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Green System and Air Quality in Sevlievo Town, Bulgaria

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Abstract. Green system and urban dendroflora can affect air quality in the following ways: (*i*) converting carbon dioxide to oxygen through photosynthesis; (*ii*) intercepting particulate pollutants (PM_{10}, dust, ash, pollen and smoke) and absorbing toxic gases such as ozone, sulphur dioxide, and nitrogen dioxide, (*iii*) emitting various volatile organic compounds contributing to ozone formation in cities (*iv*) lowering local air temperatures (*v*) reducing building temperature extremes in both summer and winter and consequently reduce pollution emissions from power-generating facilities. The aim of this study was to investigate the regulating service of urban dendroflora as a depot of carbon and the role of the green system as a reducer of dangerous for people PM_{10}. In 2017 of the territory of Sevlievo Town were investigated 2555 trees of 45 species taxonomically belonging to 16 families and 30 genera. In 2019 using Huber's simple formula the trees biomass, biomass energy, absorbed CO_2 and accumulated carbon of trees biomass in the streets, quarters and parks were calculated. The total biomass of the dendroflora in Sevlievo Town was found to be equal to 2892.65 t. The total carbon dioxide (CO_2) in urban trees was 1446.33 t; the separated oxygen (O_2) was 542.37 t and the accumulated carbon (C) was 394.45 t. PM_{10} in Sevlievo Town have high daily concentrations above the LD50.

Key words: urban dendroflora, CO_2, climate change, PM_{10}.

Introduction

According to the urban impacts, the planet becomes more and more an urban system - many cities and their inhabitants are facing heat stress, pollution and growing disconnection with the biosphere. Improving sustainability in urban areas should be thus a major goal on the local and global policy. However, the extent to which urban green system can offer relevant solutions to these challenges is rarely considered in ecosystem service assessments, and therefore unknown to decisionmakers (Baro, 2016). Cities are major hubs for economic and business opportunities and centralize many basic human services such as healthcare and education. Although urban areas still cover a relatively small proportion of the terrestrial land surface of the planet (estimates range from 0.2% to 2.4% circa 2000, according to Potere & Schneider, 2007), they have disproportionate environmental impacts well beyond their borders, affecting ecosystems at the local, regional, and global scales (Grimm *et al.*, 2008; Seto *et al.*, 2012).

Many cities worldwide are vulnerable to the environmental extremes such as droughts, (coastal and inland) flooding or heatwaves because their frequency and magnitude is rising due to climate change (Revi *et al.*, 2014). Pollution and other disturbances (e.g., noise) generated in cities

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have also direct and sometimes dramatic health impacts on the urban population (Brunekreef & Holgate, 2002; WHO, 2014). Many urban dwellers also suffer the manifold negative effects of sedentary lifestyles, social exclusion and increasing disconnection with the biosphere's ecological dynamics (Andersson *et al.*, 2014).

Human impacts on ecosystems reflect on their functions and processes, as well as – on "their direct and indirect contributions to human well-being" (TEEB, 2010) or providing ecosystem goods and services, which were classified into four main categories: provisioning, regulating, cultural and supporting or habitat services (MEA, 2005; TEEB, 2010).

Provisioning ecosystems services include all the material goods obtained from ecosystems, such as food, fiber, fresh water or medicinal resources. These services of forest ecosystems only contribute directly to the world economy, estimated at 1% of the world's gross product and 3% of world trade. Regulating ones include all the ways in which ecosystems can mediate or moderate the ambient environment, including climate regulation, moderation of extreme events, erosion prevention or biological control. Cultural ones are the non-material outputs of ecosystems that affect physical and mental states of people, for example through spiritual experience, recreation, aesthetic appreciation or sense of place. Finally, supporting or habitat ecosystem services are defined as the ecological processes and functions that are necessary for the production of the previous, including habitat for species and maintenance of genetic diversity.

