5 Nature

By Antonino Marvuglia, Javier Babí Almenar, Naomi Morishita-Steffen

> I am glad I shall never be young without wild country to be young in.
>
> Leopold 1949

The integration of nature in cities has a long history behind it, and yet on many occasions the potential of nature in cities have been disregarded in the environmentalist agenda (Grimm & Schindler, 2018). Over past decades, this trend has been reversed, and urban nature is more and more becoming part of urban strategies, plans, and policies (Cortinovis & Geneletti, 2018; Geneletti & Zardo, 2016; McPhearson, Hamstead & Kremer, 2014). Associated with this increasing interest, new ecological concepts emphasizing the value of nature have emerged and have quickly been transferred to urban studies over the past two decades. Green and blue infrastructure, ecosystem-based adaptation, ecosystem services, and lately, nature-based solutions (NBS), are part of this list of emerging concepts. In all cases, these concepts emphasize the value of nature for people in the form of benefits, and consequently, the enhancement or maintenance of their well-being (Nesshöver *et al.*, 2017).

In their literature review on the relationship between people's health and the built environment, Kent and Thompson (2014) proposed three domains where support for health and well-being can most effectively be focused on urban planning and:

1. The built environment and physical activity;
2. The built environment and connecting and strengthening communities;
3. The built environment and equitable access to healthy food.

NBS have the potential to contribute in all of the three areas by influencing citizen's behaviour towards a healthier lifestyle (increasing attractiveness of urban infrastructure that supports active transportation: walking paths, cycling lanes; supporting community interaction in safe and attractive public spaces) and by providing productive urban landscapes with sustainable food systems (urban agriculture and gardening), besides the other beneficial effects such pollution absorption, cooling effect of tree foliage and increased biodiversity.

Perhaps, from all the above concepts, NBS is the one that emphasizes the utilitarian aspect of nature to the largest extent. Current definitions of NBS describe it as cost-effective solutions, because it can concurrently provide environmental, social and economic benefits and address multiple societal challenges (Cohen-Shacham, *et al.* (Eds.), 2016; European Commission, 2015, 2016). The recent critical reviews carried out by Keeler *et al.* (2019) and Babí Almenar *et al.* (2021) identified recurrent benefits that different types of urban NBS can provide, as well as problems for which NBS could be suitable solutions. These reviews illustrate that urban NBS can mitigate urban heat-island effects and flooding risks and contribute to the enhancement of carbon sequestration, air and water quality, biodiversity, liveability of urban public spaces, and both the mental and the physical health of people. As a result of its multiple capacities, urban nature is clearly a relevant component to consider in the visioning of climate resilient, liveable and regenerative cities.

Regarding climate resilience, (Seddon *et al.* 2020) highlighted the prominence of NBS in the 168 Nationally Determined Contributions in support of the Paris Agreement that were submitted to the United Nations Framework Convention on Climate Change However, it is important to remark that with respect to other societal challenges, such as social cohesion and social equity, the co-involvement of citizens and the different groups of stakeholders are usually stressed as important factors to ensure the success of NBS interventions.

In terms of co-involvement of stakeholders, NBS communities should build a strong portfolio of evidence for the effectiveness and long-term positive outcomes of NBS, compared to other adaptation options (Kabisch *et al.*, 2016). Building this strong evidence, Kabisch *et al.* (2016) stressed the importance of developing locally relevant, context-specific indicators with which to measure progress towards meeting targets. These indicators and targets should be developed through a deep understanding of the effects of different nature-based interventions on social-ecological systems and their resilience under different climate change scenarios. Inevitably, to achieve this deep understanding, researchers, practitioners, and policy makers should be co-involved, thereby bringing together scientific, traditional and experiential knowledge. New NBS communities combining science, practice, and policy knowledge are in fact emerging, backed up by projects of international initiatives such as the H2020 of the European Commission. For example, the aim of the Horizon 2020 project Nature4Cities (www.nature4cities.eu) is to create a comprehensive reference platform for NBS, offering technical solutions, methods and tools to support urban planning decision-making. Platforms such as OPPLA (https://oppla.eu/nbs/case-studies) are also collecting successful examples of urban nature interventions, to serve as a guide for future projects.

A well-known example of an NBS community that implemented the first carbon neutral comunnity strategy to becoming the first carbon neutral community in North America is Eden Mills, Ontario, Canada. In 2007, community residents, determined not to wait for government or corporate action to address climate change, and launched a grassroots project, Eden Mills Going Carbon Neutral (Fig. 1.1.4).

