Environmental Engineering and Management Journal *March 2019, Vol.19, No. 3, 517-530*
http://www.eemj.icpm.tuiasi.ro/; http://www.eemj.eu

"Gheorghe Asachi" Technical University of Iasi, Romania

STATISTICAL APPROACH OF ENVIRONMENTAL QUALITY MANAGEMENT AND POLITICAL DECISION-MAKING AT LOCAL LEVEL: CASE STUDY IAŞI CITY, ROMANIA

Silviu Petru Grecu[1]*, Bogdan Constantin Mihailescu[1], Brindusa Mihaela Sluser[2]*

[1]"Alexandru Ioan Cuza" University, Faculty of Philosophy and Social-Political Sciences, Department of Political Sciences, International Relations and EuropeanStudies, 11 Carol I Blvd., 700506, Romania
[2]"Gheorghe Asachi" Technical University of Iasi, "CristoforSimionescu" Faculty of Chemical Engineering and Environmental Protection, Department of Environmental Engineering and Management, 73 Prof. D. Mangeron Blvd., 700050 Iasi, Romania

Abstract

Environmental quality is directly influenced by the level of pollution generated by economic, industrial or anthropogenic activities and directly affect the citizens' life quality and wellbeing, and ensuring a good status of environment it is a stringent topic that must become the major interest for the local public authorities. The main goal of this study is to evaluate the environmental quality in Iasi city, how the overall quality is influenced by the level of pollution and what are the actions and measures taken by the local authorities. Thus, the research took into consideration the level for air pollution based on PM10 measured concentration for the period 2009-2018 and is structured on three levels: 1. the impact evaluation of the particulate matter (PM10) on public health; 2. the identification and impact evaluation of the mobile and static pollution sources on air quality in Iași city and 3. the relevance and effectiveness of the local public policies for air quality management. Also, beyond political strategies the article emphasize the fact that an increased level of the green areas could improve the air quality in Iasi city. Statistical correlations reflect a weak association between the dynamics of the green areas during 2009-2018 and the level of PM10 pollutants. As rational player, interested in maximizing the votes and maintaining the political power at a constant level, the local officials develop strategies, programs and policies that should be more effective in environmental management field.

Key words: air pollution, decision making, environmental quality, Iasi local administration, public health

Received: October, 2019; Revised final: January, 2019; Accepted: February, 2019; Published in final edited form: March 2019

1. Introduction

The theory of the rational choice offers a powerful explanatory framework for political-decision making (Parsons, 2005). Thus the rational decision means to choose, in accord with convictions, the best alternatives for satisfying preferences (Elster, 1988; Elster, 2015). According to Downs' theoretical model (1957a), the rational voter is the one who gives his vote to the one whom he thinks will bring the greatest advantages, compared to the other political offers (Downs, 1957a). At the same time, according to Downs' model, political decision of those who have power, in the context of the dependence on the votes, is dominated by the desire to maximize political support, to win as many voters and to minimize electoral losses (Downs, 1957a). This fact forces rational decision-makers to correlate their political actions with what they consider that will maximize their votes (Downs, 1957b). In the absence of the information about citizens' willing, their political knowledge or their assessment of the political decisions, rational decision-makers have to investigate all these aspects (Downs, 1957b). In this process,

* Author to whom all correspondence should be addressed: e-mail: silviu.grecu@uaic.ro; bmrobu@gmail.com

political decision-makers will focus equally on the groups with a very high intensity of preferences and on the problems which could mostly influence the public opinion (Downs, 1957b). On the other hand, as Downs (1957a) points out, the rational citizen seeks to minimize the costs he has for his information, using mainly the syntheses of information, leaving others this task, or using the ideological structures for simplification (Downs, 1957a). Given the incertitude framework which characterize the sphere of the voters, political ideology could be seen as an efficient vehicle for political orientation, a kind of shortcut for rational citizens who need easy points and tools for sorting, classifying or ranking proposals, programs or political decisions, according to their own perspectives on what is good (Downs, 1957a; Freeden, 2016; Hoffman and Graham, 2006).

The perspective of being "green" involves to abandon the habits that negatively influence the ecosystems and their quality, or to limit the modern development that dominates the nature, and these are the environmentalists (Hards, 2011). In the other perspective, more extreme, the ecologists assume the eco-centrism and demand a serious rethinking of the society, a complete change of the image on the world, so that the nature, in its integrality, becomes the key-point for interpreting human actions (Hards, 2011). Human activity can no longer claim prevalence over any other activities, the limits of nature must be accepted, transformed into benchmarks and guidelines for human behavior, and, starting from these perspectives, citizen's lifestyle should be in harmony with the environment (Hards, 2011). Therefore, within the political movement of the greens, there are both a moderate tendency - which manifests itself by the will to protect, to conserve or to treat and enhance the environmental quality, for a healthy life - and an approach which considers the incremental approach as being inefficient, and which proposes major and radical changes of the modern lifestyle, of the modern social thinking and of manners of reporting to the nature (Harrison and Boyd, 2003). In this respect, we have to underline the political controversy between the ecologists and the greens, between the messages of those who advocate extreme measures against polluters, consumerism or industrialism, and the positions of those who believe that gradual reforms in current societies can take place, so that they should be friendlier with the environment (Harrison and Boyd, 2003).

Environmental issues have been set on the public agenda, being a major theme in the contemporary political debates (Jou and Dalton, 2017). Thus, concepts such as "ecological democracy" or "ecological citizenship" are already being used and developed in the field of the social and political sciences (Fischer, 2017). At the local political level, all these aspects are considered necessary tools for responding to the imperatives of the environmental concern, and for preserving and improving the democratic political process (Fischer, 2017). There is a belief that participatory ecological governance is both necessary and possible in local communities (Fischer, 2017). In recent years, it can be observed an increased level of public preferences regarding the environmental issues. In this respect, there are numerous public demonstrations, debates and concerns about environmental quality damage, organized by non-governmental organizations (NGO) that are growing and developing worldwide (Carter, 2018). For instance, Romania has a large number of NGO significantly playing in environmental protection field. Although on the official reports of the Ministry of Environment more than 1200 NGOs are listed (ME, 2016; Opincaru, 2017). However, at the local level – Iasi city, environmental issues directly affect the citizens' quality lives. Taking into account the rise of the green ideology and civic organizations for protecting the environment, the multiplication of news about the deterioration of the environment and the negative impact of the environmental quality on the public health, environmental issues must become a matter of major interest for the local public administration. Also, according to the rational choice theory, public officials are obliged to solve this public issue, for maintain and maximize their political support.

In correlation with all these premises, this study aims to measure, in terms of Downs' model of rational actor, the reaction of local political authorities of Iași city to environmental issues. One of the topics that have emerged lately in the public space of Iași is the air quality. The main environmental policies are always correlated with the local context, needs and realities (Cohen, 2018). The concern of the administration for pollution control is old, evolving with the industrial development and the need to diminish its negative effects on health and the environment, thus gradually imposing different standards of acceptability of economic practices and environmental quality (Knoepfel, 2007). There have been regulations aimed at reducing emissions, considered as pollutants, made by industry, transport or households, as well as reducing the concentrations of harmful substances existing on a certain surface (Knoepfel, 2007; Wang and Chang, 2018). More recently, in terms of urban community life, within the academic literature and administrative and local governance practices, the concept of sustainable city has been imposed, the protection of the environment remaining the main goal of this approach (Evans et al., 2005). There are studies that show that the most popular practices for achieving the sustainable development are the conservation of green, the development of the low-polluting car sector, the promotion of environmentally friendly public transport, or the development of ecological standards in the field of construction (Cohen, 2018).

