

# Forests for green cities

## Editorial

Today over 50% of the world population lives in cities and peri-urban areas. In Europe this figure currently exceeds 73% and is predicted going over 80% by 2050. 65MP of the resources they consume are imported from outside the (peri-) urban territory. Their metabolism emits 70% of the greenhouse gasses and experience significant more air pollution than the surrounding rural areas. These examples illustrate not only major problems of contemporary urban areas, but raise equally important questions on the vision on and the planning of the city of tomorrow, which should be a better, safer and more equitable place to live than many cities of today.<sup>1</sup>

In this search most often the green city appears. "Green cities" emerged from the challenge of turning the weaknesses of post-industrial cities (pollution, urban degradation, consumptive resource use) into opportunities. They focus on a sound environment in which accessible green is a main component, next to carbon neutrality, sustainable mobility and outstanding environmental management (including among others zero waste, clear air and high quality piped drinking water) and services.<sup>2</sup> Green cities pay a lot of attention to health and well-being. This concern dovetails in the historical link with the healthy city concept. This latter was launched by the World Health Organization in the 1970ies and combined aspects of physical with mental health.

More recently "green cities" are also associated with sustainable and smart cities. Sustainable cities put emphasis on the social and economic aspects of a city in combination with its environment. They have an equitable and inter-generational outlook, aiming at reaching more livable communities. A committed definition of a sustainable city reads as: "a sustainable city is one in which the conditions under which I live make it possible that my children and the children of my children will live under the same conditions". "Smart cities" are the more recent policy synthesis of how livable cities should look like in the future. Combining the sustainability concepts, they see efficiency as an essential component. This might be reached, at least in part, by innovative technological developments.<sup>3</sup> They rely on ecosystem services of an equilibrated urban environment.

As suggested by the name, the green component is essential for a green city. Green in the city not only provides the urban ecosystem with a natural and open character, but provides alleviation for at least three main problems urban areas of today face:

**The urban heat island (UHI):** this is an urban area that is significantly warmer than its surrounding rural areas due to urbanization and increasing population. Most (but not all) cities experience this effect. The difference with the surrounding rural area can be up to 5°C on average. The temperature difference usually is larger at night than during the day, and is most apparent with a mild winds. The UHI is most noticeable during the summer and winter.

Urban green infrastructure can to a certain extent mitigate urban warming. Green roofs attracted most attention in this respect, but parks and configurations with trees are likely more efficient. The efficiency of the cooling depends on a wide range of parameters among which:<sup>4</sup>

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- a) The plant species: Leafy plants are more efficient than gymnosperms leaf area index).
  - b) The canopy cover size: The more extended he canopy, the greater the cooling effect. Multiple layers of canopies result in more cooling than a single layer.
  - c) The location: Higher efficiency values are realized in green residential areas away from main roads and parking lots.
- (1) **Environmental health impact:** Urban living is associated with more sedentary lifestyle, overweight, type II diabetes, cardio-vascular diseases and mental health. Urban green spaces are restorative environments for urban stressors. Accessible green spaces as parks and forests provide the settings which contribute to the health of the urban residents. Urban citizens, who actively use these greenspaces experience a better general health condition, take less prescribed medical drugs, and when hospitalized, they leave the hospital faster than a relevant control group. Adults who live in a green urban environment report better mental health than people who live in less green environments. Although the mechanisms behind these findings are incompletely understood, there is increasing evidence for the association between the active use of urban green spaces and both physical and mental health.
- (2) **Carbon sequestration** is about carbon capture and its (CO<sub>2</sub>) removal from the atmosphere. It mitigates the CO<sub>2</sub>-concentrations in the atmosphere and is an important instrument in mitigating climate changes. Carbon sequestrations related to a series of biological processes both on land and in water masses. One of them is urban forestry. Planting trees increases the amount of carbon taken up and the sequestration of carbon occurs over the lifetime of the tree. The urban aspect is of importance as cities emit a lot of CO<sub>2</sub> while, as compared with the surrounding rural or (semi-) natural areas, as an ecosystem, they fix only a limited amount. Although the amount of carbon which sinks in urban trees is variable and relatively limited, urban forests have an important education function in remembering the citizens regularly to the massive carbon imbalance the city results in.
- Next to these functions urban forests contribute to a series of other service systems: Cleaning up the air, preventing noise, mitigating runoff, and regulating the water balance, listing only these examples.

The term urban forests are generally used for forests nearby a city. However, the above examples show that forests which are integrated in the urban tissue might have clear advantages. As in a contemporary city a high competition for space exists, this is a main limiting factor for establishing urban forests and connecting green spaces. However, part of this is related to the vision of planners on the city and the role they allocate to green urban functions. In particular in the fast growing cities of e.g. South–East Asia it is perfectly realistic foreseeing significant surfaces of land for urban forest functions.

The science behind this concept of integrated urban forests is another limiting factor. The complex concept is interdisciplinary and characterized by uncertainty. Each of the above theoretical benefits raises a series of questions for which science currently offers no or a most incomplete answer. This journal offers a forum to publish research eroding this uncertainties.<sup>5</sup>

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### Conflict of interest

Authors declare there is no conflict of interest.

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