

## Can urban environmental problems be overcome? The case of Skopje—world's most polluted city

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**Abstract.** The condition of the environment is one of the most fundamental concerns of cities worldwide, especially when high levels of pollution and environmental destruction exert immense impact on people's quality of life. This paper focuses on Skopje, the capital of Macedonia, which often tops the charts as the world's most polluted city. Despite associated problems such as congestion, ill health, and premature death, Macedonia's scarce resources are instead spent on controversial projects, such as 'Skopje 2014', involving creating a national identity through massive and extremely costly constructions of neo-classical government buildings, museums and monuments. The aim of this paper is to compare the situation of Skopje to environmentally oriented activities conducted in several Polish cities and to discuss the possibility of their implementation in Skopje. Considering the scale and scope of Skopje's environmental problems, the paper offers some priorities for action, including solutions that emphasize institution building, technical input and self-governance. It also highlights a number of economic, ecological, and socio-cultural contradictions involved in the process of achieving sustainable development.

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**1. Introduction**

The quality of the natural environment constitutes a major challenge for contemporary large cities. A significant problem concerns the quick and uncontrolled urban growth which exerts strong pressure on the natural environment. Major cities in developing countries are faced not only with the problem of intensive urbanization, but also with the lack of financial resources which could be used to improve the quality of life of their inhabitants. An important aspect of the quality of life is the environment in which the inhabitants of a given city spend each day. Urban solutions implemented in accordance with sustainable development assumptions may not only become a meaningful tool to fight current urban environmental problems, but they can also prove to be a significant element in the implementation of environmental education of the inhabitants and a driver of change in their current lifestyles.

The problem of urban sustainable development implementation is a frequent subject of scientific elaborations (Wheeler, Beatley, 2014; Sofeska, 2016, 2017; Angelidou, Psaltoglou, 2017; Pandit et al., 2017; Pupphachai, Zuidema, 2017; Yan et al., 2018). However, the analyses concern most often only one aspect influencing improvement of urban natural

environment quality and urban inhabitants' life, such as waste management (Zhang et al., 2010; Wilson et al., 2012; Guerrero et al., 2013; Lewandowska, 2018), water management (Burian et al., 2000; Uitto, Biswas, 2000), air quality (Vos et al., 2013; Holman et al., 2015), renewable energy exploitation (Droegge, 2011; Niemi et al., 2012), green areas (Fuller, Gaston, 2009; Kabisch, Haase, 2013) and other ecological aspects of cities and regions (Platt et al., 1994; Jepson Jr, Edwards, 2010; Leźnicki, Lewandowska, 2014, 2016; Dymitrow, Stenseke, 2016).

Restoring urban space to its natural condition and removing harmful and unattractive elements may encourage the creation of new meeting places for inhabitants to create new social bonds. Extending green public spaces makes a city friendlier for its inhabitants (Chiesura, 2004). In rapidly growing cities, rivers also play a crucial role in creating such areas (Kubiak-Wójcicka et al., 2017), constituting an essential element of the natural urban ecosystem. Thus, keeping rivers in the best possible condition is extremely important, so that they will not be merely a receptacle for waste water, but begin to play a city-building role in the social sphere and promote the integration of the local community through participation in the planning process (Findlay, Taylor, 2006). All these activities contribute to city ecologi-

sation which is a natural consequence of the idea of sustainable development implementation in the environmental dimension. It is a symptom of development which concerns natural environment, and precisely the improvement of the condition of cities in the ecological dimension (Lewandowska, Rogatka, 2017). It also has a positive impact on the inhabitants' quality of life, and in particular their health (cf. Arsovski et al., 2009; Brauer, Dymitrow, 2014; Kwiatkowski et al., 2017; Díaz et al., 2018).

An important aspect of the functioning of cities, especially national capitals, is their image, which usually has an impact on the perception of the entire country. Municipal officials responsible for creating urban space often engage in large-scale and high-cost projects. However, they can prove useless or seem to be in opposition to the real issues of those cities. The implementation of activities connected with sustainable development is extremely important for developing countries, as well as for areas with problems or in a difficult financial situation. Energy recovery and attempts to preserve the environment in the least disturbed possible condition provides an opportunity for areas which seem to be less developed. Awareness of both the authorities and the inhabitants that the reuse of waste, including sewage, has an economic justification needs to be raised. It is of great importance, because it allows achieving a reduction in the costs of removal and production of energy, as well as other raw materials. It should therefore be remembered that activities carried

In this paper, we focus on a number of pro-ecological activities taken up by large cities in Poland, which could enable the quality of the environment and the quality of life in a city to be improved, and which could be implemented in other European cities. On the basis of restricted financial resources it could solve problems by reducing pollution which occurs in the urban area and create a new space attractive for the inhabitants. The proposed implementation relates to Skopje, currently the capital of the Republic of Macedonia, a city of roughly half a million inhabitants, which urgently requires projects which could improve its environment. Moreover, the problem goes beyond the confines of environmentalism. As Donevska (2017: 152) argues, "there are trade-offs to be made between multilevel policy networks and a hierarchical structure, short-

term and long-term perspective, human capacities of professionals and elected officials, political and community interests, community participation, and government control". In this paper, we tackle the problem of the World's most polluted city in this multifaceted approach.

## 2. Materials and methods

The paper is based on research divided into several stages, each of which aimed to analyse individual elements necessary to reach the assumed objective. The first stage involved a diagnosis of the condition of the environment in Skopje performed by comparing the values of indicators measuring pollution levels for selected elements of the natural environment. The analysed data referred to pollution levels ( $PM_{10}$ ), waste disposal methods, sources of emission, national health status, urban planning (zoning schemes), transport and infrastructure, as well as construction and land-filling activities. They were obtained from the Ministry of Environment and Physical Planning, the World Health Organization – Regional Office for Europe, IQAir, the State Statistical Office of Macedonia, and the General Urban Plan for the City of Skopje, but also from reliable investigative journalistic inquiries, whenever official data were undisclosed. This part also assessed the manner in which public funds were spent on investments in the city while focusing on certain deficits in the support for the development of green areas. It also characterised major investment activities in the city's history, whose outcomes seem to be in stark contrast with the expected impact on the inhabitants' quality of life.

In the subsequent stage, the research analysed environmental conditions in 65 Polish cities which are capitals of poviats (counties; NUTS 3). Wałbrzych was excluded from the study as a complete set of data could not be retrieved for that city, making a correct analysis impossible. The data encompassed the years 2004–2016, thus exhibiting changes which occurred since Poland's accession to the European Union. Statistical data from the Local Data Bank of the Central Statistical Office of Poland were used to compute the indicators. In order to assess the implementation of sustainable develop-

ment principles and related factors with an impact on life quality, the authors analysed the dynamics of changes of the following variables between the years 2004 and 2016: values of particulate matter emissions from particularly arduous plants, volume of municipal waste collected during the closure of illegal landfills, level of expenditure on municipal waste management and environment protection, as well as the share of parks, lawns and green areas in housing estates in the total area of cities. Such variables allowed for a comparison of the situation in Poland with the above-mentioned problems identified in Skopje. Moreover, their analysis was to indicate whether Polish cities were coping with implementing pro-ecological solutions.

