Paper received: 05.11.2018. Journal of Agronomy, Technology and Engineering Management
Paper accepted: 29.01.2019. ISSN: 2620-1755 Prodanović, et al., 2019. Vol. 2 (1): 178-191

Review paper

AIR POLLUTANTS AND AIR QUALITY OF URBAN REGIONS

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ABSTRACT: The aim of the paper is to present the air quality, sources of pollution, as well as the process of its pollution in urban regions such as cities. Focus is aimed on the air quality of the city of Novi Sad located in Vojvodina with most important air pollutants such as SO_2 and NO_2, which represent sources of air pollution. Aim is also focusing on possible proposals of measures for improvement of air quality. In order to improve air quality, environmental protection and natural resources, as well as to prevent human health damage, measures must be taken to reduce air pollution. Most important measures are related to further research into air pollution and the creation of appropriate policies and strategies. Possible methods of reducing the negative impact of air have been identified and particularly prominent. Environmental policy includes air quality standards, cost benefit analysis, urban planning, and assessment of the impact of local projects on the environment. New measures are also being identified, which distance themselves from conventional solutions and a control approach in reducing air pollution. The problem of air pollution and implications alarms that it acts synergistically towards the realization of research and projects with a focus on a proposal of a set of new measures in the function of improving the quality of air and reducing pollution.

Key words: *air quality, pollution, urban areas, aeropollutants, SO_2, NO_2*

INTRODUCTION

Air quality is a growing problem worldwide (Kumar et al., 2018). The term "air quality" is related to the relative air condition around us. Good air quality refers to clean, unpolluted air. Ambient air quality refers to the quality of the outside air in our environment. The polluted air, as a result of industrialization, affects the health of people in cities, and has other negative implications. There is growing concern about the effects of air pollution on human health, architectural heritage, the environment, agriculture and forestry. Air pollution is a burning problem in developed countries, and more recently in countries that are developing (Aquino et al., 2018). Over the past few decades, emissions of pollutants include a significant increase in fuel combustion in motor vehicles, leading to negative implications in remote rural areas. Furthermore, the rapid pace of industrial development and urbanization means an additional negative impact on the agriculture and natural resources of developing countries (Baklanov et al., 2016). There is a trend of air pollution, regardless of planetary efforts to reduce greenhouse gases. The negative impact of air pollution on human health in large cities is evident, with limited focus on damage to important historical buildings. Economic, environmental and social implications of air impact can be significant (Chen et al., 2015).

A case study from the area of the city of Novi Sad estimates the potential risk at the local and national level, highlights guidelines for future research priorities and describes the political context within which the problem is and some potential solutions. A large number of evidence has confirmed that air pollutants have a negative impact on human health (Nowak et al., 2018), the environment and natural resources. A review of the air quality in urban areas will serve to draft new guidelines and policies for the improvement of air management, its monitoring, further economic development on sustainable principles (Gulia et al., 2015). In order to carry out this work, it is necessary to develop a national air management strategy that will incorporate environmental principles and provide crucial sanctions for polluters (Van Rooij et al., 2018).

The aim of the paper is to present the air quality, sources of pollution, as well as the pollution process in cities. Focus is given on the air quality of the city of Novi Sad and the most important aeropollutants sources of air pollution (SO_2 and NO_2) and possible measures for improvement of its quality.

AIR POLLUTANTS

Air is one of the most important elements of the environment, which with the expansion of industry and traffic has become contaminated with ingredients harmful to human health and the environment (Nowak et al., 2018). Although air quality in developed zones has improved in relation to SO_2 concentration, the problem with concentrations of NO_2, Volatile Organic Compounds (VOC) and suspended particles, which derives from traffic, is increasing (Vrekić, 2013; Lucattini et al., 2018). According to Bell and Treshow (2002), air pollutants are all airborne substances that have the potential to cause harmful effects on humans, plants, animals or cultural property. Currently, there are more than 300 substances that can be emitted into air which are known and significant as air pollutants (Emberson et al., 2003; Ycas et al., 2019). Air pollution is defined as any atmospheric state in which substances are present in high concentrations, sufficient above their normal levels to produce a measurable effect on humans, animals, vegetation or materials (Mina et al., 2013). Any change in the composition of air in relation to natural conditions due to the presence of other gases, vapours, particles in concentrations affecting human health or affecting the biosphere is considered as aerosolification (Trumbulović-Bujić and Aćimović-Pavlović, 2008).

