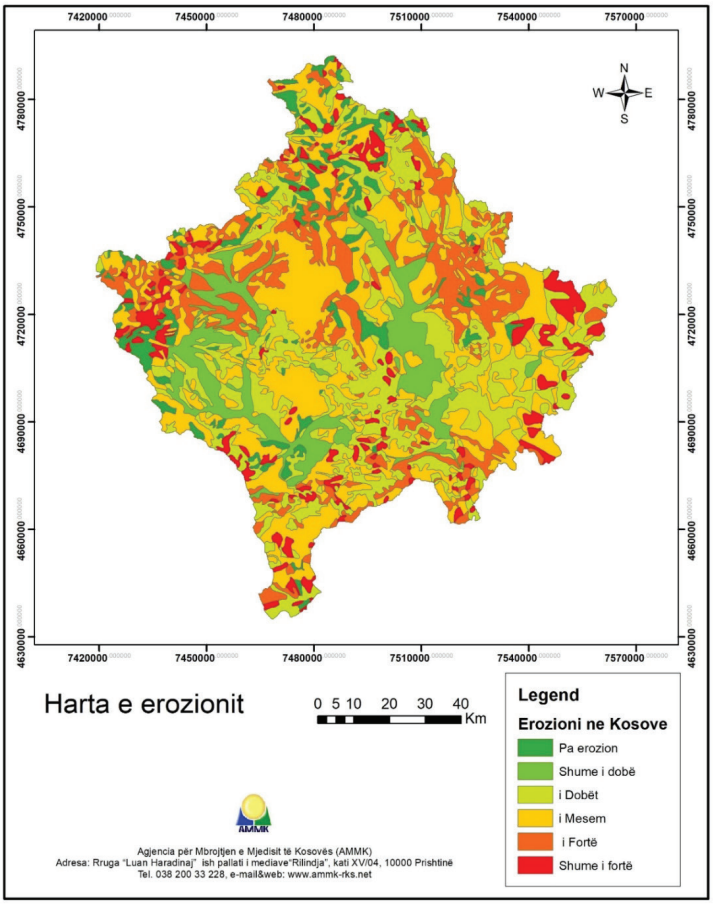

Figure 43: Map of the distribution of erosion types

8. Environmental indicators of agriculture

Following the year 2000, the tendency of increasing agricultural production has been emphasized in Kosovo, as well as the tendency of changing the development of agriculture. The number of farms and agricultural producers has increased. The use of fertilizers, chemicals and other chemical products with an impact on the environment has increased. However, despite these developments, the interest for the certification of organic products (products) is still low..

8.1. Surfaces with organic farming

Indicator name	**Surfaces with organic farming**
Indicator code	BU01
Indicator type according to DPSIR model	Response indicator
Description of the indicator	The indicator presents the total area of organic farming, including the areas under development, their participation in the overall agricultural production, and the number of farms that deal with organic farming.
Methodology for determining the indicator	The indicator is determined on the basis of data on the surface area of organic production farming, total area of agricultural production and number of farms dealing with organic agriculture. The area with organic farming is calculated by dividing the total area of organic agriculture with the total area of agricultural production.
Measuring Unit	• The total surface area of agricultural production is expressed in hectares (ha). • The organic farming area is expressed in hectares (ha) • Production share of organic farming in percentage (%)
Data source	MAFRD and Kosovo Agency of Statistics
Dynamic time of data collection	On an annual basis .

In Kosovo, the organic agriculture sector is still in the early stage of development. According to the data from the Ministry of Agriculture, Forestry and Rural Development, in Kosovo there are about 160 ha cultivated and 179,580 ha certified areas for the collection of medicinal plants and wild fruits. There are about 155 certified producers of organic products. In this sector there is developed especially the sector of cultivation and collection of medicinal and aromatic plants. These producers are organized in 45 collection centers throughout Kosovo. The export is made as a semi-processed product and 95% of the production is exported outside Kosovo.[36]

Krahasuar me vendet tjera Kosova pothuajse qëndron në shkallë të njëjtë të zhvillimit me vendet e regjionit (Shqipëri, Maqedoni Veriore, Bosnje dhe Hercegovina), ndërsa është ende larg nga kapacitetet dhe standardet e vendeve të Bashkimit Evropian

Compared to other countries, Kosovo stands at almost the same level of development as the countries of the region (Albania, Northern Macedonia, Bosnia and Herzegovina), while it is still far from the capacities and standards of the European Union countries (Table 14).

Table 14: Areas with organic farming, their share in total agricultural land, number of organic producers in Kosovo and comparison with some other countries [37]

Country	Year	Areas with organic farming [ha]	Share of organic areas in the total agricultural land [%]	No. of organic producers
Kosova	2018	160.00	0.04	150
Albania	2018	746.54	0.06	82
Austria	2018	637,805.00	24.66	25,795
Bosnia and Herzegovina	2018	896.40	0.04	251
Bulgaria	2018	162,332.37	3.49	6,471
Croatia	2018	103,166.00	6.57	4,374
Estonia	2018	206,590.00	21.58	1,948
France	2018	2'035,024.00	7.34	41,632
Germany	2018	1,521,314.00	9.09	31,713
Italia	2018	1,958,045.00	15.79	69,317
Northern Macedonia	2018	4,409.00	0.35	775
Romania	2018	326,260.00	2.50	7,908

36 *Source: Department of Agricultural Policy and Markets/MAFRD*

37 *The Word of Organic Agriculture, Statistics and Emerging Trends 2020, FIBL/IFOAM*

Serbia	2018	19,254.58	0.55	373
Slovenia	2018	47,848.28	9.85	3,738
Spain	2018	2,246,475.00	9.64	39,505
Sweden	2018	608,758.00	19.85	5,801
Turkey	2018	646,247.00	1.68	79,563
United Kingdom	2018	457,377.00	2.66	3,544

8.2. Use of mineral fertilizers

Indicator name	**Use of mineral fertilizers**
Indicator code	BU02
Indicator type according to DPSIR model	Pressure indicator
Description of the indicator	The indicator presents the total amount of mineral fertilizer used based on Azone (N), Phosphorus (P_2O_5) and Potassium (K_2O) in agricultural production as well as the consumption of fertilizers separately by categories in kilograms per hectare, total and by crops.
Methodology for determining the indicator	The indicator is determined on the basis of data on the consumption of mineral fertilizers on agricultural land surfaces. The data is collected once a year for the agricultural production season.
Measuring Unit	The indicator is expressed in kilograms per hectare per year (kg/ha/year) or tonnes per year (tonnes/year)
Data source	MAFRD and Kosovo Agency of Statistics.
Dynamic time of data collection	On an annual basis .

One of the main pressures of environmental impact from the agricultural sector is the use of chemical fertilizers, pesticides and other agricultural chemicals. According to the data from agricultural questionnaires conducted by the Kosovo Agency of Statistics, in 2019 were used about 76,467 tonnes of fertilizers that contain nitrogen (NPK, UREA and ALN). The general trend of fertilizer use in agriculture is increasing. Compared to the previous year, about 6100 tonnes less fertilizer were used (figure 44).

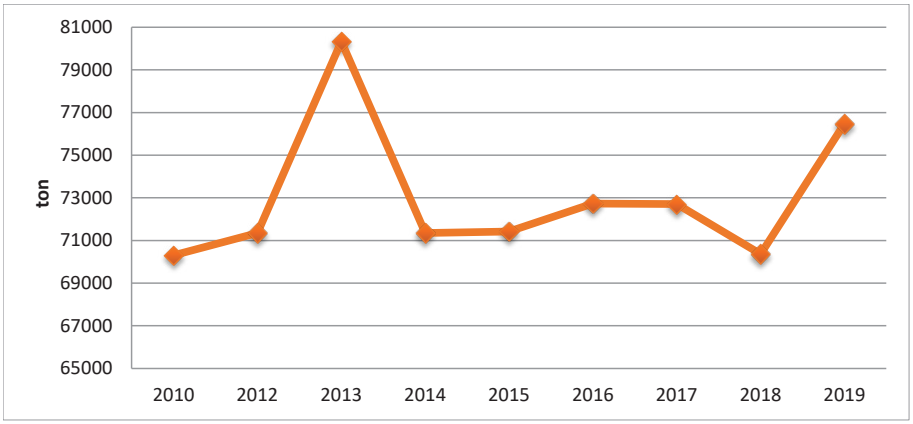

Figure 44. Trend of fertilizer use 2004-2019 tonnes/ year [38]

8.3. Use of plant protection substances

Indicator name	**Use of substances for plant protection**
Indicator code	BU03
Indicator type according to DPSIR model	Pressure indicator
Description of the indicator	The indicator presents the total amount of substances used for plant protection, import, export and production of plant protection substances, treated surfaces and total crop area.
Methodology for determining the indicator	• The expense of the substances used for Plant Protection (SH) for the surface unit (ha) is calculated according to the formula: Sh/ha = (I+PV-E)/ST • Where: I-Import, LP-Local Production, E-Exports and ST-Surface treated per hectare.

