MINISTRIA E MJEDISIT DHE PLANIFIKIMIT HAPËSINOR
AGJENCIONI PËR MBROJTJEN E MJEDISIT TË KOSOVËS

STATE OF THE AIR REPORT

Prishtinë, 2012

MINISTRY OF ENVIRONMENT AND SPATIAL PLANNING
KOSOVO ENVIRONMENTAL PROTECTION AGENCY

STATE OF THE AIR REPORT

Prishtinë, 2012

This report is prepared by Kosovo Environmental Protection Agency

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FOREWORD

This is the first sectoral report for the state of the air, in the history of environmental sectoral reporting in Kosovo. Ministry of Environment and Spatial Planning, through KEPA, has published several reports on the state of environment, nature, waste, and other sectoral reports. This report, in addition to introducing the state of the air, provides a realistic assessment based on existing data from air quality monitoring systems and data on emissions from economic operators, or other sources of air pollution.

Air quality monitoring is a legal obligation (Law on environmental protection - Article 50, Law on air protection-Article 23, and Law on hydro-meteorological activity-Article 5). Air quality monitoring should provide data on the level of air pollution, climate change, as well as impacts on human health, materials, ecosystems and vegetation. The data collected serve to take appropriate measures, in order to reduce, minimize and eliminate the air pollution and its impacts.

The existing air quality monitoring network in Kosovo is very modest in terms of the number of monitoring stations, as well as the number of parameters measured in these monitoring stations. In this report, the existing monitoring stations in Kosovo, and parameters measured at these stations are presented. Current air monitoring network does not meet the criteria for a necessary national network, and does not give full information about the state of air quality in the entire territory of Kosovo. Given this, a preliminary study for the extent of adequate national air quality monitoring network is needed, in order to appropriately cover the entire Kosovo territory, and to be able to more accurately assess the air quality in Kosovo.

Monitoring of emissions is made by relevant economical operators, which mostly monitor certain parameters, depending on their activity. The current situation on emissions monitoring also does not meet the requirements, since no polluting operators has not yet installed the system for self-continuous monitoring of emissions. For the moment, data

on emissions are provided from the following operators: KEC, Cement Factory "SharrCem" NewCo Feronikeli, and the Prishtina city heating company "Termokos". Since this data is not verified by any referential accredited and certified institution, the quality and format of these reports is not satisfactory.

The detailed, completed, and continuous data providing is a good basis for assessing the state of the environment and for developping policies and strategies for the protection of air from pollution. Unfortunately, it is difficult to accurately assess the state of the air in Kosovo, because of data insufficiency.

For the same purpose, setting up the environmental indicators, such as on climate change, ozone concentration levels, precipitation quality, noise level, radioactivity, etc are needed.

From the data available to the KEPA, it is estimated that Kosovo air is not of the required quality, and in some localities it is contaminated by manufacturing activities (surroundings of KEC, Ferronikel, Sharrcem, traffic pollution, industrial and urban waste landfills etc.). Mostly, there are evidences for exceedance of allowed values of dust, and dust particles PM_{10} and $PM_{2,5.}$ Therefore, it is necessary to take measures as soon as possible, to apply appropriate policies and strategies, to improve air quality.

The state of the air report has been prepared by the Kosovo Environmental Protection Agency, in cooperation with other sectors of the Ministry of Environment and Spatial Planning, and in close cooperation with economic operators, who have provided data from self-monitoring of air quality.

KEPA acknowledges all institutions, and other contributors, who have helped in the preparation of this report. We hope that this collaboration is a good indicator that expresses the commitment of the institutions, donors, experts and other stakeholders, in order to improve the situation in the air sector in general, and improve the air quality in particular.

INDEX OF ACRONYMS

MESP	Ministry of Environment and Spatial Planning
KEPA	Kosovo Environmental Protection Agency
KHIM	Kosovo Hydro-meteorological Institute
UNFCCC	United Nations Framework Convention on Climate Change
EU	European Union
EC	European Commission
NIPH	National Institute of Public Health of Kosovo
KEC	Kosovo Energy Corporation
TPP	Thermal Power Plant Kosovo
DEP of KEC	Department for Environment Protection of Kosovo Energy Corporation
WHO	World Health Organization
IPA	Instrument for Pre Accession Assistance
INKOS	Inkos Institute
EIONET	European Environment Information and Observation Network
GHG	Green House Gases
IPCC	Intergovernmental Panel for Climate Change
EEA	European Environment Agency
UN	United Nations Organisation
UNDP	United Nations Development Program
CRF	Common Reporting Format
IAEA	International Atomic Energy Agency
DLP of KEC	Department for Lignite Production of Kosovo Energy Corporation
SOK	Statistical Office of Kosovo
MTI	Ministry of Trade and Industry
MEF	Ministry of Finance
ANP	Pristina International Airport
PM	Particular Matter
KFOR	Kosovo Forces
MTPT	Ministry of Transport and Post-Telecommunication
AI	Administrative Instruction

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INTRODUCTION

Reporting on the state of the environment in Kosovo is KEPA's responsibility and task, defined by the Law on Environment Protection. In the process of reporting, in addition to preparing the report on the overall state of the environment, KEPA has the obligation to prepare reports for certain sectors of the environment, such as the report on the state of air quality.

This report contains data collected during KEPA work, namely by the monitoring system of the Hydro-Meteorology Institute and from data provided by various institutions that monitor the air.

The data reported and assessments in this report are based on the laws and administrative instructions for air, as well as on EU directives and reporting methodology of the European Environment Agency.

Some data presented in this report were obtained from publications, and reports and strategic documents in the area of environment.

Data in this report mainly refer to the period from 2007 to 2011. The report is divided into chapters, and each chapter deals with a specific aspect.

The first chapter contains generalized data on the geographical position of the Republic of Kosovo, relief, climate, population growth and urbanization.

The second chapter provides information on national and international legal framework, environmental institutional structures, documents and Action Plans related to air protection.

In the third chapter the state of air and sources of air pollution are explained very briefly, while in the fourth chapter the monitoring capacities for both air emissions and air quality are presented. Also this chapter presents plans for the development of air quality monitoring network throughout the territory of Kosovo.

The fifth chapter includes assessment based on reports on emissions from economic operators, and air quality assessment based on data from different monitoring institutions/organizations.

Other chapters provide evaluations related to air pollutions such as climate change, ozone depletion, radioactivity, noise etc.

In the last chapter of this report, conclusions and recommendations are provided.

The report contains 33 figures, 4 maps and 15 tables.

1. GENERAL CHARACTERISTICS OF KOSOVO

1.1. **Geographical position**

Kosovo is characterized by convenient geographical position. It lies in South-eastern Europe, and in the central part of the Balkan Peninsula, being so important crossroads splicing transit routes that connects different parts of Europe and beyond, from ancient times until today. In ancient period, the road network of Kosovo was consisted of two regional roads: the northeast-southwest, respectively Naissus (Nish) - Lissus (Lezhë), and northwest-southeast, linking Bosnia with Scupin (Skopje).

Geographical position acquired special importance after the construction of the Thessaloniki-Skopje-Fushë Kosovë-Mitrovica railway in 1874, linking the northern and southern parts of the Balkans and Europe. The transition function, was further increased with the construction of Ferizaj-Pristina-Mitrovica highway, which continued along the Ibri valley, creating connection of Kosovo with Central and Western Europe, and to the south by Kacanik Gorge connects to the South Europe and «Corridor 8 «Durres-Skopje-Sofia-Varna.

Construction of the Adriatic highway (1971) increased even more the transitory character, linking Kosovo with the Adriatic coast, and with the «Dalmatia» corridor, turning Kosovo into an important regional crossroads. The later construction of road and railway network, increased the importance and Kosovo›s transitional role, especially the highway Durres-Morine-Merdar.

In political and geo-strategic terms, the importance of Kosovo›s geographical position is that Kosovo is a transit territory between: South, Central, and Western Europe; the Aegean; South-Western Asia, and Eastern Mediterranean, which in historical aspect present important regional categories. The geographical position of Kosovo has been important since the days of historical past, and the intensity of the transition function depends on the political and economic situation.

1.2. Relief

The most important forms of relief are: hollows (Kosovo, Dukagjini etc.), and mountains: (Sharri, Albanian Alps, Kopauniku etc). Mountains make up 63%, while hollows 37% of the territory of Kosovo. The average altitude of Kosovo is 810 m. The lowest point is in Vermicë 270m, and the highest peak is in Gjeravicë 2656 m.

In hypsometric terms, the areas under 700m account for more than half of the territory (52.6%), the areas from 700 to 1000m account for more than a quarter (26.6%), while the areas over 1000m comprise over 1/5 (20.8%) of the territory of Kosovo.

The relief represents a very important and influential element on: climate, hydrograph, establishment and development of settlements, etc.

13. Climate

Kosovo's climate is influenced by the macro-climatic factors: geographical latitude, the position towards land and water masses, position to baric systems (Azorean maximum and Iceland minimum), as well as influence of local factors: geographical position, relief and altitude.

Based on the climate macro factors, Kosovo is characterized by moderate continental climate, but local factors enable the appearance of other climate types.

Due to the influence of these factors, the eastern part (Kosovo plain) is characterized by a continental climate, while the western part (Dukagjini plain) is characterised with moderate continental climate, with significant influence of Mediterranean climate from the Adriatic Sea through the Drini valley. Hilly-mountainous areas (700-1000m) as transitional areas are characterized by subalpine climate, whereas mountainous areas (above 1000m) are characterized by alpine climate.

Kosovo average temperatures are around 10 degrees ^{0}C, with minimum temperature -27.2 degrees ^{0}C, and maximum 39.2 degrees ^{0}C. The annual average precipitations are 596mm (KHMI 2008).

Because of the influence of local factors, western part of Kosovo is characterized by higher temperatures (in average for 1 degree C), and by higher average of rainfall amount (for approximately 100mm) than the eastern part of Kosovo.

1.4. Population growth

Despite the large displacement, and various emigration pressures, the total number of Kosovo population is constantly increased at different rates in the period after World War II. During the 63 years period (1948-2011), the Kosovo population has been increased for 138.2%, from 727,820 (1948) to 1733872[1]

The population growth has an impact on the environment in many ways, of which the most important are: the impact on the scale of production, the use of natural resources, land use model, waste generation, and environmental pollution.

The relationship between population, and the impact on the environment can be expressed as the increased population means: increased consumption, production, depletion of natural resources, natural ecosystem degradation, waste generation.

1.5. Urbanisation

In comparison with 1948, the rural population, in 2004[2] is increased for 110.0%, while the urban population shows an increase of 1430.8%. Regarding the participation in the total population, the urban population is increased from 9.7% (1948) to 46.7% (2004). This level is quite controversial, because the peripheral parts of the cities of Kosovo in most cases do not provide even the minimum conditions of urban life.

Although the urban environments in some aspects offer advantages compared to rural areas (more compact, smaller occupied area per capita, efficiency on water supply, electricity, roads and better services for waste collection, etc), their negative impact on the environment is much greater compared to rural areas. Especially, the negative impact on the environment increases with uncontrolled migrations that occur through: increased density (overpopulation), of urban areas, and the depopulation of rural areas.

Also, the concentration of industrial facilities in and near urban areas, uncontrolled urban construction, lack of infrastructure, housing dif-

1 Preliminary results of population census- SOK 2011.

2 Assessment of Prof. A. Pushka (2004). "Statistikat vitale të kohës më të re", Kosovo Statistical Office. Prishtinë.

ficulties, waste collection problems, uncontrolled dumping of construction waste, increased wastewater quantity, which without treatment is discharged in natural environments, contribute to worsening the environmental situation in urban areas.

The traffic in urban areas is very dense and is considered a major source of environmental pollution. Consequently, the air quality in urban areas is poorer than in rural areas, from which derives the importance of urbanization treatment. Urbanization movement trends indicate that the population exposed to poor environmental conditions has steadily grown, which undoubtedly is accompanied by increased cases of "environmental" diseases.

2. LEGAL FRAMEWORK AND INSTITUTIONAL STRUCTURE

Aiming to address the air protection from pollution, the MESP has drafted several laws and administrative instructions. Another important document is the Strategy and Action Plan for Air Quality, which is a requirement arising from the Law on Air Protection from Pollution. This document is in the process of approval in the Kosovo Assembly

2.1. Air related laws and administrative instructions

Air quality management in Kosovo is regulated by the Law on air protection from pollution No. 03/L-160. This law aims to regulate and guarantee the right of citizens to live in an environment with clean air, protecting human health, fauna, flora and, natural and cultural environment values.

For the implementation of the law on air protection, the following Administrative Instructions are adopted or are in process of adoption:

- Administrative Instruction on rules and standards of the discharges on air by the stationary sources of pollution. Nr. 06/2007;
- Administrative Instruction on allowed norms of discharges on the air from mobile sources; **Nr. 03/2011**
- Administrative Instruction on limited values of air quality; **Nr.02/2011**
- Administrative Instruction on fuel quality (MTI) ; **Nr.17/2011**
- Administrative Instruction on criteria for defining the air quality monitoring points, number and frequency of measurements, classification of pollutants which are monitored, the methodology of work, form and timing of data reporting; **Nr.15/2010**
- Administrative Instruction on emissions from volatile organic compounds during storage, filling, discharging, packaging and transfer of fuels; **Nr.04/2009**

2.1.2. European Union Directives on air quality

Among the main environmental challenges for Kosovo are the completion of European environmental standards, and the adoption of national legislation with the EU directives. The EU has set outclearly the criteria and methodology and allowed norms, which must be met by the EU member states, but also by developing countries, candidate countries or countries that are in process for EU membership.

The following directives are the grounds that set the criteria, methodologies and regulations and other EU norms,:

- Directive 2008/50/EC, on ambient air quality and cleaner air for Europe.
- Directive 2004/107/EC, relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air.,
- Directive 2001/80/EC, on the limitation of emissions of certain pollutants into the air from large combustion plants.
- Directive 2002/3/EC, relating to ozone in ambient air,
- Directive 2000/69/EC relating to limit values for benzene and carbon monoxide in ambient air,
- Directive 1999/30/EC relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in ambient air,
- Directive 96/62/EC, on ambient air quality assessment and management

2.2. Institutional organization

The institutions that have duties and responsibilities in the management of air sector are organized at national and local level. Also, economic operators have legal obligations to monitor the air quality.

2.2.1. Ministry of Environment and Spatial Planning

MESP creates policies, monitors the implementation of laws, and supervise activities for protection of environment including air, water, soil, biodiversity, etc.

Within the MESP operate the following institutions, which have certain responsibilities related to air issues:

- Department of Environmental Protection (Air Division)
- Kosovo Environmental Protection Agency (that includes KHMI)

In the field of air quality management, the MESP performs the following activities:

- Develops the strategic plan for air quality management;
- Provides continuous control and monitoring the state of the environment in accordance with the law;
- Assessment and reporting on the state of the air;
- Etc.