In the Republic of Serbia, air governance is defined by the Law on Air Protection, which regulates air quality management in a comprehensive manner, as well as measures that prevent the emission of pollutants into the air. Air quality management aims at achieving appropriate limit or target values set by the Law on Air Protection.

According to estimates of the World Health Organization (WHO, 2016), about 2 million people die every year from air pollution (Zhang et al., 2017). By destroying the ecosystem, air pollution also affects the global economy and the terrestrial concept of sustainable development (WHO's Urban Ambient Air Pollution database, 2016). Air pollution in major cities is subject to the attention of international urban planning organizations. In contrast, coordinated monitoring of air pollution in rural areas of developing countries is very limited (Sidhu et al., 2017). In addition, there is a sharp upward trend in the emission of air pollutants as a result of industrialization, urbanization, population growth and energy consumption (Gurjar et al., 2016).

Air pollutants are recognized as abiotic (non-living) pathogens because they cause disease with specific disease syndrome (Cowling and Horsfall, 1979; Kollist et al., 2019). Secondly, air pollutants develop relationships with different types of biotic pathogens, which affect the frequency and intensity of biotic diseases (Haggag et al., 2016). These two groups of pathogens (e.g. air pollutants) and biotic (e.g. fungi, bacteria, viruses, etc.) coexist in the common path system, so it is quite understandable that they can produce damage and make the living world more vulnerable and suffer more damage caused by pollutants (Khan and Khan, 1990; Mertens, 2014).

Table 1. Influence of motor vehicles in emissions of pollutants (Vrekić, 2013)

Polluting substances	Share of motor vehicles in total emissions
Carbon monoxide (CO)	60.0
Hydrocarbons (C_xH_y) x = 1,2,3 ..., y = 2,3,4 ...)	45.0
Nitrogen oxides (NO_x)	34.0
Sulphur dioxide (SO_2)	5.9
Solid particles	6.8

In the Republic of Serbia the share of road traffic in total emissions of nitrogen oxides (NO_x) is about 35%, but is responsible for half of the total carbon monoxide (CO) emission (Pejić, 2015). Different air pollutants have been identified as phytotoxic agents. Air pollutants can be divided into two categories (Marjovi et al., 2015). Primary pollutants, such as SO_2, NO_2, NH_3 and particles, are emitted directly into the atmosphere. They are mostly present in high concentrations in urban areas or near sources, such as thermal power plants, where they can have great effects on local communities. Gases dissolve in the rainwater and under the influence of sunlight and O_2 have been turn into an acid rain, the mixture of sulphur and nitric acid (Rosi-Marshall et al., 2016). Secondary pollutants include tropospheric ozone[1] (O_3) and are formed by chemical reactions in the atmosphere, and the main source are combustion products in motor vehicles. Each spent fuel fossil fuel litre produces about 100 g of carbon monoxide, 2.5 g of carbon dioxide, 30 g of nitric oxide[2], 20 g of volatile organic compounds and many other harmful substances. The highest levels of air pollution were measured in the vicinity of the main urban roads (Vrekić, 2013). They are spreading in high concentrations hundreds of kilometres away from urban and other sources. Reactions that cause the formation of ozone from primary pollutants stimulate high temperature

[1] In the mesosphere at a height between 40 and 60 km, there is a diluted atmosphere, where molecular oxygen (O_2) passes into ozone (O_3) during the electric discharge and the action of ultraviolet rays from the sun. Ozone absorbs almost all of the organisms harmful to ultraviolet rays. Ozone is considered the most important phytotoxic air pollutant.

