Prospective research

How can Brussels transition towards a just and resilient city with nature-based solutions (NBS)?

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Key messages

1

Mapping demand for nature-based solutions (NBS) reveals that the city centre of the Brussels Capital Region, as well as the zones along the canal and to the west of the petite ceinture, receive the most environmental stress, including a strong urban heat island effect (+5.8°C), significant exposure to air pollution (48 $\mu g/m^3$ NO_2 ; WHO max = 40 $\mu g/m^3$; 14.1 $\mu g/m^3$ $PM_{2.5}$; WHO max = 10 $\mu g/m^3$), heightened flood risk (26% of all buildings), sub-optimal infiltration of rainwater (50% of the Molenbeek catchment is less than 25% impervious), and are therefore most in need of NBS.

2

A detailed inventory of NBS suitable for use in the BCR is proposed, documenting ecosystem service potential, costs and maintenance needs of each type of NBS, as well as conditions required for its use.

3

Findings from a map-based survey on the use of urban green spaces show that those living in the city centre travel longer to reach green spaces and visit them less frequently; urban green spaces in the city centre lack qualities essential for providing a restorative experience due to overcrowding and noise pollution.

Key messages

4 Brussels residents are relatively willing to have nature-based solutions implemented on residential streets, yet potential conflicts between neighbours as well as a lack of knowledge about NBS maintenance are seen as main barriers for street greening initiatives.

5 Participative scenarios are an effective instrument for discussing the resilient future of the region and should be used in all important planning decisions.

Introduction/summary of the problem

Climate change and demographic growth put pressure on the environmental quality of cities. While urban green can help mitigate the negative impacts of these phenomena, urban green and the benefits it provides are unequally distributed, with vulnerable populations more often lacking access to green. As demand for urban development to support growing populations mounts, there is a need for innovative ways to prioritise green in the dense urban fabric.

Nature-based solutions (NBS) are recognised as one of the most effective ways to address many of the environmental and social challenges facing cities, yet questions remain about how to best incorporate NBS in cities. For instance, where and how should we implement NBS to maximise their benefits? And how can we improve access to public green spaces such that they better meet citizen's needs?

The positive perception of public green spaces and NBS are a key component to the successful uptake of nature-based urban regeneration strategies. Policy recommendations should therefore be co-produced by relevant stakeholders through a democratic and realistic process where design and debate are central.

At the same time, widespread surveying of public experiences of and preferences for green can provide insights into how well the supply of green meets public demand. Besides policy recommendations, new tools are needed to optimally plan and deploy NBS.

Methods, approaches and results/body

Based on a comprehensive study of the literature we developed a detailed catalogue of nature-based solutions (NBS), which includes cost, maintenance needs, and environmental potential of NBS suitable for the BCR. In total, 140 NBS have been identified and classified, and 35 detailed data sheets for NBS were created. We then mapped the demand and suitability for NBS implementation within the region. Demand was considered from both an environmental and human centred perspective.

We also explored people's experiences and expectations of urban green spaces (UGS) around the region. We made use of a map-based Public Participation GIS survey for this assessment. From the spatially explicit information that was collected, we were able to identify spatial variations in UGS supply and demand in the region. We used these insights to map accessibility to UGS using a novel method that integrates public perceptions of the qualities of these spaces.

We created a Living Lab for constructive interaction with stakeholders and participative co-production of scenarios of Nature-Based Urban Design solutions. Participants were presented with a proposal for the redesign of case study sites and then asked to evaluate and adjust the proposals to better address site-specific needs. Case study sites included areas in Heyvaert, Koekelberg-Molenbeek, the L28, and the Ex-NATO site. The site redesigned addressed interventions to improve mobility, water, agriculture, and biodiversity, as well as social and economic factors. This process revealed there was a shared concern for re-naturing the city and a support for the concept of NBS and the proposed approaches. We also conducted focus groups with citizens, which provided insights into people's preferences for NBS and their concerns regarding the implementation of NBS on residential streets. We find that greening is not just a matter of "adding" green but has implications for mobility and social interactions.

Conclusions

Mapping NBS demand revealed that the centre of the BCR, as well as the zone along the canal, experiences the highest environmental pressure in terms of urban heat island effect, flood risk, and air pollution and is most in need of NBS. Our findings also show that UGS in the city centre lack qualities essential for providing a restorative experience, such as quietness and calmness. UGS both in the centre and in the periphery are perceived as overcrowded.

Poor quality of UGS contributes to reinforcing inequalities in the provision of UGS, particularly in the city centre, which is inhabited by vulnerable populations.

To ensure the uptake of NBS at street level, focus should be placed on improving the cohesion between neighbours and creating partnerships between citizens and the public sector. Measures between communes should be harmonised and simplified. To ensure the success of future street greening, steps should be taken sooner rather than later.

Policy recommendations

1. NBS implementation should be prioritised in the poorer, central area of the region, and citizens should be engaged in the participatory creation of scenarios for future greening.

The growing environmental pressures on the region's inhabitants are strongest in the poorer, central area of Brussels. Funds should be directed to this area to counter these pressures with a network of effective NBS crossing public-private boundaries. To prevent gentrification, local policies must be put in place before improvements are made. Given that space is lacking and highly contested, a concerted and participative effort must be made to create a parallel network of car-free streets to create space for NBS. As loss of parking is often the main reason for citizen disapproval, a combined strategy of developing neighbourhood parking clusters and incentives to give up personal vehicles must follow.

Scenarios are a pertinent tool for discussing the resilient future of the region and for use in the planning process. The regular urban design scenario is a good basis for understanding challenges, to enable productive debate, and to find common ground amongst stakeholders. This is the case for the discussion of specific neighbourhood interventions and more abstract concepts, such as greening options of residential streets. We encourage policy makers to include participative scenario discussions for all important planning decisions, while addressing the limitations of these processes.