38 *Calculation of data based on KAS Agricultural Household Surveys*

Measuring Unit	• Spending of plant protection substances is expressed in kilograms of active substances per unit of agricultural area per year (kg/ha/year). • Import, export and domestic production is expressed in kilograms of substance 9kg/ year). • Treated agricultural areas and total areas with agricultural crops are expressed in hectares (ha).
Data source	MAFRD/Veterinary and Food Agency or Kosovo Agency of Statistics.
Dynamic time of data collection	On annual basis, no later than 31 March of the following year for the previous year.

Another environmental pressure from the agricultural sector is the use of pesticides and other agricultural chemicals. According to the data from the Agricultural Household Survey for the years 2015-2019 conducted by the Kosovo Agency of Statistics, it results that in 2015 115,083.40 ha were treated with pesticides, to mark an increase of 3,967.53 ha of areas treated with pesticides in 2019, with a total of 119,050.93 (figure 45).

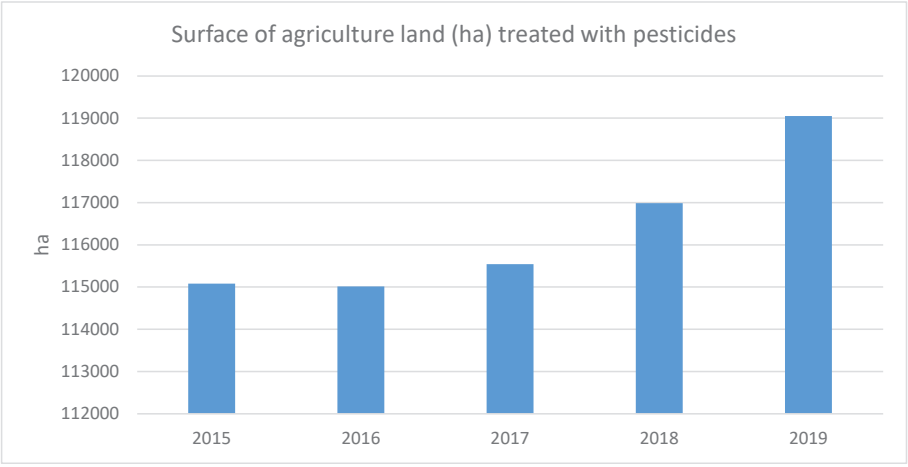

Figure 45: Agricultural land surfaces (ha) treated with pesticides [39]

39 KAS, Agricultural Household Survey 2015-2019

9. Fishery environmental indicators

Kosovo, in addition to many other sectors, has great potential for the development of the fishery sector. Surface waters and suitable climatic conditions that the country has, make fishing one of the most attractive sectors for investment.

9.1. Evaluation of the fish stock biomass and allowable quota for fishing

Indicator name	**Evaluation of the fish stock biomass and allowable quota for fishing**
Indicator code	PE01
Indicator type according to DPSIR model	State indicator
Description of the indicator	The indicator shows the state of biomass and the level of exploitation of the fish stock at the national level.
Methodology for determining the indicator	The indicator is determined on the basis of the percentage participation of economically important species of fish within the framework of the maximum sustainable profitability assessment. Calculation of population dynamics parameters is based on growth, mortality, reproductive characteristics, spatial distribution, biomass estimation, etc.
Measuring Unit	Biomass evaluation and its distribution expressed in kilograms respectively kilograms per square meter kg/m2. Data on the total annual total catch of fishes, annual fishing by groups and annual fishing by specific species are presented graphically.
Data source	The state administration body responsible for agriculture issues, or the administrative body responsible for statistics.
Dynamic time of data collection	On annual basis, by March 1st of the current year, data for the previous year should be sent.

According to the data of the Ministry of Agriculture, the number of licensed entities that deal with fish farming is 30 with a capacity of 10 to 300 tonnes. From this activity, within the year are produced about 600 tonnes of trout that are mainly traded for domestic consumption.

10. Environmental indicators of energy

Energy plays an important and irreplaceable role in modernized human life. But also its impacts on the environment are quite pronounced. Any way of energy production has a significant impact on the environment, due to the operations that follow it, from the provision of raw materials and its transport to the production process and the use of energy itself. Achieving a balance between energy demand and maintaining the state of the environment is a major challenge. By choosing the types of energy sources and appropriate technologies the impact on the environment is reduced.

10.1. Consumption of primary energy

Indicator name	**Consumption of primary energy**
Indicator code	E01
Type of indicator according to DPSIR model	Driving Force indicator
Description of the indicator	The indicator is represented by the total primary energy ie the amount of energy necessary to meet the energy consumption in the country through the general consumption of primary energy and the consumption of all energy sources, the primary energy structure consumed by energy for the last year for which data are available and increase the average annual rate for different energy products.
Methodology for determining the indicator	The indicator is calculated as the sum of gross consumption of all energy sources which are grouped into the following categories: coal, oil and petroleum products, gas, renewable energy sources, and others where "others" include energy produced from industrial waste and net electricity imports.The relative share of energy separately is measured as the ratio between the energy consumption of that energy source and the total primary energy consumption and is calculated for the calendar year. The average annual growth rate is calculated using the following formula: (data for last year available/basic starting year ^(1/year number)-1)*100

Measuring unit	• energy consumption is expressed in thousand/million tonnes of oil equivalent (kten/Mten); • The share of energy in total energy consumption as well as the average annual growth rate for different energy products are presented in percentage (%).
Data source	Energy Balance - Kosovo Agency of Statistics and Ministry of Economic Development.
Dynamics of data collection	On annual basis, at the latest by 31 March of the current year the data for the previous year should be sent.

Petroleum products with 46% have the highest share within resources in final energy consumption, for 2019, biomass has a share of 24%, while electricity with 27%. Regarding the trend of final energy consumption by sources, there is a constant increase from 2012 to 2019 (figure 46 and figure 47).[40]