[2] The largest amount of nitrogen oxides occurs in the operation of thermal power plants and motor vehicles, creating a high temperature causing the reaction between oxygen (O) and elemental nitrogen from the air. NO_2 can be linked to hemoglobin, creating an oxiazohemoglobin, which prevents the transmission of oxygen, and can also cause lung cancer. The average NO_2 concentration in rural areas is about 5 μg m^{-3}, and in cities 20-90 μg m^{-3}. According to the recommendation of the World Health Organization, the average annual NO_2 concentration would not exceed 30 μg m^{-3}.

and intensity of light (Kerckhoffs et al., 2015). Concentrations of air pollutants vary, depending on meteorological conditions (the highest concentrations are in autumn and winter) (Arsenović et al., 2016). Complex mixtures of pollutants can cause significantly higher adverse effects than individual pollutants. The main source of sulphur dioxide (SO_2)[3] emissions is combustion of fossil fuels loaded with sulphur compounds, especially coal and fuel oils. In urban areas, combustion of energy sources in households is the most dangerous component of urban smog in the winter period (Arsenović et al., 2016).

The risk assessment for SO_2 can generally be compared to that of ozone, although there is a tendency for the SO_2 risk to be greater in the vicinity of industrial plants or large thermal power plants, rather than high population density. The planned sulphur emission for 2025 is very similar to ozone risk (Marshall et al., 2005). Carbon monoxide is a widespread air pollutant, and it is created by incomplete combustion of fossil fuels in energy and industrial plants, cars and households. Concentrations of CO in nature are almost harmless (Arsenović et al., 2016), but they influence the formation of NO_2, which is more toxic (Liu et al., 2016).

AIR QUALITY OF URBAN REGIONS

The Air Protection Act defines three categories of air quality (Pejić, 2015):

I - clean or slightly polluted air, where the limit values (LV) levels are not exceeded for any pollutant;

II - moderately polluted air, where limit values for one or more pollutants have been exceeded, but no tolerated values (TV) have been exceeded by any pollutant; and

III - excessively polluted air, where tolerant values of the emission (TVE) for one or more pollutants are exceeded.

Table 2. Emission limits for inorganic substances, μg m^{-3} ("Official Gazette of RS", 6/2016)

Substances	Uninhabited and recreational areas			Populated areas		
	Sampling time			Sampling time		
	24 hours *	1 hour	**	24 hours *	1 hour	**
SO_2	100	150	30	150	350	50
Soot	40	-	30	50	150	50
Suspended particles	70	-	40	120	-	70
NO_2	70	85	50	85	150	60
Ground ozone	65	120	60	85	150	80
Carbon monoxide	3	5	3	5	10	3

(*average 24-hour value, **average annual value)

[3] It is believed that about 1/3 of the sulfur in the atmosphere comes from the burning of fossil fuels. Large amounts of sulfur compounds are released by combustion in the production of energy, melting sulfur containing ores. Sulfur oxides in the presence of water vapor lead to formation of toxic fog (smog), which causes damage to the lung parenchyma. Average annual concentrations of SO_2 in the ecosystem where there are no human activity are below 5 μg m^{-3}, and in urban environments of 20-100 μg m^{-3}. The recommendations of the World Health Organization are that the concentration of SO_2 in the air is below 40 μg m^{-3}.

The objective of air quality control is to protect human health, determine the sources and degree of pollution, determine the movement of air pollution, assess the vulnerability of certain locations, determine critical situations in order to alert the public and to determine the protection measures (Arsenović et al., 2016). Emission Limit Values (ELV) represents the highest allowed concentration level of pollutants in the air (Salis et al., 2017).

Table 3. Trend of air quality of cities in the Republic of Serbia (SEPA, 2014)

City	Number of residents	Air quality category			
		2010	2011	2012	2013
Belgrade	1.586.916	III	III	III	III
Bor	48.615	III	III	III	III
Valjevo	90.312	I	I	III	III
Kosjerić	12.090	-	III	III	II
Niš	260.237	III	III	II	I
Novi Sad	341.625	III	III	I	I
Obrenovac	72.524	-	III	II	II
Pančevo	123.414	II	III	III	I
Smederevo	108.209	I	III	I	III
Užice	78.040	II	II	II	III

Polluted air or its poor quality is the cause of respiratory and other diseases, it affects the pollution of environmental resources, and air management has now become a very topical issue of numerous symposiums and professional circles (Nowak et al., 2018). Air quality management includes an assessment of its quality and the use of obtained data for the creation of strategies and policies that regulate and control the emissions and the ability to react in case of non-compliance with quality standards (Vrekić, 2013).