The indicator analysis concerning individual aspects of implementation of sustainable development principles was supplemented with a desk research covering strategic documents of selected largest cities in Poland and other studies referring to the implementation of pro-ecological solutions in Polish cities. The research comprised the assumptions of *Kraków's Development Strategy 2030* (2017) and *Warsaw's Development Strategy 2020* (2005). The review of documents indicated directions for development in the analysed cities, with attention paid to actions in the sphere of sustainable development and the cities' current accomplishments in that area. Similar studies regarding the ecologisation of cities in Poland were also addressed, which helped indicate new areas where sustainable development is introduced, i.e. sustainable construction or urban farming.

The last part of the study was an attempt to assess whether the proposed solutions may be introduced in Skopje. It also presented proposed urban planning solutions which, if implemented, could alleviate the effects of the previously diagnosed problems. The collected material allowed the authors to propose tailor-made solutions, as well as practical and efficient guidelines concerning actions directed at improving the environment and the resulting quality of inhabitants' lives.

### 3. Entering a contorted reality: the Skopje problem

#### 3.1. The glittering façade

The case study of this paper is Skopje, a city covering an area of 1818 km<sup>2</sup>, inhabited by 506,926 inhabitants (SSOM, 2002) (1), spreading 23 km longitudinally and 9 km latitudinally along a narrow canyon of the river Vardar at a height of 245 m above sea level. Skopje is also the largest city and the capital of the Republic of Macedonia—a landlocked country in the Balkans, which earned its independence in 1991 as one of the successor states of the former Yugoslavia. While Macedonia has gradually improved its economy (with trade accounting for 90% of its GDP), it retains a high unemployment rate of 27.3% (in 2015) (cf. also Apostolovska Toshevska et al., 2012). The Gini coefficient in 2014 for Macedonia was 35.2 (Eurostat, 2017) while the share of population at risk of poverty in 2014 was at 24.8 % (World Bank, 2017). Facing such figures, Macedonia has become one of the most economically challenged countries in Europe, exhibiting major inequities and inequalities (cf. SSOM, 2017). These are especially visible in Skopje.

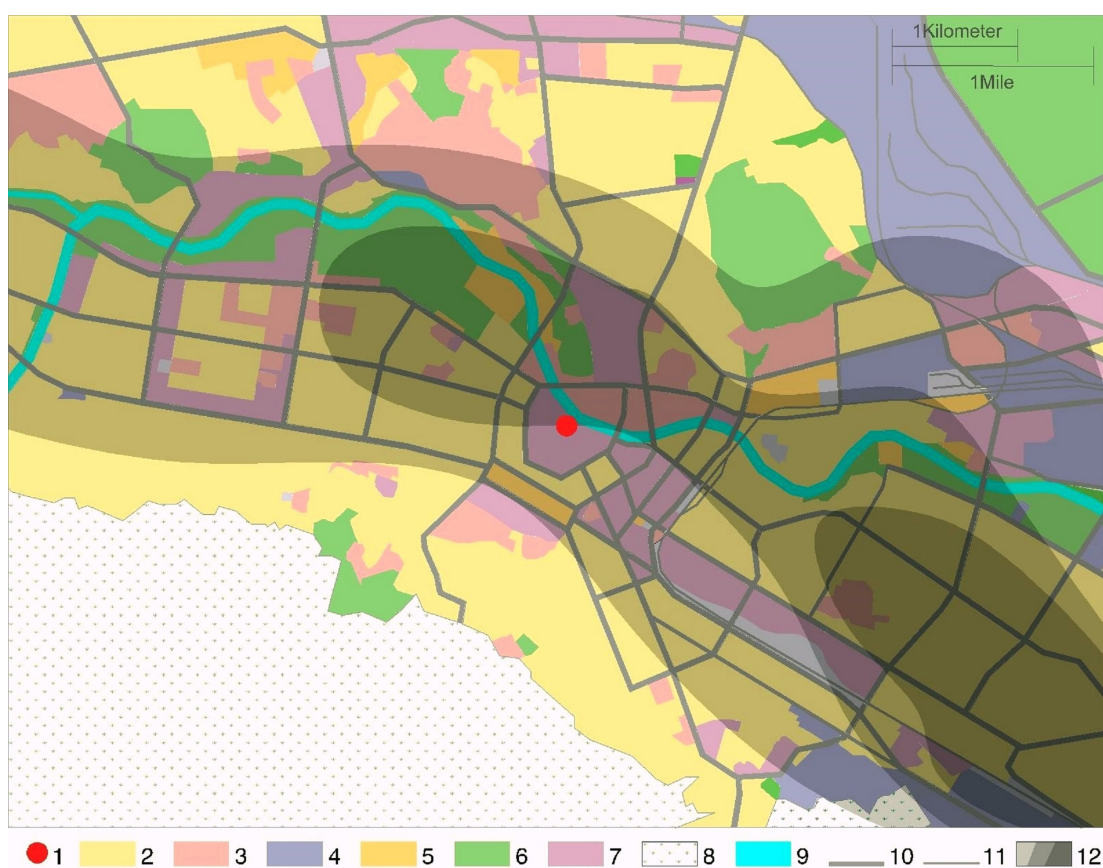
Also the history of Skopje is marred by a slew of fragmented development projects stemming from various sources including natural disasters, foreign occupation, massive migration, regional positioning, and geographic location (cf. Koželj, Stefanovska, 2012). The changes caused by various factors have had a considerable impact on the spatial development of the city. In the 1960s, Skopje was struck by an earthquake which destroyed almost 80% of the urban area, leaving over 150,000 inhabitants without a place to live. Despite the huge scale of the disaster, it became a unique opportunity for urban planners to rebuild the city from scratch. Thanks to external financial support, the authorities attempted to reconstruct it by applying a completely new plan which allowed for the elimination of mistakes from previous modernist planning (cf., e.g., Jordanov, Arsovski, 2001). A great effort was put into the new spatial organization, with an international team of planning experts invited to provide creative and efficient ideas for building the new Skopje. Since the 1990s, when Skopje became the capital of independ-

ent Macedonia, this planning process stopped, leaving the 1965 plan partially realized. Not only did this entrain chaotic development and urban sprawl, but the closed-off fortification-like urban planning in combination with the local gorge-like topography has given rise to extremely poor atmospheric mixing and unheard-of pollution (Anttila et al., 2016) (cf. Figure 1).

In spite of these problems, the last ten years (2006–2017), governed by the right-wing nationalist party (VMRO), saw a slew of different priorities. As Mattioli (2016) argues, a series of failing financial processes, which included the use of illiquidity, created the material and moral conditions for subjection to a system of power that monopolized the Macedonian market, “forcing companies either to become its cronies or systematically lose money by

accepting partial or no payment for the work they provided” (p. iv).

These years also saw Macedonia’s scarce resources being spent on rather controversial projects. One of VMRO’s flagship investments was *Skopje 2014*, a finalized yet unfinished urban development project (2009–2017) with the purpose of giving Skopje a classical, pseudo-nationalistic “super-urban” appeal, rivalling only Pyongyang (North Korea) and Ashgabat (Turkmenistan) for eccentricities. Involving massive construction of governmental buildings, manicured museums and gold-plated monuments depicting historical figures from the wider region of Macedonia (disputed with Greece), the project was heavily criticized (cf. Pencic, 2009; Pajaziti, 2012; Graan, 2013; Muratovski, 2013; Gillet, 2015; West, 2015; Mattioli, 2016; Petrović, 2016; Dérens, 2017;



**Fig. 1.** Land use map of Skopje (according to GUP, 2002) overlaid by plumes of pollution (according to the measurements of  $PM_{10}$  by MEPR, 2017).