2.2.2. Monitoring Institutions

Monitoring of air quality in Kosovo is realized through: KHMI, NIPH, and some of economic operators such as: KEC, Sharrcem and Feronikeli.

KHMI – Has in place two fixed and one mobile air quality monitoring stations, which are located in: the KHMI's yard, the yard of the new building of government (ex-Rilindja), and the mobile station that is currently set in Drenas municipality's yard.

NIPH – has two monitoring stations, which are located in the city centre of Pristina (at the Tax Administration Authority's yard - MEF), and at the NIPH yard. These stations have been in operation for a period from January to March 2009, but currently they are out of function.

KEC – Monitors the air quality in the generation division, the lignite mining division, and in the KEC surroundings.

Feronikel – There are two fixed air quality monitoring stations located within the Ferronikeli area.

Some of the economic operators have not yet established continuous measurement system of emissions in the air, but they report data from empirical calculations, and some of them have contracted external companies for environment monitoring.

3. GENERAL OVERVIEW ON THE STATE OF AIR

Air is a very important element for human health and the surrounding environment generally. It 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.

Air is considered as polluted when the air contains substances in quantities that could harm the health of people, animals and plants, or may cause material damage. Some pollutants can have global impacts – e.g. increasing greenhouse gas effects, or damage to the ozone layer. Any source of pollution is contributing to the territory where it appears, but air pollution is taking a global dimension[3].

3.1. State

It may be concluded that the air quality is still unsatisfactory, although the monitoring of all indicators, as defined by the Law on Air is incomplete and consequently the data are incomplete. The inventory of air emissions and the air pollutants cadastre are not yet completed. These deficiencies make it impossible to assess the level of emissions in Kosovo, which affect the air quality, and climate change.

As air pollution sources, except KEC, Trepca, Ferronikel, public heating facilities and other industries, traffic is considered a significant air pollution sector.

Also, it should not be underestimated the air pollution caused by radioactive waste materials used in industry, medicine, and radioactive lightning arresters installed in buildings, and industrial facilities.

3 Report, State of Environment in Kosovo 2008-2010

3.2. Air pollution sources

The main current air pollution sources in Kosovo are:

- KEC that includes thermal power plants (Kosova A and Kosova B) and lignite mines in Obiliq;
- Industrial complex in Mitrovicë ;
- Ferronikeli in Gllogovc;
- Cement factory -SharrCem in Hani i Elezit;
- Factory of industrial chemistry and rubber BALLKAN in Suharekë;
- District heating systems (Prishtinë, Gjakovë and Mitrovicë);
- Basic heavy industry, which actually is not operating (Gjakovë, Pejë, Gjilan);
- Traffic;
- Agriculture;
- Urban and industrial landfills.

Cement factory –SharrCem- in Hani i Elezit

4. MONITORING OF AIR EMISSIONS AND AIR QUALITY

4.1. Monitoring of air emissions

Kosovo is not a signatory to any of the conventions, protocols or international agreements, related to air protection. Despite this, great efforts are made to incorporate and implement the international norms, primarily those of the EU, as in legal framework, as well as on implementation.

To achieve this, the MESP requires all operators who have an environmental impact to monitoring the air emissions.

Currently, monitoring of air emissions is conducted by:

- Thermal power plants Kosovo A and Kosovo B;
- Ferronikeli Complex in Gllogovc;
- Cement Factory –Sharrcem- in Hani i Elezit;
- Public heating company "Termokos";

4.1.2. Assessment of air emissions

Within the assessment of air emissions, this report presents estimates of emissions from KEC, Feronikeli, Cement Factory Sharrcem, and public heating company "Termokos".

4.1.2.1. Assessment of air emissions from thermal power plants Kosova A and Kosova B

KEK continues to be one of the major sources of air pollution, due to higher emissions from the power plants Kosovo A and B. There is not yet installed continuous monitoring system of emissions from the power plant Kosovo A and B. For the future, KEC plans reconstruction

of electro-filters system TPP Kosovo A (A3, A4 and A5), by increasing the efficiency of existing electro-filters. While for Kosovo B, although lower emission level reported, there are also evident excedances of emission limited values.

Assessment of emissions from power plants PPA A and PP B is based on the results of measurements and calculations, performed for these parameters: dust, SO_2, NOx and CO_2.

Dust – emissions are continuously measured at the PP B only.

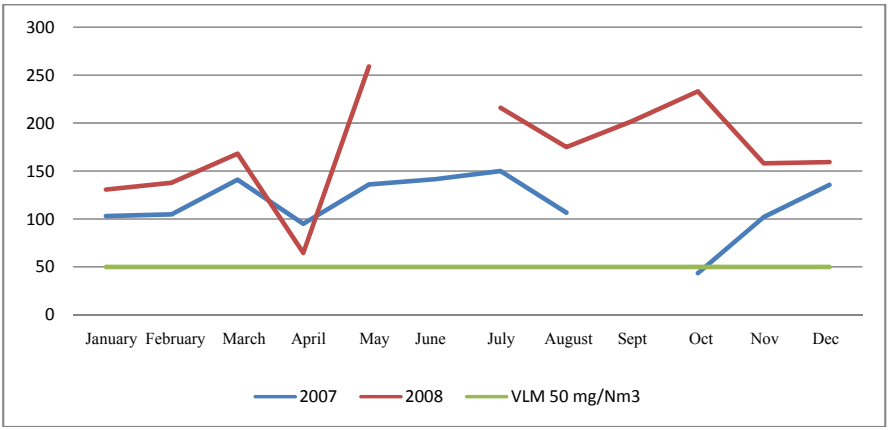


Fig.1. Measured dust emissions PP B1 in 2007 and 2008 - mg/Nm³

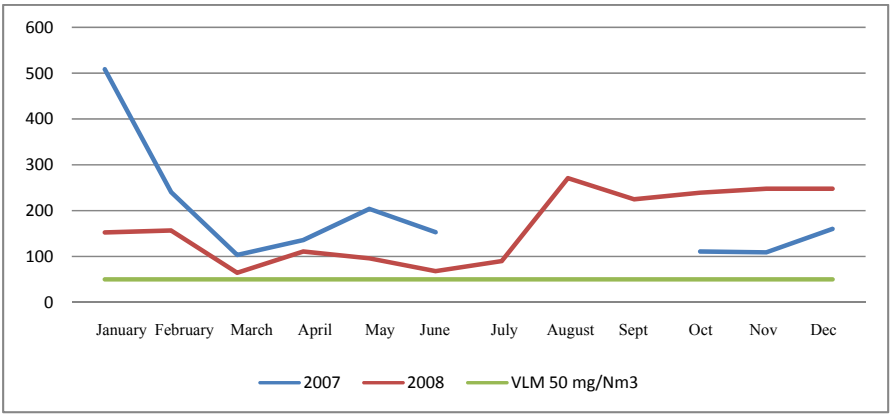


Fig.2. Measured dust emissions PP B2 in 2007 and 2008 - mg/Nm3

Data from dust measurements were available only for period 2007 and 2008. This data shows for exceeded values in both years, and in both power plants.

The results of dust emission calculations are presented in the figure below.

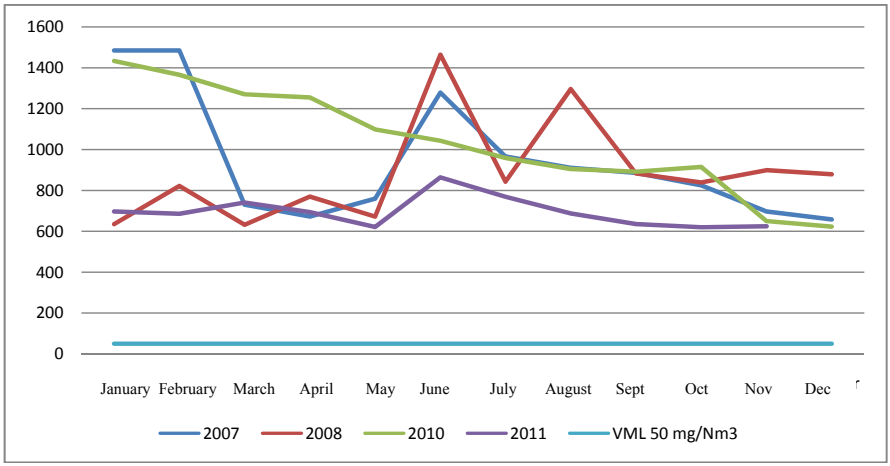


Fig. 3. Calculated dust emissions mg/Nm3 for TPP A in the period 2007 - 2011

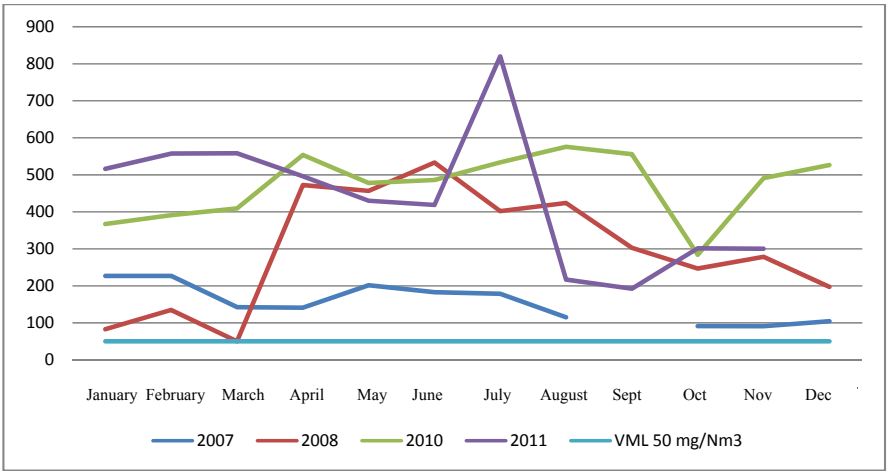


Fig. 4. Calculated dust emissions mg/Nm3 for TPP B in the period 2007 - 2011

The figure presented above clearly shows that during the period 2007-2011 the maximum allowed value (50mg/Nm3) [4], is exceeded, especially at the TPP where are evidenced enormous dust exceedances.

Sulphur dioxide (SO_2)

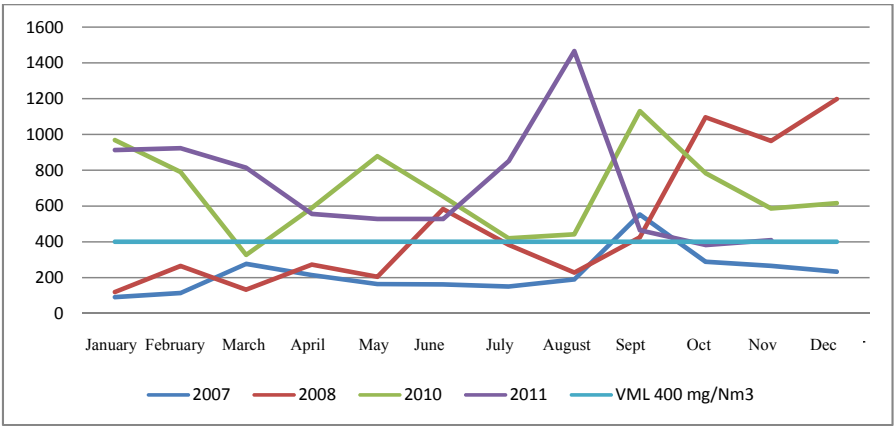


Fig.5. Calculated SO_2 emissions in mg/Nm³ for TPP A in the period 2007 - 2011[5]

The Fig. 5, shows that during 2010 and 2011 are registered exceeded maximum allowed values (400 mg/Nm³) [6], while in 2007, during the entire year, concentration of SO_2 emitted was below the maximum allowed value, with the exception of September.

4 Administrative Instruction on rules and standards of the discharges on air by the stationary sources of pollution, Nr. 06/2007

5 Monthly and annual reports of Environment Department - KEC

6 Administrative Instruction on rules and standards of the discharges on air by the stationary sources of pollution, Nr. 06/2007

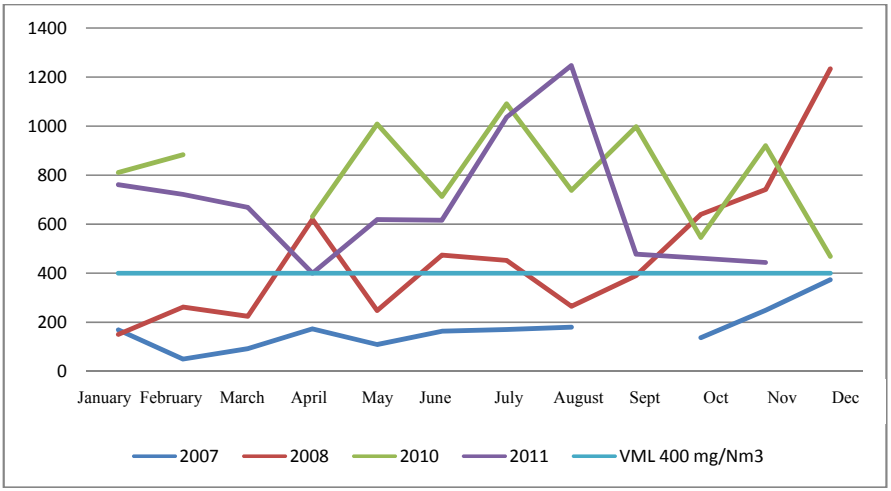


Fig.6. Calculated SO_2 emissions in mg/Nm³ for TPP B in the period 2007 - 2011

For the PP B, data calculated are presented in Fig.6, which shows that during 2010 and 2011 are registered exceedances of maximum allowed value. A better situation was recorded during 2007, while in 2008 exceedances were recorded during the months of April, June, July, October, November and December.