Urban ecosystems are considered in a good condition if the living conditions for humans and urban biodiversity are good (Maes *et al.*, 2016). This means, among others, a good quality of air and water, a sustainable supply of ecosystem services and a high level of urban species diversity. Important pressures on urban ecosystems are unsustainable land take, air and water pollution, noise, and unwanted introductions of invasive alien species. (Maes *et al.*, 2018). Air conditions are part of the regulating ecosystem services (Harmens *et al.*, 2014). The evaluation of climate and air quality related ecosystem services of urban trees is an important task (Kiss *et al.*, 2015). On the other hand, urban dendroflora stands modify the city's air quality by sequestration of carbon dioxide and removal of various air pollutants – PM_{10}, and by reducing stormwater runoff (Kirnbauer *et al.*, 2013; Nowak *et al.*, 2013; Jim & Chen, 2014). Furthermore, trees in particular are considered to have significant aesthetic and eco-psychological values (O'Campo *et al.*, 2009; Tyrväinen *et al.*, 2003). Urban dendroflora provides environmental, health, and economic benefits to cities. Urban dendroflora mitigate the effects of urban heat island through evapotranspiration and the shading of streets and buildings. This improves human comfort, reduces the risk of heat stroke and decreases costs to cool buildings (Pearlmutter, 2018). Green system improves air quality by absorbing pollutants such as ozone, nitrogen dioxide, ammonia, and particulate matter (PM_{10}) as well as performing carbon sequestration (Konijnendijk, 2018). Urban trees are important to stormwater management. Trees absorb and store rainwater through the canopy, and slow down and filter runoff with their roots (United States Environmental Protection Agency, 2015). Urban green system also encourage more active lifestyles by providing space for exercise and are associated with reduced stress and overall emotional well-being.

Global climate change is already a fact, and the question of how to deal with this change and how to manage the consequences stays in front of humanity. It is clear to all today that cities are one of the most serious heat nuclei and generators of harmful emissions that engage the climate in a vicious circle. One way to catch up or slow down these processes is to increase the quantity and improve the quality of green areas in urban environments (Rangelov *et al.*, 2016; Rangelov, 2019). It is fact that the city does not usually offer trees ideal living conditions. The growth of a tree planted on the street displays important differences as compared to a tree of the same species and age planted in natural conditions, or even planted in a green space in a city. Many constraints that the typical urban environment places on trees limits the average lifespan of a city tree to only 32 years – 13 years if planted in a downtown area – which is far short of the 150-year average life span of trees in rural settings (Herwitz, 2001). Soil conditions directly affect the growth of street trees. When soil is too compact, due to the weight of asphalt, pavements, vehicles and so on, this results in a reduction in oxygen levels and the ensuing asphyxiation of the roots and the mycorrhizae responsible for nutrition. The same thing happens, when the soil is flooded for a long period of time. Furthermore, as the years go by, the soil in tree pits deteriorates in quality, mainly due to the absence of fallen leaves and dead wood. Therefore, the soil becomes impoverished; it lacks organic matter and the microorganisms that break it down, causing a chemical imbalance in the soil. If this is compounded by a shortage of available water – because most rainwater flows directly into the sewers due to the impermeability of the soil – the result is a tree with a stunted root system and poor growth. The urban environment also contains a series of atmospheric pollutants that may cause damage to trees. For example, there is a great deal of dust in Barcelona (Barcelona City Council, 2011). Trees filter these dust particles, but in excessive amounts. They can form a layer on the leaves and impede the absorption of light and gas exchange. Trees in the urban environment already have a shorter life and smaller dimensions than in the natural environment and these attacks further weaken the tree and reduce life expectancy. Trees, and plants in general, help to attenuate noise pollution in several ways: by absorption, diversion, reflection and refraction of sound, which reduce the reverberation caused by the noise of cars on the facades (Barcelona City Council, 2011). The recognition of this hierarchical linkage among healthy urban forests and the effectiveness of broader ecosystem protection goals (e.g., maintaining biodiversity and wildlife corridors), highlights the need for scientists and policymakers to gain a better understanding of the socio-spatial dynamics that are associated with tree canopy health at different scales (Wu, 2008).