Figure 1.1.4. *Township Mayor Chris White (far right) with his team installing the Eden Mills going Carbon Neutral sign. (Credit: Sword, 2010).*

The aim was to show that individuals and small groups of people of all ages could make a difference and inspire others to join their endeavors. These groups within the village decided to measure change by taking household surveys to determine baseline and changing carbon emissions. Among their projects, the community has implemented an ongoing community information campaign, village reforestation projects, a carbon-neutral renovation of the Heritage Community Hall (Fig. 1.1.5) with rigorous energy conservation strategies, a high-efficiency heating/cooling system and the installation of a photovoltaic roof array (Simon, 2015; Sword 2010). Individual inhabitants of Eden Millshave improved energy efficiency at home, have upgraded heating/cooling systems, built straw-bale homes, captured and reused local rainwater, and installed roof-mounted solar panels. Youth and children were involved at the launch of the Carbon Neutral Project, singing with the Carbon Neutral Youth Choir. The nearby University of Guelph has provided invaluable support. The project is dependent upon donations and has successfuly applied for government grants on occasions. This approach therefore informs and involves community members as stakeholders of the project.

Figure 1.1.5. *Eden Mills Heritage Hall after the deep thermal energy retrofit and photovoltaic installation. (Credit: Sword, 2010).*

Another village initiative undertaken by the Eden Mills Eramosa River Conservation Association was dedicated to re-naturalizing the river ways and estuaries within Eden Mills (Fig. 1.1.6), not only to benefit the local community, but also to help stabilize the overall hydrological cycle (Simon, 2020).

Figure 1.1.6. *Eramosa River east branch renaturalization project.* *(Credit: Simon, 2019).*

RESTORD 2030, (Brown 2020) as a small future city could learn from ongoing NBS community initiatives such as Eden Mills. It should also take advantage of the specific and multiple capacities of different NBS. As summarized in the mind map shown in Fig. 1.1.7, both aspects would help RESTORD 2030 to optimize the services that nature brings to the city.

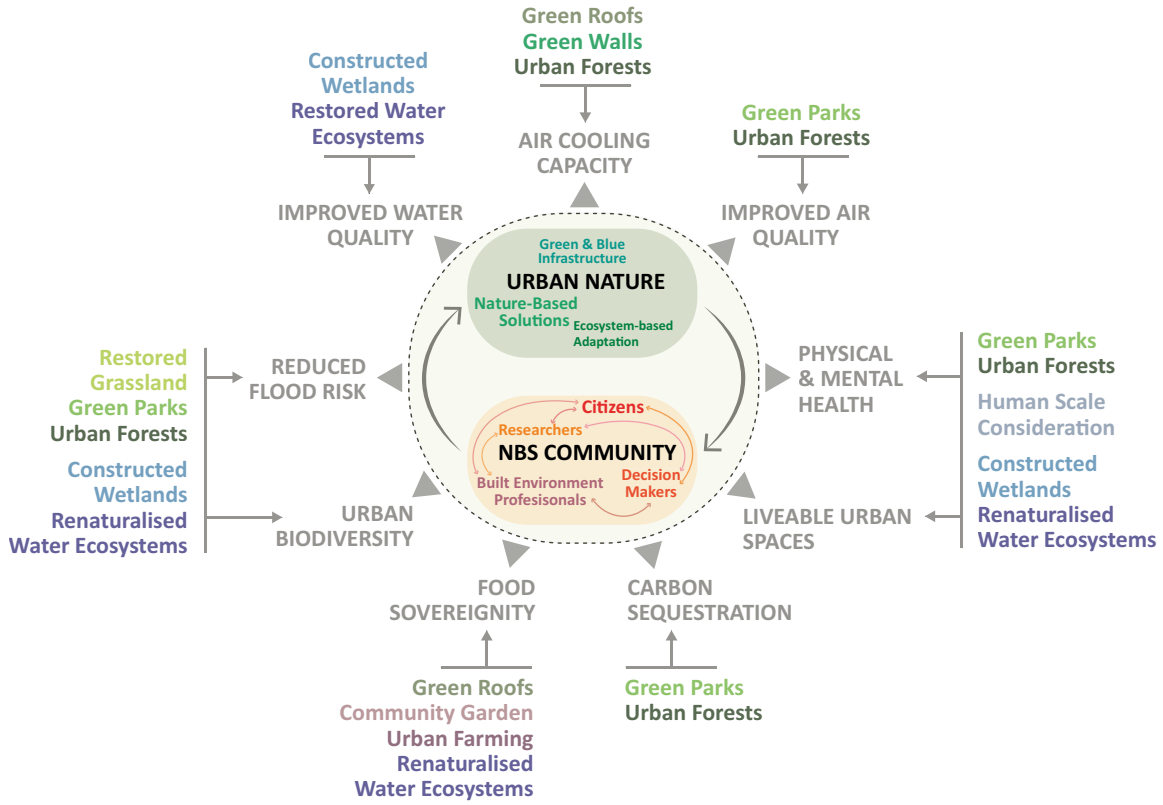

Figure 1.1.7. *Mind Map summarizing the benefits that a combination of urban nature and well-developed NBS communities could bring to existing and future cities.* *(Source: Antonino Marvuglia).*