Nitrogen oxides (NOx)

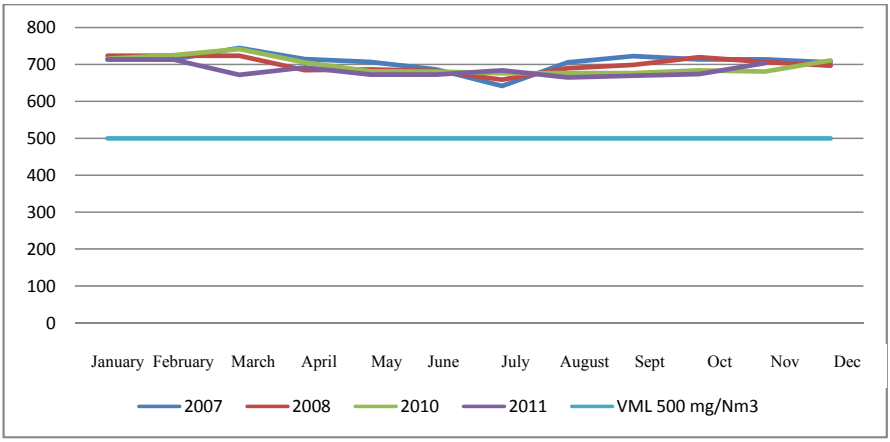


Fig.7. Calculated NOx emissions in mg/Nm3 for TPP A in the period 2007 - 2011

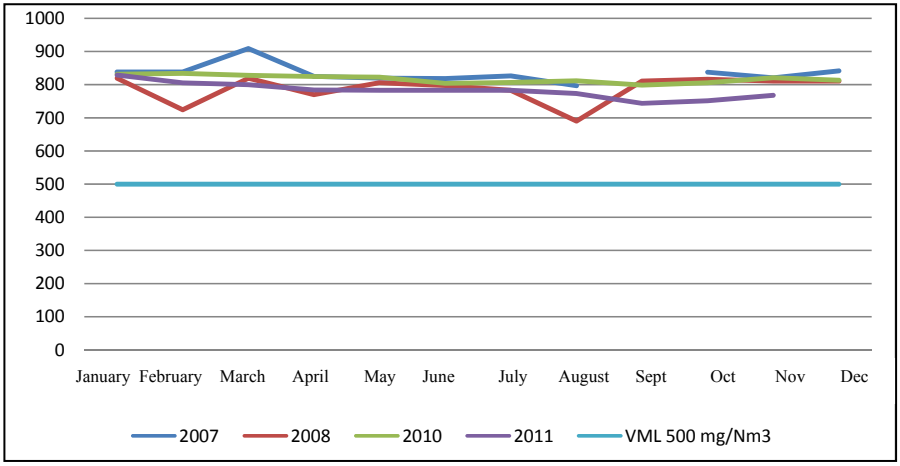


Fig 8. Calculated NOx emissions in mg/Nm3 for TPP B in the period 2007 - 2011

From the figure presented above (Fig 7 and Fig.8) exceedances are indicated during all years, in both thermal power plants.

Carbon dioxide (CO_2)

Calculated CO_2 emissions from PP A and PP B are presented in fig.9.

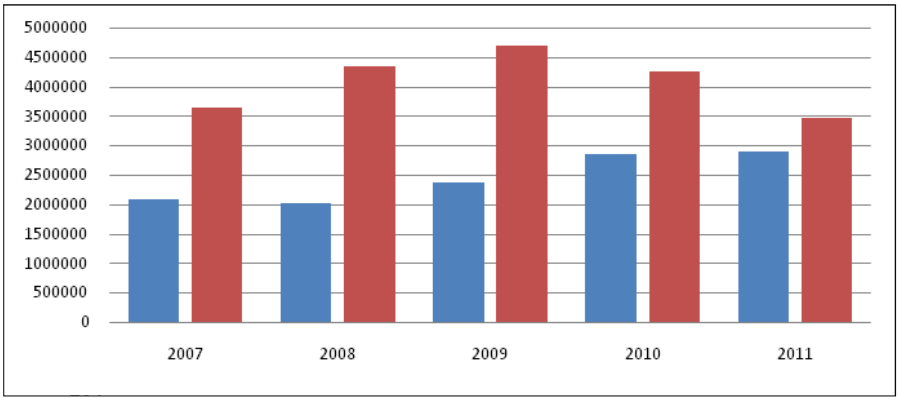


Fig.9. Calculated CO_2 emissions of PPA and PPB in ton/year for the period 2007 - 2011

4.1.2.2. Assessment of air emissions from Ferronikeli

Ferronikeli throughout its manufacturing chain, from ore extraction, transport, preparation, storage, alloy of ferro-nickel production process, and up to disposal of industrial waste, represents an environmental pollution source.

At Ferronikel, emissions are measured at six monitoring points (rotary kiln, electric furnaces at two measuring points, convector, dryer and heating facilities). These measurements are carried out only once a month, by a certified contractor.

In this report, the included data for the year 2011 represents the data recorded by monitoring the dust emissionsf, SO_2 and NOx in rotary furnace, since at this measuring point, the gas flow is higher compared to other points.

Tab1. Measured dust emission in rotary kilns of Ferronikeli during 2011

Months	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**
Emission mg/m3	270	180	172	141	112	127	90.1	142	107	80.75		102.1
MAV												

Tab.2. Measured SO_2 emission in rotary kilns of Ferronikeli during 2011

Months	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**
Emission mg/m3	1.58	1.91	1.93	1.75	619	<1.00	<1.00	1.44	390	977		841.4
MAV	**800mg/Nm³**											

Tab.3. Measured NOx emission in rotary kilns of Ferronikeli during2011

Months	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**XII**
Emission mg/m3	227	222	188	262	131	124	156	157	311	69		85.4
MAV	**400mg/Nm³**											

Note - Data on emissions in above presented tables are given in the unit mg/m3, and not in mg/Nm3. For this reason, data comparison with the maximum allowed values is not made.

4.1.2.3. Assessment of air emissions from Sharrcem

Technological process of clinker production, in the cement factory of Sharrcem in Hani i Elezit, is largely followed by emissions of pollutants affecting the environment. Major impacts on the environment from cement factories are the impacts on air from the rotary kiln, as a result of the physical and chemical dissolution of raw materials, and the process of burning in the oven at temperatures up to 1450 ° C[7].

Sharrcem makes periodical measurements by an external contractor. Monitored parameters are: dust, SO_2, NOx, and CO, which are presented below.

Dust

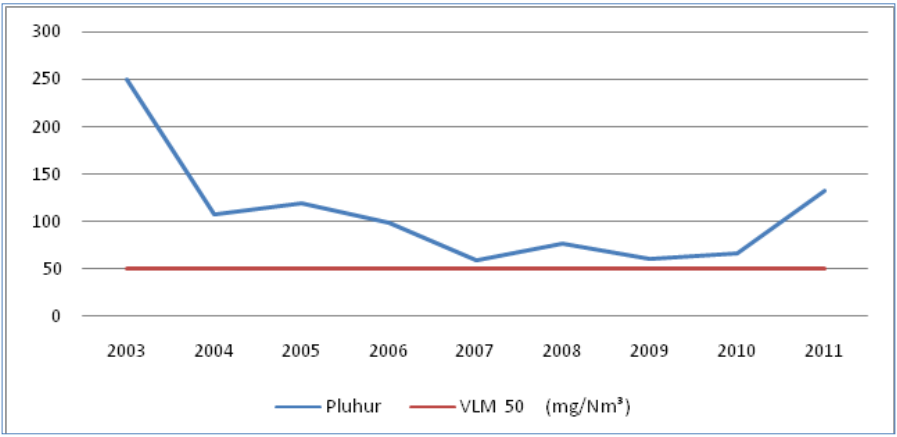


Fig.10. Annual average values of dust for 2003-2011 from Sharrcem

Fig.10 shows that throughout the years, the maximum allowed values were exceeded. It is indicated that from 2006, there is a decrease of dust emitted as a result of investment in the electro filters, whereas in 2011 there is again an increase of the dust emissions.

7 Annual report of Environmental Sector, Sharrcem factory, 2008

Sulphur dioxide (SO_2)

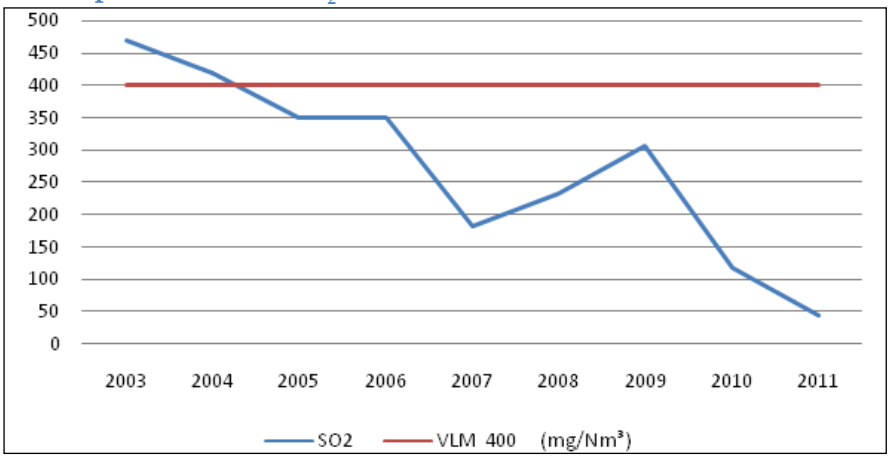


Fig.11. Annual average values of SO_2 for 2003-2011 from Sharrcem

As seen from the above presented figure, the concentration of emitted SO_2 is almost at all times under the maximum values allowed (400mg/Nm^3) [8], with the exception of 2003. From 2010 -2011 there is a considerable decrease of SO_2 values .

Nitrogen oxides (NOx)

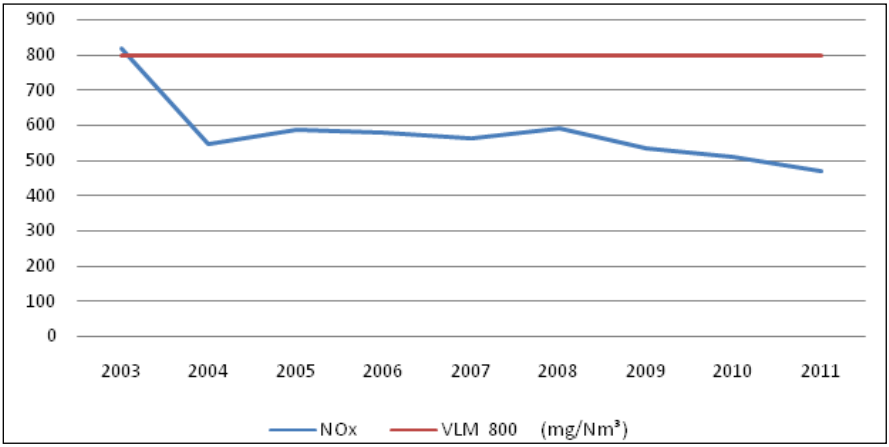


Fig. 12. Annual average values of NOx for 2003-2011 from Sharrcem

8 Administrative Instruction on rules and standards of the discharges on air by the stationary sources of pollution, Nr. 06/2007

During the all years of monitoring represented in this report, the NOx values were under the maximum allowed value (800mg/Nm^3)[9].

Carbon dioxide (CO_2)

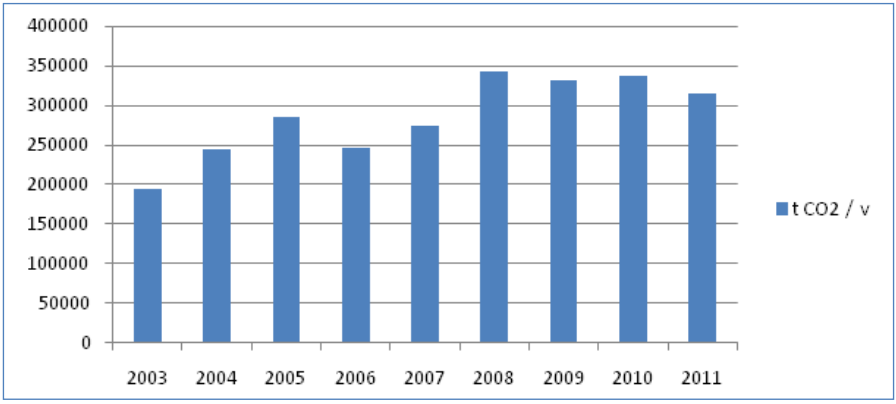


Fig.13. Absolute CO2 emissions (tCO2/year)

At Figure 13, it is indicated that even though the value of absolute CO_2 emissions is increased, they are smaller for 9%, in relation to the increase of cement production, compared to previous years.

4.1.2.4. Assessment of air emissions from district heating plant

There are 3 public heating companies in Kosovo, located in Prishtina, Gjakova and Mitrovica. There are no reliable data from these activities, so in this report will present only the data obtained from Pristina heating company, "Termokos".

Assessment of emissions from Pristina Heating company - For the first time, the public heating company of the city of Pristina "TERMOKOS 'has presented general information during the process of development of the strategy for air quality. The total amount of fuel consumption for heating season 2007/2008 was 9,320.16 t, and for heating season 2008/2009 was 9,438.82 t.

9 Administrative Instruction on rules and standards of the discharges on air by the stationary sources of pollution, Nr. 06/2007

The total output of heat for heating seasons 2007/2008 was 86,561.532 MWh, and for heating season 2008/2009 was 92,259.645 MWh.

Public heating company of Prishtina - Termokos

4.2. Air quality monitoring

Air quality monitoring is carried out by the following institutions: KHMI, NIPH, and several economic operators (pollutants) as: KEC, and Feronikeli.

The air quality monitoring in Kosovo is still incomplete even though some progress is made, as it has started the process of establishing the automatic air quality monitoring stations in several cities in Kosovo.

4.2.1. Air quality monitoring by KHMI

Based on the Laws on Environment, Nr.03/L-025, Law on air protection from pollution, Nr.03/L-160, and law on Hydro-meteorological activities, Nr.02/L-79, the KHMI is obliged to conduct the air quality monitoring in entire Kosovo territory.

During the implementation of WHO[10] project on assessment of human health risk from lead in Mitrovica town, the KHMI conducted air quality monitoring in Mitrovica and at KHMI yard, which is made with classical methods and with an indicative monitoring network, where the following parameters are measured: air sediment (total dust deposited), SO_2 and smoke black. The results of this study will not be considered for assessment in this report, as they are found not to be comliant with the laws, administrative instructions, and EU air directives

By the end of 2009, the first automatic air quality monitoring station has begun to operate in Pristina, placed at the KHMI yard.

During 2010, the Department of Environmental Protection of MESP, and Kosovo Hydro-meteorological Institute, based on the criteria of Directive 2008/50/EC, have made preliminary study to determine the monitoring points[11].

In the abovementioned study, the zoning was made as well. Kosovo will have one agglomeration (Pristina), and the rest of the country will form one zone.

The number of stations is assigned on the basis of criteria defined by the AI on criteria for determination of monitoring points, the number and frequency of measurements, methodology, form and timing of data

10 Assessment of human health risks from lead in Mitrovica town, 2004

11 Report on the air quality network in Kosovo

reporting, Nr.15/2010. Based on this AI, the Kosovo air quality monitoring network will have 9 automatic monitoring stations, and one mobile monitoring station. Currently two automatic stations in Prishtina (KHMI and Rilindja) and one mobile station are operating.

The first automatic station[12] for air quality monitoring, is placed at KHMI location, (Map 1.). The geographical coordinates of the location are 42°38'56.03"/ 21° 8'13.00". This station is equipped with automatic analysers of sulphur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide, (CO), ozone (O_3), particulate matters PM_{10}/$PM_{2.5}$ as well as with sensors of meteorological parameters.