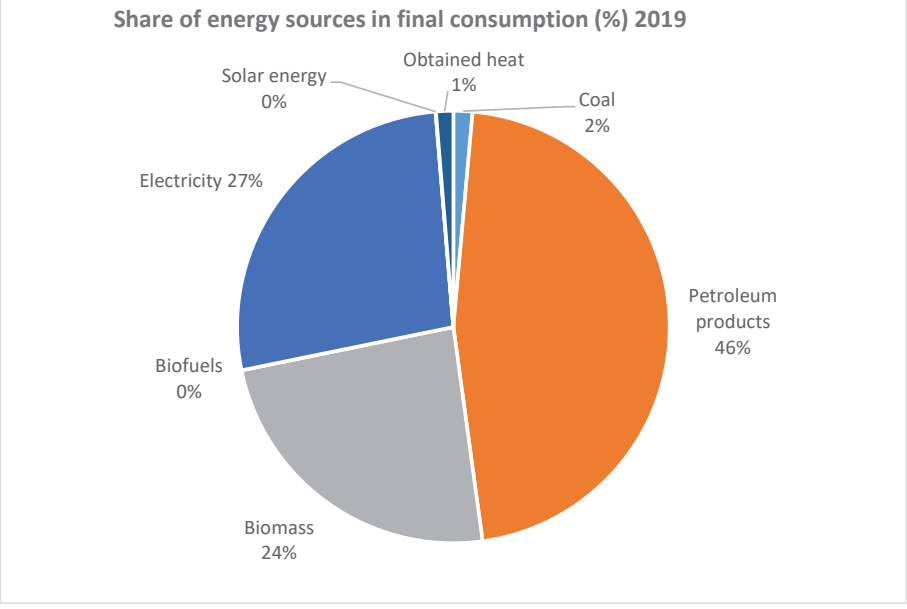

Figure 46: Overview of final energy consumption by sources 2019

40 *Energy Balance 2012-2019 KAS.*

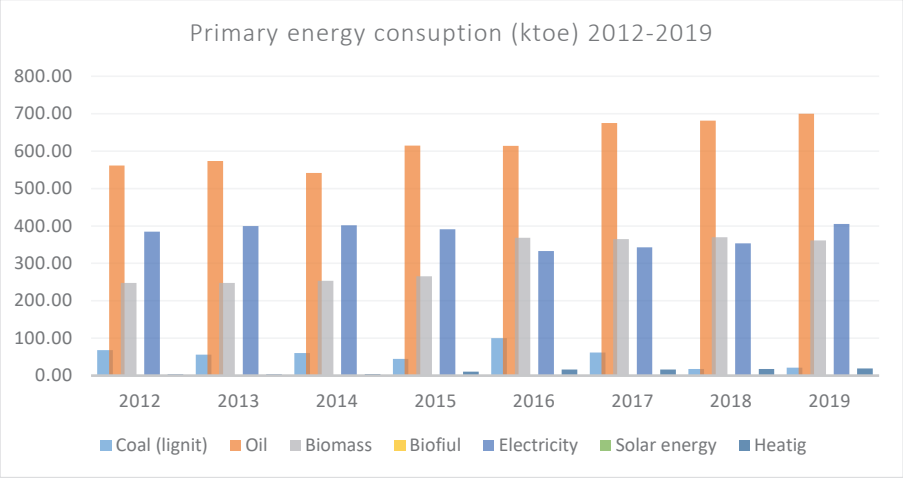

Figure 47: Final energy consumption trend by sources 2012-2019

10.2. Final energy consumption by sectors

Name of the indicator	**Final energy consumption by sectors**
Indicator Code	E02
Type of indicator according to DPSIR model	Driving Force indicator
Description of the indicator	Consumption of final energy for energy purposes (energy consumed by consumers) is the amount spent on final energy in all sectors: industry, traffic, households, services, agriculture, and other consumables. The indicator includes total final energy consumption, sector spending structure, average annual growth rate for different sectors, final energy consumption per capita for the last year for which data is available and the final energy consumed in industry by industry branch.

Methodology for determining the indicator	The consumption structure by sectors is calculated as the ratio between the final energy consumption of that sector and the total final energy consumption calculated according to the calendar year. The final energy consumed per capita is obtained by dividing the total final energy consumption (in tons of oil equivalent (tons)) and the number of inhabitants for the last year for which the data are available. The increase in the average annual rate is calculated according to the following formula:(data for last year available/starting-base year ^(1/year number)-1)*100
Measuring unit	• final energy consumption is expressed in thousand/million tonnes of oil equivalent (kten/Mten); • The structure of consumption by sectors and the increase of the annual average rate is represented by percentage (%). • the final energy consumption per capita is expressed by the equivalent tonne of oil per capita per year ten/capita/year; • the final energy consumption in industry by industry is expressed in thousand/million tonnes of oil equivalent (ktoe/Mtoe).
Source of data	Energy Balance - Kosovo Agency of Statistics and Ministry of Economic Development.
Dynamics of data collection	On annual basis.

The household sector with 38% has the highest share within the final energy consumption, for 2019, the transport sector has a share of 28%, while that of industry with 24%. The services sector and households have the lowest share in final energy consumption with 10% and 3% respectively. Regarding the trend of final energy consumption by sectors, there is a constant increase from 2012 to 2019 (figure 48 and figure 49).[41]

41 *Energy Balance 2012-2019 KAS.*

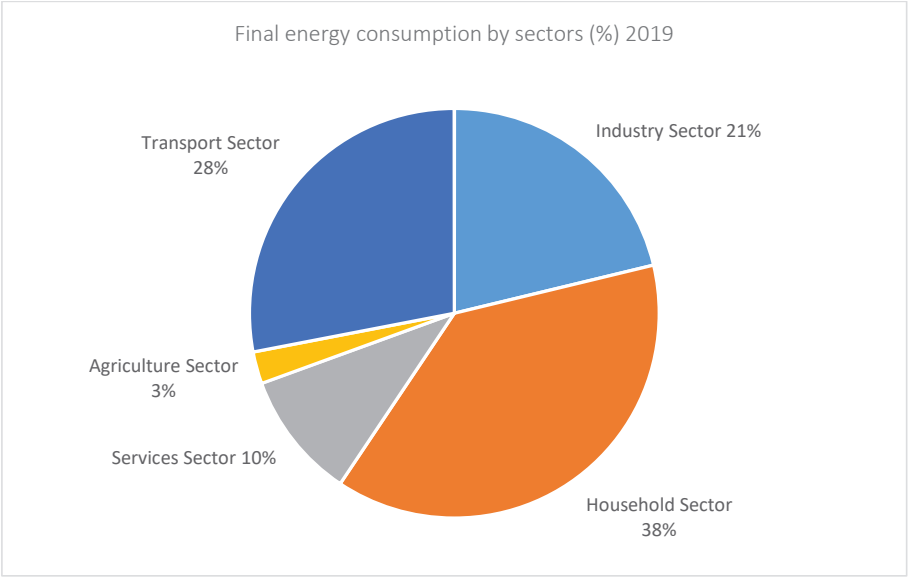

Figure 48: Overview of final energy consumption by sectors 2019

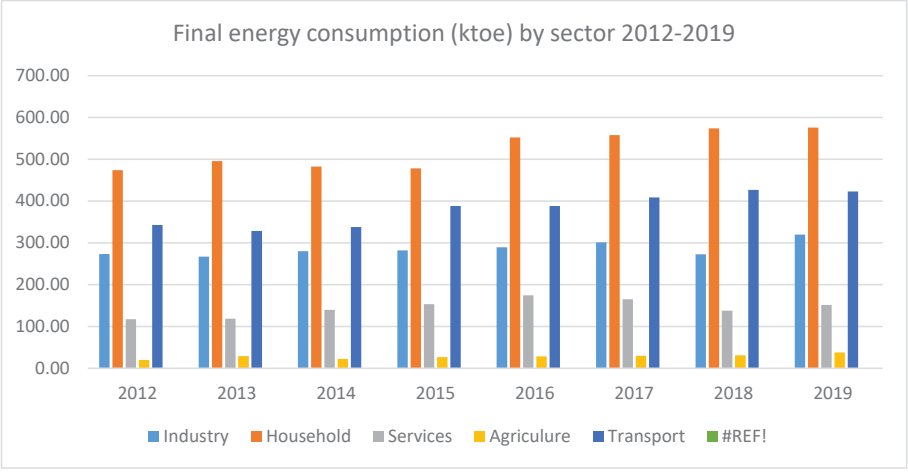

Figure 49: Final energy consumption trend by sectors 2012-2019

10.3. Dependence on energy imports

Indicator name	Dependence on energy imports
Indicator code	E03
Indicator type according to DPSIR model	Driving Force indicator
Methodology of identification indicators	The indicator is determined based on data from the annual energy balance. Import dependence represents the ratio of net imports (sum of exports and imports) and total energy consumption and primary energy in relation to total primary energy consumption.
Measuring Unit	• total imported energy is expressed in ton oil equivalent (ten); • import dependence is expressed in percentage (%).
Data source	Energy Balance - Kosovo Agency of Statistics and the Ministry of Economic Development.
Time dynamics for data collection	On an annual basis, data for the previous year must be sent no later than March 1 of the current year.

Based on data from the Kosovo Agency of Statistics, reported to EUROSTAT, net energy imports in Kosovo range between 505 ktoe (2013) and 575 ktoe (2018), while energy dependence on exports varies between 21.8% (2013) and 29.3 % (2018), table 16.