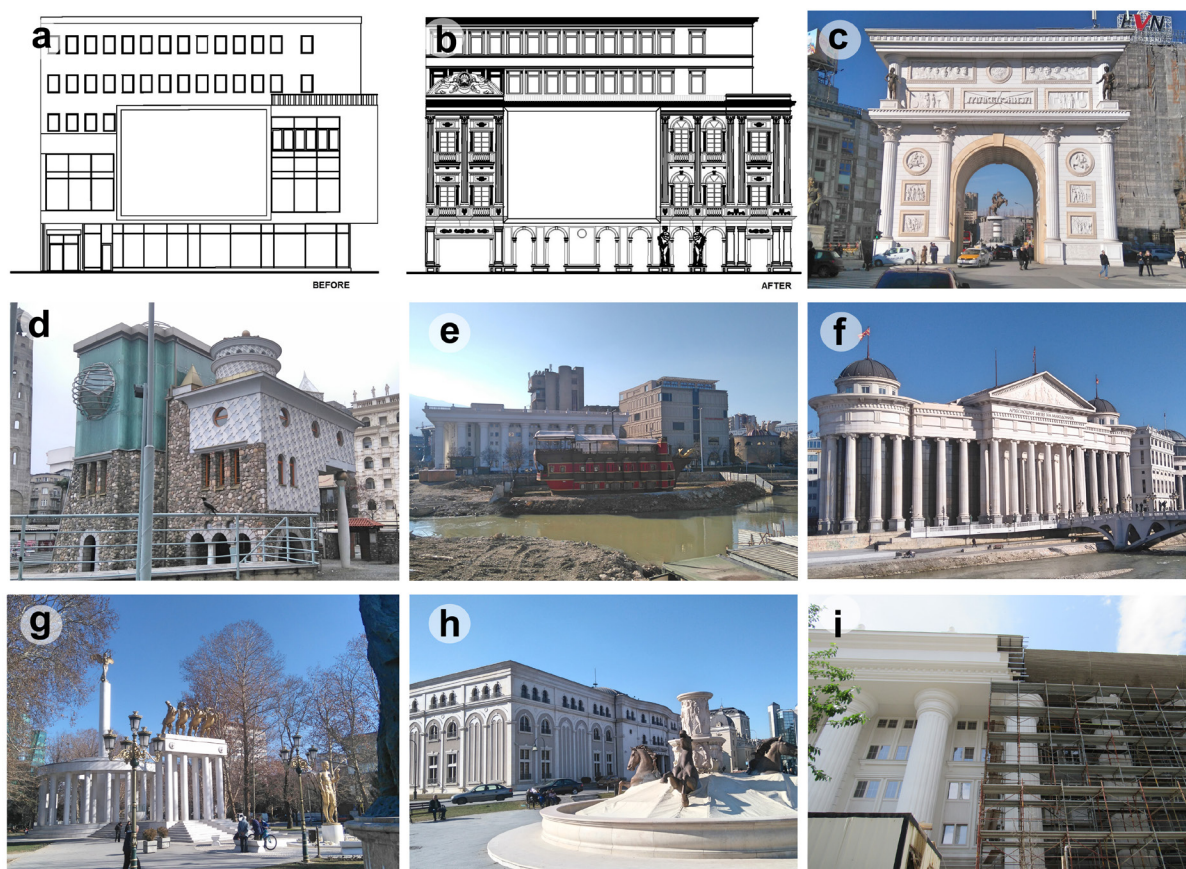
*Explanation:* 1 – city centre, 2 – residential housing, 3 – public institutions, 4 – industry, 5 – commerce and business, 6 – greenery and recreation, 7 – mixed use, 8 – mountain Vodno, 9 – river Vardar, 10 – main thoroughfares, 11 – railways, 12 – concentrations of air pollution ( $PM_{10}$ ).

*Source:* S. Arsovski

Götz et al., 2017; Janev, 2017; Pojani, 2017; Tanuszevska, 2017), not least for constructing nationalistic historicist kitsch – a ‘mini Las Vegas’, a ‘megalomaniac Disneyland’ or a ‘master hyperreality’ of sorts – by deploying various exoticisms from a catalogue of heritage clichés. Replete with romantic pavilions, fake river boats, a Ferris wheel, a cosmic Mother Teresa house, a Paris-style triumph arch and a switched-off eternal flame (cf. Fig. 2), the project has been accused of mixing different styles (classicism, baroque, colonialism, romanticism, futurism) and points of mimicry (Paris, Berlin, Athens, Vienna, Havana) in cumbersome proportions and with slipshod finishes, using cheap, easily degrada-

ble materials, and by imposing an aura of ‘monoculture’ (e.g., Bozhinoski, Arsovski, 2013a, 2013b). It has also been believed by many to be a distraction from real problems (Jakov Marusic, 2012) and became the main object of destruction during the massive protests in 2016 (nicknamed ‘The Colourful Revolution’), with protesters throwing permanent dye at the project’s main works (cf. Reef, 2017).

Assembled in the vein of past hubristic endeavours in line with Albert Speer’s *Welthauptstadt Germania* or Nicolae Ceaușescu’s *Project Bucharest*, its remnants are largely regarded as anachronistic examples of a form of urban design that should have been avoided (cf. Gold, 2009). As Dymitrow (2014)



**Fig. 2.** The cityscape of Skopje amidst the implementation of the project *Skopje 2014*.

*Explanation:* (a–b) transformation of one of the more recognizable buildings on the Main Square; (c–h) some of the project’s ‘oeuvres’: (c) Paris-inspired (*Arc de Triomphe*) ‘Porta Macedonia’ and a 30 m tall statue of Alexander the Great in the aperture; (d) futuristic Mother Teresa’s Memorial House; (e) Spanish-inspired galley (fake boat) ‘anchored’ in shallow water with a gilt-plaster figurehead at the prow; a false colonnade and an ornamented parking house in the background; (f) *Parthenon*-inspired Archaeological Museum along the riverfront with withered palm trees and a beach-volley court; (g) Berlin-inspired (*Brandenburger Tor*) ‘Monument of the Fallen Heroes of Macedonia’, replete with staggering horses, a Vienna-style (*Johann Strauss-esque*) golden Prometheus in a fountain, a misspelled Latin inscription, a death-drop pit and a switched-off ‘eternal’ flame; (h) baroque-inspired Museum of the Macedonian Struggle, double-charging foreigners; (i) covering socialist-era façades with cheap plaster-cardboards.

*Sources:* (a–b) Bozhinoski, Arsovski (2013b); (c–h) S. Arsovski; (i) Blazhevski (2016)

suggests, assuming that ‘urban revitalization’ is the way to go, three conditions need to be fulfilled: a) the intervention needs to be consistent with inferred logic about what ‘urban’ is thought to be; b) the intervention must respect the scale, individuality and social context of the place of deployment; and c) the intervention needs to focus on the basics rather than the details in order to align with the goals set (cf. also Dymitrow, 2012). In view of the deluge of criticism the project has received, none of these conditions seem to have been fulfilled. Instead, the project can be said to have defied the basic academic principles of architecture and functionality by thwarting regional specificity (cf. Jordanov, Arsovski, in Tokarev, 2006: 169), imposing historical discontinuity, covering world-renowned brutalist architecture with cheap plaster and galvanizing mistrust in the authorities for mismanaging social life (cf. Hirsch, 1993). More importantly than lack of taste or finesse, the immense cost of the project (estimated to USD 800 million) has made it a white

elephant in the face of Macedonia’s many pressing socio-economic problems (cf. Fig. 3).