The air quality monitoring station at KHMI yard.

The second KHMI station is a donation of Slovenian government. This station is placed at the yard of new Government's building, ex Rilindja (Map 1), at the geographical coordinates 42°39'35.03"/21° 9'25.81".

This station is equipped with a three-channel optic analyser (Grim Model 180), which is configured to measure particulate matters PM_{10}, $PM_{2.5.}$ This station measures also the meteorological parameters such as: wind direction, wind speed, air temperature, relative humidity, atmospheric pressure.

12 Annual report of KHMI for the year 2011

Air quality monitoring station located at ex Rilindja yard.

Map.1. Existing air quality monitoring stations in Prishtinë

Mobile station – is placed at city centre of Drenas, near the municipality building, (Map 2), where in the near future, a permanent air quality monitoring station will be established. Geographical coordinates of this location are 42°37'33.13/20°53'46.45". This station measures the primary parameters of air quality, as defined by the law on air protection from pollution (table 4).

Map 2. Location of station in Drenas (mobile station)

Distribution of analysers in these three monitoring stations is not the same (table 4), but it is expected that one of three stations that are under the instalment process, to be incorporated at the monitoring station in Prishtina-Rilindja, in order to be completed with all required analysers.

Tab.4. Air quality monitoring stations and parameters 2010-2011

Station	PM10	PM2.5	SO2	NO2	O3	CO
Prishtinë-KHMI	•		•	•	•	•
Prishtinë-Rilindja	•	•				
Mobile station -Drenas	•		•	•	•	•

4.2.1.1. Expanding the air quality monitoring network

During 2012, it is planned to establish 5 automatic stations for air quality monitoring in Kosovo (IPA-MESP project, donated by the EC). These stations will be located in the following cities: Gjilan, Hani i Elezit, Shtërpce-Brezovicë, Prizren and Pejë.

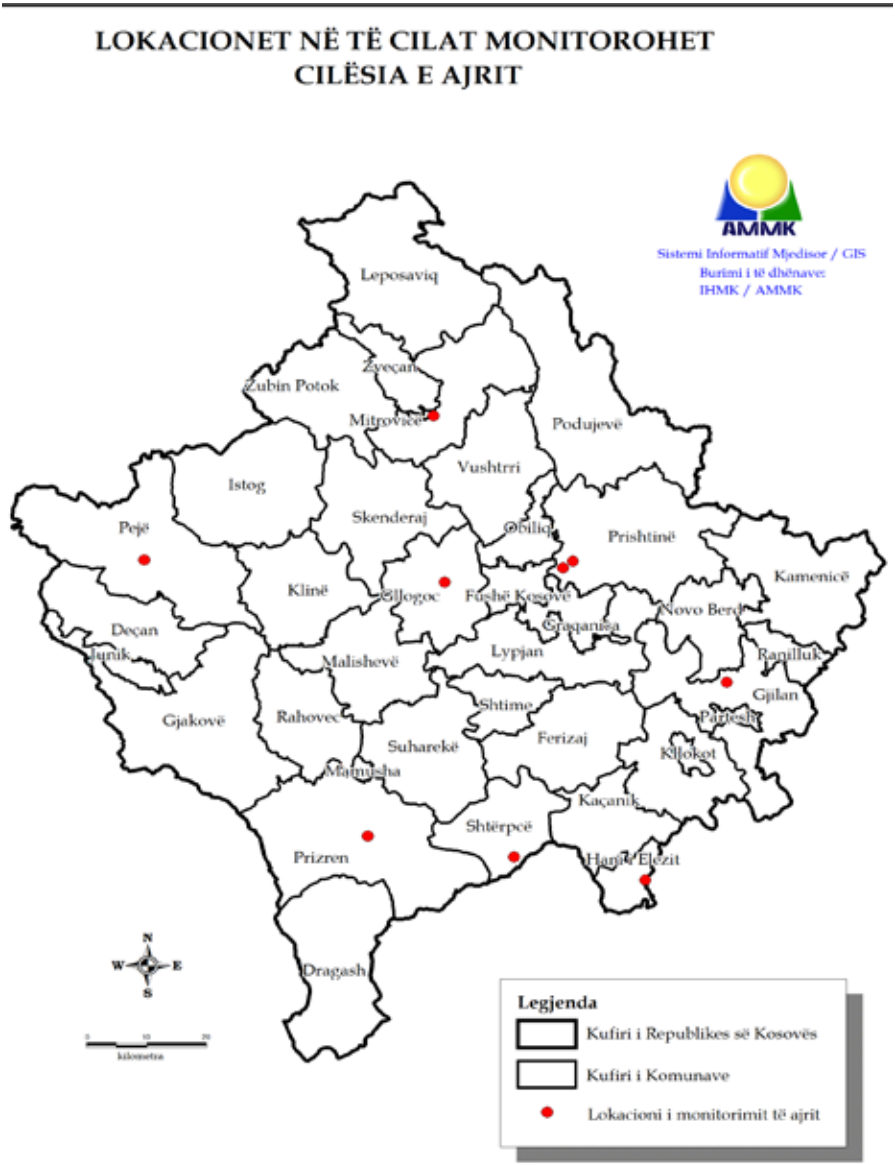
The table 5 presents details about the new stations to be established and parameters to be monitored.

Table. 5. New air quality monitoring stations to be operative in 2012

First quarter 2012							
Station	PM10/sampl.		PM2.5	SO2	NO2	O3	CO
Prishtinë-Rilindja	•				•		
Mitrovicë	/•					•	•
Drenas	/•			•			
First half of 2012							
	PM10/sampl.	BTXsamp.	PM2.5	SO2	NO2	O3	CO
Pejë	•	•	•	•	•	•	•
Prizren	•	•	•	•	•	•	•
Hani i Elezit	•	•	•	•	•	•	•
Gjilan	•	•	•	•	•	•	•
Brezovicë	•	•	•	•	•	•	•

Overall, the monitoring network in Kosovo will have 9 automatic stations for air quality monitoring, which will be spread in eight Kosovo municipalities (Map 3).

Two of stations placed in Prishtinë, represents the **urban** air quality (Rilindja) and **sub-urban** air quality (KHMI), whereas the 7 other stations to be located in municipalities Mitrovicë, Drenas, Pejë, Prizren, Hani i Elezit, Gjilan will represent the urban air quality. The station in Brezovicë will represent air quality in **rural** areas.



Map 3. Air quality monitoring network in Kosovo

4.2.2. Air quality monitoring by NIPH

The NIPH carries also the air quality monitoring in Kosovo, which has two stations for air pollution monitoring. The following parameters are measured at these stations: sulphur dioxide (SO_2), nitrogen oxides (NOx) and total suspended particles. However, currently these two stations are out of order, and no data are available.

First NIPH station is located in the yard of Ministry of Finances, which measures air pollution from traffic. But this station does not meet the criteria as defined by the directive 2008/50 EC. There are plans to dislocate this station, at a more appropriate location, in order to meet the criteria of above mentioned directive.

The second station is located at the NIPH yard, in the southern part of Pristina. Location is just 1.8 air distance from the KHMI station. In order to integrate this station within the national air quality monitoring network, it is recommended to move this station in the north of Pristina, in the residential part.

Map 4. Air quality monitoring stations in Prishtinë -NIPH

4.2.3. Air quality monitoring by KEC

In the industrial area of KEC[13], the air quality monitoring is conducted in two zones, in power generation zone, and in mines zone, where the following parameters are monitored: SO_2, smoke black, particulate matters, and aero-sediment.

Monitoring of SO_2 and smoke black is carried out in Kastriot and Bardh. The particulate matters are monitored at one point only, in INKOS, where measurements are made five days a month, out of which a monthly average is estimated.

In the power generation zone, the aero-sediment is measured in three monitoring points: PPB, Kastriot, and Dardhishte; while aero-sediment is monitored also in the mining zone, in three monitoring points: two in Bardh, and one in Dardhishte.

The KEC has also monitored the mining area, at: southwest Sibovc, and Hade.

Parameters monitored by KEK for air quality are not in accordance with the air related national law, administrative instructions, and EU directives, so that the results of this monitoring are not considered in this report, with except for SO_2.

Industrial zone of KEC

13 Report on the state of environment in the KEC area

4.2.4. Air quality monitoring by Ferronikeli

Due to the pollution caused by this industrial complex, air quality in the area is required to be monitored. Feronikeli monitors the air quality within the Ferronikeli plant area, and outside the plant area. The following parameters are monitored: SO_2, dust, Aero-sediment and heavy metals in aero-sediment.

Periodical measurements of SO_2 and Dust are conducted at two locations: at the Rescue station in Drenas, and inside magnetic separation facility (in the west of the plant).

Also, the monitoring made by Feronikeli is not in concordance with the air related Law, administrative instructions and EU directives, so that the results of this monitoring are not considered in this report, with except for SO_2.

The Feronikeli complex in Drenas

5. ASSESSMENT OF AIR QUALITY IN KOSOVO

For the assessment of air quality in Kosovo, the analysis was made based on the available data, and by taking as a point of comparison the standards defined by the EU Directive 2008/50/EC on air quality; and the administrative instruction for limited values - air quality norms; **Nr.02/2011.**

The directive 2008/50/EC on ambient air quality and cleaner air for Europe, directs the activities, assessment and management of air quality, setting the target values and limit values for air quality, which objective is the protection of environment and human health.

The Ministry of Environment and Spatial Planning has made a good progress in the transposition of European legislation, through approval of legal acts, such as the Administrative Instructions for air quality norms.

5.1. Assessment of pollution from particulate matter (PM)

The particulate matters (dust) generated by natural and anthropogenic processes, which in diffusive form are dispersed in the air and soil, fall under the influence of gravity, or together with atmospheric precipitation.

Particulate matters are categorized based on the size of the particles, such as particulate matter PM_{10}, $PM_{2,5}$ and PM_{1}, with certain aerodynamic diameter <10μm, <2.5 m m and <1μm, and total suspended particulates (TSP).

The environmental impact of particulate matters depends on their size. Particles smaller than 10 micrometers, usually are of round shape, and under the wind influence, can be transferred in long distances.

Particulate matters on the air are present because of two mechanisms: the particulates with a diameter smaller than 1 micrometer, mainly result from condensation process, while the larger diameter particulates, known as dust, occur through the process of burning solid and liquid materials, mainly as a result of various human activities. Dust always contains particles from the ground, and other fractions of particulates are emitted from: cars, pedestrians, and wind on the ground. Different particles emerge from industrial processes. The concentration of airborne particles depends on the meteorological conditions during the day and during the seasons.

The presence of particles in the air has significant impact on public health. Human exposure to dust particles in the air is much higher in urban areas. Particulate matters effects in the human body vary depending on the composition and their penetration in the body, causing damages to the respiratory organs and lungs.

The particulate matters can have toxic, pathological or physiological effects. It is well-known that certain substances in the atmosphere that are in the form of particles or aerosols, such as polynuclear aromatic hydrocarbons may cause cancer.

Particles also affect the intensity of solar radiation that reaches the earth. Particles can affect different materials by accelerating corrosion (oxidation) of metals.

5.1.1. PM_{10} - Particulate matter with aerodynamic diameter <10µm

In the below table is showed the number of days with daily exceedances during 2010 and 2011.

Tab. 6. Number of days with exceeded limit values of PM_{10}

PM_{10} number of days with exceeded daily limit values for 2010 and 2011		
	2010	2011
Daily limit value	50µg/m3	
Number of days with exceedances within a year	35days	
Prishtinë - IHMK	99	68*
Prishtinë- ex- Rilindja	69*	92*
Drenas- Municipality	No measurements	41*

*Note:*number of days with exceedances of daily values, taken from the number of valid data -90%- of daily values during the year, which is a data quality objective, specifically for continuous measurements.*

From the data in Tab.6, is seen that the number of days with daily value exceedances, within the year 2010 is accounted to 99 days in Prishtina-

KHMI, and 92 days in Prishtina-Rilindja station. In Drenas station are recorded 41 days with exceedance (monitoring period 01.04-31.12.2011).

The majority of days with exceedance of average daily values were during the winter months.

Given that the number of measurements per year is different, and varies from station to station, the number of days with exceedances varies also, but taking as a point of comparison the Pristina station at KHMI, which posses all the data throughout the year, it is expected that the number of days with daily exceedances within the year, in other stations (Pristina-Rilindja and Drenas Municipality, to be approximately the same with the station of Prishtine-KHMI, see fig 14.

In the figure below are presented the annual average values for the three monitoring stations during 2010 and 2011

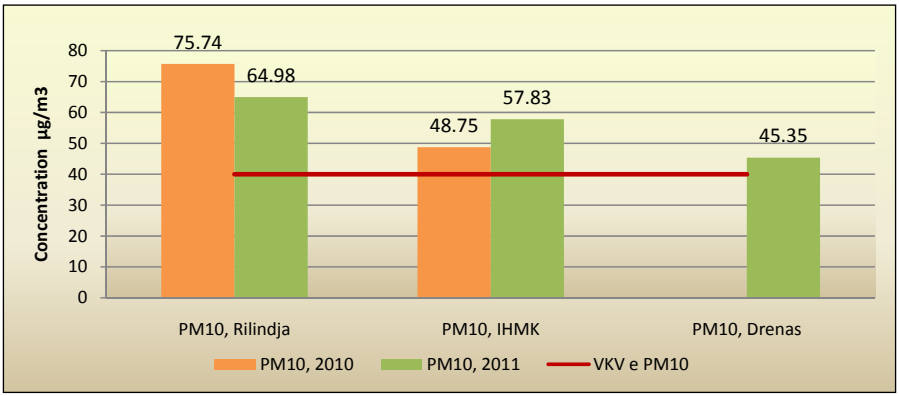


Fig.14. Annual average values of PM_{10} in three monitoring stations

The diagram shows that in the three monitoring stations, the annual limit value (40µg/m^3)[14] is exceeded during the monitoring period 2010 and 2011. Representative station for traffic pollution in Pristina reaches the highest annual average value, for up to 75.74 µg/m^3, which means that there is an excess of 1.9 times, more than the annual limit value (40µg/m^3). While the data provided by the mobile station in Drenas, the PM_{10} pollution has a slight exceedance (45.35 µg/m^3) of the annual limit value 40µg/m^3.

When comparing the data obtained between representative stations for pollution in urban/suburban areas, the highest concentration of PM_{10} pollution is evidenced in urban areas.

14 Directive 2008/50 EC

In the graph below are presented the monthly average values of PM_{10}, measured at monitoring stations KHMI and Rilindja in Prishtina, in 2010 (fig.15).

