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CONSIDERATIONS ON CLIMATE STRATEGIES AND URBAN PLANNING: BUCHAREST CASE STUDY

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Abstract
The present paper aims to recommend several urban planning measures resulting from the urban climate strategies, measures which are based on the research reached during the "Urban Climate Study of Bucharest", project financed by Romanian-Swiss Program, which focused on the study of relevant characteristics such as urban development, land use, urban sprawl, urban heat island and green space situation.
Keywords: urban climate study, urban planning.

1. INTRODUCTION

The climate is defined by the climatic elements such as air temperature, humidity, precipitation, air pressure, wind, clouds and radiation. This definition shows that "the climate" cannot be quantified through a measured variable, consequently what can only be measured, monitored and evaluated are single climatic elements (Hantel 1987).

While the climate in undeveloped areas largely depends on natural conditions and factors, the climate in cities is influenced by buildings and is called the urban climate (Landsberg, 1981). The term "urban climate" nowadays also includes changes in the natural composition of the air as a consequence of man-made influences (like corrosive gases and aerosols).

Therefore quality of life in cities is affected by several factors, one of them being the diminishing quality of the air (Carter, 2015). The fall in the green space area of the public use domain, such as the public parks, and the situation of the green belts of the Bucharest city, contribute to the issue of air quality quite significantly (Luca, 2014). There are specific regulations that provide for the areas of green space necessary for every person, but their spatial arrangement is not always uniformly distributed nor correlated with the population densities (Aldea, 2016).

The decision makers and planners should be able to take into consideration the climate state and introduce it into the strategic management of their community.

2. BEST PRACTICES ON URBAN CLIMATE STUDIES MEASURES

2.1. Tree Master Plan in Barcelona

Barcelona is a well known touristic city but is also particularly vulnerable to climate change. It has high density of population which increases the local heat island effect causing multiple dysfunctions related on of people's health and also is raising environmental challenges. Barcelona has comitted on developing and implementing a Trees Master Plan 2015-2035 (EEA) which involves planting and managing trees for many years, in lines with the goal of the Barcelona Green Infrastructure and Biodiversity Plan 2020 (BGIBP). This is particularly necessary due to the fact that Barcelona has a relatively low ratio of green space per inhabitant (2,96m2/inhabitant), but it has more street trees than most other European cities. Currently there are over 200.000 trees of 150 different species lining the streets of Barcelona (approximately 1 tree for every 10 m of street), with new trees being planted every year. When including the trees in parks (about 36.000) and those in forest areas (73.500) all together about 310.000 trees are managed by the City Council. (EEA)

2.2. Pringle Creek Green Streets (Salem, Oregon, USA)

The Pringle Creek Community is an example of an entire community designed and constructed with an emphasis on environmental and social sustainability (Condon, 2010). The community's "Green Streets" are designed to allow rain water to percolate into the ground and return to the aquifer. These streets feature what is believed to be the biggest residential application of porous asphalt in the US. This allows rainwater to soak through the pavement into the subsoil. According to the Pringle Creek website, "with 9,000 linear feet of streets and alleyways, it is believed to be the largest residential application of porous asphalt in the North America." A second benefit of porous pavement is the ability of the water to soak through the pavement during a heavy rain, as opposed to high volumes of runoff causing the storm sewers to back up and flood the streets.

2.3. Seoul case study - Urban renewal

A stream runs through the center of Seoul, dividing the city into North and South, but for three decades it was totally buried beneath a busy downtown highway. Considered an example of 'successful industrialization and modernization', the highway remained there until 2003, when city planners decided to revitalize the area and contribute at Seoul's sustainability.

An urban park has been recreated between the north and south parts of the city as that bridging the gap and bringing people together. The park was reconstructed and the stream was rehabilitated using

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over 75% of the material torn down from the old highway. Fish, bird and insects have made their way back into the urban river, and the area surrounding the park is about 3.6 oC cooler than other parts of the city.

In addition to the restoration project, Seoul has implemented transportation planning, rerouting traffic through other corridors and adding more public transportation. As a result there has been a decrease in the number of vehicles entering the city and bus and subway use has increased. Therefore, an efficient planning and the expanded public transportation were able to redirect and decrease traffic (World Bank, 2016).

2.4. Smog purifying tower in Rotterdam

Smog purifying tower is a 23-foot metal tower, capable of absorbing and purifying a million cubic feet of air every hour (Singapore Engineer, 2016). The tower, located in a Rotterdam park, resembles a giant vacuum cleaner, and is equipped with environment-friendly and patented ozonefree ion technology that filters the dirty air. It uses technology similar to that for indoor air purifiers but is reinforced for outdoor use. Created specifically for public parks, the 7.0 m x 3.5 m modular system is made of lightweight aluminium and has a slightly tapered sculptural form.

3. RECOMMENDATIONS FROM URBAN CLIMATE STUDY OF BUCHAREST

The recommendations in the present paper resulting from the above case studies may be introduced in the integrated strategies developed for cities, metropolitan areas, counties or regions and may considered as a main climatic objectives.

The most relevant measures in the urban climate studies are the ones aiming to improve air quality. For Bucharest there will be emphasized the ones that can be implemented immediately.

