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The thorny path toward greening: unintended consequences, trade-offs, and constraints in green and blue infrastructure planning, implementation, and management

Jakub Kronenberg[1], *Erik Andersson*[2,3], *David N. Barton*[4], *Sara T. Borgström*[5], *Johannes Langemeyer*[6,7], *Tove Björklund*[5], *Dagmar Haase*[7,8], *Christopher Kennedy*[9], *Karolina Koprowska*[1], *Edyta Łaszkiewicz*[1], *Timon McPhearson*[2,9,10], *Erik E. Stange*[11] and *Manuel Wolff*[7,8]

ABSTRACT. Urban green and blue space interventions may bring about unintended consequences, involving trade-offs between the different land uses, and indeed, between the needs of different urban inhabitants, land users, and owners. Such trade-offs include choices between green/blue and non-green/blue projects, between broader land sparing vs. land sharing patterns, between satisfying the needs of the different inhabitants, but also between different ways of arranging the green and blue spaces. We analyze investment and planning initiatives in six case-study cities related to green and blue infrastructure (GBI) through the lens of a predefined set of questions—an analytical framework based on the assumption that the flows of benefits from GBI to urban inhabitants and other stakeholders are mediated by three filters: infrastructures, institutions, and perceptions. The paper builds on the authors' own knowledge and experience with the analyzed case-study cities and beyond, a literature overview, a review of the relevant city documents, and interviews with key informants. The case studies indicate examples of initiatives that were intended to make GBI benefits available and accessible to urban inhabitants, in recognition of GBI as spaces with diverse functionality. Some case studies provide examples of trade-offs in trying to plan and design a green space for multiple private and public interests in densely built-up areas. The unintended consequences most typically resulted from the underappreciation of the complexity of social–ecological systems and—more specifically—the complexity of the involved infrastructures, institutions, and perceptions. The most important challenges addressed in the paper include trade-offs between the different ways of satisfying the residents' different needs related to the benefits from ecosystem services, ensuring proper recognition of the inhabitants' needs and perceptions, ecogentrification, caveats related to the formalization of informal spaces, and the need to consider temporal dynamics and cross-scale approaches that compromise different goals at different geographical scales.

Key Words: *environmental justice; trade-offs; unexpected outcomes; urban ecosystem services; urban green space;*

INTRODUCTION

Recent years have seen a growing wave of green and blue initiatives in cities as a way to ensure sustainability and the health and wellbeing of a large part of the world's population—as reflected in a number of reports by prominent international organizations (e.g., Convention on Biological Diversity (CBD) 2012, United Nations 2015, 2017, World Health Organization (WHO) 2017) and high-level academic publications (Elmqvist et al. 2013, 2018). This has been paralleled by a growing interest in concepts such as urban ecosystem services (ES), green and blue infrastructure (GBI), and nature-based solutions (European Commission 2015, Kabisch et al. 2017). Most often, the relevant reports and academic publications highlight success stories that indicate the potential of urban green and blue spaces to solve a number of problems and ensure benefits—from mitigating noise and other nuisances (Koprowska et al. 2018) to ensuring urban competitiveness (Fok and Law 2018). Many initiatives focused on improving the availability, accessibility, and attractiveness of urban green and blue spaces in different geographical and institutional scales and contexts (Wolch et al. 2014, Haase et al. 2017, Biernacka and Kronenberg 2018, Li et al. 2019). Such initiatives include not only infrastructural improvements but also changes in institutional arrangements and shifting perceptions of green and blue spaces, aiming at the improved and equitable flow of benefits from urban nature to all inhabitants (Langemeyer and Connolly 2020). This is so especially given the broad understanding of urban green and blue spaces followed here: any green or blue space in the city, regardless of its ownership or formal status.

However, as in the case of any intervention, dealing with urban green and blue spaces may bring about unintended consequences, and it involves trade-offs between the different land-use interests, and indeed between the needs of different urban inhabitants (Grêt-Regamey et al. 2013, Hansen and Pauleit 2014, Turkelboom et al. 2018, Biernacka and Kronenberg 2019). Such trade-offs include choices between green/blue and non-green/blue projects ("parks vs. car parks"), residential densification and local green space access, broader land sparing vs. land sharing patterns (Stott et al. 2015), but also between different green and blue space designs (corresponding with the divergent needs of the different users), and the sheer distribution of benefits between beneficiaries, and even between different ways of communicating potential benefits to the respective beneficiaries. Indeed, green

[1]Social-Ecological Systems Analysis Lab, Faculty of Economics and Sociology, University of Lodz, Lodz, Poland, [2]Stockholm Resilience Centre, Stockholm University, Stockholm, Sweden, [3]North-West University, Unit for Environmental Sciences, Potchefstroom, South Africa, [4]Norwegian Institute for Nature Research (NINA), Oslo, Norway, [5]Department of Sustainable Development, Environmental Science and Engineering, KTH Royal Institute of Technology, Stockholm, Sweden, [6]Institute of Environmental Science and Technology (ICTA), Universitat Autònoma de Barcelona, Barcelona, Spain, [7]Department of Geography, Humboldt Universität zu Berlin, Germany, [8]Department of Computational Landscape Ecology, Helmholtz Centre for Environmental Research (UFZ), Leipzig, Germany, [9]Urban Systems Lab, The New School, New York, New York, USA, [10]Cary Institute of Ecosystem Studies, Millbrook, New York, USA, [11]Norwegian Institute for Nature Research, Lillehammer, Norway

and blue initiatives may be contested on the grounds of justice—because they may be perceived as serving the needs of certain economic interests and social groups more than others (Anguelovski 2016, Haase et al. 2017). In this context, justice issues are not limited to the unequal distribution of environmental goods or bads (Koprowska 2019), but also to whether the needs of all potentially affected stakeholders are considered in the relevant processes (procedural justice) and whether the different stakeholders are not harming or otherwise negatively affecting others, thus ensuring a proper recognition of the needs of all (interactional or recognition justice) (Schlosberg 2003, Walker 2012, Low 2013).

The trade-offs and unanticipated consequences for different stakeholder groups that may be associated with urban greening and blueing can be understood as distributional, procedural, and/or recognition injustices. Almost any decision on where to introduce or upgrade green and blue spaces has justice implications. Ernstson (2013) explored the environmental justice effects of the different social and political interactions behind the generation of ES and the related benefits. Few other studies have explicitly engaged in urban planning for environmental justice, with a focus on reducing wellbeing inequalities through urban greening (Kronenberg et al. 2020, Liotta et al. 2020), but interest in this area is growing, especially in terms of trade-offs in the distribution of benefits (Baró et al. 2021). It is increasingly recognized that "urban ecosystem services (ES) assessments need to address the societal distribution of ES, people's multiple values, perceptions and needs, fairness of ES-based decision-making processes, and aspects related to spatial, temporal and interactional justice" (Baró et al. 2021: 45).