Air quality monitoring is carried out at the local, national and global level. In our country, a small number of local communities perform monitoring of air quality, and monitoring of emissions is not represented to the extent necessary (Arsenović et al., 2016). Monitoring the atmospheric level of pollutants has the potential to provide significant benefits to human health and the environment (Nowak et al., 2018). Air quality research refers to the determination of levels, variations and sources of major atmospheric pollutants (Malinović-Miličević et al., 2015). In order to effectively remove pollutants from the air, it is necessary to identify them first, determine the sources from which they come from, and work on prevention, i.e., preventing pollutants from entering the air (Laumbach et al., 2015).

At the Serbian national level, a network for air quality monitoring has been established, and additional measuring points are being formed at the level of the autonomous province and local self-government. Air quality is measured using the assessment criteria in accordance with the Regulation on the conditions for monitoring and air quality requirements. Air quality requirements are defined for pollutants through the determination of limit values, limits of assessment and tolerance, target values and long-term objectives.

Table 4. Structural assessment of air quality (SEPA, 2014) - *SAQI_11*[4]

Pollutant	ELV (μg/m³)	TVE (μg/m³)	Excellent	Good	Acceptable	Polluted	Very polluted
SO_2	125		0-50.0	50.1-75.0	75.1-125.0	125.1-187.5	>187.5
NO_2	85	125	0-42.5	42.6-60.0	60.1-85.0	86-125	>125
PM_{10}	50	75	0.0-25.0	25.1-35.0	35.1-50.0	50.1-75.0	>75
CO	5000	10000	0.0-2500	2501-3500	3501-5000	5001-10000	>10000
O_3-8 h max	120		0.0-60.0	60.1-85.0	85.1-120.0	120.1-180.0	>180.0
Soot	50		0.0-25.0	25.1-35.0	35.1-50.0	50.1-75.0	>75

PM - Particulate Matter

A significant ecological problem in the city of Novi Sad is polluted air. Air in the city is subject to pollution from industrial plants and households (Sofilić, 2014):

- combustion of fuel in power plants (including city heating plants),
- combustion of fuel in motor vehicles,
- industrial processes,
- solid waste landfill,
- evaporation of various organic solvents.

In Novi Sad in the previous years air was predominantly I and III categories, while in 2016 air quality in Novi Sad was category II, which is deterioration compared to 2015 when it was category I. As a serious problem, in Novi Sad, the following pollutants are separated: NO_2, particles and ground level ozone O_3. Variation of air quality in Novi Sad can also be viewed through a relatively small number of valid data from measuring points, as well as the great influence of the main pollutants. The city of Novi Sad is still advantageous in relation to the cities in the valleys, because it is in the plain and has a good rose of the wind, which reduces the concentration of aeropollutants (Zubović et al., 2018).

In addition to stationary (factory plants) and mobile sources (traffic), the air quality in Novi Sad is also important to note the potential impact from the immediate environment. For instance the Lafarge, a Beijing cement factory could serve as an example. Air pollution with NO_2 from the mentioned plant is present in the crossroads of blowing wind, but it cannot cause the limit values to exceed the measuring points at the measuring points in the city itself (Wu and Jia, 2018).

As measures to prevent further air pollution in the area of the city of Novi Sad, compliance with legal regulations, modernization of the process of production of large polluters and activities on the greening of surfaces are included (Zubović et al., 2018).

[4] Part of the "AQI" is the usual indication for the air quality index, "S" means the Serbian version, while "SAQI_11" indicates the year when it is defined. This index has 5 classes depending on the concentration of pollutants, from excellent to very bad.