A very important variable for the healthy environment is air quality. The main air pollutants analyzed by environmental experts, according to the European Standards are: particulate matter (PM2.5 and PM10), nitrogen oxides, sulfur dioxide, carbon monoxide, volatile organic compounds or ozone -

these are coming mainly from the mobile sources of transportation, various combustion, industrial processes, or construction areas that involve demolition and / or construction (Quarmby et al., 2019; Wang and Tseng, 2018). Therefore, public measures and policies are needed to implement a proper and more effective environmental management plan to reduce the air pollution, caused both by the local industry and transport activities (European Parliament, 2019). Among the most popular measures taken to improve the air quality are those related to car transportation (Quarmbyet al., 2019). In this regard, it is important to mention that the delimitation of low emission areas, where car traffic is drastically restricted; improving public transportation and biking infrastructure, so as to change the behavior related to the use of the personal car; introducing regulations on the speed of cars, encouraging the choice or switching to hybrid or electric cars; by building barriers on the side of the roads, meant to mitigate noise, as well as to retain some of the polluting elements; or by the introduction, according to careful studies, of areas and tree cover (Quarmby et al., 2019).

Related to political decision for environmental protection, academic literature emphasizes several models for research the air quality and political strategies for reducing the level of the pollutants. In this respect, in EU countries political decisions were designed for reducing the road traffic sector which is considered to be one of the most important sources of pollutants with PM10 and NO_2. Thus, the main strategies in EU space were "technical, traffic management, public transport, traffic restrictions, road construction, speed reduction, street cleaning and others. Technical measures are closely related to technological improvements to reduce emissions, for example through the investment on the progressive introduction of electric and hybrid vehicles" (Miranda et.al.,2015). Regarding the road traffic public administration could regulate the car circulation and parking. The development of the urban public transport, speed limitations and cleaning the streets are other public strategies for improving the air quality (Nagl, et.al., 2007).

European practices for increasing the air quality are based on FAIRMODE (Forum for Air Quality Modelling) community and tools. This forum is addressed to scholars and practitioners engaged in the management of the air quality for sharing different models, practices, experiences and results. In this respect, FAIRMODE aims to: create modelers of the air quality, to create protocols or tools for air management, to improve plans, policies or measures regarding the air quality and to formulate further recommendations for sustainable environmental development (Pisoni et.al.,2019). This pilot study could be seen as a good tool for air quality evaluation both for researchers/ scholars interested in environmental management and for political decision-makers engaged in designing environmental public policies. Beyond traditional factors which generate an increased level of air pollution, experts observed that green areas could have both positive and negative effects for the air quality. Many empirical studies demonstrated that vegetation characteristics could have an adverse effect of road-side vegetation on near-road air quality (Abhijith, 2017).

2. Methodology

For testing the theoretical framework, this paper aims to observe the administrative impact on both environment issues and public health. The research objectives for this study are: i. to estimate the air quality' impact on the public health considering the air quality indicator PM10; ii. to identify the main determinants of the environmental issues -air quality; iii. to measure the impact of the public policies, strategies and projects on the air quality management. Our hypothesis is that: As rational actor, local government is interested in environment issues for solving an important problem from the political agenda. Besides other political, economic or social issues, environmental issue could be seen as a major social and political problem, especially in industrialized or agglomerated cities. Also, this problem is integrated in the sphere of the "sustainable development", being a key-point in the EU regional, social and economic policies.

The research method is represented by the case study of the environmental issues in Iaşi city. In Romanian environmental assessments based on EPA Reports, Iaşi is considered one of the most polluted cities, the main problem being represented by the air quality. Regarding the health policies, scholars, physicians and officials have observed an increased number of the patients with respiratory allergy. Both academic literature and medical practices reports that the main cause for this type of immunologic response could be related to air quality. Urban agglomeration and a high level of demographic density related to different mobile or static sources of the pollution are involved in increasing the level of pollutants.

All the data are selected from secondary sources. In this meaning, we have extracted quantitative measures from the local political authorities and National Institute of Statistics. The study aims to explain the increasing level of PM10 in association with indicators from public health, geographical and ecological determinants and local public policies, strategies and projects. In this analytical framework, the level of PM10 represents the dependent variable. In a single situation PM10 indicator was used as independent variable regarding the impact of the air quality on public health. In this order, in academic literature it is pointed out by several studies which emphasize the environmental impact on the public health. Moreover, some studies underlined the impact of the administrative capacity in the sphere of the environmental issues. Scholars are interested in generating statistical or stochastically models for predicting the relation between air pollution and public health (Brunekreef and Holgate, 2002). Air pollutants are studied in relation with respiratory

diseases and immunologic responses (Seo et al., 2016). Beyond respiratory allergy, air pollution through different particulate matter (2.5 or 10) is strongly related to a high level of mortality (Pope III et al., 1992). At local level, different pollutants have a negative impact on public health. This fact generates premises for creating models and strategies for environmental security (Gavrilescu, 2009).

Regarding this negative impact of the air quality in public health, we have to stress that environmental aspects should be seen as important issues for the political agenda. Thus, academic literature had tried to create the scientific framework for different local or national strategies or policies for the environmental quality protection. Environmental studies are interested in analyzing the relation between epidemiologic impact and public policies (Anderson et al., 2012; Bell et al., 2011; Dominici et al., 2006; Olmo et al., 2011; Samet et al., 2000; Zigler and Dominici, 2014). Other studies are interested in designing multi-criteria methods for the assessment of the impact of the political decisions in environmental protection field, both in European and national political systems (Robu and Macoveanu, 2009).

Beyond the impact of the air pollution on the public health, scholars are interested in monitoring the mobile sources of pollution and administrative decisions for preserving the quality of the environment (Beattie et al., 2000; Woodfield et al., 2001). These perspectives should be related to both political ideological perspectives (ecologism or environmentalism) and administrative capacity for generating public policies (Daily et al., 2009; Groffman et al., 2006; Herrick and Sarewitz, 2000; Rom, 2012).

An important indicator for estimating the impact of the public policies on the environmental issues, especially reflected in the air quality, is represented by the green areas (ha) and urban trees cover (Novak et al., 2006). As public policies, members from EU space agree on the positive effect of the green areas for protect environment and air quality (ECE, 2007). Related to this topic it is mandatory to stress the importance of the European projects such as Horizon 2014-2020 for shaping the new political priorities in case of Air Quality or Circular Economy and Waste Management as supporting tools for sustainable development (Sluser et. al., 2017).

Another relevant factor involved in environmental decision-making is related to demography. Demographic density and geographical conditions could be several predictors for shaping a good political strategy related to environmental issues. In correlation with demographical factors, economic and social costs are relevant for environmental public policies (Chiesa et al., 2014; Greens/EFA, 2019).

Academic literature indicates several research directions for environmental policies: i. the impact of the air pollution with PM 2.5 and PM 10 on the public health; ii. the impact of the mobile sources of pollution on the quality of the air in urban areas; iii. public policies for sustaining "green economy" and green areas; iv. the impact of the demographic indicators related to urban population and demographic density; v. the relevance of the economic expenditures, GDP and social costs for sustainable development. In this empirical study, the following research variables as statistical indicators were used (Table 1):