Two of the ecosystem services provided "free of charge" to humanity also from urban green system are its ability to retain / accumulate carbon and PM_{10}. Cycling of carbon (C) is essential to processes that provide food, fiber, and fuel for all of the Earth’s inhabitants. Carbon dioxide is the second most abundant greenhouse gas after water vapor in the Earth’s atmosphere (Churkina, 2016). According to the Intergovernmental Panel on Climate Change (IPCC) the anthropogenic impact leads to an increase in greenhouse gases concentration in the atmosphere such as carbon dioxide, nitrous oxide, methane etc., which in turn causes gradual warming of our planet. For this reason, the so-called carbon absorbers, using carbon dioxide from the atmosphere for their living needs, regulate its concentration, which in turn mitigating impact on global climate change.

The aim of presented study was to investigate the regulating service of urban dendroflora as a depot of carbon and the role of the green system as a reducer of dangerous for people PM_{10}.

Material and Methods

Urban dendroflora analyses

The investigation of urban dendroflora was carried out in 2017. The green system of Sevlievo Town consists of: 60 streets with afforested trees; 4 quarters – “Doctor Atanas Moskov”, “Dimitar Blagoev”, “Mitko Palauzov/Yug” and “Vazrajdane/Balabanitsa”; 3 parks –

"Chernichkite", "Aprilsko vastanie" and "Kazarmite".

The inventory data included: species, genera, family, life form, geo-element, geographical coordinates and altitude, tree height, diameter of breast height (DBH), basal diameter (BD), age of trees, diameter of the crown (max and min), defoliation in % and pest presence. Geographical coordinates and altitude were taken by APS device (Garmin Montana 610). The BD (basal diameter), DBH (diameter of breast height) and tree height have been measured according to DIMITROV (2000). The information about the age of trees was according to the archives of the city. Tree species were determined according to the relevant guides and floras in Bulgaria (DELIPAVLOV *et al.*, 2003, VAKARELOV & ANISSIMOVA, 2010). The floral analyses of dendroflora were published by PETEVA *et al.* (2018).

Huber's modeled simple formula (DIMITROV *et al.*, 2012) was applied to calculate the stem volume (V_{stem}) in m^3:

$$V_{stem} = G * H * F, \qquad (1)$$

where G is the circular area, $G = \pi * (DBH/2)^2$; H - the height of tree and F - the species type number. F is based on the height of the predefined scales or the altitude tables (DIMITROV *et al.*, 2012).

Hence, the stem biomass (B_{stem}) in kg is calculated by the formula:

$$B_{stem}\ (\text{Biomass}) = V_{stem} * V_{weight} \qquad (2)$$

where V_{weight} is volume weight/density in $kg.m^{-3}$, which was found in the corresponding tables (KRASTANOV & RAIKOV, 2012).

Finally, the biomass of one tree is calculated by the formula (LYUBENOVA, 2009; KRASTANOV & RAIKOV, 2012):

$$B_{tree} = B_{stem} + B_{branches} + B_{leaves} \qquad (3)$$

where $B_{branches}$ is the biomass of branches and B_{leaves} – the biomass of leaves, that were found in the corresponding tables (KRASTANOV & RAIKOV, 2012).

Following the methodology, the biomass for all trees in the town was calculated using the number of trees per species and arithmetic average (X_{av}) of their traits:

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \qquad (4)$$

For the approximate calculation of carbon and energy reserves in biomass, the following ratios (LYUBENOVA, 2009) were taken into account:

$$1\ g\ CO_2 \approx 2\ g\ \text{biomass} \qquad (5)$$

$$1\ g\ CO_2 \approx 10\ kcal \qquad (6)$$

In formula (5) we can calculate absorbed CO_2 and in formula (6) - the energy reserves in biomass. The accumulated carbon was calculated using the molecular weight of CO_2.