In light of the above, the objective of this article is to propose an analytical framework for assessing greening or blueing initiatives (i.e., initiatives related to GBI). Our framework builds on a systems approach that positions the flows of benefits from GBI to urban inhabitants as mediated by three filters: infrastructures, institutions, and perceptions (Andersson et al. 2019, 2021). To successfully translate ES into benefits—or to enable the flow of benefits—local authorities and other stakeholders need to consider all three filters and combinations of the three. Implicitly, this shows how one can work with flows of GBI benefits also without working directly with GBI itself. In the present article, we further build on this approach to propose an analytical framework to assess greening or blueing initiatives, and to identify the key challenges and unintended outcomes related to the implementation of such initiatives. In other words, we suggest how to empirically use the approach to assess specific GBI-related initiatives.

So far, perhaps the most relevant perspective on what can go wrong in urban greening and blueing initiatives emerged within political ecology. However, this perspective—as the name suggests—focused on political power and the institutions behind the relationships between different stakeholders, with insufficient inclusion of the interests and needs of some socioeconomic groups in planning (Tubridy 2020). In particular, political ecology highlights the need to reconsider the basic mental model underlying greening or blueing initiatives, i.e., the most common neoliberal approach that focuses on working with the market and highlighting the economic efficiency of the implemented nature-based solutions (Kotsila et al. 2020). Other researchers focused on institutional challenges and failures, including insufficient political priorities and the related lack of funds or legal and planning inconsistencies, and poor social mobilization and social fears (Battaglia et al. 2014, Kronenberg 2015). On the part of institutions, other problems featured in the literature include poor collaboration between stakeholders involved in urban GBI governance (Kronenberg et al. 2016) and selective management in the face of poor data availability (Feltynowski et al. 2018). These different strands were often brought together in studies regarding environmental justice, and especially with regard to ecogentrification (Anguelovski et al. 2018*a, b*). However, with few exceptions (cf. Langemeyer and Connolly 2020), the environmental justice literature has not comprehensively investigated the combined effects of the three filters on GBI benefits.

This article is organized in the following way: in the next section, we present the methods used to select and analyze our case studies, with a particular emphasis on the analytical framework. Then, we provide an overview of the case studies, each following the same format. The case studies come from the following cities: Barcelona (Spain), Halle (Germany), Lodz (Poland), New York City (USA), Oslo (Norway), and Stockholm (Sweden). We synthesize the most important lessons learned from the case studies in the Discussion, where we also emphasize specific aspects that decision makers need to keep in mind when they prepare plans or projects intended to improve the availability and accessibility of GBI benefits to urban inhabitants. We pay special attention to potential negative outcomes and how to be proactive about them. A brief final section highlights the main conclusions.

METHODS

This article builds on the authors' involvement in research and debates on urban greening and blueing initiatives in six case-study cities, and it follows the systems approach developed within the ENABLE project. The two subsections below focus on the analytical framework derived from the general ENABLE approach and the more specific methods used in our six case studies.

Analytical Framework

The framework developed within the ENABLE project (Enabling Green and Blue Infrastructure Potential in Complex Social–Ecological Regions) can be used not only to conceptualize the flow of benefits from GBI to potential beneficiaries, but also for empirical assessments of the effects of GBI-related initiatives and the challenges inherent in their realization. It focuses on three systemic filters that mediate the flow of benefits: infrastructures, institutions, and perceptions, and how they influence the ES potential, mobilization, and realization (Andersson et al. 2021). Infrastructures refer to the combination and integration of green, blue, and gray (primarily transportation and housing) physical structures; institutions include ownership and user rights, but also policy intentions and prescriptions, and social norms; perceptions concern how opportunities and constraints to access ES are perceived, interpreted, and valued by the potential beneficiaries. Thus, indirectly, this allows for a comprehensive understanding of how GBI functionality is embedded in and contingent on overall urban morphology and governance across sectors and scales.

Table 1. ENABLE filters mediating the flow of benefits from GBI to potential beneficiaries translated into an analytical framework for the assessment of GBI-related initiatives.

	Infrastructures	Institutions	Perceptions
Barriers	Which infrastructural barriers might have negatively influenced the realization of the initiative, and how have they been addressed?	Which institutional barriers might have negatively influenced the realization of the initiative, and how have they been addressed?	Which barriers related to the stakeholders' preferences might have negatively influenced the realization of the initiative, and how have they been addressed?
Enabling factors	Which infrastructural factors might have positively influenced the implementation of the initiative, and how have they been strengthened?	Which institutional factors might have positively influenced the implementation of the initiative, and how have they been strengthened?	Which factors related to the stakeholders' preferences might have positively influenced the implementation of the initiative, and how have they been strengthened?
Trade-offs	What trade-offs have been considered, and how have they been solved?	What trade-offs have been considered, and how have they been solved?	What trade-offs have been considered, and how have they been solved?
Environmental justice	How have the justice aspects been dealt with (here, in particular, distributional justice)?	How have the justice aspects been dealt with (here, in particular, procedural justice)?	How have the justice aspects been dealt with (here, in particular, interactional or recognition justice)?

Following the systems approach and the different interdependencies between the filters and other system dynamics (including the different roles of stakeholders and their different interests), we aim to identify the mechanisms behind the unintended consequences or any failures to fully achieve set targets for the analyzed initiatives. Our framework can also be used to study positive aspects (the three filters can mediate the flow of benefits both negatively and positively). Eventually, strengthening the positive enabling factors should be the most important application of the framework. However, to strengthen the enabling factors, we need to properly acknowledge and study potential barriers. Also, we note that there is a publication bias toward success stories, things that worked well, and that more attention needs to be paid to what is not working properly (cf. Kronenberg et al. 2021). Thus, the focus of this study is on the unintended consequences and incomplete achievement of GBI-related initiatives. Those who undertake such initiatives need to be aware that they may bring about such unintended consequences. Also, they need to account for such potential risks to be proactive in designing their initiatives. We do acknowledge, however, that planners often make trade-offs with known/intended negative consequences, but where the benefits outweigh the disadvantages, and that there are also unintended positive consequences of urban planning (e.g., realizing that urban parks are important for municipal preparedness for pandemics (Venter et al. 2020)).