Table 1. Research variables

c	***Symbol***	***Data Source***
1.The increasing level of the particulate matter PM10	γ	Air Quality Plan in the Municipality of Iași for PM10 Indicator, Period: 2018-2022 (http://www.primaria-iasi.ro/imagini-iasi/fisiere-iasi/1517480402-PCA_Iasi_rev_6.00_30.01.2018.pdf)
2. Respiratory allergy: ASTHMA	δ	Air Quality Plan in the Municipality of Iași for PM10 Indicator, Period: 2018-2022 (http://www.primaria-iasi.ro/imagini-iasi/fisiere-iasi/1517480402-PCA_Iasi_rev_6.00_30.01.2018.pdf)
3. Respiratory diseases: CHRONIC BRONCHITIS	δ_1	Air Quality Plan in the Municipality of Iași for PM10 Indicator, Period: 2018-2022 (http://www.primaria-iasi.ro/imagini-iasi/fisiere-iasi/1517480402-PCA_Iasi_rev_6.00_30.01.2018.pdf)
4.Respiratory diseases: EMPHYSEMA	δ_2	Air Quality Plan in the Municipality of Iași for PM10 Indicator, Period: 2018-2022 (http://www.primaria-iasi.ro/imagini-iasi/fisiere-iasi/1517480402-PCA_Iasi_rev_6.00_30.01.2018.pdf)
5. Mobile sources of the air pollution	θ_1	Air Quality Plan in the Municipality of Iași for PM10 Indicator, Period: 2018-2022 (http://www.primaria-iasi.ro/imagini-iasi/fisiere-iasi/1517480402-PCA_Iasi_rev_6.00_30.01.2018.pdf)
6. Stationary sources of the air pollution	θ_2	Air Quality Plan in the Municipality of Iași for PM10 Indicator, Period: 2018-2022 (http://www.primaria-iasi.ro/imagini-iasi/fisiere-iasi/1517480402-PCA_Iasi_rev_6.00_30.01.2018.pdf)
7. Demographic density	ε	National Institute of Statistics (http://www.insse.ro) Air Quality Plan in the Municipality of Iași for PM10 Indicator, Period: 2018-2022 (http://www.primaria-iasi.ro/imagini-iasi/fisiere-iasi/1517480402-PCA_Iasi_rev_6.00_30.01.2018.pdf)

8. Green Areas (m^2/ in. and ha.)	ϑ	National Institute of Statistics, (http://www.insse.ro/cms/) and (http://www.primaria-iasi.ro/imagini-iasi/fisiere-iasi/1517480402-PCA_Iasi_rev_6.00_30.01.2018.pdf)
9. Local expenditures for environmental protection	φ_1	Local Budget in the municipality of Iași (https://www.primaria-iasi.ro/portal-iasi/pmi/informatii-de-interes-public/97/bugetul-local)
10. Governmental subsidies for environmental protection	φ_2	Local Budget in the municipality of Iași (https://www.primaria-iasi.ro/portal-iasi/pmi/informatii-de-interes-public/97/bugetul-local)
11. Political decisions, policies and strategies regarding environment	ω	Air Quality Plan in the Municipality of Iași for PM10 Indicator, Period: 2018-2022 (http://www.primaria-iasi.ro/imagini-iasi/fisiere-iasi/1517480402-PCA_Iasi_rev_6.00_3Allergy, Asthma & Immunology Research 0.01.2018.pdf), Indicator, Period: 2018-2022
12. Public projects for environment protection and air quality	ω_1	Air Quality Plan in the Municipality of Iași for PM10 Indicator, Period: 2018-2022, (http://www.primaria-iasi.ro/imagini-iasi/fisiere-iasi/1517480402-PCA_Iasi_rev_6.00_30.01.2018.pdf)
13. Private projects for environment protection and air quality	ω_2	Air Quality Plan in the Municipality of Iași for PM10 Indicator, Period: 2018-2022, (http://www.primaria-iasi.ro/imagini-iasi/fisiere-iasi/1517480402-PCA_Iasi_rev_6.00_30.01.2018.pdf)

This study uses a time series from the 2009-2018. Moreover, all the statistical observations are the average of the monthly measured concentration values of the PM10, respiratory diseases, mobile/ stationary sources of pollution. For local expenditures and governmental subsidies for environmental protection we use the average between semi-annually reported data. In practice, if we refer to air quality indicators we should emphasize the fact that there are more than 10 observations, because we estimate the average between 12 values which characterize each month. As quantitative design, this study aims to test the relation between air quality indicators and public health, ecological perspectives and administrative capacity through several regression equations (Eqs.1-3):

$$\delta = \alpha + \beta * \gamma + u_{ij} \quad (1)$$

where uij is the coefficient of the residuals

$$\gamma = \alpha + \beta_1 * \theta_1 + \beta_2 * \theta_2 + \beta_3 + \varepsilon + \beta_4 * \vartheta + u_{ij} \quad (2)$$

where uij is the coefficient of the residuals

$$\gamma = \alpha + \beta_1 * \varphi_1 + \beta_2 * \varphi_2 + \beta_3 * \omega + \beta_4 * \omega_1 + \beta_5 * \omega_2 + u_{ij} \quad (3)$$

where u_{ij} is the coefficient of the residuals.

Regarding the mathematical models, this study aims to test through empirical data the impact of the air quality in the sphere of the public health and several implications for public decisions related to the management of the environment. In the first case we opt for a linear equation of regression between the impact of the air quality (pollution with PM10) on the public health (cases with respiratory allergies and asthma). This statistical model developed in other academic studies which stress the fact that respiratory allergies are statistically correlated with the air pollution was applied (Brunekreef and Holgate, 2002; Pope III et al., 1992; Seo et al., 2016). Although this model implies a cause-effect mechanism, we are not interested in generating a deterministic approach between pollution and asthma. Moreover, we intent to observe the real impact of the air pollution with PM10 in Iasi city on the public health. We use OLS estimator between these variables, being interested to "minimize a quantity called the residual sum of squares" (Weisberg, 2005). In practice, the paper intents to create a general and comprehensive view of the public management of the air quality in Iasi city. The second and third equations of regressions are multiple linear regressions (MLR). Thus, we use these models for observing the role played by different sources of pollution (mobile and stationary) for increasing the PM10 and the impact of the green areas for a better management of the air quality. In this respect, the last MLR reflects the role played by the political decision in shaping a good strategy/ plan for the management of the air quality in Iasi city.

3. Results and discussion

There were measured both central tendency, dispersion and statistical distribution as presented in Table 2. The dependent variable: the increased level of PM10 has the mean 40,7 and median 34,63. The high level of σ=17.22 reflects a high level of variability during 10 years. Right asymmetric distribution confirms the tendency for an increased level of PM10. Moreover the range reflects the magnitude of the phenomenon (a high level of pollution and reduced quality for the air in Iasi city in the last decade). Also, the impact on the public health is reflected by the average of the asthma: 608 and chronic bronchitis: 831. High levels of the variances and standard deviances present the magnitude of the respiratory allergies and diseases in Iasi city. Regarding the green areas we should stress the fact that there are several variations in the green areas surfaces from 682 ha in 2009 to 695 ha in 2017-2018. The same significance could be introduced to

economic variables (local expenditures and governmental subsidies for environmental protection). In practice the mean of 2.23% from the local budget is intended for secure and protect the natural environment. In the Tables 2 and 3 are presented all the descriptive statistic measures for the research variables.

3.1. Air quality and public health issues on the local political agenda

Regarding the first objective of the case study: "to estimate the air quality' impact on the public health", this work underlines the fact that there is a middle association between the increased level of the particulate matter PM10 and respiratory allergy as asthma. The County Department of the Public Health has reported an increased number of respiratory allergies generated by air pollution. This increased level of respiratory allergies and diseases is reflected by the statistical measures as: 455 patients in 2010 and 582 patients in 2014.

Thus, it can be estimated an increased level with 27% of respiratory allergies from the beginning of the time series.