$$\text{Accumulated C} = (CO_2 * 12)/44 \qquad (7)$$

The emitted oxygen (O_2) was calculated using the following ratio (LYUBENOVA, 2009):

$$\text{Accumulated } O_2 = CO_2 * 0.375 \qquad (8)$$

The mitigating role of urban dendroflora for PM_{10}, as described in MANES *et al.* (2016), was obtained using the following equation:

$$Q = F \times L \times T \times 0.5 \times LAI_i, \qquad (9)$$

where Q is the amount of air pollutant (in our case PM_{10}) removed by trees in a certain time; F - the pollutant flux; L - the total canopy cover in that area; 0.5 - the resuspension rate of particles coming back to the atmosphere (ZINKE, 1967); $LAI_i = 4$ is a variable used to refer the removal to 1 m^2 of soil covered by the given functional group.

In this case, Q for 2012-2014 was calculated, because there was no recent data and the formula was modeled not only for the conopy cover, but also for the entire green cover of the city including shrubs and grass areas.

Study area. Sevlievo Town (latitude 43° 1' 32" and longitude 25° 6' 48") is situated in the central part of the Fore Balkan, Gabrovo District, Bulgaria. The town (area of 41,244 кm^2) is an economic center – 1/4 of the town's area is occupied by industrial zones. The city is located mainly on the left bank of the Rositsa River in the center of the Sevlievo Valley at the altitude of 196 - 210 m a.s.l. (Development Plan of the Municipality of Sevlievo, 2014-2020).

Results

The street dendroflora of Sevlievo Town is constituted of totally 2555 trees referring to 45 species. The inventory containing the characteristics of the trees and the most useful data for maintenance work is basic to good tree heritage and sustainable management. The trees upon the streets (52%) are followed by these in the quarters - 30%. The interesting fact is that only 18% of trees are located in the parks (PETEVA *et al.*, 2018).

The collected data (Table 1) of height (H) and diameter of breast height (DBH) was statistically processed to calculate X_{av} for each trait and species.

The calculated trees biomass in streets, quarters and parks is about 3 Mt with energy equivalent stock of 60.5 GJ (Table 2). The absorbed CO_2 by photosyntesise is about 1.4 Mt, and carbon reserves - about 0.4 Mt. The emitted O_2 stock was about 0.5 Mt, destributed mainly in quarters (Table 2).

According to the analyzed data the tree species that provide the greatest accumulation of carbon (including carbon dioxide) and oxygen release in the atmosphere are: *Acer campestre* L., *Acer negundo* L., *Acer pseudoplatanus* L., *Aesculus hippocastanum* L., *Betula pendula* Roth, *Juglans regia* L., *Picea abies* L., *Robinia pseudoacacia* L., *Tilia cordata* Mill. and *Tilia tomentosa* Moench. (Table 1).

According to the Sevlievo Municipality (2016), there are no permanent posts for air quality control on the territory of Sevlievo Town in 2014. The measurement of the main atmospheric pollutants (PM_{10}) levels was carried out by the mobile station for emission air control at EEA (RL) - Rousse on schedule and on-site - monitoring station (PM) with a location approved by the MOEW (2019). For the period up to 2014, the town of Sevlievo is implemented by the PM - "OSC" located in the central part of the town in the parking lot next to the building of the Municipality of Sevlievo.

Table 1. Tree traits for the biomass calculation in Sevlievo Town.

N	Species in Sevlievo Town	Number of trees (n)	Average height, m	Average DBH, cm	Total C, t	Total O_2, t
1.	*Abies alba* Mill.	15	13.0	29.6	1.14	1.57
2.	*Acer campestre* L.	74	11.4	36.7	10.47	14.40
3.	*Acer negundo* L.	109	10.3	37.7	13.39	18.41
4.	*Acer platanoides* L.	12	14.7	43	3.81	5.24
5.	*Acer pseudoplatanus* L.	148	9.8	31.9	11.83	16.27
6.	*Acer saccharinum* L.	2	9.0	52.0	0.36	0.49
7.	*Aesculus hippocastanum* L.	136	11.8	31.0	11.53	15.85
8.	*Ailanthus altissima* Mill.	7	7.4	34.6	0.30	0.42
9.	*Albizia julibrissin* Durazz	42	8.5	28.9	1.65	2.27
10.	*Betula pendula* Roth.	333	14.1	34.0	35.74	49.14
11.	*Caragana arborescenc* Lam.	26	5.5	11.0	0.15	0.21