The correct integration of **green roofs and green facades** in the buildings of RESTORD 2030 will keep indoor spaces colder and decrease the cooling load in summer, although green roofs and green facades in some climates can slightly increase the heating loads in winter. As a co-benefit, they could also become a source of food by following the example of Agripolis. Its inauguration, in Paris, of the largest green roof found in Europe that developed into a business profitable Edible Green Roof[1]. In fact, the use of edible green roofs, together with **community gardens** and other types of **urban farming** activities could help increase local food provision within RESTORD 2030. These activities would contribute to the food independency or food sovereignty of the city, and more importantly to ensuring a resilient and sustainable city.

A well-distributed network of **green parks and community gardens** in RESTORD 2030 could positively refesh the mental health of its citizens and provide places for physical exercise and reconnection with nature as well as with community building. For example, the Magneten Sensory Garden (Denmark), developed by MASU Planning, is an aromatic garden with a focus on special needs visitors, helping to alleviate mental health issues. Green open spaces that are well distributed in terms of social interaction, with principles of green justice guiding implementation and working conditions leaves little room for green gentrification issues and creates a more equitable network of open spaces. In the same sense, well distributed green open spaces can from a physical point of view serve to assist with flood control, water flow regulation and as biodiversity stepping-stones.

In RESTORD 2030, **urban forests** can also contribute to enhance biodiversity and water flow regulation, while positive climatic effects are attributed to CO2 reduction, urban heat-island mitigation, and better air quality. For example, a metropolitan network of urban forests within Madrid, the capital city of Spain, addresses air pollution issues, and as a co-benefit improves its biodiversity connectivity and nature-based recreation. Another similar project, the Metro Forest Project (LAB - Landscape Architects of Bangkok), has targeted the restoration of forest for biodiversity, offering an educative connection with nature.

The nature-based urban strategy of RESTORD 2030 should also consider how urban water use can complement and replenish the hydrological cycle. **Grassland restoration** and **natural sequence farming** in the surrounding areas of the city are two ways to reverse the effects of desertification (Von Weizsäcker & Wijkman, 2018), mitigating extreme runoff and flash floods. **Urban wetlands**, and even constructed wetlands, can be used for wastewater treatment by reducing energetic resources used for wastewater treatment, while increasing the amount of urban vegetation and promoting biodiversity through the flora and fauna of a wetland habitat (Stefanikis, 2015). For example, Qunli National Urban Wetland (China), designed by Turenscape (Fig. 1.1.8), is positive for urban biodiversity, nature-based recreation and water depuration. In a similar sense, a **re-naturalisation of bays and estuaries** could mitigate extreme flooding and precipitation, improve water cleansing, nature-based recreation, aquatic biodiversity, and examples of food supply capacity. One example is the Oyster[2] texture project in New York, which targets the re-naturalisation of estuaries and bays using oysters for water depuration, their regenerated habitats serving as a barrier to mitigate sea waves. It is expected that their condition of keystone species and food sources will contribute to biodiversity enhancement and food supply in the long-term.

Finally, besides urban nature, RESTORD 2030 plans to rely on an efficient **network of public transport infrastructure**, promoting public transport use and bike lanes, rather than cars. A people-centered size and form of the transport network space must be considered, the way they interact and build spontaneous social relations (the "human scale" concept developed by J. Gehl). The network should also be interconnected, in so far as possible, with the network of green open spaces. As a result, people will feel that the city was built to be lived within and enjoyed, creating liveable open spaces, and rather than imposing barriers, transport infrastructure will become biodiversity corridors of ecological connectivity.

---

1 http://agripolis.eu/project/la-plus-grande-ferme-urbaine-en-toiture-au-monde/

2 https://www.scapestudio.com/projects/oyster-tecture/

Figure 1.1.8. *Aerial view of the Qunli National Urban Wetland (China)* *Picture Sara Daneshmand used with permission.*

Acknowledgements

Javier Babí Almenar would like to acknowledge funding from the European Union's Horizon 2020 research and innovation programme under Grant 494 No: 730468 (www.nature4cities.eu).