### 3.2. The dark underbelly

Instances of poverty notwithstanding, contemporary Skopje is one of the most polluted cities in Europe and the world. The city acquired this dishonourable title as recently as in the winter of 2017, beating Third World cities like Kolkata or Dhaka, and placing itself way ahead of Lahore, Mumbai, Port Harcourt, Ulaanbaatar, Delhi, Guangzhou and Chengdu (Fig. 4b). For instance, on 15 December 2017, “Skopje was affected for the second day in a row by air pollution that almost paralyzed the Macedonian capital” (USA Today, 2017), with “Macedonian authorities hav[ing] taken emergency measures [such as free public transport for everyone and excuse from work for pregnant women and people over 60] to fight high air pollution level in Skop-



**Fig. 3.** Examples of substandard, illegally constructed, dwellings in the strict centre of Skopje

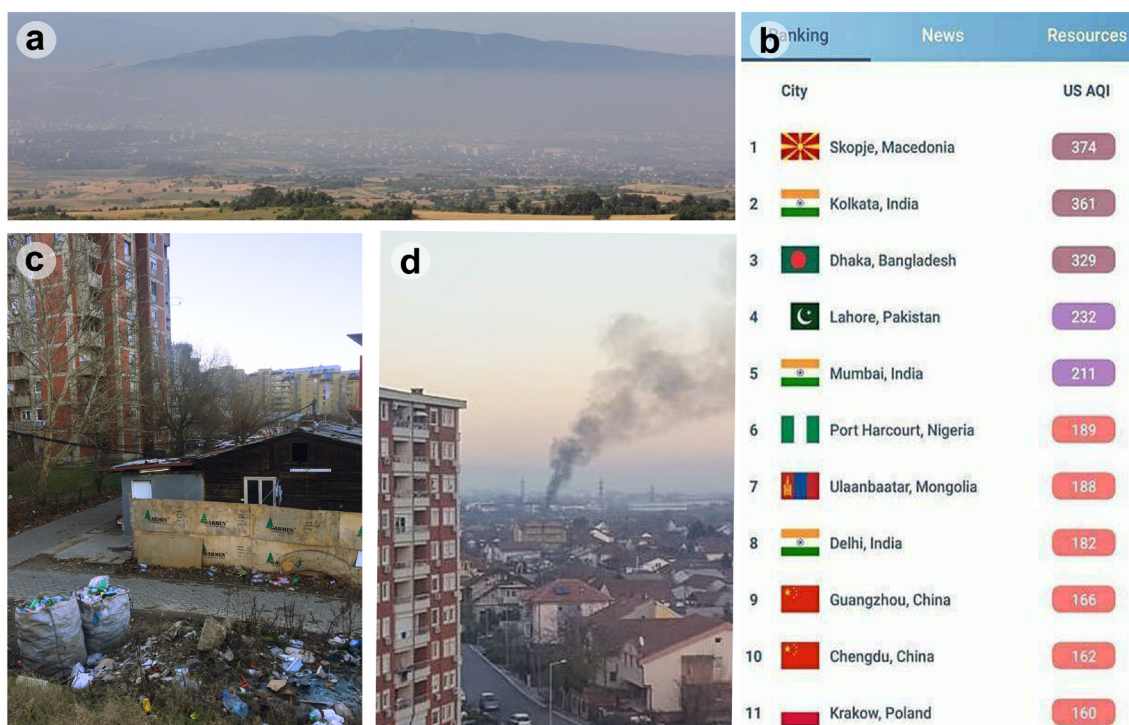
Source: (a, c) S. Arsovski; (b, d) Z. Jordanov

je – with little to no effect” (Deutsche Welle, 2017). What is more, local media reported that shops in Skopje have run out of anti-pollution masks during the peak readings (374 AQI (2)) (Makfax News Agency, 2017).

Overall, air pollution in the country is a cause of serious concern as the limit values set for protection of human health, especially for particulate matter, are exceeded significantly, primary in the urban and industrial areas (MEPR, 2017). The situation is the worst in the biggest urban settlements such as Skopje and Tetovo, with the annual mean concentrations of  $PM_{10}$  exceeding the annual limit value ( $40 \mu\text{g}/\text{m}^3$ ) at all urban monitoring sites in all years from 2005–2015. Similarly, daily limit value is exceeded at all sites and all years, except for one (MEPR, 2017). The air quality in the country has been monitored with modern methodologies for more than 10 years, consisting of 17 automatic ambient air monitoring stations out of which 5 are located in Skopje (cf. Stafilov et al., 2003) with pollution on very high level, widespread and persistent in urban locations of the country (MEPR, 2017).

According to official statistics “[p]article pollution (PM) in Skopje is more than ten times higher than the air quality standards set by the European Union – both regarding  $PM_{10}$  – particles measuring less than 10 microns – and smaller  $PM_{2.5}$  particles, which can enter the lungs and even the bloodstream”. The problem escalates every winter due to industrial emissions, smoke from wood-burning stoves and exhaust fumes from old cars (Fig. 4a/4c). Air pollution in Skopje exceeds acceptable levels during 269 days per year, and, consequently, “causes more than 1,300 premature deaths per year in the Macedonian capital” (Deutsche Welle, 2017).

The main sources of air pollution are heavy road traffic transport, industry and energy production, residential heating, and other sources. The road traffic contributes to the nitrogen oxides, carbon monoxide, benzene and particulate, heavy metal and polycyclic aromatic hydrocarbon emissions. Approximately half of the passenger cars and buses still belong to the high-emission Euro-0/Euro-2 classes whereas the share is less for light- and heavy-duty vehicles (MEPR, 2017). It should also



**Fig. 4.** Pollution in Skopje: (a) the city under a thick cover of smog; (b) indicators revealing Skopje as the most polluted city in the world on 14 December 2017; (c) a landfill of illegal plastic collectors near the city centre; (d) one of Skopje’s many contaminants.

Sources: (a) M. Morell; (b) AirVisual (2017); (c) Z. Jordanov; (d) A. Girevski



be noted that Skopje's public transportation system is severely underdeveloped, consisting only of buses that do not meet basic environmental standards. Because of poor infrastructure and aggressive road traffic culture, bicycles are rarely used, exacerbating problems such as congestion, impossibility to find a parking space at peak hours, and, most expediently, add to the extreme air pollution. Industry is another significant source for emissions of particulates and heavy metals, while energy production is a key source for SO<sub>x</sub>, NO<sub>x</sub>, particulate and CO emissions at the national level with two major installations in Skopje within iron and steel production: Titan and Makstil AD Skopje (MEPR, 2017).

Residential heating is an additional source of pollution with 62% of households consuming fuel wood as the primary source of heat, while 29% use electricity, 8% rely on heat energy from district heating systems, and the remaining 1% utilize other types of heating sources (SSOM, 2015). Illegal and uncontrolled landfills, the use of plastic, motor oil, vehicle tyres for heating are also producing additional adverse effects on ambient air in Skopje (MEPR, 2017). The agricultural sector is a major source of ammonia (NH<sub>3</sub>) emissions. Unauthorized open burning of waste (including agricultural waste, wood, pruning, slash, leaves, plastics and other general waste) is another notable pollutant. Emissions from construction and demolition activities mainly contain particulates, but other pollutants are also emitted, depending on the materials used. There is only one clinical waste incinerator operating, while more than 99% of the municipal solid waste is landfilled in ways that do not fulfil European standards (cf. Fig. 4c).