Table 15: Energy imports (ktoe) and energy dependence on imports (%)[42]

	Net energy imports (ktoe)	Energy dependence on imports (%)
2008	601	27.1
2013	505	21.8
2018	757	29.3

42 https://ec.europa.eu/eurostat/statistics-explained/index.php/Enlargement_countries_-_energy_statistics

10.4. Energy intensity

Indicator name	**Energy intensity**
Indicator code	E04
Indicator type according to DPSIR model	Response indicator
Description of the indicator	This indicator presents the amount of total energy consumed in relation to economic activities during a year.
Methodology of identification indicators	The indicator is determined based on the ratio of primary energy consumed and gross domestic product. Gross domestic product appears at constant prices in order to escape the impact of inflation.
Measuring Unit	• primary energy consumption expressed in thousand or million tons of oil equivalent (ktoe); • total primary energy intensity is displayed in indices (annual basis = 100); • Gross Domestic Product is displayed in annual EURO million (annual base is 2010)).
Data source	Energy Balance - Kosovo Agency of Statistics and the Ministry of Economic Development.
Time dynamics for data collection	On an annual basis .

There is a negative or falling trend of energy intensity during the period 2010-2019, from 100 ktoe to 59 ktoe. This is due to the 68% increase in GDP from 2010 to 2019. Primary energy consumption had an almost constant trend with small variations in growth (figure 50).

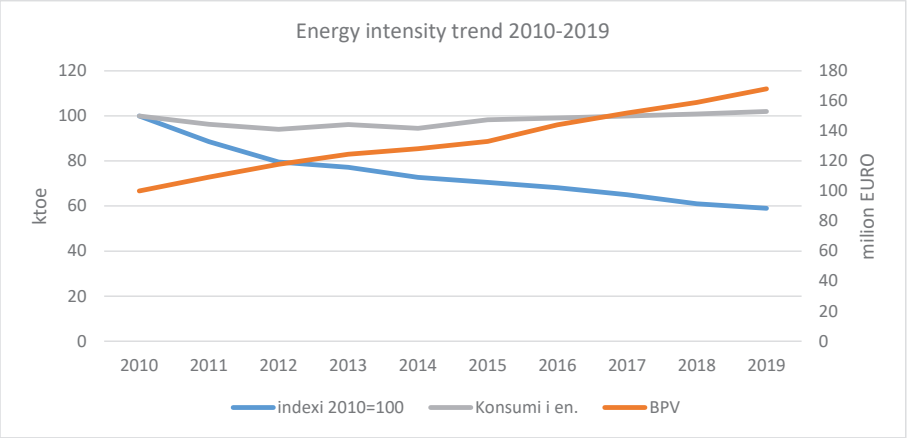

Figure 50: Energy intensity trend 2010-2019[43]

Also according to Eurostat data, energy intensity in the economy in Kosovo for 2018 was 446 kgoe per Euro of GDP, which compared to the countries of the region is the highest except Bosnia and Herzegovina. While the gross energy consumption was 2585 ktoe, which compared to the countries of the region was higher than in Albania, North Macedonia and Montenegro, while it is lower than in Serbia and Bosnia and Herzegovina (Table 16).

Table 16: Gross energy consumption and energy intensity in the economy for the year 2018[44]

Country	Gross domestic energy consumption (ktoe)	Energy intensity in the economy (kgoe per EUR 1000 of GDP)
Kosovo	2585	446
Albania	2351	214
North Macedonia	2572	300
Montenegro	1078	278
Bosnia and Herzegovina	6754	458
Serbia	15528	428

43 *Source of data on energy consumption and GDP from KAS.*

44 https://ec.europa.eu/eurostat/statistics-explained/index.php/Enlargement_countries_-_energy_statistics

10.5. Consumption of primary energy from renewable energy sources

Indicator name	**Source of data on energy consumption and GDP from KAS**
Indicator code	E05
Indicator type according to DPSIR model	Response indicator
Description of the indicator	The annual consumption of primary energy produced from renewable sources in relation to the total consumption of primary energy is presented as an indicator. The indicator includes the total consumption of primary energy from renewable energy sources, the share of renewable energy sources in the total consumption of primary energy and the increase of the average annual rate of energy consumption from renewable sources by sources.
Methodology of identification indicators	Relative share, from specific sources of renewable energy are created by the ratio between the energy consumed which derives from that source and from the total consumption of primary energy is calculated for the annual calendar. The average annual rate increase is calculated according to the following formula: ((data for last year available / base year ^ (1 / year number) -1) * 100
Measuring Unit	• energy consumption from renewable sources and total primary energy expressed in thousand or million tons of equivalent oil (kten / Mten); • The increase of the average annual rate of energy consumption from renewable sources is expressed in percentage (%).
Data source	Energy Balance - Kosovo Agency of Statistics and the Ministry of Economic Development.
Time dynamics for data collection	On an annual basis .

Renewable energy participates with about 380.89 ktoe in the final energy consumption or about 20% of the consumption from the total of 1507.51 ktoe. If we look at the trend there is a progressive increase in the share of renewable energy in final energy consumption since 2012 when it was 251.63 ktoe (Figure 51). While the share of renewable energy sources in the total production of electricity at the national level for 2019 is about 6%[45].

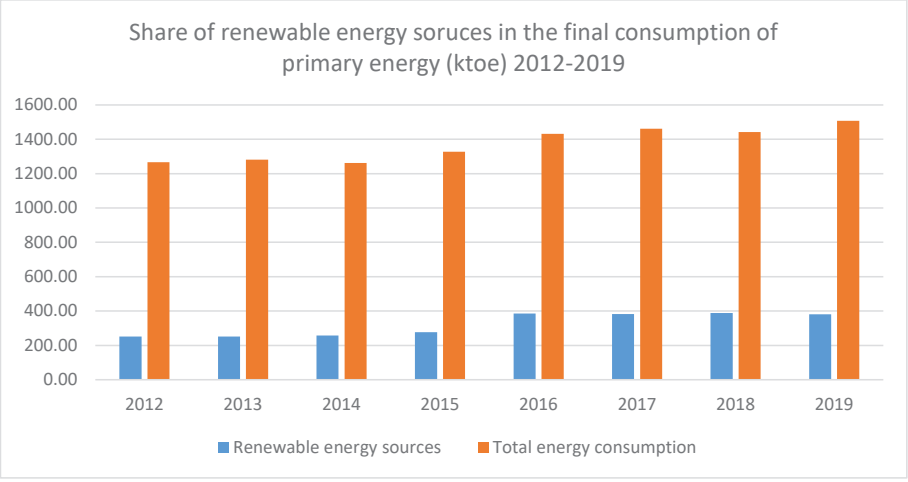

Figure 51: Trend of participation of renewable energy sources in the final consumption of primary energy (ktoe / year) 2012-2019[46]

45 *ERO 2020, Balance of Electricity and Thermal Energy*
46 *KAS, Energy Balance 2012-2019*

11. Environmental transport indicators

This sector affects the overall quality of the environment, especially in urban settings. Most vehicles use diesel, which means releasing emissions into the air, water and land. Landscaping and land changes are also made during road construction, including possible habitat degradation. Unused vehicles also pose a serious risk to the environment. Accidents with dangerous consequences for the environment can also lead to the transport of hazardous materials.

11.1. Passenger traffic

Indicator name	**Passenger traffic**
Indicator code	TR01
Indicator type according to DPSIR model	Driving Force indicator
Description of the indicator	The indicator represents the amount of passenger kilometers (kmp) for a year in Kosovo in relation to the growth rate of Gross Domestic Product-GDP. Land transport includes the transport of passengers by road and rail. Air transport is not covered by the budget. The indicator also contains land passenger traffic according to the type of transport which is measured as the percentage of each type of transport in total land passenger traffic.
Methodology for determining the indicator	The division of demand for passenger transport and GDP are determined based on index values, where as a base year it takes 2000 (2000 = 100). In this way he can monitor the rate of increase of passenger kilometers compared to the rate of GDP growth.
Measuring Unit	- land transport includes the transport of road passengers and rail passengers, and is expressed in passenger kilometers (kmp) and / or the number of passengers (kmp) when the number of kilometers represents the transport of a passenger over a distance of one kilometer. - Gross Domestic Product (GDP) is expressed in constant prices (EUR). - kilometers per passenger are expressed in kmp, and the division of passenger demand and GDP represents an index (2000 = 100).

Data source	Ministry of Infrastructure and Kosovo Agency of Statistics
Dynamic time of data collection	On an annual basis .