The three ENABLE filters and their effects were translated into a set of questions that investigate the role the filters played in the studied initiatives, posing problems that prevented or skewed the flows of benefits, or providing supporting structures that enabled or strengthened the flows (Table 1). The general questions listed in Table 1 were adapted to the character and aim of each initiative, and the answers were assessed in the light of additional information available in each specific context. The general questions were complemented by more specific, operational ones. For example, regarding the perception filter, the responses need to be positioned relative to the different prioritizations, and the agendas of different stakeholder groups that have been taken into consideration. Have there been any studies regarding those preferences, or were the preferences assumed by the decision makers? Which dimensions did such studies cover (e.g., transportation, visitation, environmental quality, social context)? Which representative groups (if any) were consulted? Was there any social awareness of insufficient availability of GBI or insufficient accessibility of the selected GBI components? Were the perceptions of different socioeconomic groups consistent (for or against the initiative/the different aspects of the initiative)? Note that the inhabitants (users) are a special type of heterogeneous interest group. This group does not typically align with specific economic interests nor with a single public interest. Was there a feeling of an inequitable division of the related benefits (opportunities for recreation, health benefits, noise mitigation, place attachment, etc.) for the different socioeconomic groups of urban inhabitants? How did it manifest? Was there community mobilization and resistance to the inequitable division of benefits?

With regard to infrastructures, it is worth noting that a potential infrastructural barrier can prevent access to a green space, but an (e.g., underground) infrastructural barrier may also make it difficult, for example, to plant trees along the streets. We mostly refer to these issues in the latter sense in our framework. We acknowledge that in the case of any greening or blueing initiative, different infrastructures, institutions, and preferences may need to be taken into account. Additionally, the different related filters may act as double-edged swords—either hindering or enabling flows of benefits to specific beneficiaries. Everything depends on the context—our main point here is that these things need to be considered systematically when studying and implementing greening and blueing initiatives.

In each case, we targeted the complications that negatively influenced the implementation and the unintended consequences of the different GBI-related initiatives concerning environmental justice. Specifically, we considered who might have benefited and who might have been negatively affected by the initiatives (or whose interests were favored—if any). In particular, we wanted to know if there were any (already) disadvantaged/marginalized groups who might have been affected by the implementation of the analyzed initiatives. Paradoxically, as discussed in the context

Table 2. Basic information on GBI and GBI availability, accessibility, attractiveness in the case-study cities—with references to some illustrative studies.

City	Description
Barcelona	Barcelona embeds 1128 ha of public green areas (and 1698 ha in the peri-urban Collserola Park), which represents 11% of the city's surface (27% if Collserola Park is considered). Given the high population density with on average 160 inhabitants per hectare, the city has a low ratio of 7 m² green space coverage per capita (17.6 m² if the peri-urban park of Collserola is considered), but more than 120 street trees per inhabitant (Baró et al. 2019). Currently, Barcelona aims at increasing its urban green spaces by 160 ha until 2030 (1 m² per inhabitant), corresponding to an overall increase of urban green spaces by 15% (De Luca et al. 2021).
Halle	About 16% of the area of Halle (Saale) is officially recognized as green or blue space, including 560 ha of public parks, 120 ha of street green, and 546 ha of (allotment) gardens. Halle hosts more than 25,000 street trees and 16,000 trees in parks and other public green spaces. GBI is not equally distributed across the city, with the largest public green areas situated in the south-east (Elster-Saale-Floodplains, Raven island, Dölau heathland). Salt mining over centuries diminished forest land use in the region. The Saale river floodplains cross the city in the center, giving overall accessibility of GBI, although perceptual hurdles exist in terms of approaching local district-located green spaces (Barber et al. 2021; M. Wolff, A. Mascarenhas, A. Haase, et al., *unpublished manuscript*).
Lodz	GBI in Lodz is not properly inventoried, and there is a large discrepancy between what is officially considered green space (12% of the city area) and what could be classified as GBI based on additional data—covering all types of green and blue spaces (up to 70% of the city area (Feltynowski et al. 2018, Sikorska et al. 2020)). Initial studies have been carried out on the availability, accessibility, and attractiveness of green and blue spaces in Lodz, but no comprehensive assessment is available as of yet (Borowska-Stefańska and Wiśniewski 2017, 2018, Biernacka and Kronenberg 2018, 2019, Biernacka et al. 2020).
New York	Approximately 27% (21,400 ha) of New York City is set aside as public parks, open spaces, or greenways, with over 965 km of waterfront, 4000 curbside rain gardens, 24 ha of green roofs, and 560 km of bicycle and pedestrian paths (Harnik 2000, New Yorkers for Parks 2008, Treglia et al. 2018, New York City Department of Environmental Protection 2019). Although this qualifies NYC as having some of the highest proportion of green spaces among major U.S. cities, the distribution and accessibility are highly uneven based on racial and ethnic demographic indicators. Miyake et al. (2010), for instance, found that communities that are low income or of color only had access to smaller or lower quality parks, and Neckerman et al. (2009) found a higher density of street trees within wealthier neighborhoods. Additionally, in considering the city's population of nearly 7.5 million permanent residents, New Yorkers only have approximately 13.5 m² of green space per person, with nearly 70% of NYC's landmass covered by impervious surfaces such as roads or buildings (Geotab 2019, WaterWorld 2019).
Oslo	Oslo was the 2019 European Green Capital. Of the total area of Oslo municipality, approximately 73% represents green spaces. Forests are major urban green spaces in Oslo (their share in the total municipal area is 57%). The city is surrounded by Nordmarka to the north and Østmarka to the east, and the Oslo fjord to the south, all large recreation areas. Marka's boundaries limit urban sprawl and provide opportunities for outdoor recreation. Regulated green spaces cover only 2% of the municipality as a whole, whereas arable lands and pastures cover 5%. Within the built zone of Oslo, there are 60 m²/inhabitant of formal green space, such as parks. There are no large areas not currently being used (their share in the total area of the city is around 0.04%) that could be treated as brownfields.
Stockholm	Of the total area of Stockholm city (216 km²), approximately 40% represents green infrastructure and 17% blue infrastructure (Stockholm Stad 2017). One-third of the green infrastructure is parks, and the rest is nature areas. The city has ten areas protected as nature reserves and one national city park. The main challenge for the Stockholm GBI, as stated in the strategic policy (Grönare Stockholm), is to combine the goals of building 140,000 new homes by 2030 while also ensuring access to high-quality green areas for all residents (Stockholm Stad 2017). The city is increasingly segregated, and different city districts and neighborhoods have very different socioeconomic profiles (Stockholm Stad 2015). There is a strong ambition within the city planning and management to engage the residents, which is also addressed in the new green space strategy (Stockholm Stad 2017). Regarding the availability of green space, all residents in Stockholm city have a green space within 500 m of their home, 98% within 300 m, and 93% within 200 m (Statistics Sweden 2019).

of eco- or green gentrification (Anguelovski et al. 2018*a, b*), increasing GBI provision may turn out to have negative consequences on the broader context of the wellbeing of those whose interests it was meant to favor. Keeping the potential justice effects in mind helps to study the trade-offs, spill-over effects, and externalities related to the analyzed initiatives.