Air pollution is also the largest contributor to disease from environmental factors, with cardiovascular and cerebrovascular causes of death accounting for most mortality cases: 80% in the case of ambient air pollution and 60% in the case of household air pollution (WHO–ROE, OECD 2015). WHO estimated that air pollution in 2012 was responsible for 7 million premature deaths, while the environmental burden of diseases in the Macedonia is 3774 death cases (WHO, 2009; WHO, OECD, 2015), estimated to be as high as 15 per cent of the total burden of disease in the country in 2004 (UN, 2011). Noise is an additional problem in the urban area.

These two risk types have adverse effects on the health, above all the health of children and other vulnerable groups (Kochubovski, Kendrovski, 2012; Spasenovska et al., 2012).

There certainly is a need for improving the lifestyles and habits of the population in the mentioned segments. To effectively tackle the problem of pollution of Skopje, decision-making requires action to be multispectral, i.e. involve all sectors of the government (WHO, 2015). The design and delivery of effective urban green space interventions is critical to the provision of positive health, social and environmental outcomes (WHO, 2017). One possible solution would be to analyse and implement evidence-based intervention by following success stories from comparably polluted cities.

## 4. Lessons from Poland

### 4.1. Selected processes inhibiting sustainable development in Polish cities

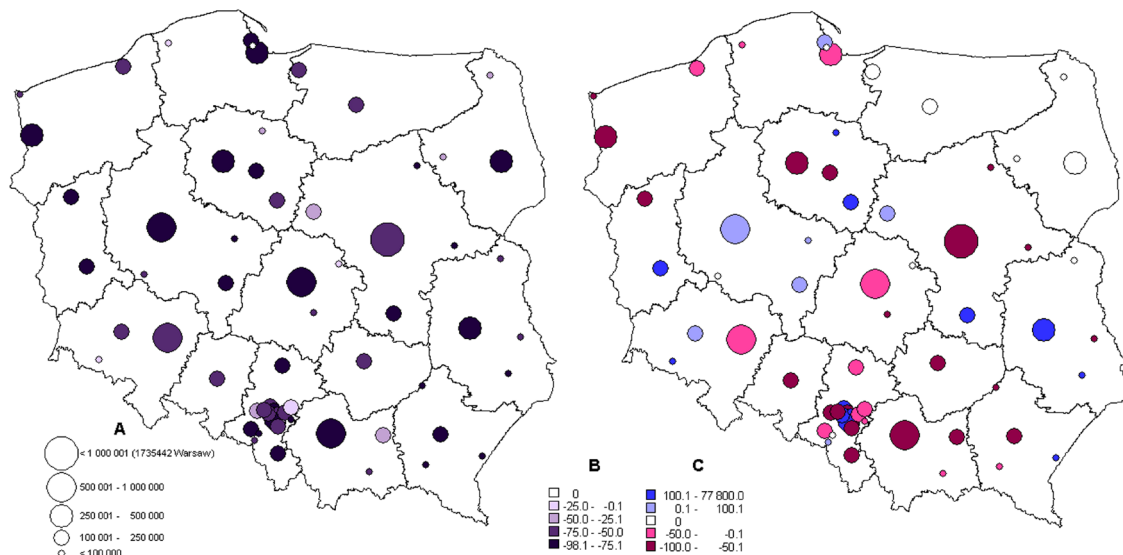
There are numerous environmental factors detrimental to city dwellers' quality of life: pollution of air, water, soil, waste, noise, etc. They pose a tremendous challenge to be dealt with by every city. This section analyses two elements worsening the condition of the urban environment in Polish cities and discusses whether the authorities managed to overcome those problems.

One of the key factors affecting the quality of the natural environment and exerting direct influence on the health of city dwellers is air quality. Depending on the size of the city, which in turn hinges on population size and road saturation, the issue of air pollution is becoming increasingly pressing, especially in cities located in developing and least developed countries. Recently, Polish cities have been the unwelcome leaders in terms of exceeding maximum admissible air pollution levels (Reizer, Juda-Rezler, 2016). This is predominantly related to low emission, i.e. the emission of particulates and harmful gases at the altitude of up to 40 m. Those pollutants are produced in household furnaces and local coal-fired boiler plants where coal is burnt ineffectively, and in road transport. It is a problem many Polish

cities must currently tackle. However, their struggle is successful in the sphere of high emission generated primarily by particularly arduous industrial plants. Poland experienced a far-reaching reduction (i.e. by 65%) in particulate emission from particularly arduous industrial plants per 1 km<sup>2</sup> from 0.34 t/y in 2004 to 0.12 t/y in 2014. An even healthier, 73% fall in particulate matter emission was recorded in the analysed Polish cities when comparing the years 2004 and 2016. This is confirmed by negative changes in this scope in all cities (cf. Figure 5). As Kubica (2012) remarks, it results from the introduced methods of curbing emissions, such as: improving the efficiency of machinery; fuel treatment—removing impurities before combustion, using low-emission solid fuel, gaseous and liquid fuel; supplying clean combustion technologies—modification of combustion chambers, burners, addition of additives to the burnt fuel (gasification, degasification, liquefaction, etc.). This is accompanied in numerous cities by the introduction of programmes for air protection and closure of unprofitable industrial plants generating air pollution.

Another important factor with an impact on the quality of life and health of city dwellers takes the form of pollution resulting from excessive waste production. Illegal and uncontrolled landfills are a

particularly dangerous phenomenon in this respect. They are directly detrimental to the natural environment, and the harmful, often toxic, substances excreted during the decomposition of waste pose a hazard to the inhabitants' health. The presence of illegal landfills obstructing sustainable development is also recorded in Polish cities. Their present analysis is grounded in data from the years 2008–2016 because prior data regarding illegal landfills are not available. It is hard to find any regularities during the said time range. The number of illegal landfills closed in Poland increased from 9,705 in 2008 to 15,289 in 2016, and it is noteworthy that over 86% of that number includes dump sites shut down in urban areas. Thus, it is a tough challenge to which Polish cities must respond. In 2016 in Poland, 12 kg of waste per inhabitant were collected during the liquidation of illegal landfills. This represented a 66% drop with respect to the year 2008. It is worth noting here that a comparison between the years 2008 and 2016 reveals that the majority of analysed cities in Poland (53%) experienced a decrease in the volume of municipal waste collected during the closure of illegal dump sites (Fig. 5). In general, a reduction in the volume of such waste was observed in cities housing more than 100,000 inhabitants, such as Warsaw, Kraków or Szczecin (Fig.



**Fig. 5.** Dynamics of changes (%) in particulate matter emission levels and municipal waste collected during the closure of illegal landfills in Polish cities.

*Explanation:* A – population, B – dynamics of changes in particulate matter emission levels from particularly arduous plants per 100 km<sup>2</sup> between the years 2004 and 2016, C – dynamics of changes in the volume of municipal waste collected during the closure of illegal landfills between the years 2008 and 2016

*Source:* The authors' draft based on data from LDB CSO (2016)

5). The conclusion is that while the number of new legal landfills in cities in recent years has risen, it has been accompanied by a drop in the volume of illegally dumped waste. We must bear in mind that the natural environment is affected by the volume of illegally stored waste rather than by the number of places in which it is left. Therefore, the positive trend involving less and less waste collected during the closure of the legal landfills derives, among other things, from new regulations organising the waste management system introduced in Poland in 2013. Consequently, numerous Polish cities have implemented information and awareness-raising campaigns promoting separate waste collection. The authorities have also improved the monitoring of sites where illegal landfills appear and have introduced more severe punishments for those dumping waste in unauthorised places.