Road construction has a direct impact on the environment for several reasons where among the most important are considered the occupation of agricultural lands, erosion and promotion of soil erosion, fragmentation of natural habitats, Water regime change and other socio-environmental aspects. Kosovo has 2311.7 km of road network of which 1509.4 km are regional, 665.2 km are national and 137.2 km are highways (figure 52).
The trend of expanding road infrastructure from year to year is increasing which carries with it the increase of pressure on the environment.

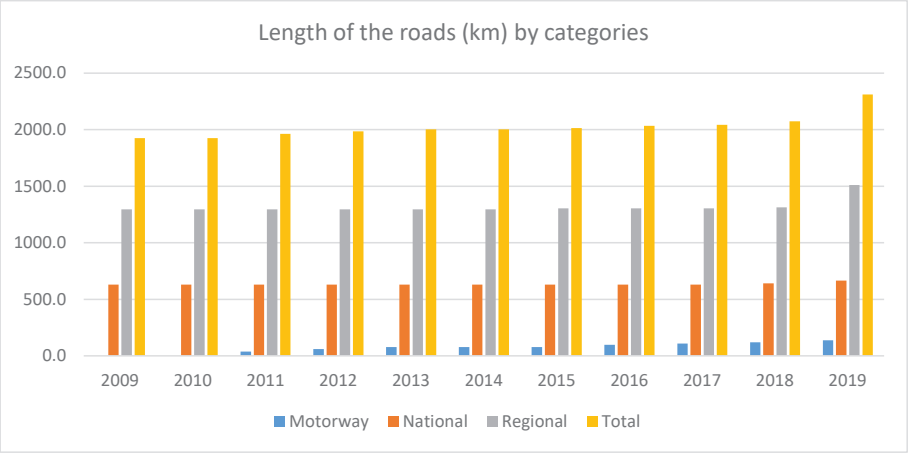

Figure 52: Length of roads (km) by categories

Kosovo has 333 km of railway network. The train is considered to be more environmentally friendly transport because its use reduces the need for the use of transport vehicles. Although in Kosovo, the trains are old and mainly with locomotives that use diesel it can be said that this type of transport has had a positive impact on reducing pollution from transport in general. From 2005 when the rail passenger transport started in Kosovo until 2010 there was a progressive increase in the number of passengers who used the train. During the period 2011-2014 there was a constant number of passengers, while during the period 2015-2019 there is a decrease in the number of passengers who have used the train for travel (figure 53).

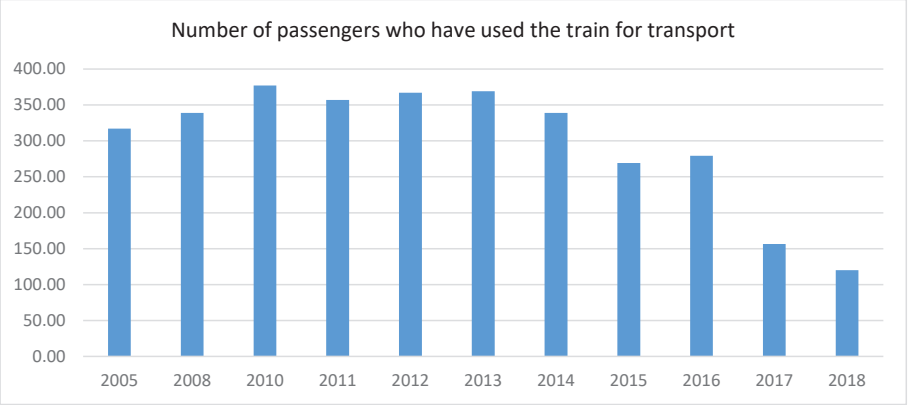

Figure 53: The trend of use of rail transport of passengers [47]

Flights are considered one of the sources of air emissions and greenhouse gas emissions. This includes in particular the period of landing and flight of airplanes where gases are discharged at the place where the flight begins or where the landing takes place. In Kosovo, Adem Jashari International Airport is used for international air transport. According to the data of IA "Adem Jashari", for the period 2006-2019 the number of passengers and the number of flights has marked a progressive increase. Figure 54 presents the trend of passengers who have used air transport through IA "Adem Jashari". The figure shows that from about 90 thousand as the number of passengers in 2006, in 2019 it has increased to over 236 thousand passengers.

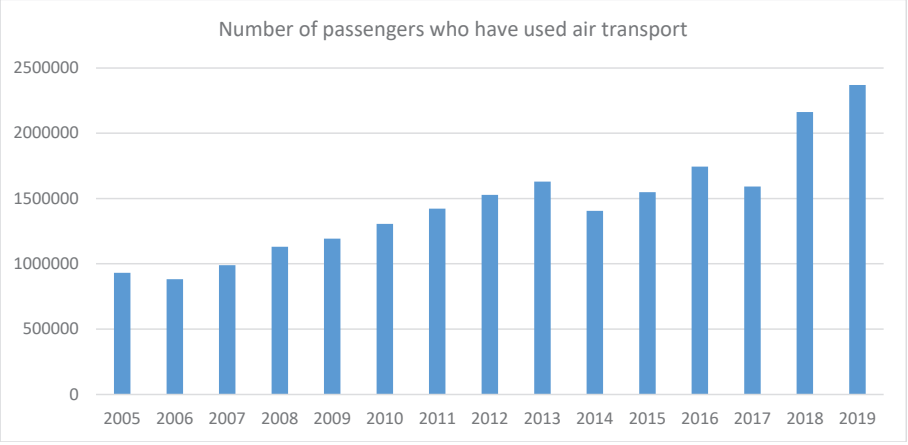

Figure 54: Trend of passengers at `Adem Jashari` International Airport [48]

47 *KAS, Transport Statistics 2005-2018*
48 *Prishtina International Airport "Adem Jashari"*

11.2. Transport of goods

Indicator name	Transport of goods
Indicator code	TR02
Indicator type according to DPSIR model	Driving Force indicator
Description of the indicator	The indicator represents the amount realized in kilometers per ton (kmt) during a year in Kosovo, in relation to the GDP growth rate. Freight traffic including land transport of goods by road and rail. The indicator also includes land freight traffic by type of transport which is measured as a percentage of road and rail freight transport in total for land freight traffic.
Methodology for determining the indicator	The division of the demand for freight transport and GDP is done based on the values of the index, where the base year is 2000 (2000 = 100). In this way it can be monitored the growth rates of kmt compared to the GDP growth rate.
Measuring Unit	• land transport (freight transport by road and rail) is expressed in ton (s) and / or ton-kilometers (kmt). Kmt is the transport of a ton of cargo over a distance of one kilometer • Gross Domestic Product (GDP) is expressed in constant prices (EUR). • tons of kilometers realized are expressed in ktm, while the division of demand for freight transport and GDP is presented through the index (2000 = 100).
Data source	Ministry of Infrastructure and Kosovo Agency of Statistics
Dynamic time of data collection	On an annual basis .

This environmental indicator aims to highlight the pressure on the environment, which comes from the freight transport sector, with special emphasis on heavy road transport vehicles and at the same time the contribution of rail transport

in reducing pollution by reducing transport freight road. There is no data on the transport of goods by land, while in terms of transport of goods by rail from 2011 to 2018, there is a decline in the amount of goods transported through this transport.

Figure 55: Quantity of goods transported (thousand tons) by rail

11.3. Average age of motor vehicles

Indicator name	**Average age of motor vehicles**
Indicator code	TR03
Indicator type according to DPSIR model	Pressure indicator
Description of the indicator	The indicator represents the average age of vehicles (motorcycles, passenger cars, buses, trucks and trailers).
Methodology for determining the indicator	The indicator is based on vehicle registration data for a given year: for each individual vehicle the age is calculated in a way that the vehicle production date is subtracted from the registration date. Add up all the vehicle years divided by the total number of vehicles.
Measuring Unit	Number of years (seniority)

Data source	Ministry of Internal Affairs, Ministry of Infrastructure and Kosovo Agency of Statistics
Dynamic time of data collection	On an annual basis .