Table 2. Descriptive Statistics for Research variables: Environmental Quality, public health and local expenditures for environmental protection

		Increasing of particulate matter PM10 level	***Respiratory dieses: asthma***	***Respiratory dieses: chronic bronchitis***	***Respiratory dieses: emphysema***	***Mobile source air pollution***	***Local expenditures for environmental protection***
N		10	10	10	10	10	10
Mean		40.71	608.14	831.28	63.0000	93.06	2.28
Median		34.63	582.00	700.00	62.0000	92.90	2.44
Mode		26.00[a]	582.00	607.00	44.00[a]	43.12 [a]	.11 [a]
Std. Deviation		17.22	162.62	446.50	29.96665	39.03	1.53
Variance		296.60	26446.47	199364.23	898,000	1523.54	2.36
Skewness		2.01	1.42	2.57	1.759	-0.07	0.98
Std. Error of Skewness		0.68	0.79	0.79	0.794	0.84	0.71
Kurtosis		4.02	2.64	6.70	3.658	-2.08	2.30
Std. Error of Kurtosis		1.33	1.58	1.58	1.587	1.74	1.40
Range		57.00	481.00	1230.00	90,00	91.92	5.46
Percentiles	25	31.62	455.00	607.00	44.0000	55.33	1.26
	50	34.63	582.00	700.00	62.0000	92.90	2.44
	75	43.20	672.00	732.00	69.0000	135.01	2.85

Table 3. Descriptive Indicators: Governmental subsidies for environmental protection, green areas, sources of pollution and projects for increasing the quality of the environment

		Governmental. subsides for environmental protection	***Green areas (M2/IN)***	***Green areas (ha)***	***Demography***	***Political decisions, policies and strategies regarding environment***	***Public projects for environment protection and air quality***	***Private projects for environment protection and air quality***	***Surface sources of air pollution***	***Stationary sources of air pollution***
N		10	10	10	10	10	10	10	10	10
Mean		1.37	23.02	685.55	345907.66	7.12	6.12	0.88	46.66	12.70
Median		0.00	22.70	682.00	341503.00	6.50	4.50	1.00	20.60	3.48
Mode		0.00	22.70	682.00	334124,00[a]	5,00[a]	3,00[a]	0.00	15,15[a]	3,10[a]
Std. Deviation		2.39	0.55	5.50	12396.88	3.48	3.39	1.05	49.94	16.30
Variance		5.74	0.31	30.27	153682748.25	12.12	11.55	1.11	294.17	265.86
Skewness		1.98	1.56	1.40	0.38	0.51	0.76	1.09	1.70	1.73
Std. Error of Skewness		0.71	0.71	0.71	0.71	0.75	0.75	0.71	1.22	1.22
Kurtosis		3.80	0.63	0.31	-1.992	-1.270	-1.368	0.611		
Std. Error of Kurtosis		1.40	1.40	1.40	1.40	1.48	1.48	1.40		
Range		7.00	1.30	130	28018.00	9.00	8.00	3.00	89.10	28.43
Percentiles	25	0.00	22.70	682.00	334374.50	4.25	3.25	0.00	15.15	3.10
	50	0.00	22.70	682.00	341503.00	6.50	4.50	1.00	20.60	3.48
	75	2.54	23.42	690.00	360071.00	11.00	10.25	1.50		

If in a low rate of the increased level of PM10 was observed, in 2017 are reported very high values (83) (Fig.1). Moreover, the air quality protection for citizens should mandatorily involved the public administration at central and local level.

The association between the increased level of PM10 and public health is explained through the statistical model which reflects with R2= 0.743 and adjusted R2 = 0.691, the middle positive correlation between respiratory diseases and the increased level of particulate matter PM10. Although, there was obtained a positive correlation between PM10 and asthma, and could not be proposed a cause-effect model between air quality and respiratory allergies or diseases. Moreover, in medical literature asthma has different biological causes and conditions, but the air quality could be seen as a favoring factor. The increased level of PM10 could be seen as a risk factor for people who have different forms of respiratory allergies. In this context, scholars have observed that asthma depends on the social, ethnical, biological factors and the quality of the environment. Empirical studies demonstrated that the air quality is one of the risk factors in generating respiratory allergies (Eggleston, 1999). In this context, the coefficient of correlation between the increased level of PM 10 and chronic bronchitis (t=4,636, p=0.006) was measured. The same result is incident for the statistical association between pulmonary emphysema and the increased level of PM10 (t=3.29; p=0.022). In the Fig. 2 the graph presents the association between asthma and the increased level of PM10.

Although, the increased level of PM10 is associated to the increased level of respiratory diseases (asthma or chronic bronchitis) and there cannot be created a deterministic relation between these variables. Moreover, there are in progress studies to emphasize the impact of the air quality on the public health in Iasi city. In the Fig. 1 is displayed the increased level of particulate matter PM10 in Iași city during 2009-2018 and in Fig. 2 the correlation between PM10 pollution and asthma disease.

3.2. Green areas and the air pollution level

In accordance to the second objective of the empirical case study: "to identify the main determinants of the environmental issues, especially of the air quality", the relation between sources of the air pollution (both mobile and static sources), geographical determinants and ecological perspectives related to the magnitude of the green surfaces (both in ha and m^2/ inhabitant), was measured.

Although empirical evidence suggested a nonlinear dynamic of the mobile sources of the air pollution, and this could be due to the fact that urban traffic is one of the major components of the increased level of particulate matter (PM10). Regarding the dynamics of the green areas there is a small variation with 682 ha and 22.7 m^2/ inhabitant in 2009 and 695 ha and 24 m^2/ inhabitant in 2018 (Fig. 3). In the Fig. 4 is displayed the dynamics of the green surfaces in Iasi city during 2009-2018.

Thus, if mobile and static sources of the air pollution aren't significant at the $p < 0.05$, green areas could be a predictor (with middle values of the statistical correlation) for estimating the dynamics of the particulate matter PM10 in this geographical area. The statistical model has R2= 0.277 and standardized β=0.526 between the dynamics of the green areas (both m^2/ inhabitant and ha) and the pollution with PM10. In practice, a weak to medium association between green areas and the dynamics of the PM10 could be noticed. In this respect, an increased level of the public administration for increasing the green areas should be one of the environmental strategies in Iași city.