Finally, the unintended consequences of the different GBI-related initiatives can be discussed at different levels of provisioning urban GBI benefits. We explicitly distinguish between availability (i.e., the presence of an area or a service), accessibility (i.e., the differential abilities of users to access an area or service and to realize a subset of potential benefits), and attractiveness (i.e., the character of an area or a service that translates into the potential users' willingness to use it) (Biernacka and Kronenberg 2018, 2019; M. Wolff, A. Mascarenhas, A. Haase, et al., *unpublished manuscript*). For example, a greening or blueing initiative in one place may bring about negative consequences for the delivery of benefits elsewhere as, due to the scarcity of resources, investing in the availability, accessibility, or attractiveness of green or blue spaces in one place affects the opportunities to invest in other places. Besides, increasing the attractiveness of urban green and blue spaces for some users may result in reduced attractiveness for others, among other things, because this may involve the preference for some ES or functions of green and blue spaces at the expense of others (Biernacka and Kronenberg 2019, Langemeyer and Connolly 2020).

Although the examples introduced in the following subsection have been preselected to be particularly illustrative, we expect that the framework can be used to assess any initiative related to GBI.

Research Methods

The six examples featured in this comparative case-study analysis represent cities studied within the ENABLE project (Table 2 provides an overview of the case-study cities). The case-study cities were originally selected to provide an overview of different GBI planning regimes, as well as diverse institutional, socioeconomic, and land-use contexts.

Table 3. Methods and data sources specific to each case study.

City	Description
Barcelona	We reviewed all available gray literature, including all publicly available and web-accessible city documents that include the renewal of Passeig Sant Joan. Despite repeated requests, we were not able to access official reports on the public participation process and had to "reconstruct" this process based on interviews. Nine informants were interviewed in May and July 2017, and they were selected due to their active role in the development or the planning process of the renewal project of Passeig Sant Joan. The informants included four former public managers from the district government, two employees of the Urban Ecology department of the City Council, two employees of municipal public consultancy agencies, and one member of a neighborhood association. Other neighbor and merchant associations that had been approached refused the interview requests. Additionally, a survey (n = 100) was conducted to examine the provision and distribution of ES as perceived by different users of Passeig Sant Joan (Giraldo Malca 2017).
Halle	We undertook an extensive literature search of scientific articles but most of all of gray literature and policy documents for the case-study city. In addition, we made an online document search and analysis, including social media, online blog entries, and the websites of different GBI-related projects. This offers a broad frame of the GBI activities and discourse in the city of Halle. We further conducted a data screening and analysis of the spatial data on green spaces, street and park trees, but also land use and cover changes following the urban development plans, greening and blueing projects, and recent investments in Halle (Barber et al. 2021; M. Wolff, *unpublished manuscript*). In order to identify/uncover problems and failures of GBI initiatives, we conducted a series (n = 15) of in-depth interviews with stakeholders in Halle, such as planners, activists from local initiatives, or actors from the district management, in order to identify barriers. We further carried out a mental mapping (n = 100) study and a participatory GIS recreational use tracking study (MyDynamicForest.de) to identify problems at the individual level related to images, perception, and behavioral aspects.
Lodz	We carried out a detailed literature review on urban revival and the Green Polesie initiative, and studied all local policy documents pertaining to this initiative. We carried out 25 in-depth semi-structured interviews with the local inhabitants (both from the general population and with those actively engaged in public discussions and activism in the district) and with local businesses and experts responsible for the initiative in the Municipal Planning Office. Finally, we performed spatial analysis of existing green spaces, divided into formal and informal (based on data from the European Settlement Map), and of the local population (based on the official population register data).
New York	This case study examines the MillionTreesNYC (MTNYC) campaign, a New York City-wide effort to plant one million trees over 10 years to address federal air quality standards and urban heat island impacts. We examined key planning documents from the NYC Mayor's Office, the NYC Department of Parks and Recreation, the U.S. Forest Service, and the MTNYC Advisory Board's Research and Evaluation Subcommittee, in addition to the relevant literature. A long-term investigation involving experimental research plots (900 m²) in each of the five boroughs of NYC was launched in 2009 to examine tree diversity and understory planting combinations to assess interactions between plant population dynamics, soil heterogeneity, and forest restoration management strategies that drive urban forest ecosystem structure and functioning.
Oslo	This case study draws on previous research on managing habitat for pollinators in the city (Stange et al. 2017, 2018), and on further ongoing work. The ongoing work involved analyzing the relevant policy documents and literature (including gray literature), and the use and reinterpretation of the blue–green factor norm in this specific context. We carried out a survey of beekeepers, and additional interviews with the beekeepers' association ByBi, a commercial property owner, and the Urban Environment Agency. Finally, this case study involved a spatial analysis of bee habitats and the precautionary zones designated for these habitats' protection, and of the distribution of existing and potential green roofs in the city.
Stockholm	The general overview was synthesized from long-term experience and expert assessments of GBI dynamics in the Stockholm Region, including Stockholm city (e.g., Ernstson et al. 2010, Andersson et al. 2014, Borgström 2019, Khoshkar et al. 2020). For the specific case, we analyzed policy documents referring to the Greener Stockholm initiative, official websites, and other key official documents regarding the process of developing and implementing the policy. We carried out three interviews with officials within Stockholm city engaged in the Greener Stockholm policy process and/or its implementation. We also analyzed the implementation by in more detail investigating five projects out of 13.