Participation and expertise have their own place and time in planning processes. Given the predictable character of the evolution of environmental pressures, and therefore required ecosystem services, it is recommended that experts decide on the performance-related objectives of NBS in scenarios, and that citizens participate in deciding which NBS are preferred, and how they are fitted into their surroundings. Co-creation should be accessible to all citizens from all backgrounds and all skill sets. Therefore, participation processes should not only rely on design as a method, but should also include alternative methods such as story writing and focus group discussions.

2. Large urban green spaces and residential streets should be prioritised as sites of improved and increased greening.

The region should focus on addressing the shortcomings of specific large UGS, particularly those servicing vulnerable groups in the city centre. The improvement of large UGS lacking restorative properties, such as calmness and quietness, should be prioritised. As opportunities to intervene in large UGS might be limited, the implementation of high-quality smaller UGS in areas underserved by high-quality large UGS should also be

Policy recommendations

prioritised. In the city centre, these small green spaces should be designed to elicit feelings of naturalness. Our research identifies two main types of UGS users: those who visit UGS for nature-oriented purposes (for peace and quiet, being around nature) and those who visit UGS for social reasons (for play, attending events, gathering with others). Assessing UGS satisfaction without making a distinction between these groups will fail to capture inequalities in access to UGS that provide the valued opportunities and experiences of these user groups. Surveying UGS use and satisfaction should consider separately the needs and preferences of these users.

In terms of street greening, we identify that most people appreciate wild greenery and recognize its benefits. They appreciate a greater diversity of vegetation in terms of species, height, and crown size. Participants of focus group discussions recognized that wild greenery must still be maintained and that cues (e.g. signage) should be provided to explain that it is cared for. We recommend that the region promote planting wild yet maintained greenery, while also providing these cues.

3. The experiences and wants of people should be centred in the improvement of existing green spaces and the creation of new green spaces.

Conducting a spatially explicit survey on peoples' experiences of UGS in the region uncovered inequalities in access to experiences that would have otherwise remained hidden. We recommend the region conduct such a survey regularly. People's experiences should be weighed against their preferences to ensure that essential demands are met. Given that map-based surveys are more challenging to complete and may exclude certain people, we recommend that the region launch surveys online while also bringing surveying people in-person.

Several barriers to the implementation of NBS on residential streets have been identified. Residents anticipated that significant street greening may lead to conflict between neighbours. Improving the cohesion and communication between neighbours can help residents deal with these conflicts. This may be facilitated through a "street liaison" who would bring together neighbours around the topic of street transformation through urban greening.

Lack of knowledge about NBS maintenance on private space was another barrier. For instance, it was unclear to participants who should maintains a green façade that spreads between the facades of several apartments. Participants also wanted to know whether they had the authority help with green maintenance in their street and in local green spaces. The region should create programs that bring together citizens and institutions to promote the installation and management of NBS on streets, while clearly communicating about these programs and working for cohesion between the programs offered by different municipalities. The region should provide financial and technical

Policy recommendations

support to enable motivated citizens to green their surroundings. Finally, street greening experiments should be used to allow for iteration in street greening.

4. NBS should be prioritised in new and existing planning instruments.

Generating urban resilience is possible by consistent and orchestrated action on the policy, planning and project levels. The concept of NBS should be(come) part of existing and new planning instruments. The PRAS should be updated into a 'PRAS Bioclimatique' to determine the maximum environmental impact of land uses and to make way for the development of green space networks. PADs/PPAS should require an NBS segment for establishing targets for ES and connecting social objectives to NBS options, and the RRU should be annexed with concrete NBS performance targets and provide information via an NBS catalogue.

We recommend that the region develops and deploys a detailed public UGS accessibility mapping, legal support, and planning stipulations to ensure accessible green spaces for all citizens. Finally, as indicated, different types of users require different green space characteristics that enable particular uses or experiences. It is therefore not enough to look at UGS accessibility without also considering UGS characteristics. Integrating public experiences of UGS into accessibility analyses can provide insights that better reflect accessibility to particular kinds of green space experiences.

List of publications

CO-NATURE (2022).
Co-producing scenarios for nature-based urban regeneration.

Phillips, A., Canters, F., & Khan, A. Z. (2022).
Analyzing spatial inequalities in use and experience of urban green spaces. Urban Forestry & Urban Greening, 74, [127674].

Phillips, A., Khan, A. Z., & Canters, F. (2021).
Use-Related and Socio-Demographic Variations in Urban Green Space Preferences. Sustainability, 13(6), [3461].

Phillips, A., Plastera, D., Khan, A. Z., Canters, F. (2022).
Integrating public perceptions of proximity and quality into an assessment of urban green space access. Landscape and Urban Planning (Submitted).

Phillips, A., Da Schio, N., Khan, A.Z., Canters, F. (2022).
"A living street and not just green": Exploring public preferences and concerns regarding nature-based solution implementation in the urban street. Urban Forestry and Urban Greening (Submitted).

Stessens, P., Phillips, A., Canters, F., & Khan, A.Z.
Nature-Based Solutions: A Review of Existing Catalogs and a Proposal for an Integrated Classification and Information Management.

The author & project

The CO-NATURE project has explored the potential for urban regeneration through NBS implementation in the BCR.

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Prospective research

Through the Prospective Research programme, the Brussels-Capital Region is hoping to fund research projects from a dual perspective: to provide a solid regional prospective vision; to build solutions to the specific challenges it will face in the years to come. The solutions proposed by the funded projects must take into account Brussels' urban complexity as well as the Region's environmental, social and economic transition objectives. The programme targets researchers in human science as much as researchers in exact or applied science.

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