12.	*Castanea sativa* Mill.	81	11.1	33.0	6.29	8.64
13.	*Catalpa bignonioides* Walt.	30	10.0	30.0	1.41	1.95
14.	*Cupressus sempervirens* L.	78	7.2	24.4	1.10	1.51
15.	*Elaeagnus angustifolia* L.	12	3.0	12.0	0.01	0.01
16.	*Ginkgo biloba* L.	12	14.1	47.2	3.63	4.99
17.	*Juglans regia* L.	67	11.6	39.7	9.83	13.52
18.	*Koelreuteria paniculata* Laxm.	20	4.4	40.0	0.32	0.44
19.	*Liquidambar styraciflua* L.	20	7.0	32.5	0.47	0.65
20.	*Malus baccata* L.	14	11.6	35.7	1.11	1.52
21.	*Malus domestica* Borkh.	19	6.5	29.8	0.35	0.47
22.	*Morus alba* L.	18	12.5	55.1	5.39	7.41
23.	*Morus nigra* L.	21	10.0	25.3	0.86	1.18
24.	*Paulownia elongata* L.	20	7.7	31.0	0.68	0.94
25.	*Paulownia tomentosa* L.	15	12.6	39.3	2.11	2.90
26.	*Picea abies* L.	147	12.1	34.6	14.52	19.96
27.	*Pinus nigra* L.	26	10.1	23.3	0.95	1.31
28.	*Pinus sylvestris* L.	15	12.8	25.7	0.91	1.25
29.	*Plananus orientalis* L.	18	14.4	31.1	2.79	3.84
30.	*Populus alba* L.	13	8.5	40.0	0.73	1.00
31.	*Populus nigra* L.	17	10.0	39.5	1.27	1.74
32.	*Prunus armeniaca* L.	14	5.4	31.6	0.15	0.21
33.	*Prunus avium* L	26	11.5	24.5	0.71	0.98
34.	*Prunus cerasifera* Ehrh.	11	4.8	22.0	0.05	0.06
35.	*Prunus domestica* L	20	5.1	32.3	0.20	0.28
36.	*Prunus persica (*L.) Batsch	16	5.6	18.6	0.06	0.08
37.	*Pyrus elaeagrifolia* Pall.	20	5.9	26.0	0.17	0.24
38.	*Quercus robur* L.	67	11.2	33.8	7.66	10.54
39.	*Robinia pseudoacacia* L.	358	10.7	35.2	23.57	32.42
40.	*Salix babyloniva* L.	33	12.1	50.6	4.98	6.85
41.	*Sophora japonica* L.	12	3.0	9.5	0.004	0.005
42.	*Thuja acidentalis* L.	12	1	4.8	0.0001	0.0002
43.	*Thuja orientalis* L.	14	14.1	48.8	2.11	2.91
44.	*Tilia cordata* Mill.	234	13.5	43.5	37.78	51.95
45.	*Tilia tomentosa* Moench.	151	13.8	40.0	21.51	29.58

Table 2. Calculated indicators for the dendroflora of the town of Sevlievo, Bulgaria.

Objects in Sevlievo Town	Total biomass			C, t	O_2, t	CO_2, t
	t	kJ	GJ			
Streets (60)	1224.85	25 633 090	25.63	167.03	229.66	612.43
Quarters (4)	1254.90	26 261 919	26.26	171.12	235.29	627.45
Parks (3)	412.90	8 640 981	8.64	56.30	77.42	206.45
Total (67)	2892.65	60 535 995	60.54	394.45	540.50	1446.33

According to research of VLAKNENSKI *et al.* (2016), also confirmed by the results of the municipality itself, the greatest contribution to the air pollution is from household sector during the heating season of the year using coal and firewood - 37% for the town of Sevlievo. The contribution is very high of local background pollution from resuspended particulate matter. According to Sevlievo Municipality (2016) the location of the polluted area and population in the area exposed to atmospheric air pollution with PM_{10}, practically covers the city's territory in its central part and the surrounding residential areas that are most affected.