NATURE AND SCOPE OF AIR POLLUTION PROBLEMS IN THE CITY OF NOVI SAD

Cities often measure concentrations of pollutants above the permitted limit values (Trujillo-González et al., 2016). By the beginning of the 1990s, Novi Sad was industrialized. However, after the break-up of the former state and war events, industrial production declined drastically, resulting in changes in sources of air pollution. The main urban air pollutants in the city of Novi Sad have been increased by automobile traffic and the heating of households on solid fuels and natural gas (Malinović-Miličević et al., 2015). The quality of air in Novi Sad reached the category of clean or slightly polluted in 2013, where no exceeding of the reference values for any polluting matter was recorded at any measuring station. In Novi Sad, this is most likely a consequence of the reduction of NO_x emissions from the heating plant to natural gas (Pejić, 2015).

In accordance with the obligations arising from the Environmental Protection Act and the Rulebook on emission limit values, manner and timing of measurement and recording of data, measurements of air pollutant emissions in Novi Sad are conducted, which include the determination of their concentrations, mainly SO_2 and NO_2. Variations in the concentration of these aeropollutants at measuring points are observed, and in some cases concentrations were above the permitted values. NO_2 concentrations were below the legal norms. Tolerant emission value for nitrogen is 125 μg/m^3. The tolerance limits were 40 μg/m^3. The measured value was 85 μg/m^3. At all measuring points, the measured NO_x values were above the tolerance limit of 40 μg/m^3. Zhao et al. (2006) suggest that seasonal variability of NO_2 can result mainly from seasonal changes in the chemical NO_x loss, which is very high during the summer and very low during the winter. Agarwal et al. (2006) found that winter months have a higher risk of exposure, since pollutants often become trapped in lower layers of the atmosphere, resulting in high concentrations.

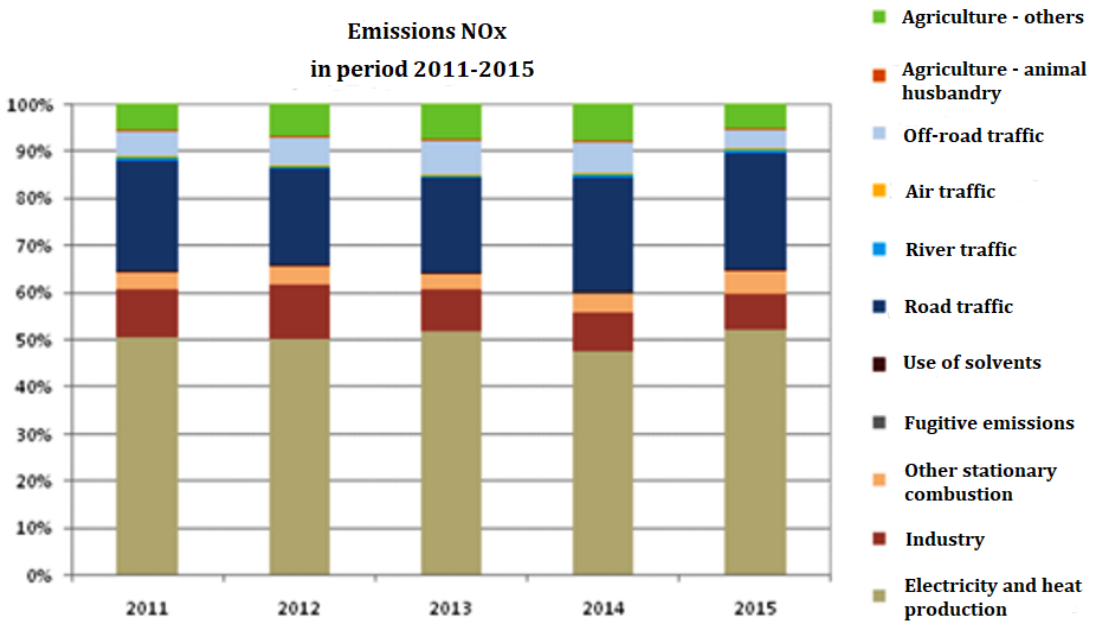

Figure 1. Area distribution of NO_x emissions (Knežević et al., 2017)