Each case study presented in this article draws on the authors' own knowledge to identify the most relevant examples of initiatives. The examples were selected to illustrate diverse challenges to urban greening and blueing that could be studied through the lens of the three filters to uncover the (often unexpected) outcomes. Each case-study initiative was analyzed not only through the lens of its outcomes, but also the process—including how the initial intentions changed during the implementation. Indeed, context matters and context is likely to change, and the initiatives often fit into existing contexts (which may be obvious for physical measures but less obvious in the case of various informational and other soft measures). Each case study has been analyzed with the same set of methods (although the data sources and thus relative contribution of each method differed across cases, as detailed in Table 3):

- a literature overview (including gray literature);
- a review of the relevant city documents;
- interviews with key informants representing the stakeholders involved in a given initiative; and
- (in some case studies only) a spatial analysis of the distribution of the selected GBI components or benefits.

The literature review was used primarily to set the context for the given initiative, whereas the review of city documents and interviews with key informants (e.g., chosen from local authorities, businesses, and neighborhood associations) provided the core information about the initiatives. It was through document analysis and interviews that we were able to establish the role of the different filters in each case study. The interviews were carried out to refine the analysis and ask questions that could not be answered based on document analysis. Additionally, in three case studies (Halle, Lodz, and Oslo), spatial analysis was carried out to study the distribution of GBI components, benefits, and the related trade-offs, but in Halle, we additionally carried out a mental mapping exercise to deepen our understanding of the inhabitants' perceptions (again, see Table 3 for detail).

Each case study description follows the same format, and each is guided by the same set of questions that the local researchers addressed (Append. 1). The questions referred to the case studies' background (including the rationale for undertaking the initiative), through the description of the relevant policy/planning response and what are the measures undertaken, to the interpretation of the case study through the ENABLE framework, and—in particular—to the unintended consequences of greening/blueing initiatives. Each case-study description is distilled from a much more comprehensive preliminary draft.

RESULTS: PRESENTATION OF THE CASE STUDIES

The presentation of each case study follows the same format: a storyline, the case interpretation through the ENABLE analytical framework, and a critical assessment, highlighting lessons learned and the key caveats.

Greening in the Face of Ongoing Social Conflict: the Renewal of Passeig de Sant Joan in Barcelona

The renewal of Passeig de Sant Joan, which took place from 2009 to 2015, was considered an important cornerstone in Barcelona's green infrastructure strategy (Barcelona City Council 2013). The initiative aimed at enhanced ecological connectivity and the provision of ES. At the same time, the renewal became a response to increasing protests by local businesses against the "degradation" of the neighborhood's gray and green infrastructure, while also emphasizing the increasing predominance of especially Chinese businesses in the area (Giraldo Malca 2017). The renewal involved transforming a six-lane street into a "boulevard" (Fig. 1), with two car lanes, two segregated lanes for bicycles, and large sidewalks for pedestrians. These broad sidewalks include benches, restaurant terraces, and several green elements, including permeable walkways, bushes, and two rows of trees (Hoyos 2012, Parraguez 2013). As a result, the alleged aesthetic degradation of the neighborhood was reversed, albeit gentrification processes have become a critical issue in the surrounding neighborhoods (Anguelovski et al. 2018*b*, Kotsila et al. 2020).

The district authority claimed that providing more sidewalk space for bars and restaurant terraces, as well as for more foot traffic in close proximity to ground-floor shops, would attract new businesses (thus, they evaluated the renewal as successful). However, not all businesses benefited from the intervention. Interviewees mentioned how, in the streets surrounding the lower part of Passeig de Sant Joan, wholesale stores mostly of Chinese ownership had been established during the years before the renovation. They were blamed for degrading the area aesthetically and buying out local businesses. The sociocultural tension this had created was expressed in the formation of a platform that included residents and merchants (*Associació per un Eixample Sostenible*), which focused on how these changes could be reversed. The renewal provided the opportunity to alter regulations on commercial uses, delivery loading and unloading, and safety, which eventually limited wholesale businesses. Decisions on the renewal of Passeig de Sant Joan were thus permeated by a demand not only to revitalize but also alter the street's commercial profile—an alteration that appeared to be racially/ethnically tainted. In fact, there is no evidence or mention of any kind of inclusion of Chinese wholesale merchants in the consultation processes (Giraldo Malca 2017). As rents kept increasing and new regulations impeded their activity, most Chinese trade in the area left to find cheaper areas to develop their commercial activities. Additionally, out of the 47 restaurants and bars from before the renewal, only seven have remained. Managers of the remaining businesses (a local bar and an ice-cream shop) emphasized the difficulties they face keeping up with increasing rental prices.

Fig. 1. Comparison of the two solutions considered in the case of Passeig de Sant Joan: a boulevard with cars in the center and pedestrians on both sides, and a rambla with pedestrians in the center and cars on both sides (Hoyos 2012).

The institutional filter involved changing regulations and the consultation process itself (Table 4). Throughout the planning phase, district authorities implemented a set of informational and consultation participatory processes. The meetings were attended by individual residents, neighborhood associations, merchants' associations, members of the City Council, and a group of architects. The historically low level of neighborhood associativity in the area contributed to an overall weak representation of the local residents in participatory processes. During the first meetings, the residents were asked whether a rambla or boulevard should be created, thus highlighting trade-offs related to the infrastructure filter. According to the interviewee from the neighbors' association, the merchants were better represented, and, by a majority, they outvoted the option of the rambla, which they assumed would be more beneficial for residents. The decision-making framing, as part of the institutional filter and related procedural injustices (Langemeyer and Connolly 2020), proved to be critical for the planning outcomes. The lack of more "user-friendly" techniques and more diverse strategies (e.g., smart technology apps, mini street-workshops) to motivate individual citizen participation contributed to this relative exclusion of local residents being able to articulate their preferences. Moreover, the residents felt that the official meetings held with stakeholders were organized mainly to fulfill legal obligations of civil participation processes and to confirm a political decision already taken. Still, despite the perceived lack of consideration of several stakeholder groups (procedural justice issues), the vast majority of people surveyed

Table 4. ENABLE filters mediating the flow of benefits from GBI to potential beneficiaries translated into an analytical framework for the assessment of GBI-related initiatives—in the case of renewal of Passeig de Sant Joan in Barcelona.