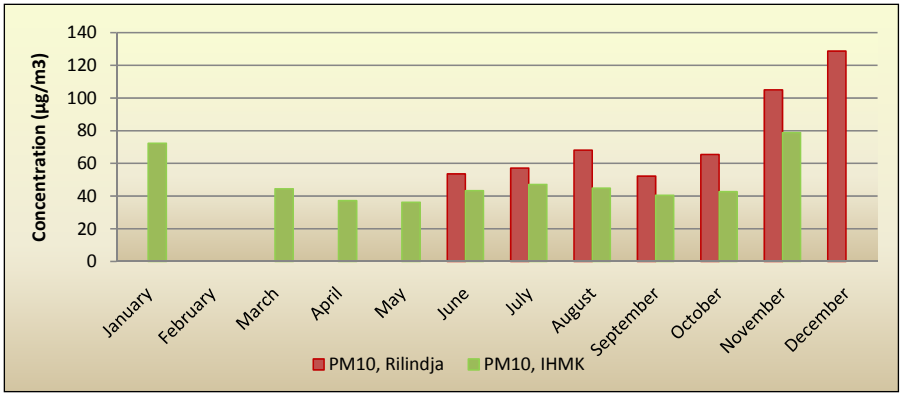


Fig.15. Monthly average values of PM_{10} at monitoring stations" Rilindja" and KHMI,2010

Measurements presented for the station located near Rilindja are valid for the period from June to December only. It is indicated that the highest concentration of PM_{10} has been recorded during the winter season.

In the graph below are presented monthly average values of PM_{10} measured at monitoring stations in IHMK, Rilindja and Drenas in 2011 (fig.16).

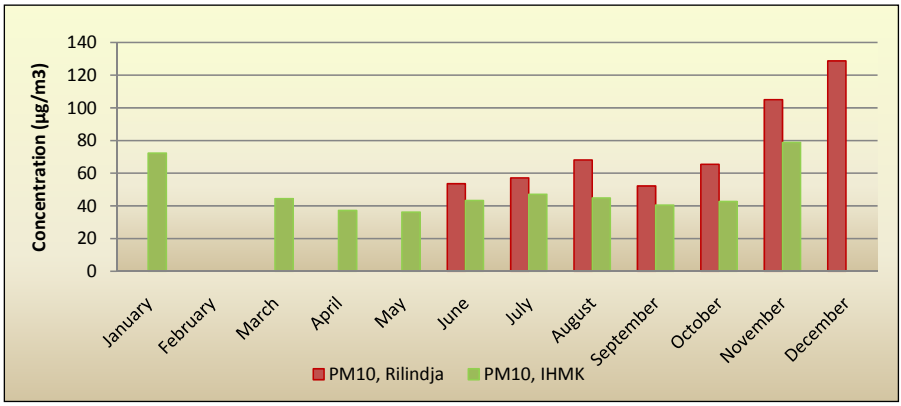


Fig.16. Monthly average values of PM_{10} (µg/m3) at monitoring stations during 2011

The PM_{10} concentration in 2011 has been increased by the same trend as in 2010, and the maximum value of monthly average of PM_{10} appeared in the same monitoring station, during the two years.

5.1.2. PM2.5 - Particulate matter with aerodynamic diameter <2.5µm

The below table represents the annual average values of $PM_{2.5}$ measured at Prishtina-Rilindja station during 2010 and 2011.

Tab. 7. Annual average of $PM_{2.5}$ at monitoring station Rilindja-Prishtinë

PM2.5- Annual average		
	2010	2011
Annual Limit Value	25 µg/m^3	
Prishtinë - Rilindja	37.34	40.04

This table shows that there is a slight increase of $PM_{2.5}$ concentration, from 37.34µg/m^3 as it was in 2010, to 40.04µg/m^3 during 2011, which means that the annual limit value (25µg/m3) [15] is exceeded.

The table below shows the monthly average values of $PM_{2.5}$, measured at Prishtina-Rilindja station during 2010 and 2011 (fig.17).

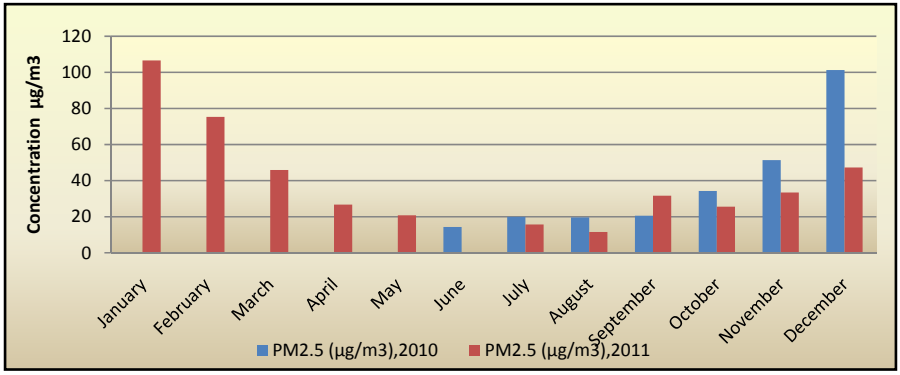


Fig. 17. Monthly average values of monitoring station in Prishtinë –Rilindja, 2010 and 2011

The graph shows that the maximum values were achieved mainly in the winter season. Another important aspect that emerges from the

15 Directive 2008/50 EC,

analysis of the available data is the comparison of annual values $PM_{2.5}$ and PM_{10} measured at the monitoring station Pristina-Rilindja (Fig.18). On annual average, the ratio between the $PM_{2.5}$ and PM_{10} in this monitoring station varies from 49.3% in 2010 to 61.62% in 2011.

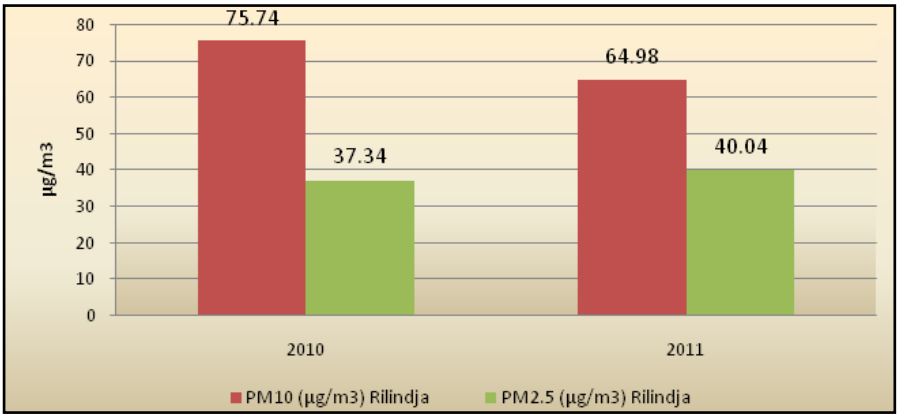


Fig. 18. Annual average values for PM_{10}, $PM_{2.5}$, 2010 and 2011 Prishtinë (Rilindja)

Referring to the monthly average, the ratio between the values of PM_{10} and $PM_{2.5 \text{ for } 2011,}$ was between 82.3% and 31.6%, with a higher percentage in the winter season, while the lowest percentage in July. In 2010, the number of data has been valid for half a year only, and based on this data, the ratio was between 78.7% and 26.7%. Also, in 2010, the maximum rate is reached in the winter season, while the lowest percentage of report $PM_{2.5}/PM_{10}$ was in June.

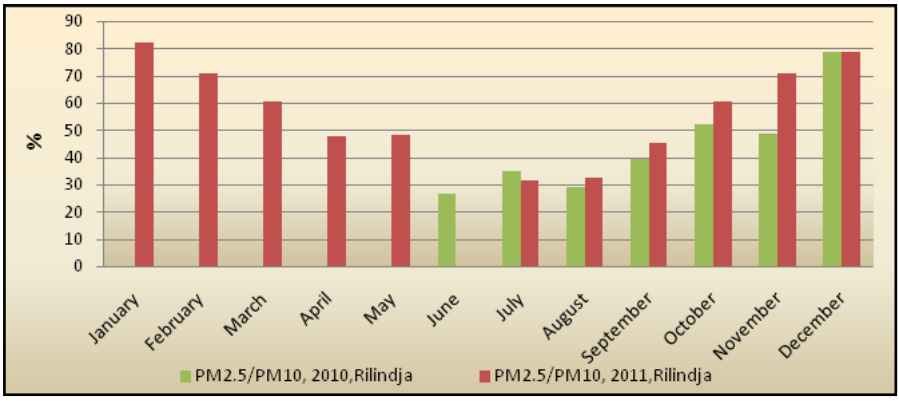


Fig.19. Ratio $PM_{2.5}/PM_{10}$ according to monthly average values, 2010 and 2011

The trend of the ratio, percentage between the two fractions in the sampling points that measures the urban / traffic pollution, reflects to be comparable between the two years for the months with available measurements, with a quite stable trend, with no major changes from year to year, (fig.19).

In the study of air pollution, measurement of fractions smaller that PM2.5, in the content of PM10 particles is of considerable importance, due to the impact on health.

5.2. Assessment of pollution from ozone - O_3

Ozone in normal conditions is blue unstable gas with strong odour. The presence of ozone in the atmosphere comes from natural sources as well as from anthropogenic sources.

Naturally, ozone is formed in the atmosphere from ultraviolet rays of the sun and from the electrical charges. Its high percentage is achieved in the stratosphere up to 20 - 30 km. Atmospheric ozone plays an important role for the provision of life on earth, since it prevents ultraviolet rays, which are harmful to life. Ozone also absorbs the earth infrared rays and thus prevents its cooling.

Ozone as a pollutant in the troposphere layer is formed as a result of complex reactions between primary pollutants present in the atmosphere, and solar radiation. It is part of a series of oxidizing compounds that in the atmosphere form the aerosol called "photochemical smog." Photochemical smog can be formed mainly in the summer months during the daylight hours, mainly from the pollutants emitted by vehicles such as nitrogen oxides, and non methane hydrocarbons.

This is regarded as a typical form of pollution in urban areas with heavy traffic. This does not exclude the possibility of creation of photochemical smog outside urban conglomerates, in places where concomitance (presence of precursors and meteorological conditions) allows photochemical pollution, such as in regions with intensive industrial development, particularly the petrol industry.

Cases of photochemical pollution have been identified in rural areas, due to the transfer by winds of precursor substances, from major metropolitan areas and industrial areas.

5.2.1. O3- Ozone[16]

The table below shows exceedances of the information threshold and alert threshold as well as the exceedance of the daily average in Pristina-KHMI station, and Drenas (mobile station) during the monitoring period (2010, 2011).

Tab.8. The number of exceedances of the daily average, information threshold, and alert threshold

Ozone O_3 – Number of exceedances			
	The long term objective for human health protection, eight hours daily average, means within a year	Information threshold, hourly average	Alert threshold, hourly average
	>120 μg/m^3	>180 μg/m^3	>240 μg/m^3
Prishtinë - KHMI	-	-	-
Drenas - Municipality	-	4	-

The table above shows that during 2010 and 2011 are recorded four (4) cases of the information threshold exceedance for ozone (O_3) in urban monitoring station located in Drenas (mobile station). Exceedances were recorded during the summer season, namely 2 times in July, and 2 in August, where the maximum value of 1h average (180μg/m^3) [17] was recorded in August, which reached the value of 196.8μg/m^3. While at the station aimed to measure the air quality at suburban area, Pristina-KHMI, there has been no case of information threshold exceedance. Also, there are no cases of exceeding the daily average value, in either of these two monitoring stations.

Tab.9. Annual average of Ozone (μg/m^3) at monitoring stations in Drenas and Prishtinë

Ozone (O_3)- Annual Average		
	2010	2011
The level for protection of materials	40 μg/m^3	
Prishtinë - KHMI	63.19	49.41
Drenas- Municipality	-	56.92

16 KHMI, Annual report on air quality 2010,2011,

17 Administrative Instruction on Air Quality Norms, Nr.02/2011

The table above shows that the annual average value (40 μg/m3)[18] for protection of materials is exceeded at two monitoring stations. At both monitoring stations in Pristina-KHMI and Drenas (mobile station), the annual average value was exceeded during the two years 2010 and 2011, but these exceedances were not so significant.

If we compare the annual average values given at fig.20, it is obvious that at the monitoring station in Pristina - KHMI, in 2011, there is a decrease in the value of the concentration of ozone, in comparison with 2010, from 63.19 μg/m^3 to 49.41μg/m^3. The highest annual average value achieved at monitoring station in Pristina is 63.19 μg/m^3, which is increased by 57.97% of the annual average value allowed for protection of materials. While at Drenas monitoring station (mobile station), the highest annual average value is 56.92 μg/m^3, which means there is an increase for 40% of the annual average allowed value (40μg/m3).

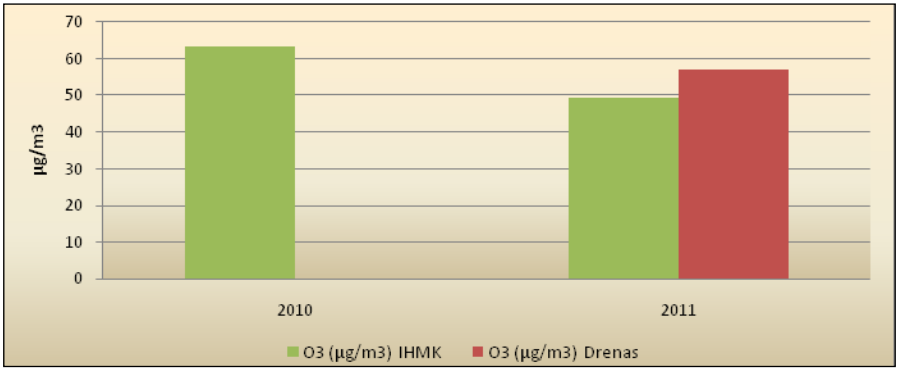


Fig.20. Annual average of O3 at Prishtinë-KHMI and Drenas, 2010 and 2011

The chart of monthly averages analysis shows that during the summer months, there is an increase of concentration of ozone pollution, as a result of higher sun radiation during these months, (fig.21). This is confirmed by the observation of meteorological data for the same period, when the ozone level is higher, the quantity of radiation is higher as well.