According to research of Knežević et al. (2017) the largest sources of NO_x were the production of electricity and heat (50%), road transport (20-25%), industry (8-12%), agriculture (5-8%) and rail transport (5-7%). Average annual SO_2 concentrations in Novi Sad range in acceptable ranges, which is for urban areas in developing countries (40-80 μg m^{-3}) and at the level recommended for urban areas in EU countries (6-35 μg m^{-3}), i.e. of the level prescribed by the EU. The average annual NO_2 concentrations were significantly below the limit values typical of the world's urban areas (20-90 μg m^{-3}). Average annual concentrations of soot are below the limit values, but the daily limit values in the heating season (October 15 - April 15) are regularly exceeded according to research of Malinović-Miličević et al. (2015), which implies that the combustion of gas and solid fuels has led to air pollution. The trend of increasing air pollution remains, which should alert to address the problem of air pollution in the near future. Renewable and alternative sources of energy (Santangeli et al., 2015) are imposed as one of the solutions, and when traffic is concerned with the use of bioenergy, hybrid and electric propulsion, as well as the prevention of the entry of large transport vehicles into the central city zone (Taefi et al., 2016).

There is currently no systemic use of renewable and alternative energy sources in the City of Novi Sad area, or exact data on their use. The use of energy from biomass (mostly firewood) is less represented, while the use of other energy resources (solar energy, wind energy, geothermal energy) is sporadic, with consumption that is negligible in relation to total energy consumption in the city area (Zubović et al., 2018). Such a trend is not sustainable and it is necessary to systematically encourage the introduction and increased representation of alternative energy sources in the function of reducing air pollution (Van Vuuren et al., 2017). Results obtained in research of Jevtić et al. (2014) during the period 2007-2009 showed that average daily SO_2 concentrations in Novi Sad were 16.33 μg/m^3 with a maximum of 31 μg/m^3 (36.6% observed days), while concentration of NO_2 were 19.93 μg/m^3 (44.9% observed days) with a maximum level of 137 μg/m^3. According the results of same authors indicated that pollution in the city of Novi Sad was moderate. The average daily values of SO_2 and NO_2 during the entire research period which lasted two years were below the National Standard and World Health Organization recommendations. The results of measurements of the concentration of SO_2 and NO_2 in the air of the city of Novi Sad show that the measured values are less than the annual limit value (50 μg/m^3 for SO_2 and 30 μg/m^3 for NO_2). During the summer season (April - September) average monthly concentrations are significantly below the annual limit value, which is the result of the absence of combustion of energy sources. Ašonja and Rajković (2017) analysed energy consumption of 200 large public facilities in the city of Novi Sad in the period 2013-2015 and come to the average value of greenhouse gas emissions in these facilities which was 25527.23 t CO_2/year.

RECOMMENDATIONS FOR THE IMPROVEMENT OF AIR QUALITY IN URBAN AREAS

Due to the short-term achievement of tolerant values and long-term provision of limit values for the most important aeropollutants, appropriate measures and policies need to be implemented. Specific recommendations include the following:

- The existing legislation needs to be amended, ensuring that it can more effectively influence the prevention of air pollution. It is mandatory to include impact assessments of all projects on the environment.
- Changes in policies that enable decentralization of pollution control. In accordance with the Law on Environmental Protection of the Republic of Serbia, the local self-government is obliged to continuously monitor the air pollution. Monitoring should take into account that some individuals may also be monitored (farmers, NGOs and other local networks). Air quality monitoring in the Republic of Serbia provides early warning in case of exceeding the limit values of air pollutants. Monitoring of air pollution in recent times is carried out by remote sensing - satellite remote monitoring of air quality. Mobile technology will be used for personalized information and warnings from the exposure report (Hadjimitsis et al., 2013).
- Air quality standards should reflect the interest of protecting ecosystems, rational use of resources, and the current pollution load. The Republic of Serbia has decided to incorporate air quality standards in its legislation into the EU and to develop capacities in order to reach these standards over time. The precondition for this was the establishment of a network of air quality monitoring stations, which the EU financed. In addition, the reduction of air pollution in the energy sector and energy efficiency is financed with around 100 million euros. Preventing and controlling industrial pollution and building regional waste management centres have resulted in a significant reduction in air pollution. The application of a set of laws from the European Union will enable the reduction of air pollution in the territory of the Republic of Serbia, and therefore in the area of the city of Novi Sad.
- Education of saving and rational use of energy resources, as well as on the importance of the environment and natural resources, and the strengthening of environmental awareness from the first days of schooling are needed.
- Economic instruments such as "green taxes" and trading licenses (transferable quotas) should be considered, as a method of internalizing some costs and reducing pollution, providing incentives for clean technologies and establishing a fund for promoting pollution control. Stimulating economic measures could also have a positive impact on air quality.
- Reconstruction of heating boilers in electric power plants and reconstruction of heat substations, which would increase their efficiency, and thus reduce air pollution.
- Adoption of the tariff rule and collection according to the measured energy consumption, where significant savings will be made, primarily in individual housing units.
- Thermal insulation of residential buildings will result in a significant reduction in the consumption of energy products in the heating plants, and consequently the reduction of aeropollutants with mandatory installation of environmental requirements during design.
- Use of alternative energy sources (solar collectors on buildings and individual housing units), or the use of biofuels, whose combustion has a significantly lower negative effect on air quality.
- Restrictions on the use of certain categories of motor vehicles in narrow city centres, i.e. reduction of traffic frequency.

- Use of voluntary funds, such as the regular publication of thematic programs aims to establish ethical rules of conduct of business entities. Shared information on emission sources, levels of pollutants and evidence of negative effects due to air pollution would be a key tool.
- It is important to create/expand the national air pollutant cadastre, conduct regular air monitoring, use better quality fuel, introduce mandatory use of catalysts on motor vehicles, and ecotype for vehicle inspection. The objectives of air quality monitoring are: identification of sources of pollution, measuring of exposure and assessment of health impacts, control of compliance with standards, information, as well as obtaining objective data necessary for air quality management.
- Air pollution management is a set of specific measures that are taken and implemented after pollution has been generated. However, in recent times, instead of "pollution management", it has switched to the concept of "pollution prevention" (also known as P2) (Harrington, 2013). Also, in order to establish an effective policy, it is essential to create active links between the scientific and research sectors and those who are discussing politics.
- Installations with renewable energy sources can be significantly contributed to air quality. For example, a solar photovoltaic power plant for 1 kWh produced energy would reduce greenhouse gas emissions by 0.568 kg CO_2 in the atmosphere (Pavlović et al., 2011; O 'Flaherty et al., 2009; Ašonja and Vuković, 2018).

CONCLUSION

Concentrations of air pollutants in the air of the city of Novi Sad range within acceptable limits. The trend of increasing air pollutants can be expected in the future due to the constant influx of the population into the urban environment and the steady increase in the amount of coal that is burned. During the winter, at very low temperatures, concentrations of pollutants are increased in the city. Fossil fuels used to heat households should be replaced with bioenergy and alternative fuels, primarily to reduce the concentration of SO_2 as well as other pollutants. The harmful effects of air pollution in urban areas indicate the need to provide clean air and for this purpose the proposed measures should be implemented. The concept of sustainable development must intertwine all policies and strategies for managing natural resources, as well as air. Implementation of successful air pollution control policies is needed, as well as the ability to integrate cost estimates and the use of alternative policies. Long-term comprehensive studies are needed to identify high and low risk zones of air pollution in different regions in order to develop a control policy to reduce the negative effects of air pollution. Research on pollution levels in urban areas should be continuously monitored, anticipated effects of applied environmental protection measures and defined new for the purpose of improving air quality as an important indicator of quality of life.

Finally, it is important to identify the links between this issue and other on-going discussions on local development and regional policies, as this will be the path to greater recognition of the importance of air as a natural resource and the identification of well-targeted interventions in order to reduce negative impacts.

ACKNOWLEDGEMENTS

This paper is a part of the project 501-2/2017-56B-II „Identification of basic air pollutants near gas stations in the function of improving the environmental protection of Novi Sad“, which is financed by City Administration for Environmental Protection, Novi Sad.

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