	Infrastructures	Institutions	Perceptions
Barriers	Infrastructural solutions involve trade-offs between satisfying the needs of different stakeholders	Low level of associativity Full stakeholder participation not ensured by the authorities	Infrastructural solutions involve trade-offs between satisfying the needs of different stakeholders
Enabling factors (potential)		User-friendly consultation techniques (not used in this case) More diverse strategies to motivate individual citizen participation (not used in this case)	
Trade-offs	Infrastructural solutions involve trade-offs between satisfying the needs of different stakeholders	Trade-offs between reaching all stakeholders and the feasibility and costs of the project	
Environmental justice		Whose interests are considered and satisfied?	Changes in the structure of businesses operating in the area Benefits for tourists and young people, not necessarily for other groups

at Passeig de Sant Joan noted the general improvement through the renewal (Giraldo Malca 2017).

The renewal of Passeig de Sant Joan seems to have favored the preferences of some stakeholders and acted against those of the others. Although it is hardly possible to satisfy the needs of all stakeholders, especially in the face of a local conflict, this case seems to show recognition and procedural injustices toward one group of stakeholders, in particular, the Chinese merchants. Their preferences seem not to have been elicited and accounted for. Interestingly, merchants are assumed to benefit the most from the new green space for socializing that the renewal created, particularly by offering space for restaurants and bars with terraces on the new broad sidewalks; however, this triggered a shift toward trendy "foodie" venues and international food chains at the expense of traditional bars and restaurants (Giraldo Malca 2017, Kotsila et al. 2020). The respondents indicated that social interaction in this new public green space is primarily related to consumption and, in addition to merchants, the cohesive space was perceived to benefit mainly tourists and young people. Although the inhabitants also benefited from the renewal, it may also have longer-term negative consequences for at least some of them, such as the low-income population who are not homeowners but live in rentals, with the ongoing gentrification that is evidenced in this part of the Eixample district (Anguelovski et al. 2018*b*). These dynamics may lead to exclusion through social displacements, thus excluding the low-income population from access to benefits from ES (Langemeyer and Connolly 2020). Paradoxically, the local merchants, who had mainly pushed for the boulevard design of the renewal, are also increasingly struggling with increased rental prices, and they keep being replaced by trendy restaurants with higher financial throughputs that satisfy tourist demands. The gentrification literature suggests that many social displacement processes are initiated by changes in the kind of commercial activities or provision of food available (Anguelovski 2015*a, b*), and—as also shown by our case study—such changes may be triggered by a lack of considerations of procedural and recognition justice in greening or blueing initiatives.

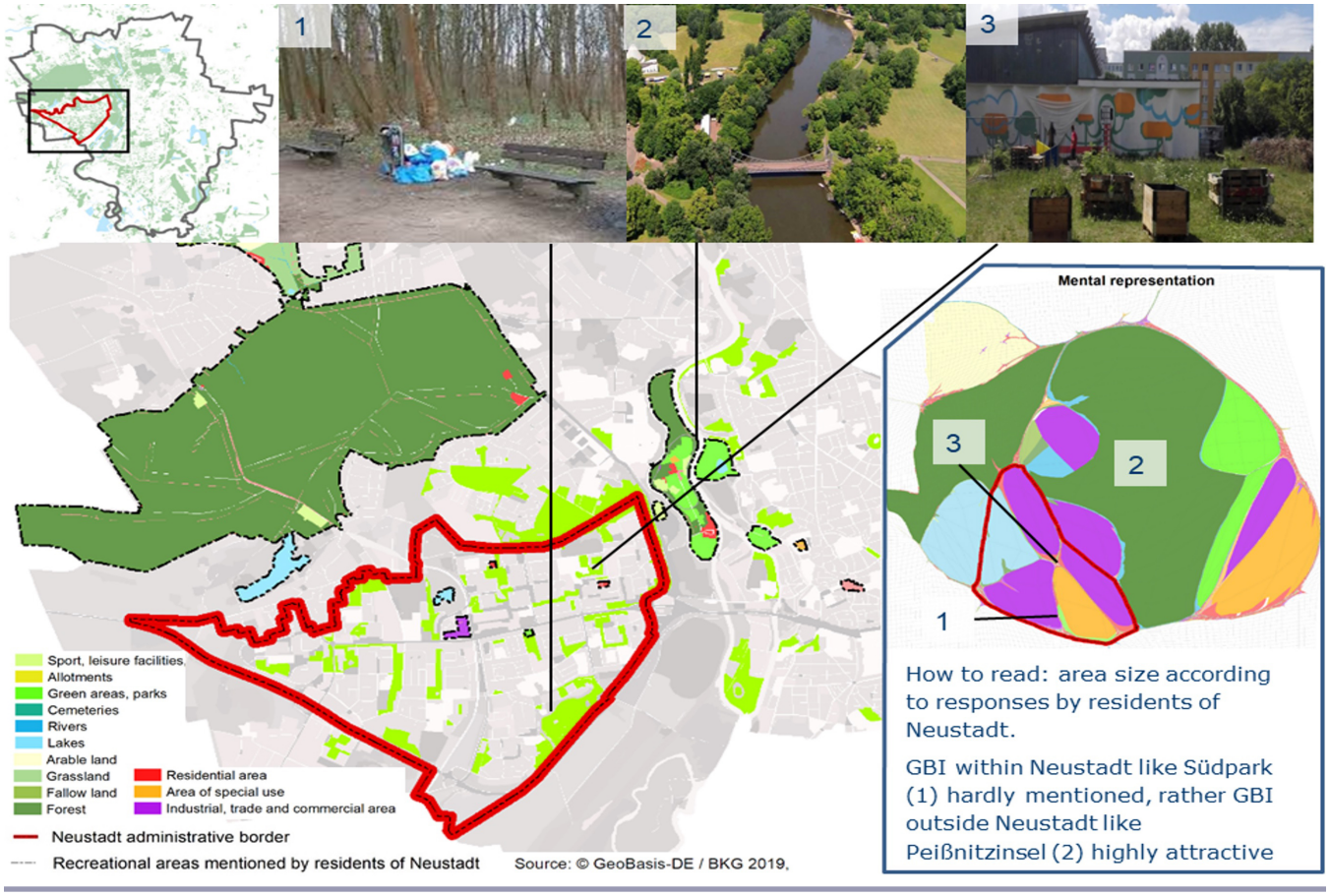
Greening in a Stigmatized Area: Green Spaces in Halle Newtown

With new green space developments, such as new gardens, playgrounds, and small greened lots, Halle Newtown aims to create more inclusiveness in a deprived and low-income neighborhood. This district of Halle, once a showcase of the German Democratic Republic as a comparatively green, mixed-socialist neighborhood dominated by prefabricated housing estates, is today in a poor state. Even though it is still a green neighborhood, its green spaces are neglected and not particularly welcoming (Fig. 2). Many single-parent families, unemployed people, and migrants from many different origins are mixed in the district. Both space–use conflicts and the lack of a sense of place are typical for this neighborhood. A new community garden and neighborhood management actions that involve green infrastructure are attempts to lower the barriers between the groups in the area and between Newtown and the center of Halle, to which most people gravitate.

