Ecosystem Services for the Sustainable Development of the Brussels Capital Region

by Philip Stessens

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Key messages

GIS (Geographic Information System) software has been used to analyse and model regulating and cultural ecosystem services (ES) in Brussels, which generated an unprecedented overview on the current state and potential of ES.

A combination of questionnaires and modelling revealed a lack of green space (GS) accessibility, especially on the residential and metropolitan scale, and especially in the southwest city centre and Matongé area.

GS quality, GS accessibility, water balance, urban heat island, etc. can be calculated from GIS models and reveals their spatial patterns, as well as the responsibilities of policy, design and management.

This allows to assess the impact of urban (green) development scenarios and to formulate strategic scenarios (on-going) for creating a resilient and healthy urban environment.

The potential of urban ecosystem services to address climate change and population rise, points at the urgency to deploy innovative Nature-Based Solutions for urban regeneration strategies.

Introduction

Brussels faces a multitude of interconnected challenges, among which the provision of a qualitative living environment while addressing strong population growth, combined with climate change aggravated risk of flooding and heat waves, air quality issues and biodiversity reinforcement. The region needs to reconnect city and nature through ecosystem services (ES) provision to evolve towards a more sustainable and resilient city. This can be achieved through a clear view on the challenges and potential concerning ES (spatial indicators) and through developing alternative scenarios and policy guidelines for Brussels. Since these issues require interdisciplinary collaboration, the co-development through research-by-design workshops is essential. Finally, custom ES models and design approaches will allow to bridge the gap between science and citizens, policy and action, research and design, and ultimately, nature and the city.

Methods, approaches and results

The project consists of a research track, a research-by-design track and a dissemination track. Their interaction is essential, as the developed indicators should be useful for planners, designers and policy makers, and the scenarios will be developed for addressing problem areas.

Within the research track, we advanced knowledge on modelling urban ES. This is done by combining existing GIS models and by developing new models to deliver a set of indicators on the delivery of urban ES. The focus on urban ES required the advancement of the state-of-the-art on ES in the following aspects: i) quality and proximity of green spaces and how it impacts, and is appreciated by, inhabitants; ii) adjusting existing water balance models to incorporate advanced land cover types, such as green roofs, impervious paving, or buffer swales. The development and parameterization of these models is achieved by a combination of literature and the analysis questionnaire data. Over 400 questionnaires were collected on-site.

Within the research-by-design track, innovative forms of ES delivery are developed and possible urban design and policy scenarios for Brussels are formulated. The developed models allow delivering indicators on the current state, as well as supporting impact assessment of the scenarios. The workshops also allow the verification of the usability of the indicators for design and policy. Finally, the lessons learnt from the research and research-by-design track are translated to policy recommendations for Brussels.

Conclusions

Nature and the city are disconnected in Brussels. A current and future challenge is the provision of qualitative living space for all, mainly by the combination of climate change and population growth. Challenges such as: increased flooding risk, the urban heat island and the provision accessible

recreation space, can be solved by improving current ecosystem services and deploying new ones. Policy makers and urban designers can use the spatial calculation models and scenarios that were developed in this research for implementing this at optimal conditions and with maximum impact. Action is needed in public green spaces, redevelopment or regeneration sites within the canal and central area, but also in private space (imperviousness of materials, green roofs, buffer systems…) and on the interaction between the two. In terms of provision, the development of small green spaces goes hand in hand with the mobility issue and the debate on public green roofs. Solutions can be found for the lack of most medium sized green space, but on the metropolitan scale, drastic measures involve the consideration of the royal gardens as public space and land use change of peripheral areas as proposed in the study Metropolitan Landscapes.

Policy recommendations

1. Mitigation of climate change

The main drivers of negative change in the quality of public space are: demographic change, urbanization out of touch with natural processes (sealing ground, canyon effects, loss of green space) and climate change. The latter is an issue of a different scale. Whereas we cannot control this as a whole, action is possible and needed. Before deploying climate change adaptation strategies, we should eliminate the causes of climate change, and thus address the problems at their roots. Priority can be with action that combines carbon footprint reduction with ecosystem service (ES) deployment. Adaptation interventions or policies with a decrease in carbon footprint on the long term in relation to the existing condition are recommended over other options. Therefore life cycle analysis of options is recommended.

2. Mainstreaming of integrated models for ES assessment

The different GIS models for the calculation of green space proximity, green space quality, water balance, local climate zones and general suitability of nature-based solutions should be used by policy makers and planners. The final goal is to arrive at an integrated, easy-to-use web-based interface for spatial decision-making support. As such, the concept of urban ecosystem services can be mainstreamed, making the city (and its urban ecology) more connected to nature.

3. Taking up the concept of ES and NBS transversally in strategic plans and planning regulations

Ecosystem services and nature-based solutions can have an impact on e.g. recreation, water balance, heat flux, food provision and their effects are often impossible to disentangle. Therefore, priorities and policies concerning nature-based solutions should be aligned and put to the foreground in the future Nature Plans, Water Plans, PRDD, and other planning related policy documents. These should be spatially explicit, including their incen-

tives, for optimal effect. Workshops have demonstrated that nature-based solutions can often not rely solely on private or public terrain, and require innovative private-public management and ownership constructions for optimal effect. Examples of this are rainwater buffering and infiltration from green roofs in public space or from public hardscape on private terrain, combining private gardens into shared neighbourhood parks, private management of public roof gardens or public management of private roof gardens.

4. Prioritization of disadvantaged areas

The developed models have indicated neighbourhoods with combined disadvantages from the point of green space qualities, accessibility/proximity, flooding and the heat island effect. A prioritization of a set of actions should be developed, not only in the affected areas, but also in the areas that contribute to the problem (e.g. rainwater retention in upstream areas or the development of metropolitan green space that are outside problem areas but still have an effect due to their large influence radius). Densification of these areas should be halted until proper strategies are formulated.

5. Focus on maintenance and stewardship

Whereas it was assumed that naturalness and biodiversity (10%), quietness (14%) and spaciousness (16%) would be the main factors for quality, it appears that maintenance and cleanliness (31%), along with the provision and state of facilities (paths, benches, playgrounds, toilets… 20%) have the greatest contribution to quality of green spaces. Many respondents of the questionnaires have indicated the that stewardship through the involvement of neighbours for problem solving, care or use through for example allotment gardens could improve the experience of other users.

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The author & project

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