18 Directive 2008/50 EC,

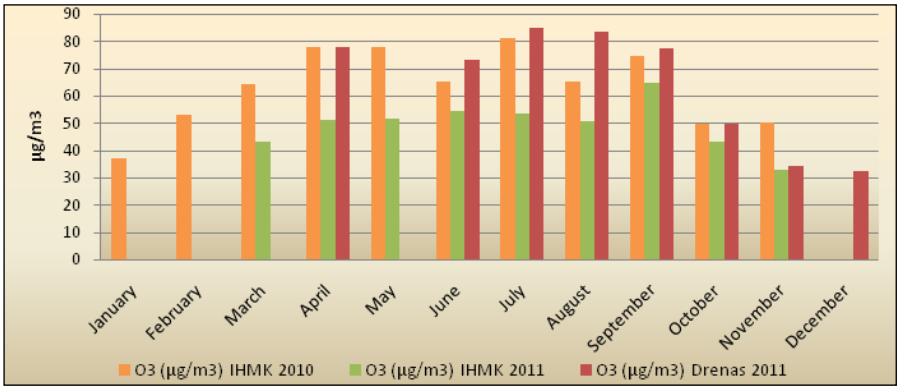


Fig.21. Monthly average values for O_3 in Prishtinë-IHMK and Drenas, 2010 and 2011

Data for the Prishtina municipality included in this report are reported at EIONET.

5.3. Assessment of pollution from NO_2

Of nitrogen oxides present in the air, the most important are: NO, NO_2, N_2O, etc. Consideration of anthropogenic NO emission is very important, especially in urban and industrial areas, because it is more concentrated. Regarding the impact of NO on materials and vegetation, experiments have shown that NO affects the colour of textile materials, causes corrosion in metallic materials, and at vegetation causes the drop of leafs. Experiments have shown that NO_2 is 4 times more lethal than NO. For this reason, the allowed limit values are set, and the results of air quality measurements refer to NO_2 concentration.

Nitrogen dioxide (NO_2) as well as Sulfur Dioxide (SO_2) are an integral part of the smog and causes of acid rain. They are created from the burning of coal, oil, and its derivatives. Each of them penetrates easily in the human body, and can cause lung disease, and increase the likelihood of receiving viruses, and irritation of the eyes or skin. The presence of NO_2 in urban areas is mainly due to increased road and rail transport.

5.3.1. NO_2- Nitrogen dioxide

The table below presents the annual average values of NO_2 concentration, against the annual average limit value for protection of materials. These values are measured at Monitoring stations in Pristina-KHMI, and Drenas-near municipality (mobile station), during the monitoring period (2010, 2011).

Table 10. Annual average of NO_2 (μg/m³) at monitoring stations in Drenas and Prishtinë

Nitrogen dioxide (NO_2)- annual average for 2010 and 2011		
	2010	2011
Annual average value Limit for protection of materials	40 μg/m³	
Prishtinë - KHMI	20.82	-
Drenas- Municipality	-	11.26

The table above shows that at both monitoring stations the annual average value is below the annual limit value (40μg/m³). At the monitoring station in Pristina-KHMI, the annual average value recorded in 2010 is 20.82 μg/m³, while in Drenas is 11.26 μg/m³. The annual average value for the two stations is calculated from a very low percentage of data collected. At monitoring station in Pristina, only 68% of the data collected are valid data, while at the monitoring station in Drenas, the percentage of valid data collected during the year is 60%. This means, the rest of the data are not compliant with the requirements of Directive 2008/50/EC.

The trend of differences between 2010 and 2011 can not be assessed, as there is data insufficiency at both stations (fig.22).

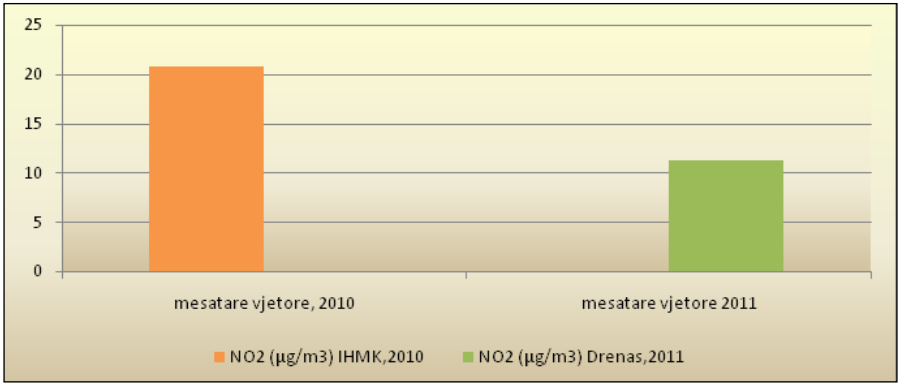


Fig.22. Annual average values of NO_2

From the analysis of monthly average values, for both stations, it is indicated that during the winter months, the NO2 concentration value in the air is higher compared to the summer months (fig.23), however, these are low values and within the standards of the Directive 2008/50 on air quality. During monitoring, it is recorded that there is no exceedance of 1h limit value (200 μg/m^3).

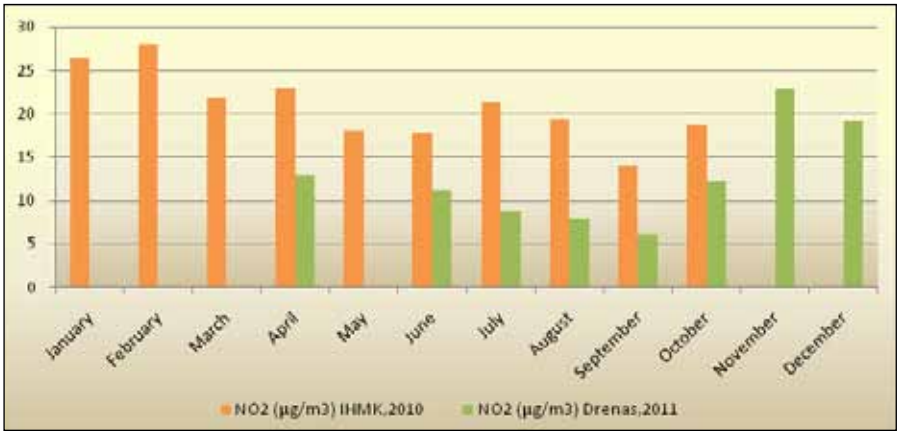


Fig.23. Monthly average values at Prishtina station-KHMI and Drenas, 2010 and 2011

5.4. Assessment of pollution from sulphur dioxide (SO_2)

SO_2 is a colourless and smelly gas. It has a heavy weight and tends to accumulate in the lower layers of the atmosphere. It is soluble in water, and in contact with atmospheric water creates acid rain. About 1/3 of the total SO_2 participation in the atmosphere emerges from burning of fossil fuels, coal and oil that contain sulphur. Coal as fossil fuel along with other elements contains 0.5 to 5% sulphur that through combustion process results with SO_2. The petroleum combustion, results also with the SO_2 emitted into the atmosphere.

Part of SO_2 emission occurs during technological processes in chemical, metallurgy, paper, and cellulose industries. SO_2 concentration that occurs in the atmosphere is different in different areas. Urban and industrial areas are more polluted with SO_2. Also, SO_2 affects metal materials, causing corrosion (oxidation), and it affects the vegetation, causing

the colour change of the leaves of plants. It is also notable the SO_2 toxic impact to humans, where his presence causes respiratory damage. Most people feel the presence of SO_2 up to 5ppm, while its concentration of 1-2 ppm affects the persons who are very sensitive.

5.4.1. SO2 - Sulphur dioxide

In the table below are presented annual average SO_2 concentration values, against the allowed annual average value, measured at monitoring stations in Pristina-KHMI, and Drenas (mobile station) for the monitoring period 2010, 2011 (Tab.11).

Tab.11. Annual average values of SO_2 in Prishtinë and Drenas

Sulphur dioxide (SO_2)- Annual average (including the winter season 01.10-31.03) 2010 and 2011		
	2010	2011
The limit value for vegetation protection Annual average (including the winter 01.10-31.03)	20 µg/m^3	
Prishtinë - KHMI	11.23	-
Drenas- Municipality	-	12.78

KHMI has conducted monitoring of SO_2 in 2010 and 2011 in two monitoring stations in Pristina KHMI, and Drenas. The data are not completed, but the assessment is made based on the available data. (Figure 24).

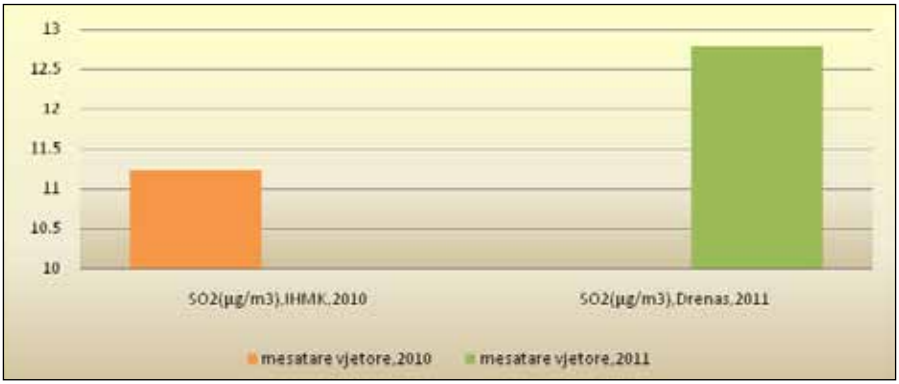


Fig.24. Annual average values of SO_2 in Prishtinë and Drenas

The diagram shows that the SO_2 concentration in the air, in both monitoring stations, Drenas and Pristina, is within the standards set out by the Directive 2008/50/EC on air quality. At the Drenas monitoring station, for monitoring period during 2011, the SO_2 concentration is higher compared to the concentration of SO_2 at monitoring station in Pristina in 2010.

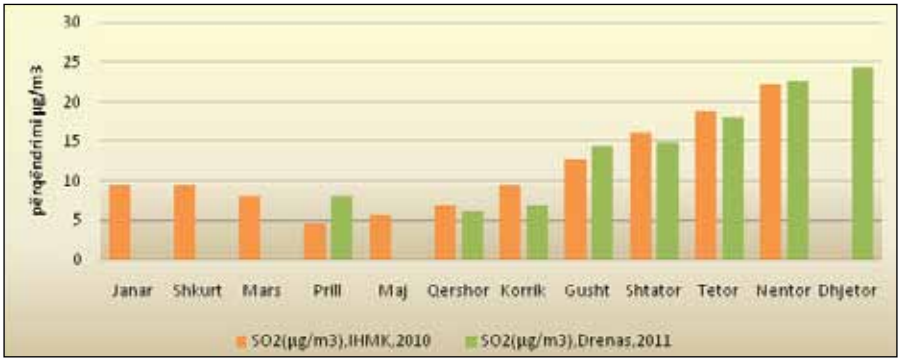


Fig.25. Monthly average values of SO_2 in Prishtinë and Drenas, 2010 and 2011

By the diagram of monthly average values, it is seen that there is no exceedance of SO_2 daily limit values, in any of the monitoring stations. The monthly average maximum value is 23 µg/m3. Diagram of S_2 monthly average values shows that the trend of SO_2 concentration was the same as in both monitoring stations.

5.5. Assessment of pollution from Carbon monoxide CO

CO is an odourless, colourless and tasteless gas, lighter than the air, and flammable. CO is a widespread air pollutant, which appears by the burning of fossil fuels.

Main sources of CO air pollution are:

- Vehicles (largest CO emitters)
- Fuel Burning (combustion of coal, liquid fuels, natural gas and wood) Industrial processes (the refineries, furnaces, paper factories and facilities for production of construction materials).

The presence of CO in lower layers of the atmosphere, by atmospheric circulation can pass on higher layers, and transferred to CO2. One of the possibilities of elimination of CO from the atmosphere is through some plants and microorganisms that use carbon monoxide as food. Large concentration of CO may cause many pathological changes in humans (blood, nerves, etc.) and can cause death. The data have shown that the concentration of CO in the air between 7.8 ppm to 13.9 ppm increases the number of deaths caused by infarct.

5.5.1. CO- Carbon Monoxide

Carbon monoxide is monitored at the monitoring stations in Pristina-KHMI, and Drenas, while further in this report, data from Drenas station are presented only. The data collected at the monitoring station in Drenas, shows that during the monitoring period 04 April -31 December 2011, there are no exceedances of daily limit values of the maximum average 8h (10mg/m3), fig 26. Percentage of valid data collected during the year is 60%.

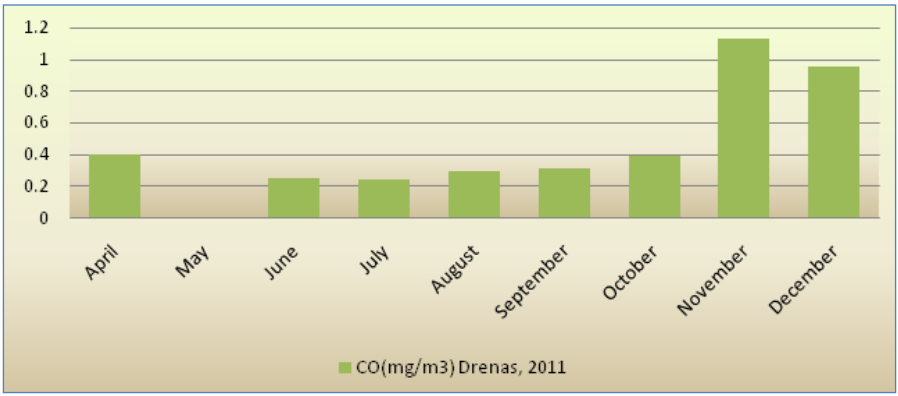


Fig.26. Monthly average values of CO mg/m³ at monitoring station in Drenas, 2011

5.6. Meteorological situation in air quality sampling points and wind rose

In air quality monitoring stations, the meteorological parameters are integrated as well. To complement the presentation of data collected from air quality monitoring network, there are reported also summary data of meteorological parameters, which influence the mechanism of accumulation, transport, diffusion, dispersion and transformation of pollutants in the atmosphere, for the monitoring period 2010 and 2011.

The meteorological parameters monitored in these stations are:

- Air temperature
- Atmospheric pressure
- Wind direction and speed
- Air humidity

Description of meteorological situation is a summary analysis on the impact of meteorological factors in the possible occurrences, especially in the creation of ozone and in the maximum accumulation of PM_{10}. The relation between the meteorological parameters and PM_{10} is showed by the figures 27 to 30, presented in this report that refers to data for the three monitoring stations.