#### 4.2. Implementation of environmentally sustainable development in Polish cities

When implemented, environmentally sustainable development proves beneficial for city dwellers' living conditions. Furthermore, any pro-ecological actions of city authorities improve inhabitants' health. In this context, certain solutions designed to improve the quality of the environment in Polish cities are presented below.

The cities use sustainable development strategies and plans as organisational instruments aimed to implement the sustainable development principles. They contain vision, objectives and development directions applying sustainable development ideas and the concepts of modern city development. Such documents have been prepared in most Polish cities. One of them is Kraków, which also made the notorious list of the most polluted cities in December 2017, at no. 11, although still with a pollution level half that of Skopje (cf. Fig. 4b). *Kraków's Development Strategy 2030* (2017) reads that the city will aspire in the coming years to implement the *smart city* idea of becoming a modern metropolis offering high quality of life and favourable conditions for innovative economy, having strength in-depth through human capital, managed with the aid of ICT technologies, considering the needs and aspirations of the inhabitants and their participation

in the public life. Moreover, in line with this concept, Kraków will develop on the basis of six factors, i.e. *smart economy, smart mobility, smart environment, smart people, smart living, smart governance*. Of importance in this context is the factor relating to *smart environment*, whereby Kraków optimises energy use, primarily through renewable energy sources, and acts to reduce the emission of pollutants into the environment. Another city to identify care for the natural environment as one of its aims is Warsaw. The operational objective entitled *Using the values of the natural environment and ensuring its ongoing improvement* is to be implemented through actions aimed to make Warsaw a green metropolis where residents and tourists can find places appealing for leisure and recreational activities.

The above-mentioned actions are, however, planned for the future. Thus, the question arises: what are the pro-ecological initiatives already in progress in Polish cities? In order to boost the quality of environment in Poland, the country has been continuously increasing its outlays on environment protection and water management. Investment outlays on environment protection tripled between the years 2004 and 2016, while outlays on water management doubled in the same period. Expenditure on municipal waste management and environment protection on city scale also recorded a rise. The data indicate that as many as 93% of the analysed Polish cities increased their outlays in that scope (Fig. 6). Many factors play a part here, such as additional EU funding for pro-ecological investments and initiatives, increased ecological awareness of local governments and the general trend towards the ecologisation of cities.

One of the solutions with beneficial effects on the life quality of the urban population is to increase the area within cities that is taken up by greenery. It is particularly visible when we analyse the share of parks, lawns and green areas in housing estates in the total area of cities. When comparing Poland in 2004 and 2016, there was a 14% rise in this index. In turn, 62% of the analysed Polish cities observed an increase in the share of parks, lawns and green areas in housing estates in the total area of cities, ranging from 0.4% in Bydgoszcz to 139.5% in Krosno (cf. Fig. 6). What is more, the availability of woodlands within cities in Poland is also on the rise. According to Szymańska et al. (2015), the

mean value of the availability of green areas per inhabitant in 2012 was 142 square metres and rose by 5% between 2004 and 2012. It should also be added that it is a very positive trend related to the construction policy and the growth of housing estate green areas (cf. Dymitrow et al., 2017).

To expand the biologically active urban surfaces in cities, city authorities may also undertake more costly investments like green roofs and green walls. A study performed by Lewandowska and Rogatka (2017) proved that these solutions are already functioning in some larger cities, such as Warsaw, Poznań, Wrocław, Kraków, Gdańsk, Gdynia.

Another area subject to the implementation of sustainable development is ecological construction (Chodkowska-Miszczuk, Szymańska, 2014). As pointed out by Lewandowska and Rogatka (2017), by the end of 2016 Poland had 378 buildings with an ecological construction certificate, including 289 with a BREEAM certificate and 89 with a LEED certificate. They are primarily located in the largest cities, and include features such as: healthy conditions for life and work, effective use of renewable energy sources, energy efficiency, use of eco-friendly and reusable materials, prevention of air, water and soil pollution, integration with the natural and social

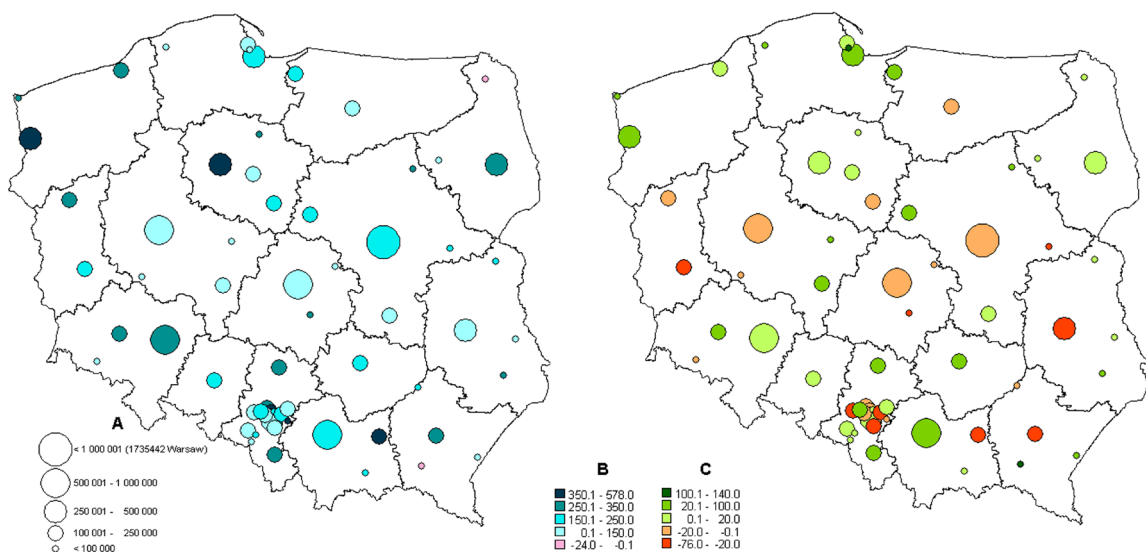
environment, and economical land use (Leźnicki, Lewandowska, 2014).

## 5. Practical possibilities of implementing solutions from Poland in Skopje

In view of the outlined problems Skopje is facing, as well as the proposed solutions from the Polish cities, this chapter provides a space for discussion on the transferability of ideas, both in terms of possibilities and barriers. The discussion will be held in three openings, each representing one of the three facets of the sustainability paradigm.

### 5.1. The economic aspect

The economic aspect is particularly important in that it often works as a tool or a means to obtain a certain vision or a higher goal. We must bear in mind that “economy” is not just a question of money, as money is no more than an abstraction of value. Values, on the other hand, are intricately enmeshed in one another along semantic water-



**Fig. 6.** Dynamics of changes (%) in the level of expenditure on municipal waste management and environment protection, as well as the share of parks, lawns and green areas in housing estates in the total area of cities in Poland.

*Explanation:* A – population, B – dynamics of changes in the level of expenditure on municipal waste management and environment protection between the years 2004 and 2016, C – dynamics of changes in the share of parks, lawns and green areas in housing estates in the total area of cities between the years 2008 and 2016

*Source:* The authors' draft based on data from LDB CSO (2016)

sheds that reflect and shape trains of thought in line with prevailing Zeitgeists. Any organized activity, hence, always reciprocates with a discursively inferred state of mind that has become politicized (Dymitrow, Brauer, 2018: 11). This is important “insofar that rules and regulations are sometimes less a factor for placement of money than are underlying ‘guiding principles’ or ‘visions’” (Dymitrow et al., 2018: 101). So, unless the national economy has reached the threshold of severe inflation (which is not the case with Macedonia) any observable trend in governmental expenditures is a reflection of incumbent values, be it formal-legal, visionary, or practical (Dymitrow et al., 2018: 101–102).