There is an overall awareness by urban planning (municipal) of the insufficient availability of high-quality GBI in Halle Newtown. One of the local initiatives led by the city administration is the Neutopia garden project. The rationale for undertaking the Neutopia garden project was threefold: to increase the area of high-quality green space, to increase the sense of place for the people inhabiting Halle Newtown, and to provide space for staying outside to promote healthy lifestyles in the underprivileged district. As the project was initiated and is financially supported by the city of Halle, secure funding has been provided. The small team of neighborhood managers responsible for running the project on behalf of the city is very active in bringing the people in Newtown to the place and in encouraging the inhabitants to participate via this form of community gardening and the related leisure activities on the ground to develop a better sense of place. Next to the garden project, the undertaken measures included on-site public parties and joint harvesting of fruits and vegetables, as well as roundtable discussions with local residents.

As part of the initiative, new green infrastructure has been created, with proper institutional support, which is aimed at influencing the inhabitants' perceptions. People in Newtown suffer from a

Fig. 2. The figure shows the GBI network of Halle, in particular of the central Saale floodplains (right part of the map and photo 2) and Halle Newtown (red bordered) in the west, including the Neutopia community garden with its planting boxes (photo 3). The map shows the real situation and distribution of the GBI network in both places, Saale floodplain and Halle Newtown, and the smaller map on the right shows the mental representation of the most important green spaces of the Halle Newtown residents as discussed in the text. All land uses were resized by the number of entries and provide a different picture: Halle Newtown and its GBI appears much smaller in this resized mental map compared with the Halle Saale-floodplains GBI—photo 1 from Halle Newtown GBI might explain why.



fundamental lack of sense of place, including a lack of visits to existing green spaces, despite their availability and physical accessibility. This mental barrier—which became clear during the mental mapping exercise (Fig. 2)—goes back to the deep fall of Halle Newtown from a socialist showcase town to an underprivileged district. Clearly, Halle Newtowners perceive their district as receiving substantially less attention than other districts in Halle in terms of the green space planning. In particular, they observe the city authorities' focus on improved accessibility of the central Saale floodplains, the city's recreational hotspot. Indeed, Halle Newtown is partly neglected in the public discussion of GBI improvement (perceptions and institutions), and it is separated from the floodplains and the city center by a busy highway (infrastructure). Thus, physical barriers add to a real and perceived isolation of the Halle Newtown residents. One of the important trade-offs here refers to investing in GBI vs. investing in other ways of improving the image and quality of life of the inhabitants (or at least making the connection between GBI and other quality of life aspects clear to the inhabitants).

The community garden of Neutopia in Halle Newtown was not particularly well received and is not frequently used by the inhabitants of the district. Reasons may include the general ongoing "decline" of the whole district in terms of an increasing number of low-income households, low education levels, and the concentration of "problematic households," which a small green space cannot buffer. Moreover, the highly motivated Neutopia team is in a tricky situation to reconcile the different future expectations of the city administration and the inhabitants (Table 5). Planners should set a clearer focus on better physical connectivity of existing and new GBI, firstly between the central Saale floodplains and the Newtown, and, secondly, between green spaces within the local district. In addition, a clear focus of the planning institutions on dissolving the complex phenomenon of "feeling underprivileged" could help to lower mental barriers. This needs to be dealt with in the first place in any planning initiative that addresses district development in Halle before accommodating new low-income and migrant households there. Bringing this issue to the public and giving the floor to an open

Table 5.. ENABLE filters mediating the flow of benefits from GBI to potential beneficiaries translated into an analytical framework for the assessment of GBI-related initiatives—in the case of greening in Halle Newtown.

	Infrastructures	Institutions	Perceptions
Barriers	Insufficient green space in Halle Newtown Busy highway separating the district from major green spaces in the city	Lack of interest and involvement on the part of the inhabitants	Mental barriers: missing sense of place, perception of the district as inferior and in further decline (receiving less attention than other districts in Halle)
Enabling factors (potential)	Ensuring physical connectivity of green and blue infrastructure in the city (connecting districts)—not planned as of yet	Funding Measures undertaken by the city office to involve all residents (not reached yet)	
Trade-offs	Investing in further green and blue spaces in Halle Newtown vs. investing in green and blue spaces elsewhere in the city		Investing in green and blue spaces vs. investing in other ways of improving the image and quality of life in Halle Newtown
Environmental justice			Perception of green and blue spaces depends on several other aspects of the perception of people's living environment, especially when compared with other parts of the city

discussion about multiple injustices—income, affordable flats, stigma—between the different neighborhoods in the city would be crucial. Thus, the case of the Neutopia garden and the entire Halle Newtown raises the general question of the role of greening in deprived urban neighborhoods. Here, the prevailing best practice GBI implementation and improvement strategies, which successfully work in better-off areas, seem to fail, and the demands of city planners cannot be met. Most crucially, decision makers need to develop a sensitive understanding of the complex setting of GBI challenges, in which an obviously green neighborhood with good GBI availability coexists with mental barriers of accessing them (such as the above example of feeling underprivileged and not being welcome there).

Trade-offs between Manicuring Formal Green Spaces and Protecting Informal Ones: Green Revival in the Stare Polesie District in Lodz

The Green Polesie initiative being implemented in Stare Polesie (Old Polesie), one of the central districts of Lodz (Łódź), is meant to contribute to the improved quality of life of the inhabitants. Introducing new green spaces to improve the quality of living is part of a bigger strategy to halt further depopulation and suburbanization and to promote "a return" to the inner city (Municipal Planning Office (MPO) 2018, Koprowska et al. 2020). The city covers 293 km², and although a large share of its area is green (around 70%), formal green spaces account for less than 15% of the city's green space, and most of the green spaces are located outside of the relatively densely built-up city center (Feltynowski et al. 2018, Sikorska et al. 2020). The part of Old Polesie covered by the Green Polesie initiative has an area of 212 ha inhabited by 31,000 residents. It has 3.75 ha of formal green spaces, which amounts to only 1.22 m² of green space per capita (compared with an average of 74 m² of formal green space per inhabitant in Lodz). Although Old Polesie has been commonly presented as the least green area in Lodz, its informal green spaces (such as small-scale backyard green and the still vacant lots) provide an additional 6.64 m² per inhabitant.