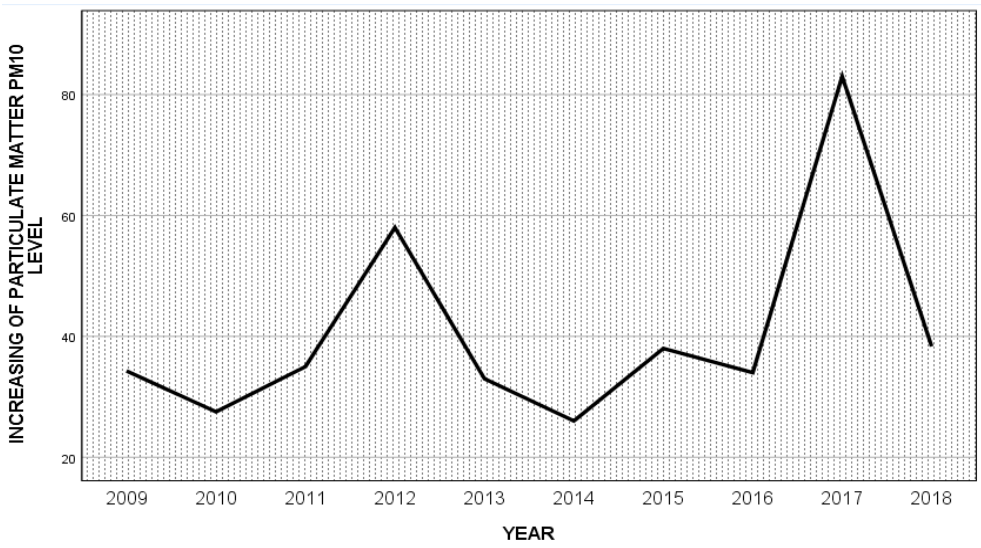

Fig. 1. The Increasing level of particulate matter PM10

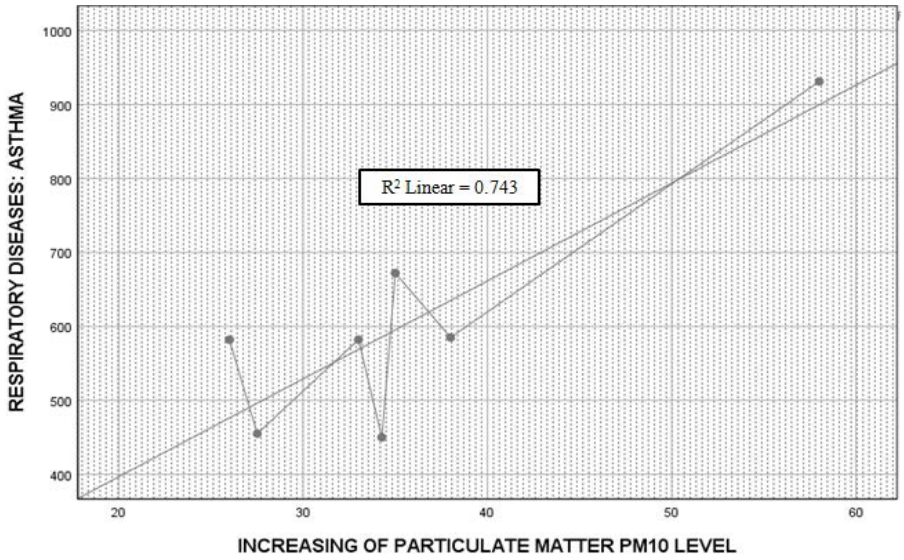

Fig.2. Correlation between Particulate Matter PM10 and Asthma

If the situation of the green areas at the national level is analyzed can be observed that in Bucharest are reported 4506 ha for 2 108 056 inhabitants, in Baia Mare (Maramureș County) are reported 1747 ha for 148 027 inhabitants, in Craiova (Dolj County) are reported 1040 ha of green areas for 306257 inhabitants, while in Cluj-Napoca (Cluj County) are reported 814 ha of green areas for 321337 inhabitants. In this context, Iasi city has a middle position in the top of the main Romanian cities, with a high level of green areas and green surfaces measured in m^2/ inhabitant (Fischer, 2017; Iordache and Șoșea, 2017). In the Fig. 4 is described the association between the dynamics of the green areas and PM10 pollution.

Beyond these statistical perspectives there should be observed that the highest density of the green areas is around the Iasi city. The Fig. 5 presents both the maps for administrative delimitation of the Iasi city and the quality of the air and green surfaces. In this respect, around Iași city there are several green forests such as: Breazu (in North-West), Șorogary (hill and forest in North), Valea Lupului (in West), Valea Adâncă (South-West) and Tomești (South-East). Within the Iasi city there are few surfaces with green areas in the West and North West part of the city (Copou Area) and several small surfaces in the center and southern part of the city. Fig. 5 displays both administrative and environmental maps of the Iași city.

3.3. Environmental policies, strategies and plans. The Nexus between public administration and Social Corporative Responsibility

Related to the third empirical objective of the case study, we measure the impact of the public policies, strategies and projects on the air quality management.

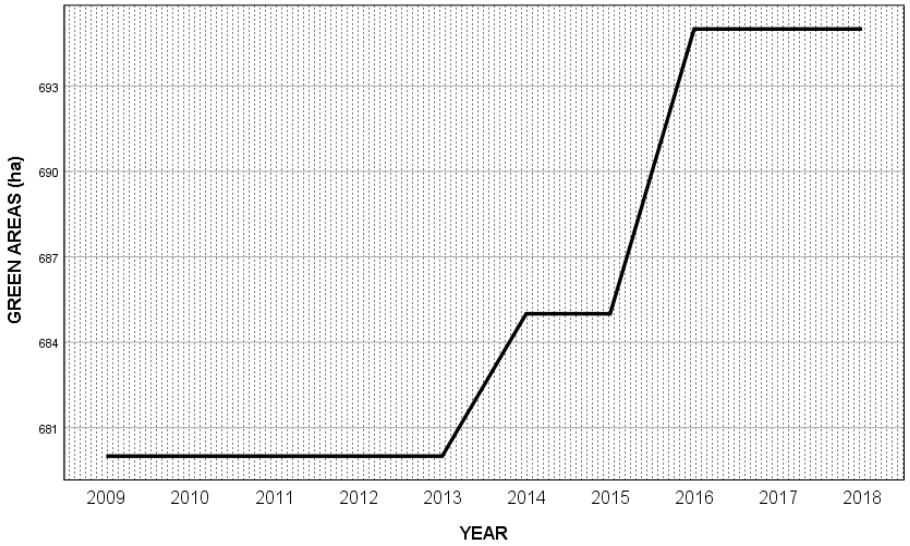

Fig. 3. The dynamics of green areas in Iasi city during 2009-2018

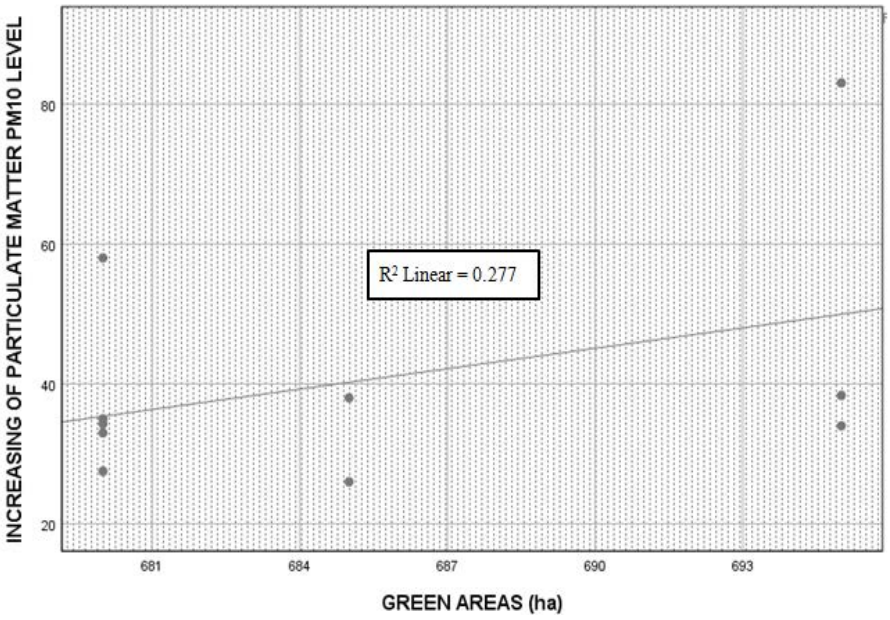

Fig. 4. The association between the particulate matter PM10 and Green areas (ha) in Iași city

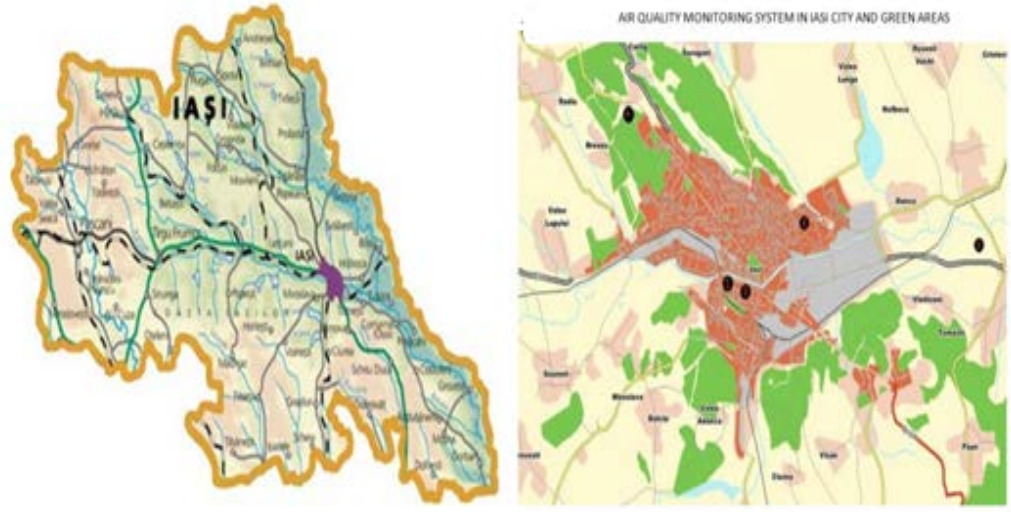

Fig. 5. Administrative map and green areas in Iași city

In this respect, the research aims to identify the association between local and governmental expenditure for environment protection, especially for the air quality, and the increased level of particulate matter PM10. In practice, we have extracted data from the local budget between 2010-2018, for estimating the percent from the local expenditures for environment protection and air quality. If in 2010 for environmental protection is allocated the value of 34,94070 RON (5,57%), in 2017 in financial public administration reports is mentioned the value of 17.565,34 RON (2,44%). Thus, local authorities allocate an average of 2,55%, with a standard deviation of 1.39% of the local expenditures for preserving and protecting the environmental quality. The lowest value of the local expenditure for protecting environment was allocated in 2013 (0.83%). Starting with 2016, an increased level of the local expenditures for the protection and management of the environment is registered. Thus, it is underlined the fact that in the period 2015-2016 environmental issues were considered important for the local public agenda. These budgetary policies were related both to medical reality and citizens' need for “clean air” and “clean city”. Although this matter hasn’t a definite solution, the presence of the Air Quality Plan in the Municipality of Iași for PM10 Indicator (Air Quality Plan, 2018, http://www.primaria-iasi.ro/imagini-iasi/fisiere-iasi/1517480402-PCA_Iasi_rev_6.00_30.01.2018.pdf) could be seen as a qualitative indicator for administrative interest in environmental dimension. Regarding the