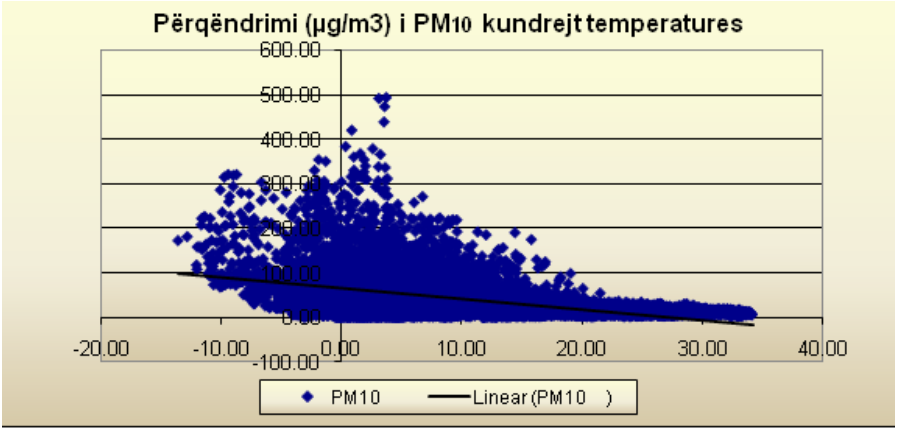


Fig.27. PM_{10} concentration and temperature (°C)

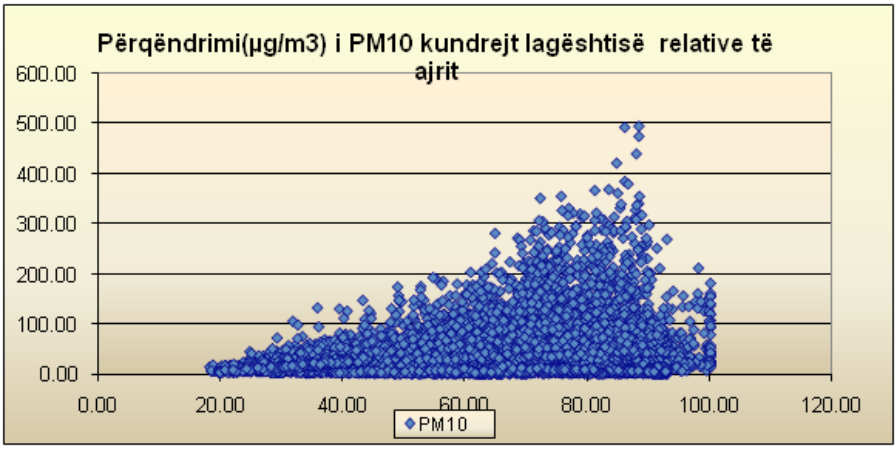


Fig.28. PM_{10} concentration and relative humidity (%)

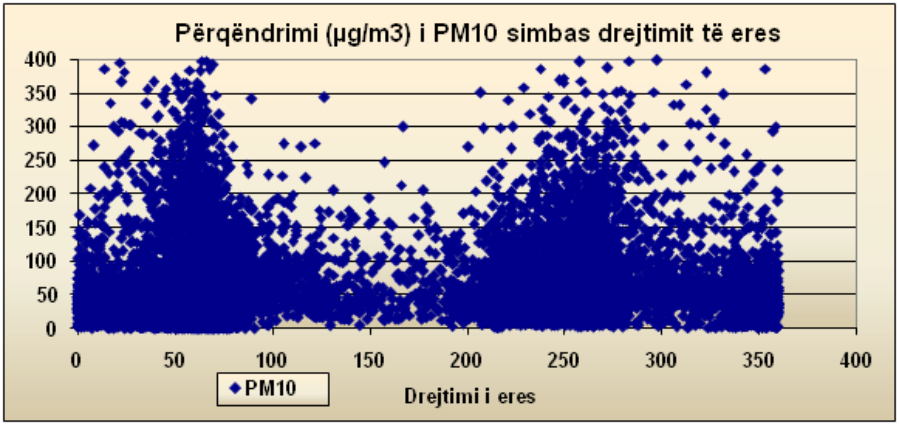


Fig.29. PM_{10} concentration and wind direction (°)00

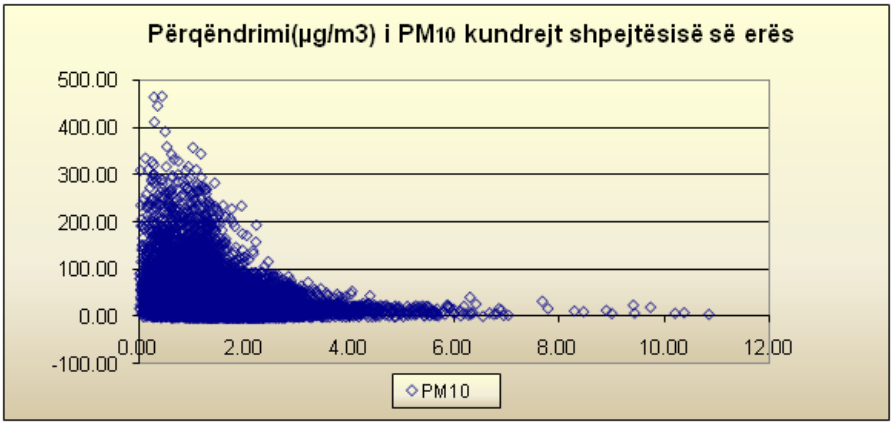


Fig. 30. PM_{10} concentration and win speed (m/sec.)

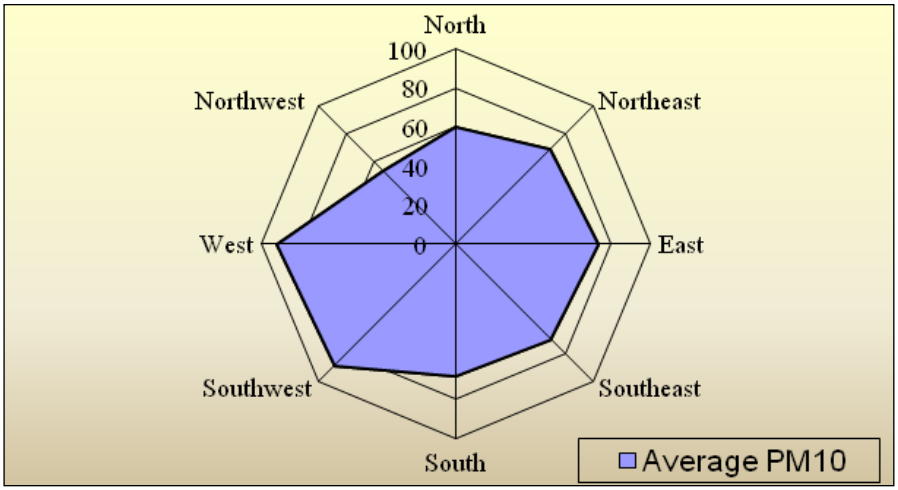


Fig.31. Concentration dispersion of PM_{10} ($\mu g/m^3$) according to wind-rose

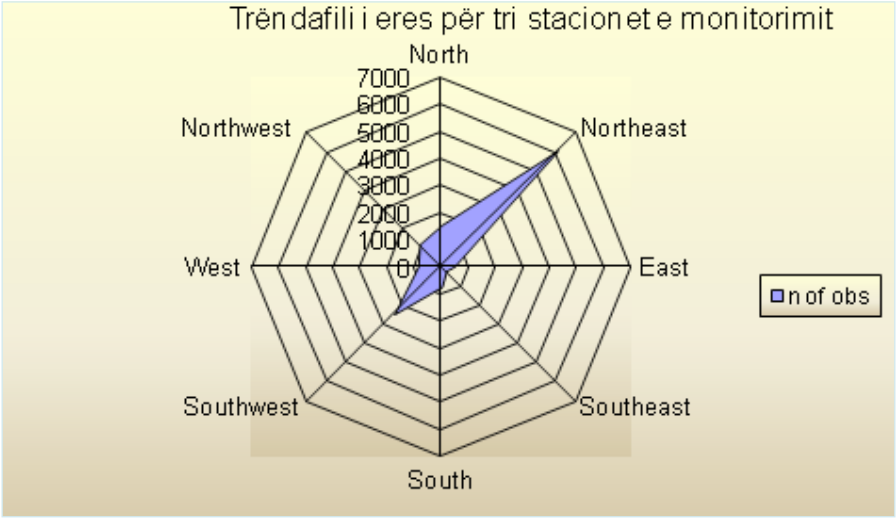


Fig.32. The wind-rose for the three monitoring stations

In Figure 32 is presented wind rose for three monitoring stations (2 in Pristina, and 1 in Drenas). The figure shows that the dominant wind direction is northeast. A same picture for the stations is presented, because the meteorological characteristics associated with wind are identical in the three locations.

6. CLIMATE CHANGE, OZONE LAYER DEPLETION, RADIOACTIVITY AND NOISE

6.1. Climate Change

Climate change, ozone layer depletion, radiation, and noise issues are closely related to air quality, and air emissions. Therefore, consideration of these issues is an important factor.

6.1.1. Climate change as a global issue

Undoubtedly, the climate change nowadays represents one of major global challenges of humanity in environmental protection. In order to mitigate and adapt to these changes, actions are taken and agreements are made at global level. Here are included the Rio Declaration (1992) which promotes the sustainable development, and the Convention on Climate Change, aiming to reduce the release of greenhouse gases into the air. Kyoto Protocol is an important step to limit emissions of CO2, CH4, N2O HFCS (hydro-fluorocarbons, and SF6 - Sulphur hexafluoride.

Climate change could lead to catastrophic impacts if unchecked - While the global climate has been remarkably stable for the past 10000 years, providing a backdrop for the development of human civilisation, there are now clear signs that the climate is changing . This is widely recognised as one of the most prominent challenges facing humankind. Measurements of the global atmospheric concentrations of greenhouse gases (GHG) show marked increases since pre-industrial times, with levels of carbon dioxide (CO2) far exceeding the natural range of the past 650000 years. The concentration of atmospheric CO2 has increased from a pre-industrial level of about 280 ppm to more than 387 ppm in 2008. Increases in GHG emissions are largely due to the use of fossil fuels, although deforestation, land-use change and agriculture also provide significant but smaller contributions. As a consequence, the average global air temperature in 2009 had risen by 0.7 to 0.8°C since pre-industrial times. Indeed, the Intergovernmental Panel on Climate Change (IPCC) concluded that global warming since the middle of the 20th century is very likely to have been due to human influences.

In addition, best estimates of current projections suggest global mean temperatures could rise by as much as 1.8 to 4.0°C — or 1.1to 6.4°C taking into account the full uncertainty range — over the course of this century if global action to limit GHG emissions proves unsuccessful. Recent observations give reason to believe that the rate of growth of GHG emissions and many climate impacts are approaching the upper boundary of the IPCC range of projections rather than the lower ones.

Changes in climate and temperature increases of such magnitude are associated with a wide range of potential impacts. Already over the last three decades, warming has had a discernible influence at the global scale on observed changes in many human and natural systems — including shifts in precipitation patterns, rising global mean sea level, the retreat of glaciers and decline in the extent of Arctic sea ice coverage. Furthermore, in many instances river run-off has changed, especially in snow- or glacier-fed river.

Other consequences of changing climatic conditions include increases in global mean ocean temperatures, widespread melting of snow and ice sheets, increased flood risk for urban areas and ecosystems, ocean acidification, and extreme climatic events including heat waves. The impacts of climate change are expected to be felt in all regions of the planet, and Europe is no exception. Unless action is taken, climatic changes are expected to lead to considerable adverse impacts.

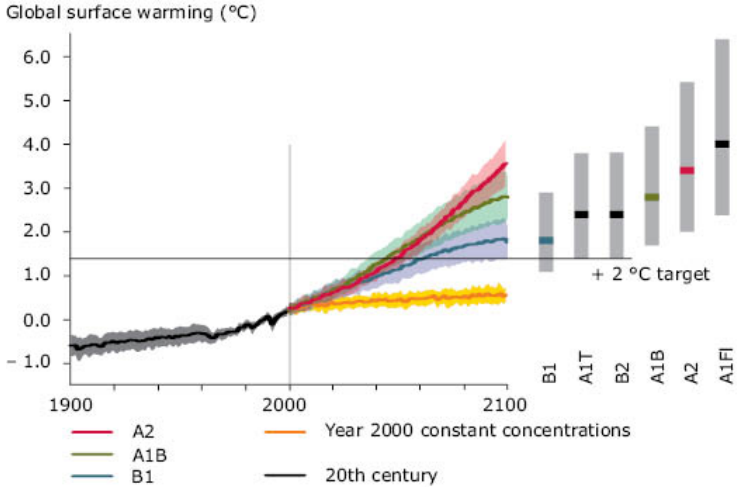


Figure 33: Past and projected global surface temperature change (relative to 1980–1999), based on multi-model averages for selected IPCC scenarios

Note: The bars on the right of the figure indicate the best estimate (solid line within each bar) and the likely range assessed for all six IPCC marker scenarios at 2090–2099 (relative to 1980–1999). The horizontal black line has been added by EEA to indicate the EU Council conclusion and UNFCCC Copenhagen Accord objective of 2°C maximum temperature increase above pre-industrial (1.4°C above 1990 because of about 0.6°C temperature increase from the pre-industrial period to 1990).
Source: Intergovernmental Panel on Climate Change (IPCC).

In addition, with increasing global temperatures, there is an increasing risk of passing tipping points that may trigger large-scale, non-linear changes.

Guiding the political discussions on how to limit dangerous interference with the climate system is the internationally recognised goal to limit the global mean temperature increase since pre-industrial times to below 2°C. Meeting this target will require substantial reductions in global GHG emissions. Considering only the atmospheric CO2 concentration, and applying estimates of global climate sensitivity, this overarching target can be translated into limiting atmospheric CO2 concentrations to around 350–400ppm. If all GHG emissions are included, a limit of 445–490 ppm CO2-equivalent is often cited.

As indicated above, atmospheric CO2 concentrations are already close to this level and are currently increasing by about 20 ppm per decade. Thus, to achieve the below 2°C target, global CO2 emissions would need to level off in the present decade and be reduced significantly thereafter. In the long run, reaching this target is likely to require emission cuts of around 50% compared to 1990 levels by 2050 globally. For the EU-27 and other industrialised countries this translates to emission cuts of 25–40% by 2020 and 80–95% by 2050 — if developing countries also reduce their emissions substantially compared to their respective business-as-usual emission projections.

However, even a 2°C guardrail provides no guarantee for avoiding all adverse climate change impacts and is subject to uncertainties. The United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties held in Copenhagen in 2009 took note of the Copenhagen Accord, which calls for an assessment of its implementation by 2015: This would include consideration of strengthening the long-term goal (by) referencing various matters presented by the science, including in relation to temperature rises of 1.5°C.

6.1.2. Climate change, situation in Kosovo

Kosovo is not actively participating in the implementation of the EU Framework Convention on Climate Change. Taking into account the fact that in the future, Kosovo will have to meet the international obligations related to the implementation of this Convention, in the national legislative documents strategic directions and priorities in this field are set.

Currently, Kosovo is not a UN member state, and consequently is not a party of UN conventions related to the environment. But nonetheless, actions are taken to establish a legal framework and to build capacities in order to be able to participate in international efforts, to combat climate change. At this perspective, Kosovo actions are in accordance with the United Nations Convention on Climate Change (UNFCCC) and the Kyoto Protocol. This will allow to getting support from international mechanisms, including opportunities to participate and benefit from the Kyoto Protocol flexible mechanisms.