All this means that there is a big problem with the PM_{10} for the population of the city which is 20 464 people according to data of the National Statistical Institute of the Republic of Bulgaria for 2019 year (NSI, 2019). Based on these results can be said that the dendroflora, respectively green system, can't compensate the higher PM_{10} (Table 3, Fig.1), which is dangerous for health and life expectancy (United States Environmental Protection Agency, 2019). The obtained results highlight a relevant contribution of urban vegetation to the ES of PM_{10} removal. Unfortunately, the green system proves to be insufficient to compensate for the large amount of PM_{10} in the air and therefore these particles have somehow affected the health of the residents of Sevlievo Town.

Discussion

In recent years, the interest in the analysis and assessment of ecosystem services has been extremely strong. The European Biodiversity Strategy by 2020 entrusts Member States to assess the economic value of the benefits of ecosystem services on their territory and to organize its integration into reporting and reporting systems at European and national level. The scope of ecosystem services is extremely broad and diverse: protecting biodiversity, providing water supplies, reducing the effects of natural disasters, increasing capacity to tackle climate change, safeguarding genetic resources, and so on. This complicates the determination of their economic value and is underestimated for a long time. Economic assessment is mostly based on financial value and misses the social and environmental benefits for which there is no official market and no pricing (KAZAKOVA-MATEVA & PENEVA, 2015). The cities must be part of the solution if an urbanizing world is to grapple successfully with ecological challenges such as climate change. In concentrated urban areas, it is possible for environmental economies of scale to reduce the impact of human beings on the Earth. This has already started to happen in Europe (SHIELDS & LAGNER, 2009). According to the UN Population Division, 72% of the continent's population is urban but the European Environment Agency (EEA) says that its cities and towns account for just 69% of energy use.

The comparative assessment of carbon dioxide emissions in different European cities is presented on Table 4.

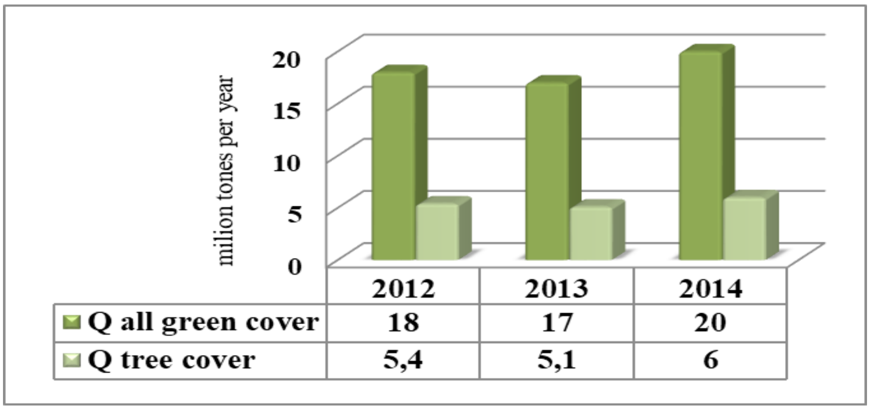

Fig. 1. Amount (Q) of the air pollutant (in our case PM_{10}) removed in a certain time.

Table 3. Measured amount of PM_{10} for the town of Sevlievo (after Sevlievo Municipality, 2016). Legend: (*) - LD50 is 50 μg/m^3.

Year	Measured above norms Average Daily Concentration (*)	Affected area	Population exposed to pollution with PM_{10}
2012	51 - 77.2 μg/m^3	2.5 km^2	20 464 inhabitants of the town of Sevlievo (about 63% of the population of the Municipality)
2013	50.5 - 85.6 μg/m^3		
2014	55 - 80.1 μg/m^3		

Table 4. Assessing the human impact of Europe's major cities.