governmental subsidies for environmental protection, in the local budget financial structure can be observed a rate of 3,23% for the year 2010 and 0,30% for the year 2016. Beyond the national interest in conserving and protecting environment, all statistical data reflect the local authority's responsibilities for shaping the optimal strategies and projects for preserving environment and air quality in Iași city. The Fig. 6 presents the dynamics of the local expenditure for environmental protection during 2010-2017.

The administrative capacity for shaping environmental policies, strategies and projects reflects the political dimension of the ecological perspective. The lowest percentages from local budget allocated for environmental protection are reflected in a poor management of the air quality.

Public administration reports a total number of 49 public projects, decisions and strategies during the period 2010-2017. Moreover, at the descriptive level, there is an average of 6 public projects/actions per year, regarding both environmental protection and air quality. For completing the public administrative capacity in the management of the environment, a total number of 8 projects/actions initiated by the private corporations can be mentioned. The main political actor for generating and implementing environmental strategies for the management of the air quality is represented by the Iași local administration, in cooperation with several governmental specialized agencies. From the private sector, the main actor involved in the management of the environmental quality can be mentioned companies that developed and implemented actions/activities for waste management or circular economy.

Local authorities have developed strategies for fluidization of the car traffic, strategies for new parking places, projects for developing bicycle routes, strategies for encouraging "green industry" and the modernization of the road infrastructure, as well as ecological actions for preserving green areas. Although there isn't a strong relation between public policies and the decreasing of PM10 level, even there is an interest of the local administration for the environmental management (Fig. 7). Fig. 8 displays the dynamics of the projects for environment developed both by local authorities and private actors.

In comparison public to private, there are significant differences between public and private projects for environmental protection and air quality. One of the most important actions which could be implemented by the local authorities for an optimal management of the environment should be represented by the partnership between public political actors and corporations. This kind of partnership will encourage the development of the social corporative responsibility, emphasizing the environmental component and new opportunities for "green economy" or "green industry". But, beyond this partnership, the main role in the environmental management should be attributed to the public administration (t=5.097, p=0.01), which has both judicial and political resorts for elaborating, implementing and evaluating the environmental policies. The main significant variable which reflects a stationary statistical model is represented both by an increased level of budgetary funds allocated for optimization of the air quality (p=0.05) and an increased number of political decisions regarding the environment (p=0.09), ARIMA model with R^2= 0.66. According to the method for prediction previously described (Tables 2 and 3), it is emphasized the fact that, with a middle level of likelihood, an increased level of budgetary funds allocated for environmental protection, in association with the partnership between public and private social and economic actors, based on social corporative responsibility, could be an optimal strategy for sustainable development in Iași city (Table 4).

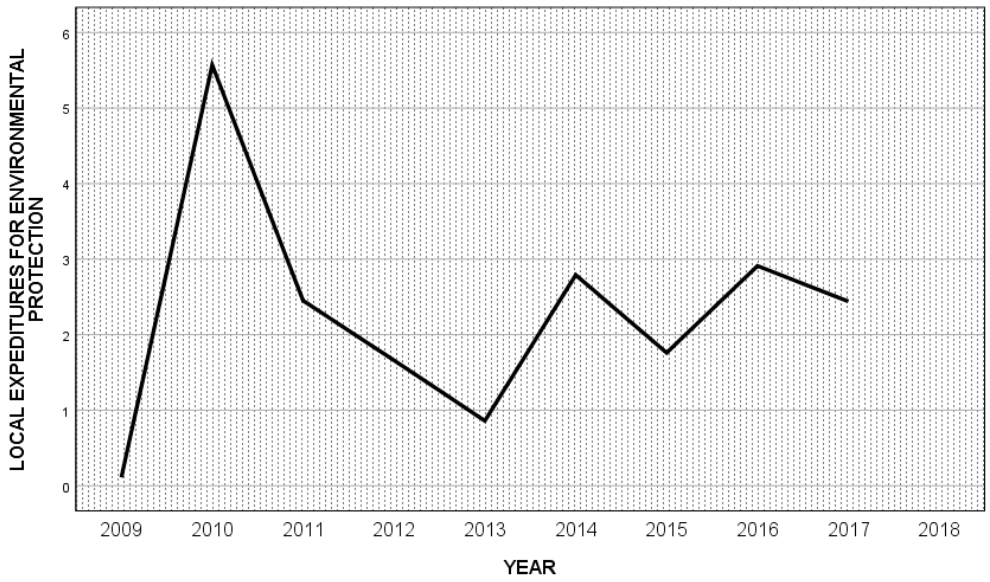

Fig. 6. Local Expenditure for Environmental Protection in Iași city (2010-2017)

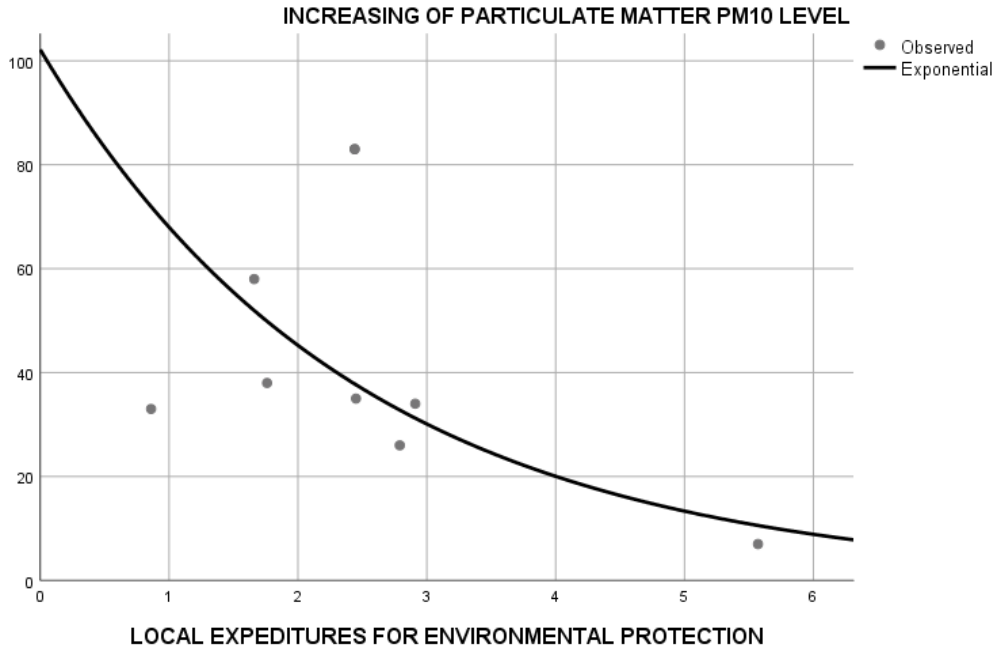

Fig. 7. The dynamics of the particulate matter PM10 and local expenditures for environmental protection