Although Kosovo remains outside such agreements, the Government of Kosovo is ready to undertake preparatory activities for the effective implementation of future commitments.

In order to increase the knowledge and understanding of current issues, especially on climate change, an international conference is co-organized by MESP and UNDP. The conference was held in Pristina 28-29 April, 2009, and was considered a great success by all participants.

Another important project that has started to be implemented in 2011 is the greenhouse gases inventory, a project supported by UNDP and the Czech Government.

Environmental reports prepared by KEPA- In the frame of the project - Participation of Balkan countries in the activities of the European Environment Agency, the Environmental Protection Agency of Kosovo, also reported GHG emissions. This report included information on the Energy and Industry Sector for the period 2008-2009. Local data from these sectors are processed by CRFR software, and then loaded at the EIONET portal on 15.04.2011.

Table 12. Sources of greenhouse gases according to sectors for 2008 and 2009

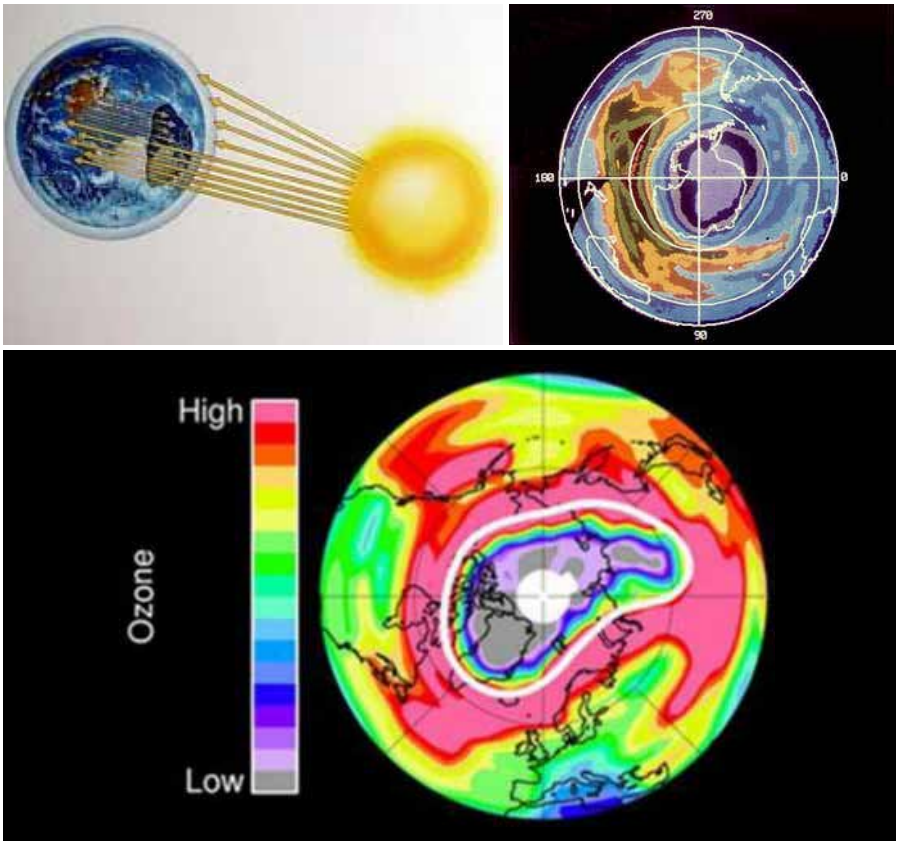
GHG Sources	Unit ton/year					
	2008			2009		
	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O
Energy	6,221,976.11	5,388.79	252.56	7,040,831.31	5,578.54	269.94
Industry	11,054.45	1.32	0.18	11,474.52	1.37	0.18
Transport	1,073.30	0.15	0.07	1,110.44	0.15	0.07
TOTAL	6,234,103.86	5,390.26	252.81	7,053,416.27	5,580.06	270.19

6.2. Ozone layer depletion

Kosovo does not produce chemical elements that are included in Annex A, B, C, and E of the Montreal Protocol to protect the ozone layer, but Kosovo imports products that in themselves contain some of these chemicals (most of them are devices and cooling systems used in household and commercial needs).

To meet the requirements for prevention of ozone layer damage, the Ministry of Environment and Spatial Planning, has regulated by a legal act, the import and export of substances that harm the ozone layer, e.g. products that contain these substances.

Kosovo is not a signatory to any Convention or Protocol to protect the ozone layer, but has developed legislative documents and strategic orientations and priorities in relation to the protection of the ozone layer.



Ozone hole appeared above Antarctica

6.3. Radioactivity

Under the criteria of the International Atomic Energy Agency (IAEA), Kosovo does not belong to B-type countries, which widely use sources of ionizing radiation in medicine, industry, and research. Kosovo has no nuclear facilities. Radiation is used only in medicine (radiotherapy), and this in very small quantities. There is a radioactive waste landfill in Obiliq (KEC industrial activities and Trepca).

Among problems of this nature, in Kosovo are considered: the so-called lost sources of radiation, soil contamination with deplet-

ed uranium (bombing during the war), and ash from power plants. In Kosovo, there is no monitoring of the radioactivity of those landfills, and there is no system for evidence of non-ionizing radiation sources (UV lamps, microwaves, radio and TV stations).

From 1978 until 1990, Kosovo had a Monitoring System for radioactive contamination, with three collection stations (Prishtinë, Prizren and Podujevë). Now the system is not in operation. Currently, only the drinking water supply system in Mitrovica, respectively "Gazivoda" is monitored, and this only one sample per year. Radioactive sources are: All kinds of ray apparatus used in medicine, industry, then radioactive lightning conductor, and at radioactive fire detectors. Also, the Kosovo environment is contaminated with non-ionizing electromagnetic waves, such as mobile phone antennas.

Regarding the legal and institutional infrastructure, Kosovo has the Law on protection from ionizing and non-ionizing radiation, and nuclear safety, and has also established the Agency for Protection from Radiation and Nuclear Safety, full functioning of which is in the process. This agency will be the institutional address, which will deal with all aspects related to the radioactivity in Kosovo. It is also approved the Administrative Instruction No. 03/2007 on the application of ionizing radiation in medicine.

A mobile phone antenna in Prishtina city

6.4. Noise

Noise pollution is especially significant in developing countries, such as our country. This is mainly due to the road traffic. In the dense traffic areas, the sound pressure levels during the day can reach 70 dB (A).

Increased Sound pollution has negative effects on human health. The main sources of environmental noise pollution include: traffic, industries, construction, etc.

KEC has made noise measurements in DLP during July to December 2011. Also the municipality of Prishtina has made noise measurements in different parts of the city.

Noise measurements are based on Article 9 of the Law on safety at work, protection of the health and environment of the Republic of Kosovo No. 2003/19; Administrative Instruction No. 08/2009 on permitted noise emission values and sources of pollution.

The noise monitoring sites – vibrations – monitored by DLP 2010 are: Sibofc-SW-L.Berisha, Shipitullë, Hade, Bardh, Dardhishtë, Palaj.

Table.13 Recommended criteria for noise according to the EU

Receiving type	Area	Period	Recommended noise value(RV)	
			RVp	RVmax.
Settlement	Rural	Day	50	55
		Evening	45	50
		Night	40	45
	Sub-urban	Day	55	60
		Evening	45	50
		Night	40	45
	Urban	Day	60	65
		Evening	50	55
		Night	45	50
	Industrial-urb.	Day	65	70
		Evening	55	60
		Night	50	55
School (classroom)	all	1h-period	35	40
Hospital -indoor -outdoor	all	1h-period	 35 50	 45 55
Cult (religious) buildings-indoor	all	When operating	40	45

Recreational sites at natural parks	all	When operating	50	55
Active recreational sites	all	When operating	55	60
Commercial buildings	all	When operating	65	70
Industrial facilities	all	When operating	70	75

Table 14. Measured noise average values July – September 2011- DLP

(Explanation of abbreviations used at the tables below: RV = recommended value; AVd=Day average value; AVev=Evening average values; AVn = Night average value; AVo=Average value outdoor; AVi=Average value indoor)

Location	Dist. (m)	$L_{d,mb,n,}$ noise level measured within 24 hours (dB)								Time of measure-ment	Micro-climate conditions	Allowed limit	
		level "0",(dB)	Vmax emission	AVd		AVmb		AVn					
				AVo	AVi	AVo	AVi	AVo	AVi			RVp	RVmax
L. Berisha Grabofc H. Berisha	96	47	88.4	54.7	30.5	57	35	58.5	37	Ld	Temp 21 ^{0}C Lr - 65 % Vm 0.5 m/s	65	70
										Lev		55	60
										Ln		50	55
L. Berisha Grabofc M. Berisha	99	47	88.4	57.6	42.4	58.5	42.3	59	42.9	Ld	/	65	70
										Lev		55	60
										Ln		50	55
Primary school Shipitullë	750- 1500	35	#	44.5	-	-	-	-	-	Ld	/	35	40
										Lev		35	40
										Ln		-	-
At Mirenët M.S Sibofc-JP	500-1000	42	#	46.3	33.5	47	35	47	35	Ld	/	65	70
										Lev		55	60
										Ln		50	55
Hade Gani Shala	800-1500	44	#	40	31	43	35.7	44.5	37.	Ld	/	65	70
										Lev		55	60
										Ln		50	55
Bardh G. Rashica	150	42	57	46	37	43	38	45	38.3	Ld	/	65	70
										Lev		55	60
										Ln		50	55
Palaj F. Preniqi	150	46	95	66	50	67	51	68.5	51.3	Ld	/	65	70
										Lev		55	60
										Ln		50	55
Dardhishtë B Gjigolli	150	46	55	50	37	53	38	54	39.7	Ld	/	65	70
										Lev		55	60
										Ln		50	55

Table 15. Measured noise average values October – December 2011- DLP

Location	Dist. (m)	$L_{d,ev,n,}$ noise level measured within 24 hours (dB)								Time of measure-ment	Micro-climate conditions	Allowed limit	
		State "0",(dB)	Vmax emission	AVd		AVev		AVn					
				AVo	AVi	AVo	AVi	AVo	AVi			RVp	RVmax
L. Berisha Grabofc H. Berisha	96	47	81.5	55.3	39	56.7	40	56.5	39	Ld	Temp 18.5 °C Lr - 55 % Vm 0.7 m/s	65	70
										Lev		55	60
										Ln		50	55
L. Berisha Grabofc M. Berisha	99	47	83.5	56.3	39	58.3	42.3	59	40.1	Ld	/	65	70
										Lev		55	60
										Ln		50	55
Primary school Shipitullë	750- 1500	35	#	41.5	-	-	-	-	-	Ld	/	35	40
										Lev		35	40
										Ln		-	-
At Mirenët M.S Sibofc-JP	500-1000	42	#	45.7	33.5	46.8	35	46.9	35	Ld	/	65	70
										Lev		55	60
										Ln		50	55
Hade Gani Shala	800-1500	44	#	42	30	43	35.3	42.5	32	Ld	/	65	70
										Lev		55	60
										Ln		50	55
Bardh G. Rashica	150	42	47	44.2	34	43	35	44	35.6	Ld	/	65	70
										Lev		55	60
										Ln		50	55
F, Palaj F. Preniqi	150	46	92	65.1	50.3	67	50.4	67	51	Ld	/	65	70
										Lev		55	60
										Ln		50	55
F. Dardhishtë B Gjigolli	150	46	57	48	35.6	49	37	48	37.1	Ld	/	65	70
										Lev		55	60
										Ln		50	55

Definition of areas, based on noise level - Based on results from the noise measurements during six months of 2011, no major impact on human health is expected. Several actions to mitigate the noise pollution were taken such as the construction of physical barriers (Villages Shipitulle, and Hade), the built green wall (Village Palaj), physical wall placement (Village Dardhishtë).

A view of noise barrier (concrete wall) in Sibofc

Views from outside and inside the wall in Sibofc mine.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusions

Based on the available data on air quality, emissions, and other statistical data, it is estimated that the air quality in Kosovo is unsatisfactory. Primary air pollution problem in Kosovo is pollution with PM_{10} particles, including other pollutants that affect the human health, vegetation, flora, animals, and materials as well. The Kosovo institutions, in the post-war period, have made great efforts in order to reduce the air pollution sources, and to improve the air quality. However, even greater commitment is needed to improve the overall situation in sector air.

Based on this, it may be concluded as follows:

- The legislative basis for the air is under completion and it is largely harmonized with EU directives;
- The Strategy and Action Plan for Air Protection from Pollution is developed, and this year is expected to be approved by the Assembly;
- The Ministry of Environment and Spatial Planning, given the assistance provided by the European Commission and other donors, is in process of completion, and functioning the air quality monitoring system;
- It is necessary to supplement the air monitoring system by other monitoring institutions, as well as economic operators, and also to increase the number of measured parameters relevant to the air quality assessment;
- Still there are no serious commitments by economic operators with the impact on the environment, to install own systems for continuous emission monitoring, although the existing monitoring system, enables a basic assessment for the issue of air emissions from economic operators;
- Although the Green houses gases inventory process is started, there is no national system for GHG monitoring and reporting;
- There is no noise, and radioactivity monitoring systems in place;
- The cooperation with international environmental institutions, and those of the EU, especially with the European Environment Agency has started;

7.2. Recommendations

Based on the situation presented in this report, based on the findings, problems and deficiencies identified, and in order to improve the state in the air quality sector, it is recommended as follows:

- Adoption and complete transposition of legislation on air, in accordance with European Union legislation, the World Health Organization and other international organizations;
- Complete drafting legal acts on air, climate change, ozone, noise, radiation, and other phenomena that affect air pollution;
- Implement the strategy and action plan on air protection from pollution, and other national programs and projects for improving the air quality;
- Complete and fully functionalize the national air quality monitoring system, self air quality monitoring system of economic operators, and increase the number of measured parameters relevant for the air quality assessment;
- Establishment of national monitoring and reporting systems for GHG, noise, and radioactivity;
- Empowerment of inspectorate at central and local level, in the supervision, control, and inspection of the implementation of legal obligations, and the measures required for air quality protection;
- Institutional and technical capacity building and employment of new staff, for maintenance and calibration of equipments of air quality monitoring network;
- Capacity building for pollution dispersion modeling, conducting analysis and researches for the state of the air;
- Deepening the cooperation between monitoring institutions, and operators, especially in the process of data flow, data processing, reporting, and more effective public information on air quality;
- Preparation for the ratification of international conventions and protocols on air, climate change, and ozone;
- Certification and accreditation of laboratories, equipments, and personnel in charge for air quality monitoring network;
- Continue the cooperation, and exchange of experiences and information with the European Environment Agency, and other international institutions on air quality, climate change, ozone layer, noise, and radiation;

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