Let us now reflect on the expenditure trends of the Macedonian government(s) in the recent years. In terms of health, WHO (2015) has assessed the economic cost of premature deaths from air pollution in Macedonia to be USD 4.8 million, without the costs for hospital admissions and treatments. The total environmental protection expenditures in 2016 amounted to only USD 200,000. Contrarily, the controversial *Skopje 2014* project, initially estimated to cost USD 100 million, has risen to USD 800 million (Jordanovska, 2015). There is a huge mismatch between societal needs and articulated needs. The new (as of 2017) social-democrat government offers a change of focus, including ending “unproductive projects” like *Skopje 2014* and focusing on “infrastructure and future” with projects such as “Macedonia MegaPolis”, “Macedonia Without Black Spots” and “Macedonia Without Mud” (GRM, 2017).

The government plans to invest USD 370 million in a public-private partnership to provide legal support to unplanned constructing, and plan for urban green space interventions. Other anticipating measures of the new government include: gasification (the Trans Adriatic Pipeline to Bulgaria and Greece), increased energy-efficient measures, import ban on high-emission vehicles, establishment of an environment fund, and development of regional centres for waste management and medical waste (GRM, 2017). Hence, while change seems underway (at least on paper), a curative approach is still the predominant method of the system, rather than a preventive one. This is associated with the often-observed discrepancy between the performance level of management and the performance

level of quality (cf. Arsovski, Arsovski, 2012). Full legal implementation of a new policy is still painfully missing due to the lack of budget planning as per WHO policy recommendations (Gray et al., 2016; Schweizer et al., 2014) and lack of reporting processes in line with international environmental programmes (UN, 2011). Additionally, there is an evident gap between available financial resources and statutory services obliged by law. Given this dearth, optimism need be paralleled by cautiousness in order not to deepen deprivation (cf. Dymitrow and Brauer, 2014; 2016; Krzysztofik and Dymitrow, 2015; Krzysztofik et al., 2016; 2017b).

## 5.2. The ecological aspect

While discussing prospects of implementing ecological solutions, one needs to consider the absolute (rather than relative) comparability between the two contexts in terms of hazard severity (cf. Krzysztofik et al., 2015). As Donevska (2017) put it, “[i]ntensification and poor management of industrial and urbanization activities increasingly threaten the health of the urban population; [hence] taking into account the ecosystems and biodiversity into urban planning are among the key aspects of urban sustainable development” (p. 152). Can this be done in Skopje?

The most evident problem concerns transportation, as the average daily mobility of Skopjans is 2.11 trips/capita, 1.40 of which are generated by vehicles, mainly cars (GUP, 2002). Skopje’s designed road capacity (5 people per car) and parking capacity (3.8 inhabitants per vehicle) are long exceeded. Beyond obvious problems with noise, disorganization of traffic (many lower-rank streets form cul-de-sacs or are unfinished) and traffic delays, the overutilization of cars generates unheard-of air pollution. To this scenario, we also need to add aspects such as limits to growth and purposes of space and land use (cf. Krzysztofik et al., 2017a). Skopje’s historically strong migration policy has not made full use of the city’s spatial potential and residential areas now cover only 45% (GUP, 2002). New constructions are done only exclusively on new land, with no reconstruction and filling-in of abandoned or devastated spaces. Moreover, Skopje faces the difficulties of illegal construction (cf. Fig. 3), with

virtually no enforced legal sanctions for non-compliance.

At this point, solutions seem bleak. Realizing that the urban network of Skopje (which is compressed into a latitudinal canyon between the river and the mountain) cannot be drastically altered nor supported by an underground system (due to geological and practical difficulties), Skopjans need to work with small means, mainly phone-based app technology. In line with Kraków's strategy (2017), one project could be developing a Wi-Fi-based real-time information service for passengers using public transportation. Such a system could be further enhanced by mapping traffic jams and similar traffic-related everyday problems. Another important project would be placing sensors on parking spaces in Skopje. Drivers could gain access to an interactive map app, and thus not only save time searching for free parking spaces, but also reduce pollution from unnecessary exhaust gases. Sustainable transport in Skopje can also be achieved through the use of car-free zones in its most vulnerable parts, installation of pay tolls and statutory bans on old cars. The City of Skopje has already (since September 2017) initiated real-time passenger information for public buses (PTE Skopje, 2017) and has announced that new electric buses will be purchased (Republika Online, 2018). Also, an innovative app—*Skopje Green Route*—has been launched (Google Play, 2014), providing Skopjans and travellers with information how to plan the quickest, cheapest and most environment-friendly routes to various destinations around the city.

Moreover, Skopje is in huge supply of unused urban land (50% of the city's area), which provides an opportunity for future growth without expanding the city limits. For instance, there are plenty of green areas for combined recreation and economic development (like urban farming) in the vicinity of the Fisheries Research Institute in the City Park (cf. Arsovski, 1994), now transformed into an animal husbandry facility. Also, being Macedonia's primate city, Skopje spawns a huge in-migration, while the swelling of the city limits comes with a great deal of unused and devastated areas, industrial and commercial zones. This situation can be used in a sustainable way by proactively planning for greater density and green areas. Mimicking the interventions in Polish cities, another important step

for Skopje would be generating additional regional waste management centres to decrease the most harmful illegal and uncontrolled landfills.

A relatively easily implementable solution would be to revise the Macedonian industry organization in order to incite environment-friendly companies. For instance, full implementation of the feasibility study of Makstil-Ferro Slag Dumpsite is needed to eliminate industrial hotspots and decrease ambient air pollution. Ecological construction, although still timid, is likely to be supported as a strategic measure of the current government, which in January 2018 has awarded five innovative companies for their technological solutions to reduce air pollution in urban environments (cf. NetPres, 2018).

Furthermore, Skopje should monitor measures for improving facilities' efficiency (like in Poland), including low-emission solid fuel, gas and liquid fuel, and technologies for clean combustion. Increased use of smart technologies like telemedicine and similar public health programmes are already getting a foothold in Macedonia (cf. Haxhihamza et al., 2011) and can be effective when targeting Skopje's children and youths. Skopje should also continue to nurture its affection for the natural landscape, howbeit in an environmentally friendly way. In line with Warsaw's strategy (2005) to recognise the value of biodiversity in the urban landscape, this should include preservation, cleaning and arranging the natural resources, e.g., by means of new avenues, parks, squares, eco-gardens and eco-boulevards (cf. Birkeland, 2009), especially in the populated yet heavily polluted areas outside the city centre.

In conclusion, while much remains to be done in the ecological arena, small steps are already being taken. On an optimistic note, much of the necessary procedures involve a radical change of policy, which in itself is not an expensive undertaking. On the other hand, implementing those policies can be cumbersome for reasons outlined next.