3.1. Measures for traffic improvement

Traffic planning measures such as the exclusion of through traffic from residential areas, bypass roads to relieve encumbered thoroughfares, speed limits, and support of the sustainable traffic means such as bicycle and pedestrian traffic are all contributing to the reduction of air pollution.

Bucharest - Ilfov region benefits from an extensive network infrastructure for multi-modal public transport, but one that has suffered over the years due to lack of funding for maintenance or investments and is affected from the rigid separation between transport modes, for certain levels. Inside the city there is an extensive network of metro, tram and trolley. Although the public transport fleet (trams, buses, trolleybuses) underwent rehabilitation, even these improvements will soon reach the end

of its usable life. Trams currently used are not only technologically outdated and does not respect the current standards, but also require intensive maintenance activities. This is why measures for improving public transport conditions are needed:

- new and modern vehicles;
- improving the condition of existing ones;
- increasing no. of km of dedicated lanes for public transport.

Bucharest does not benefit from a parking management system for the whole city as in most European cities. Thus, most of the parking on the roadway in areas with high demand is regulated, parking fees apply, and most often, time is limited for parking and discourage commuters from bringing cars into the city center. None of these provisions exist in Bucharest - drivers can park anywhere, almost without any regulation or payment. Promotion policy for more available parking spaces has led to the transformation of public spaces in various squares and public spaces in municipal parking spaces, based only on space at ground level. These measures were implemented in parallel with the decommissioning of lanes and upscaling narrow streets in one way streets to increase parking capacity. Parking on sidewalks is present on many of the city's streets. Since parking rules do not apply, double or triple curb parking can be met. This significantly reduces the street capacity, while the number of lanes is reduced, parking makes traffic difficult and a significant percentage of traffic in the center is made up of cars looking for parking spaces, increasing demand and further slowing traffic.

At the same time an awareness campaign is necessary for discouraging using individual transport (one person in one car). Population must be informed about the alternatives and their consequences. Special citizen information day may be used as a general information platform for the local population, to inform them about climate change and the conditions in 50 years when their present kids will be adults and that they have to act today to be well prepared tomorrow.

Encouraging more sustainable types of transport as cycling, car –sharing would also improve the traffic situation and, consequently the air pollution in Bucharest.

3.2. Measures for limiting emissions related to using domestic fuels for heating in residential areas.

An important factor for the reduction of emissions on behalf of air pollution control and climate protection is the type of energy supply and of the selected fuels. The use of wood as renewable energy source (Healion, 2002), which is advocated by current climate protection efforts, must be critically examined in urban agglomerations from the point of air quality. The combustion of wood requires at least modern

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firing systems where the best available techniques control the wood loading, burnout behaviour, flue gas treatment and flue conducting. In financial terms, this often only pays for larger, i.e. generally commercial, installations.

3.3. Using renewable energy for heating with reduced emissions

There is a great potential for energy savings in the residential sector. Energy conservation measures need to be developed for newly constructed buildings and for buildings under refurbishment. However, to achieve a significant reduction in energy consumption apart from the standard energy-efficiency methods, innovative technologies should be implemented, including renewable energy. Renewable energy sources at local level are increasingly seen as important ways to reduce carbon emissions and fossil fuel demand from housing and public buildings (Rezaie, 2011).

3.4. Avoiding construction of new streets/passages/freeways which can attract traffic growth. Improving quality of public space by reducing space allocated to individual transport

Traffic engineers have discovered in the last few decades that you can't build your way out of congestion because the roads themselves cause traffic (Gehl, 2001). The concept is called induced demand, which is economist-speak for when increasing the supply of something (like roads) makes people want that thing even more. If you expand people's ability to travel, they will do it more, living farther away from where they work and therefore being forced to drive into town. Making driving easier also means that people take more trips in the car than they otherwise would. San Francisco removed a highway section, called the Central Freeway, that carried nearly 100,000 cars per day in 1989. The boulevard that replaced it now only carries around 45,000 daily cars and yet they move.

3.5. Maintain transport of fresh air - Preserve and create the sources of fresh air and their corresponding transport paths.

When cold-air production areas lie in or near the catchment areas of valleys and vales leading to developed areas, natural paths for the supply of fresh cold air are thereby provided, since cooler air continually flows towards lower topographical areas. The intensity of flow depends upon the size of the catchment area, the angle of slope inclination, the width of the valley, and the degree of freedom from obstruction. Cleaner fresh air can only be supplied by local air flows when the environment (in the form of the surrounding area and larger parks in cities) is intact and not excessively burdened by pollution. Cross-municipal planning must take care that regional cold-air production areas can fulfill their special function. This includes the restriction of development on open areas, avoid building in locations where

the constructions can become obstacles for the ventilation paths and, where necessary, artificial foresting (Parlow, 2011).

4. CONCLUSIONS

The present study provides initial information and best practices for decision-makers and the public about the preferable mitigation measures in urban planning in order to avoid the deterioration of the urban climate and the environmental stress produced to human organism. It is crucial that these measures to be part of an integrated climate strategy, taking into consideration also to improve awareness about the importance of urban climate not only among decision-makers but especially among the public.

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