The age of vehicles is an environmental indicator, which indicates the pressure exerted on the environment by these sources of emissions of pollutants into the air and greenhouse gases. The older the cars and the older their EURO standard, the higher the emissions will be and the higher the pressure will be. Regarding the age of vehicles in Kosovo (table 17 and figure 56), the largest number of vehicles from all categories belong to the group that meet the standard EURO3 and EURO4, and that can be considered as vehicles of average age e. After these categories comes the category of vehicles before EURO1, which can be considered as old vehicles, while the smallest number of vehicles circulating in Kosovo belongs to the category EURO6, which can be considered new vehicles..

Table 17: Number of vehicles registered by type and Euro standard (2018)

	Before Euro1	Euro1	Euro2	Euro3	Euro4	Euro5	Euro6
Passenger car	50414	11622	35194	92342	61456	25267	9507
Easy transport vehicle	5851	4808	11435	12695	6932	2055	464
Heavy transport vehicle	3372	1129	2476	3562	1011	857	210
bus	354	342	907	661	158	99	55
Motorcycles	437	377	260	660	149	1	6

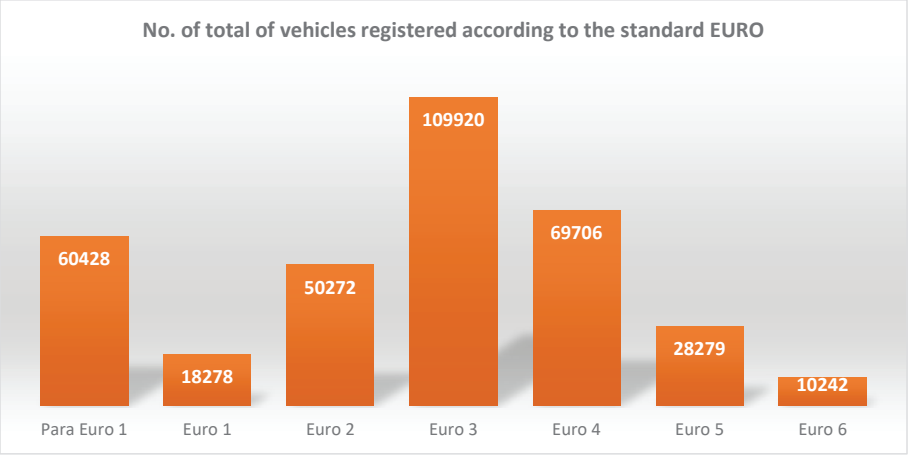

Figure 56: Total number of vehicles registered in Kosovo according to the standard EURO

11.4. Number of vehicles

Indicator name	**Number of vehicles**
Indicator code	TR04
Indicator type according to DPSIR model	Pressure indicator
Description of the indicator	This indicator represents the number of vehicles in Kosovo, based on data from vehicle registrations (motorcycles, passenger cars and commercial vehicles), by type of fuel (diesel, gasoline, natural gas, diesel, electric vehicles and hybrid vehicles). The indicator includes the following information: - number of motor vehicles by type; - number of motor vehicles according to the type of fuel; - percentage of passenger vehicles that use diesel in the total number of passenger vehicles; - number of passenger cars per thousand inhabitants;

Methodology for determining the indicator	This indicator is based on the number of vehicles by type, the number of vehicles by fuel, and the year of vehicle registration.
Measuring Unit	- number of motor vehicles by type; - number of motor vehicles according to the type of fuel; - percentage (%) of passenger vehicles that use diesel; number of passenger cars / 1,000 inhabitants;
Data source	Ministry of Internal Affairs and Kosovo Agency of Statistics
Dynamic time of data collection	On an annual basis .

In Kosovo, vehicles are used as the main means of transport, which is due to the inadequate functioning of urban transport, which operates with outdated buses which are very slow and cause a lot of pollution. The number of vehicles is an important environmental indicator as transport is one of the main sources of air pollution and greenhouse gas emissions. As shown in Figure 18 and Figure 57 from 2008 to 2019 there has been a progressive increase in the number of vehicles in Kosovo. From this it can be concluded that there has also been an increase in fuel combustion from these cars which has necessarily increased the amount of pollutants in the air. Regarding the number of passenger cars per 1000 inhabitants, Kosovo in 2019, had 291 cars per 1000 inhabitants.

Table 18: Number of vehicles by types 2011-2019

Vehicle types	2011	2012	2013	2014	2015	2016	2017	2018	2019
Car	170321	176398	222537	236145	281847	260291	273862	280422	291292
Transport vehicle 3.5 and over 3.5 t	10877	11547	15352	15769	18330	17963	18559	33889	35157
Transport vehicle under 3.5 t	17901	18225	24659	26949	30846	31285	32299	19371	19379
Van	2698	2520	3225	3161	3212	2841	2535	2917	2977
Bus	1117	1298	1570	1697	2124	1916	1949	2326	2135
Motorcycles	546	809	1488	1540	1849	1790	1690	2038	2087
Tractors	39	137	776	1036	941	613	523	1791	1851
Trailer under 3.5 t	101	117	217	250	286	288	288	572	681000
Trailer 3.5 and over 3.5 t	1766	1800	2283	2281	2707	2628	2735	305	271000
in total	205366	212851	272107	288828	342142	319615	334440	343631	355829

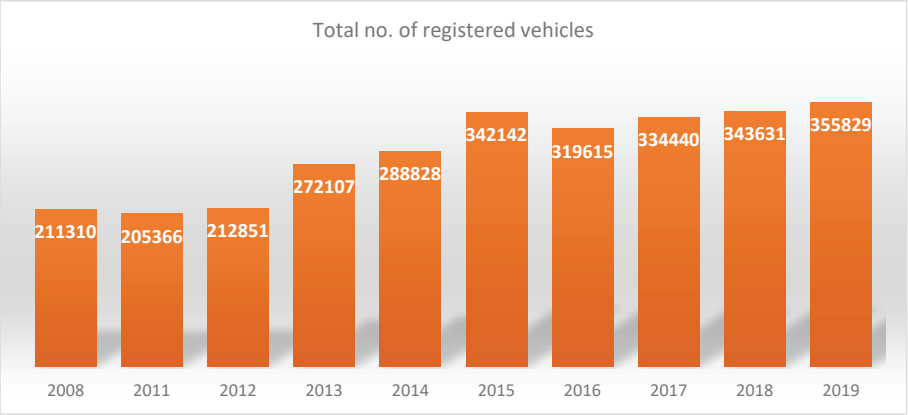

Figure 57: Total number of vehicles registered in Kosovo 2008-2018[49]

11.5. Number of deaths in road accidents

Indicator name	**Number of deaths in road accidents**
Indicator code	TR05
Indicator type according to DPSIR model	Pressure indicator
Description of the indicator	This indicator represents the number of deaths in road accidents in Kosovo, the number of people injured in road accidents, and the trend. This indicator is monitored annually, and expressed in absolute numbers or per 10 000 inhabitants
Methodology for determining the indicator	Number of persons (dead and injured) in road accidents each year.
Measuring Unit	Number of deaths in road accidents. Number of injured in road accidents..
Data source	Ministry of Internal Affairs and Kosovo Agency of Statistics.
Dynamic time of data collection	On an annual basis .

49 *Transport and Telecommunications Statistics 2015, KAS*

Based on the data of the Kosovo Police for the period 2010-2019, road traffic accidents and the number of injured and dead in these accidents tend to fall (table 19). This can be related to the improvement of road infrastructure, the improvement of road signs, the increase of the awareness of car drivers and other participants in traffic and the efficiency of the work of the Kosovo Police.

Table 19: Road traffic accidents in Kosovo and persons killed in these accidents 2010-2019[50]

Year	Accidents with material damage	Accidents with injuries	Fatal accidents	Injured persons	Dead persons
2010	12,594	4327	158	7731	175
2011	18,888	4490	130	8321	157
2012	19,756	4555	116	8561	121
2013	13,878	4960	104	9817	119
2014	10,333	4876	111	9713	127
2015	11,145	5275	117	10671	129
2016	12,312	6130	99	12009	110
2017	11,183	6390	122	12645	137
2018	9,424	6217	100	12360	129
2019	9,974	6148	100	11860	113

50 *Road Safety Strategy and Action Plan in Kosovo (2016-2020) and Annual Reports of the Kosovo Police 2010-2019.*

12. Environmental indicators of tourism

Tourism is of great importance in the economic and cultural development of a country. But its development has a negative impact on the environment and in particular on natural ecosystems as a result of uncontrolled waste disposal, damage to natural resources and biodiversity. In order to reduce this impact in addition to the economic aspect, tourism should pay attention to environmental protection, so as an advanced form of tourism today is known ecotourism or sustainable tourism.