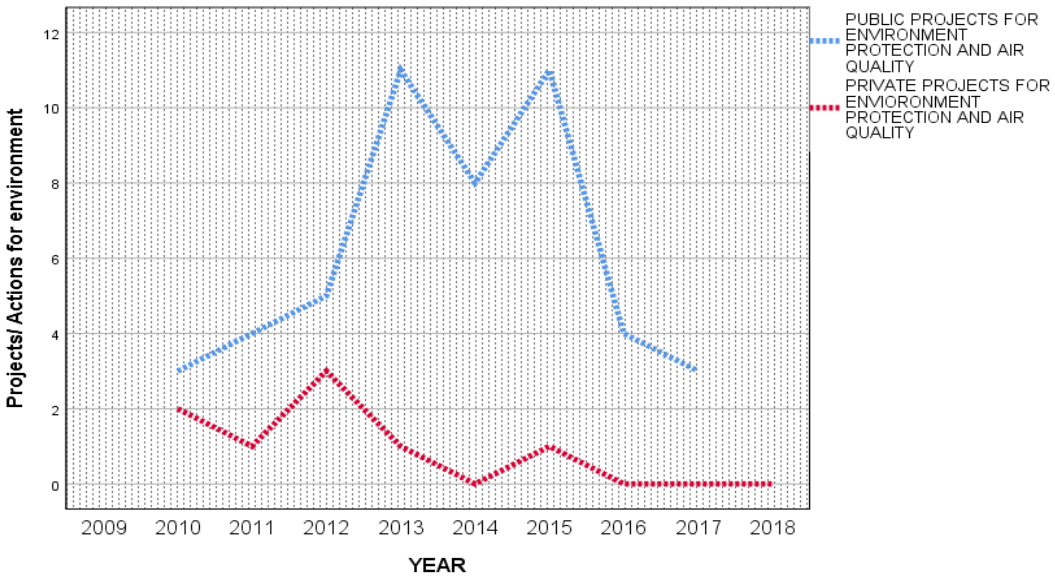

Fig. 8. Local Public/ Private Projects for Environmental Protection and Air Quality

This case study shows that the influence of PM10 pollution on air quality in Iasi city is associated to the respiratory diseases and allergies. Moreover, this social situation should be an important topic of discussion and analysis for local public administration. Even from 2014-2015, in administrative practices there can be observed an increased interest level of County Department for Public Health, Local Environmental Protection Agency, Local Council and stakeholders. Starting from these empirical findings, can be mentioned that the public investments for developing new green areas, associated to an increased level of percentages from local budget and the partnership between public and private economic factors, could be several strong points in establishing an effective environmental management.

4. Conclusions

This paper aimed to stress the relevance of the environmental protection issues for local public administration, the need and the perspectives, and, a new analytical framework, based on statistical modeling of the environmental policies and air quality management at the local level in Iași city was developed. Thus, the main environmental issues in Iași city through an interdisciplinary perspective based on political ideology, environmental perspective and statistical models were analyzed.

Table 4. ARIMA statistical model for explaining the management of the Air Quality in Iași city

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob*
C	114.7447	28.55123	4.018907	0.0159
LOCAL EXPEDITURES	-15.98043	5.969845	-2.676858	0.0554
PUBLIC PROJECT	-5.280456	2.449488	-2.155739	0.0974
PRIVATE PROJECT	-2.321949	6.177743	-0.375857	0.7261
R-squared	0.660096	Mean depended var		39.25000
Adjusted R-squared	0.405168	S.D. depended var		22.57527
S.E. of regression	17.41126	Akaike info criterion		8.858964
Sum swuaredresid	1212.608	Hannan-Quinn criter.		8.898685
Log likelihood	-31.43586			8.591064
F-statistic	2.589311	Durbin-Watson stat		2.503920
Prob (F-statistic)	0.190259			

The methodology considered a new approach as a cross-statistical analysis between political variables, public health indicators, environmental perspectives and social outcomes. The main results of this study emphasized the fact that the environmental issues in Iași city are relevant for local public administration. However, in the last years we observed the administrative interest for solving environmental issues, in conditions in which Iași city is one of the most polluted geographical areas from Romania. This topic is present on public agenda, local authorities generating an operational plan and strategy for ameliorating the air quality. But the administration is obliged to pay very much attention to its plans, so that these plans should be applied, and sufficiently ambitious.

At the empirical level, we have stressed several strong positive associations between air quality and respiratory diseases. In this respect, public health has to be a major concern both for local and national political strategies and legislation. Green cover, measured in m^2/ inhabitant, is related to the air quality. Several budgetary reconsiderations for the environment protection, associated to social corporative responsibility in the field of the partnership between public administration and private stakeholders could be a key-point in sustaining "green industry" and sustainable development.

This study has several limitations that derive from the access to the dataset regarding statistical indicators for a long time. Moreover, the functional model based on linear or multi linear equations of regressions could be seen as limitation of the statistical and methodological tools. This article is a radiography of the air quality in Iași city, reflecting that environmental issues are important, from the rational choice perspective, for local public administration. Another limitation is generating by the lack of the predictive models.

It is very difficult to predict political behaviors of the political decision-makers related to environmental policies. Secondary dataset creates us the opportunity of describing several conditions and effects of the air pollution in Iași city. Further studies will focus on the relation between PM2.5 pollution and the impact on public health considering the environmental protection framework in Iași city. The chemical compositions of the PM10 and their associations with the public health indicators could be more comprehensive for understanding the real impact on air quality and for shaping decisions models for public administration.

All statistical results indicate the role played by the local authorities in generating environmental policies for reducing PM10 level that has negative consequences on public health. New electoral cycle 2020-2024 could be seen as a political vector for create new environmental responsibilities for local political actors. As rational actor, interested in maximizing the votes and conserving political power, local officials should develop strategies, programs and policies for a better management of the environment. Beyond the public-private partnership, we agree that a better coordination between health, transport and environmental policies could be a key-point for local political authorities.

References

Anderson O.J., Thundiyil G.J., Stolbach A., (2012), Clearing the air: A review of the effects of particulate matter air pollution on human health, *Journal of Medical Toxicology*, **8**, 166-175.

Abhijith K.V., Prashant K., Gallagherc J., McNabolac A., Baldaufe R., Pillag F., Broderickc B., Di Sabatinoh S., Pulvirentii B., (2017), Air pollution abatement performances of green infrastructure 1 in open road and built-up street Canyon environments – A review, *Atmospheric Environment*, **162**, 71-86.

Beattie I.C., Longhurst J. W.S., Woodfield N.K., (2000), Air quality management: challenges and sollutions in delivering air quality action plans, *Energy and Environment*, **6**, 729-747.

Bell L.M., Cifuentes L.A., Davis D.L., Cushing E., Telles A., Gouveia N., (2011), Environmental health indicators and a case study of air pollution in Latin American cities, *Environmental Research*, **111**, 57-66.

Brunekreef B., Holgate S.,(2002), Air Pollution and Health, *The Lanced*, **360**, 1233-1242.

Carter N., (2018), *The Politics of the Environment*: *Ideas, Activism, Policy*, Cambridge University Press, Cambridge.