### 5.3. The socio-cultural aspect

At a policy forum of *Science*, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) maintains that "the major challenge today and into the future is to maintain or enhance beneficial contributions of nature to a good

quality of life for all people”. At the same time, IP-BES also recognizes “the central and pervasive role that culture plays in defining all links between people and nature” (Díaz et al., 2018: 270). This means that without taking into account the role of *culture*, any societal endeavour—no matter how elaborate and earnest—might prove futile (cf. O’Brien, 2013; Thomas, 2011; Meadows, 2008). *Sensu lato*, culture is all what people do, think and possess as members of a community; *sensu stricto*, it denotes a sphere of intercommunication in which socially accepted meanings of value are important. In other words, culture is a set of learned phenomena transmitted by socialization (Rykiel, 2014: 67). Hence, the cultural formation of individuals lies in the inculcation of various cultural codes. Importantly, to act as carriers of meaning these cultural codes cannot linger in isolation but must operate in systems of references (Bauman, 1996: 156). If not, Bauman argues, codes of meaning produce closed social systems at best, or totalitarian systems at worst. The question that yet remains to be answered is what kind of system does *Macedonian* culture represent?

For as long as people have managed natural resources, they have engaged in collective action. But development assistance has paid too little attention to how social and human capital affects environmental outcomes. Social capital comprises relations of trust, reciprocity, common rules, norms and sanctions, and connectedness in institutions (Pretty, Ward, 2001). Behaviour change is one of the important goals when we speak about sustainable development (cf. Dymitrow, 2017; Dymitrow, Brauer, 2018) and involvement of the inhabitants of Skopje in this process. The sustainable development programme should also anticipate changes in people’s behaviours and differences between age groups, especially the most vulnerable children and the elderly (Jordanova Peshevska et al., 2014). In order to make a behaviour change we have to define the culture of Macedonians and anticipate it in the sustainable development change. While cautious about resorting to stereotypes (cf. Kitromilides, 1996; Todorova, 2004), Macedonian (Balkan) culture is ridden with a slew of counterproductive traits, such as tardiness, resentfulness of planning, habitual procrastination, tribalism/nepotism, tolerance of corruption, envy and suspiciousness of fellow countrymen, or fear/distrust in/of authority, which should certain-

ly be taken into account when introducing changes. Inertia and habit are hard for a system to break. As Glanz et al. (1990: 19) suggest, designing interventions to produce behaviour is best done with an understanding of behaviour change theories and an ability to use them in practice or to describe the key variables of behaviour change models, and to explore the link between behaviour change and attitude.

On the optimistic end, Macedonian’s culturally acquired sense of sociability can be made beneficial in combination with Skopje’s urban planning model of compactness. Both reinforce meetings between people, be it through informal gatherings or social activities, and, as such, are engrained in Skopje as part of its local culture. Interaction is a first step towards the exchange of ideas. The main issue here is: what kind of ideas? While identity-building projects such as Skopje 2014 remain a thorn in the side of many Skopjans and strike up many conversations, perhaps the focus of discussion should be less on what the money is spent on, and more on what lures in the background. The epithet “world’s most polluted city” should not be taken figuratively. It is an ominous reality, which half a million Skopjans have to face every day, and, what is more, to deal with the exponentially hazardous effects on the quality of life it entails. As Peterson (2015) contends, by organizing ourselves against any system of meaning, we “inherently must concede part of [our] individuality towards a homogenous goal”. In this sense, idiosyncrasies of culture should be taken to mobilise change towards a common good, rather than to further division. This is particularly important when economic resources are scarce, and when there is no room to pursue both national identity and clean environment.

## 6. Conclusion

In light of the research carried out, it should be emphasized that Skopje requires instant activities in implementing the initiatives improving environment quality. The response to the diagnosed problems can be taken from the experience of Polish cities towards sustainable development in three key domains: economic, social and environmental.

Firstly, the conducted research indicates that environment-oriented budgeting and continuous financial provision within the areas of urban economy, waste management and transport infrastructure *can* be achieved. The activities are in line with the dynamics of changes in the city's expenses on urban economy and governmental projects concerned with environment protection. In line with the interventions in the Polish cities, another important step for Skopje would be to generate additional regional waste management centres to decrease the most harmful illegal and uncontrolled landfills. By these means, Skopje can combine sustainable solutions with economic growth and higher quality of life.

Secondly, our analysis points to the urgent need of investment in a natural urban ecosystem. This includes creating new green urban public spaces, more open spaces for the containment of cleaner air and water, as well as energy-efficient construction and green housing. As the examples from Poland show, green areas must not be a barrier for new urban investments; on the contrary, they may be turned in to a positive feature for creating good neighbourhoods that support activities to improve healthy lifestyles. Moreover, such solutions can be implemented even on small allotments in the central parts of the city, e.g., by means of green roofs. As these are also some of the most efficient and low-cost ways for decreasing air pollution, we deem their feasibility in Skopje as high.

Thirdly, investment in human capital is crucial for sustainable development of Skopje. An increase in public awareness of the benefits of sustainability can be easily achieved through improved education and public broadcasting. Concepts such as participation, dialogue, collaboration, societal responsibility, proactive approach are key ingredients to inspire change in the ecological culture of Skopjans and to finally resolve the long-standing (un)sustainability issue. The cultural aspect can also be achieved through the creation of green areas. By creating new meeting venues for the residents, we allow them spend their leisure time in more attractive environments, which is also likely to psychosocially build a collective understanding of the value of such spaces in a broader range of dimensions.

The conducted research shows that environmental problems in urbanised areas can be limited by

using a number of simple, low-cost and fast tools. This, however, is only possible once a more advanced level of ecological consciousness is achieved, and this in turn is tightly interwoven with the positive attitudes of Skopjans. In the next few years, it is likely that Skopje may be moving towards realizing the assumptions of sustainable development and trying to become a smart city by investing in up-to-date capital, including offering friendly conditions for innovative economies, and people-oriented city planning. Only brave and determined action can contribute to a substantive improvement of the environmental condition and the inhabitants' quality of life (3).

## Notes

(1) 2002 was the year when the last official census in Macedonia was held. The planned census of 2012 was not held because of political boycott. According to more recent unofficial estimates (2017), the Skopje population is roughly the same (502,700).

(2) AQI (Air Quality Index) is an index for reporting daily air quality in terms how clean or polluted it is, and what associated health effects it might incur. 0–50 = good; 51–100 = moderate; 101–150 = unhealthy to sensitive groups; 151–200 = unhealthy; 201–300 = very unhealthy; >300 = hazardous (EPA, 2017).

(3) This article is part of the 40<sup>th</sup> issue of *Bulletin of Geography. Socio-economic Series* entitled “Sustainability—differently”, edited by Mirek Dymitrow and Keith Halfacree (Dymitrow, Halfacree, 2018).

## Addendum

Shortly after this paper was accepted for publication (March 2018), the situation in Skopje began changing drastically. In a move to improve relations with Greece and resolve the decades-long dispute that has held up Macedonia's prospects of joining the EU and NATO, the ruling social-democratic party (SDSM) commenced a rapid process of re-



versing policies and removing artefacts introduced earlier by the right-wing nationalist party VMRO. This includes re-naming the country (adding a geographical qualifier), the language, the airports, the highways, the stadiums etc., abandoning the construction of ongoing projects (e.g. the City Hall) as well as removing the most blatant statues and edifices from the public spaces of Skopje (including the giant *Warrior on a Horse* impersonating Alexander the Great and the triumphal arch *Porta Macdonica*). This event has certain, yet still unknown, bearing on the findings of this paper in two dimensions. Firstly, the ‘de-antiquisation’ process is costly and one could argue that the money spent on extracting things, which many Macedonians by now have come to accept, could be spend more wisely, e.g. by prioritising improving the environmental condition. Secondly, a strategical move towards entering the EU is at the same time a (prospective) guarantor that radical environmental measures *will* have to take place to be granted accession. In conclusion, the current events are likely to improve the environmental condition of Skopje in the long run, but until then, the chances of obtaining this aim seem bleak.

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