12.1. Tourist visits

Indicator name	**Tourist visits**
Indicator code	TU01
Indicator type according to DPSIR model	Indicator of driving forces
Description of the indicator	This indicator presents the dynamics of tourist visits (local and foreign), in total and by country of origin, by municipalities, by tourist places, by places where they are located and the types of facilities where they are located. The term visitors means the number of tourists who stay one or more nights in the respective facilities (hotel or other) for a certain period of time monitored. Through this indicator presenting data on the density of tourist flow and pressure is shown in tourist areas based on the following parameters: • Number of tourists per km^2 • Number of tourists per inhabitant • Number of tourists per month • Number of tourists by regions, zones
Methodology for determining the indicator	The methodology of collecting statistical data in the tourism sector carried out by the national institution responsible for statistics, should be based on guidelines for tourism statistics according to the European Union or the World Trade Organization..

Measuring Unit	• Number of tourists expressed in thousand per km², per capita, per month and per region • Participation of the tourists number by municipalities, countries of origin, types of accommodation facilities, in the total number of tourists expressed in percentage
Data source	Kosovo Agency of Statistics and the Ministry of Trade and Industry - Tourism Division
Dynamic time of data collection	On an annual basis .

In Kosovo from year to year there has been an increase of the number of foreign tourists who have visited the country, but at the same time the number of domestic tourists has increased too. If we analyze the number of foreign tourists in Kosovo since 2010 to 2019, we will notice that there is a progressive increase in the number of tourists and their overnights stay. In 2019, according to the Kosovo Agency of Statistics, about 177,358 foreign tourists were registered. In terms of local visitors, the number of tourists was 109,725 tourists. Compared to the previous year there was a slight falling number of foreign and domestic tourists. Compared to 2010, the number of foreign and domestic tourists has increased fivefold (figure 58).

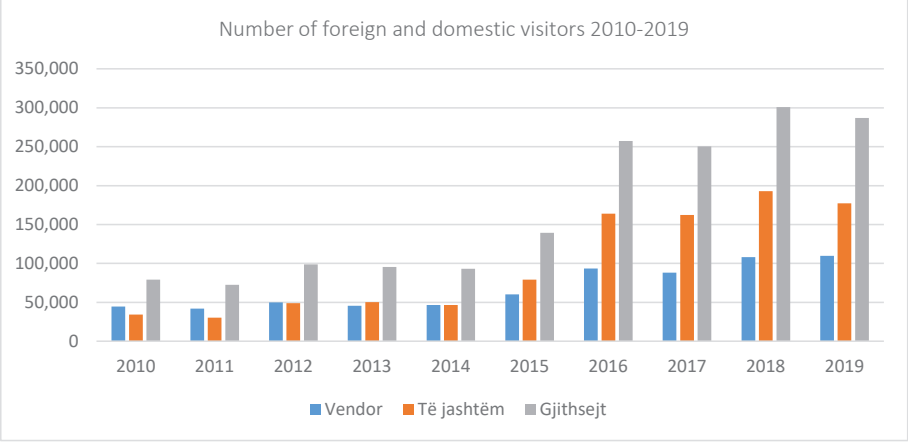

Figure 58. Number of foreign and domestic visitors 2010 – 2019

Regarding the participation of tourists by regions, Prishtina leads with 59% of the total number of visitors, Prizren with 15% of visitors and Peja with 13% of

the total number of visitors (figure 59).

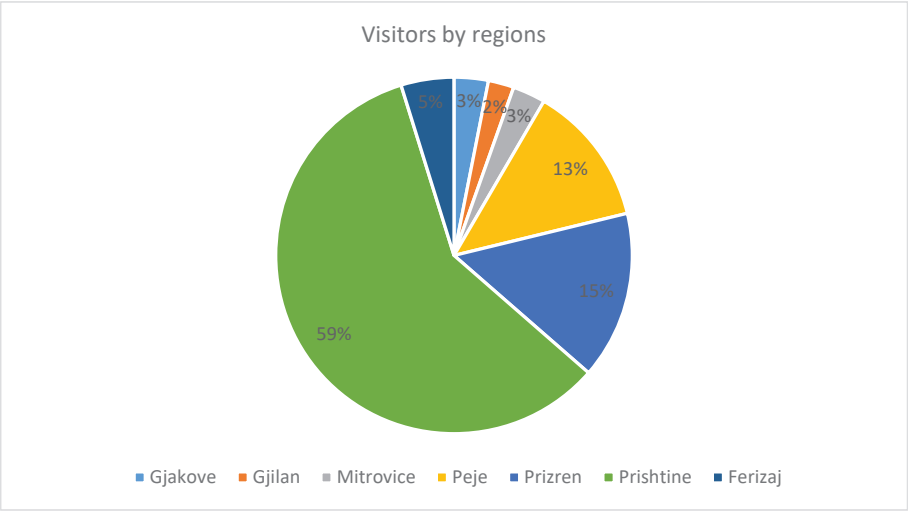

Figure 59: Visitors by regions (%)

According to 2019 data, Kosovo on an annual basis has about 26 tourists per 1km^2, and about 0.28 visitors per capita. The monthly average of visitors is about 40,866.

Regarding the countries of origin, the largest number of foreign tourists come from the countries of the region (Albania 26%, Northern Macedonia 22% and Serbia 26%), while from other countries outside the region the largest number of visitors come from Germany 5% and Switzerland 4% (table 20).

Table 20: The origin of foreign tourists visiting Kosovo

Country	No. of tourists	%
Austria	57,414	1
Belgium	33,692	1
Great Britain	58,235	1
France	32,165	1
Germany	229,486	5
Italy	29,203	1
Croatia	32,504	1
Montenegro	154,715	3

Macedonia	1,086,626	22
Serbia	1,399,829	28
US	48,006	1
Albania	1,272,024	26
Turkey	75,345	2
Switzerland	207,906	4
Other	245185	3

12.2. Tourist overnight stays

Indicator name	**Tourist overnight stays**
Indicator code	TU02
Indicator type according to DPSIR model	Indicator of driving forces
Description of the indicator	This indicator presents the trend of overnight stays of tourists (local and foreign), in total and by country of origin, by municipalities, by tourist places, by places where they are located and types of facilities where they are located. This indicator presents data on the density of tourist traffic and shows the pressure in tourist zones and seasonal impacts based on these parameters.: • Number of tourists per km^2 • Number of tourists per inhabitant • Number of tourists per month • Number of tourists by regions, areas
Methodology for determining the indicator	The methodology of collecting statistical data in the tourism sector carried out by the national institution responsible for statistics should be based on guidelines for tourism statistics according to the European Union or the World Trade Organization.

Measuring Unit	• Number of nights spent by tourists expressed in thousand • Participation of the number of nights spent by tourists by municipalities, countries of origin, types of facilities for accommodation in the total number of tourists expressed in percentage (%) • The number of nights spent by tourists according to the types of tourist places, expressed in thousand or as a percentage (%) of the participation of each tourist place in the total number of tourists
Data source	Kosovo Agency of Statistics and the Ministry of Trade and Industry-Tourism Division
Dynamic time of data collection	On an annual basis .

As for the number of tourists in Kosovo from year to year there has been an increase in overnight stays for both groups of foreign and domestic tourists. If we analyze the nights of stay of foreign and domestic tourists, from 2010 to 2019, there is a progressive increase in the number of nights of their stay. In 2019, according to the Kosovo Agency of Statistics, about 321,581 overnight stays of foreign tourists were registered, while the overnight stays of local visitors were 168,821 nights. Compared to the previous year, there was a slight increase in the number of nights spent by foreign and domestic tourists, while compared to 2010, the number of foreign and domestic tourists has increased fivefold (figure 60).