Chiesa M., Perrone M.G., Cusumano N., Ferrero L., Sangiorgi G., Bolzacchini E., Lorenzoni A., Denti A.B., (2014), An environmental economical and socio-political analysis of a variety of urban air pollution reduction policies for primary PM10 and NOx: The

case study of the province of Milan (Northern Italy), *Environmental Sciences and Policy*, **44**, 39-50.
Cohen S., (2018), All environmental politics is local, *Sustain, a Journal of Environmental and Sustainability Issues*, **37**, 8-15.
Daily C.G., Polasky S., Goldstein J., Kareiva M.P., Mooney A.H., Pejchar L., Ricketts H.T., Salzman J., Shallenberger R., (2009), Ecosystem services in decision making: Time to deliver, *Frontiers in Ecology and the Environment*, **7**, 21-28.
Dominici F., Peng D.R., Bell L.M., Pham L., McDermott A., Zeger L.S., Samet M.J., (2006), Fine particulate air pollution and hospital admission for cardiovascular and respiratory diseases, *JAMA*, **10**, 1127-1134.
Downs A., (1957a), *An Economic Theory of Democracy*, Harper&Row Publishers, New York.
Downs A., (1957b), An economic theory of political action in a democracy, *The Journal of Political Economy*, **65**, 135-150.
ECE, (2007), Strategies and policies for air pollution abatement review prepared under the Convention on long-range transboundary air pollution, Economic Commission for Europe, On line at: www.unece.org
Elster J., (1988), *The Nature and Scope of Rational-Choice Explanation* In: *Science in Reflection*, Ullmann-Margalit E. (Ed.), Kluwer Academic Publishers, Dordrecht, Boston, London, 51-65.
Elster J., (2015), *Explaining Social Behavior: More Nuts and Bolts for the Social Sciences*, Revised edition, Cambridge University Press, Cambridge.
Eggleston P.A., Buckley T.J., Breysse P.N., Wills-Karp M., Kleeberger S.R., Jaakkola J.J., (1999), The environment and asthma in U.S. inner cities, *Environmental Health Perspectives*, **107**, 439-450.
European Parliament (2019), Parliament starts new term with seven political groups, On line at:https://www.europarl.europa.eu/news/en/hearings2019/parliament-leadership-2019/20190612STO54311/parliament-starts-new-term-with-seven-political-groups.
Evans B., Joas M., Sundback S., Theobald K., (2005), *Governing Sustainable Cities*, Earthscan, London.
Fischer F., (2017), *Climate Crisis and the Democratic Prospect: Participatory Governance in Sustainable Communities*, Oxford University Press, Oxford.
Freeden M., (2016) The resurgence of ideology studies: Twenty years of the JPI, *Journal of Political Ideologies*, **21**, 1-8.
Gavrilescu M., (2009), Behaviour of persistent pollutants and risks associated with their presence in the environment - integrated studies, *Environmental Engineering and Management Journal*, **6**, 1517-1531.
Greens/EFA (2019), The Greens/EFA group in the European Parliament, On line at:http://extranet.greens-efa-service.eu/public/media/file/1/6078.
Groffman P.M., Baron J.S., Blett T, Gold J.A., Goodman I., Gunderson L.H., Levinson M.B., (2006), Ecological thersholds: the key to successful environmental management or an important concept with no practical application?, *Ecosystems*, **9**, 1-13.
Hards S., (2011), *Ecologism*, In: *Green Politics: An A-to-Z Guide*, Mulvaney D., Robbins P. (Eds.), SAGE, Los Angeles, London.
Harrison K., Boyd T., (2003), *Understanding Political Ideas and Movements*, Manchester University Press, Manchester and New York.
Herrick C., Sarewitz D., (2000), Ex post evaluation: a more effective role for scientific assessments in environmental policy, Science, *Technology and Human Values*, **25**, 309-331.
Hoffman J., Graham P., (2006), *Introduction to Political Ideologies*, Pearson Longman, Harlow.
Iordache C., Șoșea C., (2017), Urban green areas from south west development region Oltenia: Typology and dynamic, *Archives of Oltenia, New Series*, **31**, 413-426.
Jou W., Dalton J.R., (2017), Left-Right Orientations and Voting Behavior, *Oxford ResearchEncyclopedia of Politics*, doi: 10.1093/acrefore/9780190228637.013.581.
Knoepfel P., (2007), *Environmental Policy Analyses: Learning from the Past for the Future - 25 Yearsof Research*,Springer, Berlin and New York.
Miranda A., Silveira C., Ferreira J., Monteiro A., Lopes D., Relvas H., Borrego C., Roebeling P., (2015), Current air quality plans in Europe designed to support air quality management policies, *Atmospheric Pollution Research*, **6**, 434-443.
ME, (2016), Ministry of Environment, On line at:http://www.mmediu.gov.ro/articol/date-de-contact-ong/1293.
Nagl C., Moosman L., Schneider J., (2007), Assessment of Plans and Programmes Reported under 1996/62/EC, Final Report, Report No. 0079,Vienna, On line at: https://www.umweltbundesamt.at/fileadmin/site/publikationen/REP0079.pdf.
Novak J.D., Crane D.E., Stevens J.C., (2006), Air pollution removal by urban trees and shrubs in the United States, *Urban Forestry & Urban Greening*, **4**, 115-123.
Olmo N.R.S., Saldiva P. H., Braga A.L., Lin C., Santos U., Pereira L.A., (2011), A review of low-level air pollution and adverse effects on human health: implications for epidemiological studies and public policy, *Clinics*, **66**, 681-690.
Opincaru I.S., (2017), *Activity Rate and Activity Areas of Non-Governmental Organizations*, In: *Romania 2017 Non-governmental Sector - Profile, Trends, Challenges*, Kivu M. (Ed.), Foundation for the Development of Civil Society, Bucharest, Romania, 25-30.
Parsons S., (2005), *Rational Choice and Politics*, Continuum International Publishing Group, London.
Pisoni E., Guerreiro C., Lopez-Aparicio S., et al., (2019), Supporting the improvement of air quality management practices: The "FAIRMODE pilot" activity, *Journal of Environmental Management*, **245**, 122-130.
Pope III A.C., Schwartz J., Ransom R.M., (1992), Daily mortality and PM10 Pollution in Utah Valley, *Archives of Environmental Health: An International Journal*, **47**, 211-217.
Quarmby S., Santos G., Mathias M., (2019), Air quality strategies and technologies: a rapid review of the international evidence, *Sustainability*, **11**, 1-18.
Robu B., Macoveanu M., (2009), Strategic environmental assessment for plans, programs, policies in Romania: multi-criterial method, *Environmental Engineering and Management Journal*, **6**, 1451-1456.
Rom N.W., (2012), *Environmental Policy and Public Health Air Pollution, Global Climate Change and Wilderness*, Jossey-Bass, San Francisco, USA.
Samet M.J., Dominici F., Curriero C.F., Coursac I., Zeger L.S., (2000), Fine particulate air pollution and mortality in 20 US cities, 1987-1994, *The New England Journal of Medicine*, **24**, 1742-1749.
Seo S.C., Kim D., Min S., Paul C., Joo Y., Choung J.T., (2016), GIB - based association between PM10 and allergic diseases in Seoul: implications for health and

environmental policy, *Allergy, Asthma & Immunology Research*, **8**, 32-40.
Sluser B., Șchiopu A. M., Bălan C., Pruteanu M., (2017), Postclosure influence of emissions resulted from municipal waste dump sites: a case study of the north-east region of Romania, *Environmental Engineering and Management Journal*, **16**, 1017-1026.
Wang N.N., Chang Y.C., (2018), Effectiveness of low-carbon governance implementation in China, *Environmental Engineering and Management Journal*, **17**, 601-609.
Wang H.C., Tseng C.H., (2018), Health damages from indoor air pollution quantified using a novel office building diagnosis methodology, *Environmental Engineering and Management Journal*, **17**, 2061-2069.
Weisberg S., (2005), *Applied Linear Regression*, Wiley – Interscience, John Wiley & Sons, New Jersey.
Woodfield N.K., Longhurst J.W.S., Beattie C.I., Laxen D.P.H., (2001), Emerging political and collaborative decision-making, frameworks for designating air quality management areas (AQMAs) in the UK: implications for future air quality action plans (AQAPs), *Transactions on Ecology and Environment*, **47**, 285-294.
Zigler M.C., Dominici F., (2014), Point: Clarifying policy evidence with potential-outcomes thinking- Beyond exposure- response estimation in air pollution epidemiology, *American Journal of Epidemiology*, **15**, 1-8.

Web sites:

http://www.primaria-iasi.ro/imagini-iasi/fisiere-iasi/1517480402-PCA_Iasi_rev_6.00_30.01.2018.pdf
http://www.insse.ro
https://www.primaria-iasi.ro/portal-iasi/pmi/informatii-de-interes-public/97/bugetul-local.
http://calitateaer.ro/public/home-page/?__locale=ro