City	Population	CO_2 emissions per head	Reference
Sevlievo Town, Bulgaria	20 464	0.07 tonnes	- - -
Sofia City, Bulgaria	1 269 384	4.42 tonnes	SHIELDS *et al.*, 2009
Amsterdam, Netherlands	743 000	6.66 tonnes	SHIELDS *et al.*, 2009
Athens, Greece	3 400 000	5.92 tonnes	SHIELDS *et al.*, 2009
Belgrade, Serbia	1 700 000	3.85 tonnes	SHIELDS *et al.*, 2009
Istanbul, Turkey	12 600 000	3.25 tonnes	SHIELDS *et al.*, 2009

According to Table 4, Sevlievo Town had the smallest share of all European cities compared, including the capital Sofia. The data showed that Sevlievo Town had no problem with this greenhouse gas as opposed to PM_{10}. The registered data from the CAA measurements in Sevlievo Town made within the NASEM for the period 2007 - 2010 do not show any exceedances of the average annual rates for the main atmospheric pollutants. With regard to the PM_{10} measurements, periodic accidental exceedances of the daily average PM_{10} values were observed. Air pollution is a consequence of the typical urban anthropogenic activity in the area, with heavy road traffic on the road network and the presence of localized production areas in the town of Sevlievo.

On the first place the major source of PM10 are the households (43%), then the industry (37%) and lastly – transport (20%). All this mean that the major factor are the town's citizens, that use unsustainable heating methods in the winter season like woods or coals.

The dendroflora cover is about 33% of all green cover of the town and cannot compensate this higher levels of PM_{10} in the atmospfere. In this 33 % are included absolutely all trees in the town's territory. In 2008, Barcelona City Council (2011) introduced a street tree management programme to meet the new needs of street tree management in the city. In Sevlievo Town, such program will be a good point for the sustainable ecosystem services management. The ecosystem services provided by trees are on going and could become more valuable in the future as external factors changes. For example, there is an increasingly urgent need to reduce levels of PM_{10}. Poor air quality associated with a congested road network and the port was an increasing problem, resulting in the recent designation of a 'Clean Air Zone' in the city (DEFRA, 2015). Planning tree stocks to maintain a high level of ecosystem service delivery is, therefore, of paramount importance (DAVIES *et al.*, 2017a; b). Dendroflora of the city can be a decisive factor. Now for the town of Sevlievo it is 33% of the green cover and system which can't compensate the high PM_{10} dose. This means that enough trees must be planted in the town's territory and the percentage of dendroflora must be at least 60% of the green system and cover. Thus will reduce the amount of PM_{10} in the air and the pollution will be captained.

Conclusions

Trees are probably the type of greenery that makes its presence nicest in the life of the people. Many researchers talk about street dendroflora and the percentage distribution of trees between streets, quarters and parks. The obtained results are a good start for other investigations on the same topic. These results will give an idea to the authorities in order to take the necessary precautions.

Air pollution in Sevlievo Town is a consequence of the typical urban anthropogenic activity in the area, with heavy road traffic on the road network and the presence of localized production areas in the city. Sources of atmospheric pollution with PM_{10} in Sevlievo Town are the household sector, industry and transport. The quantitative results of the inventory of the main PM_{10} emission sources in the ambient air of the town of Sevlievo show that the household sector has the largest contribution to the atmospheric pollution of the area, with the tendency to decrease the local PM_{10} emissions. There is an urgent need to reduce levels of PM_{10} in Sevlievo Town. Therefore, planning a methodology for this as an ecosystem service is paramount. Modeling dendroflora in the city can be a deciding factor. At present, for Sevlievo Town, the dendroflora with its 2555 trees or 33% of the green system cannot compensate higher levels of PM_{10}. This means that enough trees need to be planted throughout the town. According to our results if the dendroflora is at least 60% of the total green coverage, it will lead to a natural reduction of PM_{10} and improved ambient air quality for the town's residents.

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