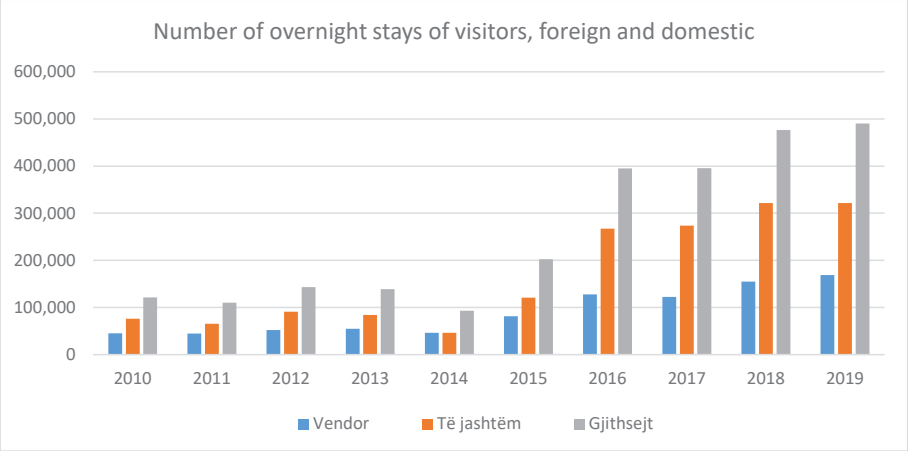

Fig. 60. Number of overnight stays of visitors, foreign and local 2010 – 2019

Regarding the overnight stays of tourists,, by regions, as well as the number of tourists, the region of Prishtina, Prizren and Peja are the regions with the highest % of overnight stays for local and foreign tourists, while the origin of tourists by overnight stays is the same as that of their visits (figure 60 and table 20).

12.3. Intensity of tourism

Indicator name	**Tourism intensity (Number of beds and utilization rate of this capacity)**
Indicator code	TU03
Indicator type according to DPSIR model	Indicator of driving forces
Description of the indicator	This indicator presents the number of beds and their availability by country of origin, by municipalities, regions and types of facilities for accommodation / vacation, and the extent of their use.
Methodology for determining the indicator	The methodology of collecting statistical data in the tourism sector carried out by the national institution responsible for statistics, should be based on guidelines for tourism statistics according to the European Union or the World Trade Organization. The calculation can also be done according to the methodology of the European Environment Agency for the tourism intensity indicator.
Measuring Unit	• Number of beds per km^2 • Number of beds per inhabitant • Ratio between the number of overnight stays of tourists and beds available for the monitoring period. • Availability of capacities for tourist accommodation expressed in percentage %.
Data source	Kosovo Agency of Statistics and the Ministry of Trade and Industry-Tourism Division
Dynamic time of data collection	On an annual basis .

Based on the data of the Agency of Statistics, Kosovo has over 11101 beds for accommodation of visitors, with 7077 rooms which are distributed in 466 accommodation units. The largest number of accommodation units belongs to hotels with 214 Units and motels with 177 Units (table 21).

Table 21: Tourist accommodation capacities in Kosovo according to the type of accommodation [51]

	Unit	Room	Beds
Hotels	214	4457	7195
Motels	177	2132	2836
Guesthouse	10	46	99
Hostels	9	43	171
Apartments	15	25	32
Bungallo	41	374	768
in total	466	7077	11101

Prishtina is the region that has the largest number of units, beds and rooms available for tourist accommodation. After Prishtina, come Prizren and Peja with the capacities available for accommodation of tourists (figure 61). According to estimates, Kosovo has about 1 bed per 1km^2, and 0.006 beds per capita.

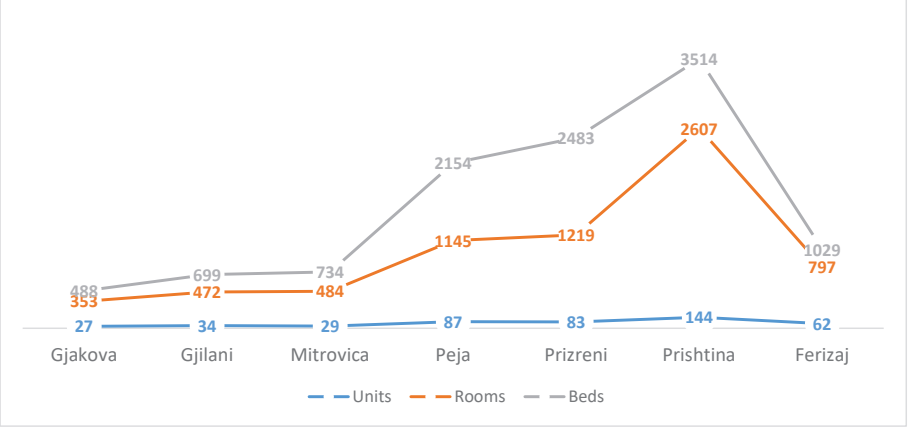

Figure 61: Tourist accommodation capacities in Kosovo by region and type

51 *Hotel statistics, ASK 2019*

12.4. Number of tourists in National Parks

Indicator name	**Number of tourists (visitors) in National Parks**
Indicator code	TU04
Indicator type according to DPSIR model	Indicator of driving forces
Description of the indicator	Through this indicator, are presented the total number of tourists in the National Parks, the number of visitors by National Parks per year / season and the number of visitors per km^2 of the park..
Methodology for determining the indicator	The methodology of collecting statistical data in the tourism sector, carried out by the national institution responsible for statistics, should be based on guidelines for tourism statistics according to the European Union or the World Trade Organization.
Measuring Unit	• Number of visitors to the National Parks • Number of visitors per km^2 of National Parks
Data source	Kosovo Agency of Statistics and Ministry of Trade and Industry - Tourism Division, National Parks Directorates
Dynamic time of data collection	On an annual basis .

National Parks are one of the most important tourist destinations in the country. Kosovo National Parks "Sharri" and " Bjeshkët e Nemuna" are among the most attractive tourist areas and favorite destinations for foreign and domestic visitors. In the absence of information offices in National Parks, there is still no complete data on the total number of tourists who have visited National Parks during a year or during a season. However, a rough estimate can be made if we take into account the data on the total number of foreign and domestic visitors who have visited the region of Peja and Prizren, alluding that the same tourists have visited our National Parks that extend in this area, respectively NP ` Bjeshkët e Nemuna` and NP `Sharri`. Based on these estimates, the annual number of tourists who visited the National Park "Bjeshkët e Nemuna " in 2019 was about 22 thousand, while those who visited the National Park "Sharri" was about 16 thousand. From this estimate it can also be seen that there was a decline in the number of tourists who visited the National Parks

in 2019 compared to the previous year (figure 62). The number of visitors per km².in the National Park " Bjeshkët e Nemuna " for 2019, was about 36 visitors / 1 km², while the number of visitors per km².in the National Park "Sharri" in 2019 was about 31 visitors / 1 km².

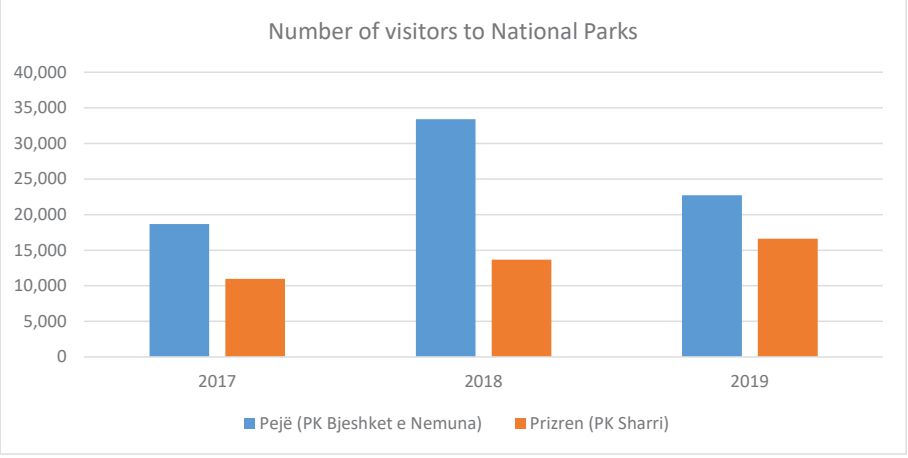

Figure 62: Number of visitors to National Parks

13. References

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"Kosovo Environment 2020, report of environmental indicators",
has been prepared by the Directorate for Environmental Assessment and Kosovo Environmental Protection Agency.

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Prishtina, 2020