When the municipality foresees for Old Polesie a target of 5 m² of green spaces per capita, it refers to public, formal green spaces only (Fig. 3). Based on the greening strategy for Old Polesie (MPO

Fig. 3. Green spaces (formal and informal) available before the start of the Green Polesie initiative and those planned within this initiative (based on CAD files provided by the Municipal Planning Office).

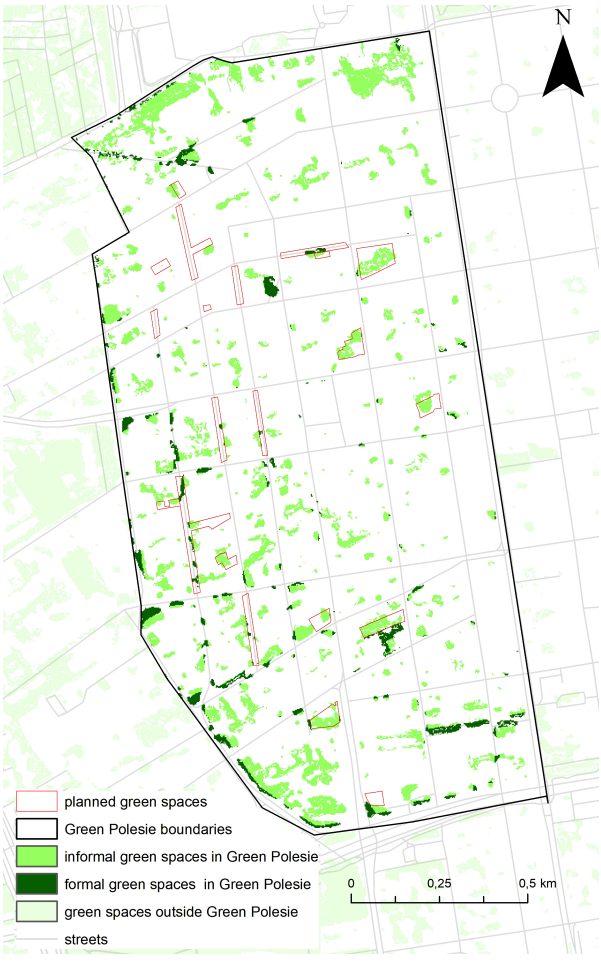


Table 6. ENABLE filters mediating the flow of benefits from GBI to potential beneficiaries translated into an analytical framework for the assessment of GBI-related initiatives— in the case of Green Polesie urban renewal project in Lodz.

	Infrastructures	Institutions	Perceptions
Barriers	Limited space for green and blue infrastructure (dense urban infrastructure) Lack of an ecosystem approach to green and blue infrastructure management—neglect of informal green spaces	Property rights—municipal greening on publicly owned and only Lack of involvement of ecologists and green infrastructure experts	Informal green spaces taken for granted Informal green spaces not protected hence often destroyed (for competing uses)
Enabling factors		Broader collaboration with local NGOs and experts (only superficial so far)	
Trade-offs	Formal green spaces—in publicly owned land—vs. broader involvement and seeking for connectivity and complexity of green and blue infrastructure	Working by the city alone vs. working with external experts and local leaders	
Environmental justice	Ecogentrification related to new visible and highlighted formal green spaces		

2017), this should be reached within 10 years, i.e., the duration of the initiative, with the assigned budget of almost 60 million euros. Due to property rights and the dense structure of developments, the only public spaces that can be potentially transformed into green are streets, additional small plots of land still owned by the municipality, and an area of the current market, which is planned to serve as a transformed community hub in the future. At this stage of the initiative, a few woonerfs (home zones—new walkable streets with an increased amount of greenery and slowed down traffic) have been created in different parts of Old Polesie, and a few pocket parks were located on small parcels of undeveloped land owned by the municipality. However, the strategy is far more ambitious, aiming to create 6.15 ha of new green spaces, of which 24% fit into existing informal green spaces and 73% will represent a totally new green space (with the remaining 4% falling within existing green spaces) (data based on CAD files provided by the MPO).

When it comes to the ENABLE filters, greening in this part of the city has been primarily prevented by the dense urban infrastructure and property rights (Table 6). Most informal green spaces are not covered by municipal activities because they remain private property. Besides, as revealed by our interviews, informal green spaces are typically taken for granted by local inhabitants, who often prefer replacing them with car parks and other competing land uses, primarily because they can visit and otherwise benefit from parks outside of the district. The interviewees indicated that the inhabitants had limited opportunities to reveal their perceptions and preferences regarding the greening of this area. Interestingly, the Green Polesie initiative was developed by the MPO, and although the Office keeps receiving credit and awards for this initiative (given its innovativeness and scope), it originated from a bottom-up action of a group of activists—*Społecznie Zaangażowani* (Socially Involved). The original initiative focused on the very limited availability of urban green spaces in this part of the city and involved several types of lobbying activities (awareness-raising events in public space, consultations with the City Office and the MPO, filing applications for the participatory budgeting program in Lodz). The leveraging of this initiative through its formal inclusion in municipal planning shows that urban greening has been given a priority in the official activities, but it still suffers from several institutional failures (cf. Kronenberg et al. 2017).

Although public authorities rarely interfere with informal green spaces, they should at least try to address this issue when working in such a seemingly gray area, and make an effort to incorporate them as part of green infrastructure. Meanwhile, informal green spaces in Old Polesie keep disappearing, either because of paving space for new parking places, or because of the undesired need to clean up leaves, or because of new developments, which is characteristic for Polish cities in general (Kronenberg 2015). Additionally, in several places, "greening" as part of the Green Polesie initiative involved removing existing trees and rearranging space. It resulted in an increase in impermeable area, which raised protests by the area's inhabitants. The initiative's implementation lies at the crossroads of competences, split between various stakeholders and decision makers. The MPO was the main responsible body for the initiative; however, over time, other municipal offices have taken the lead. As revealed by the interviewees, the activities of these bodies are not necessarily coordinated, at least not at a practical level. Members of the local NGOs are particularly concerned that the city authorities welcome developers (who are increasingly interested in this area) and are reluctant to impose any specific requirements on them, to the extent that they turn a blind eye to violating the provisions of the local zoning plans created by the MPO. Communication with the local activists and residents remains unsatisfactory, leading to social distrust and dissatisfaction. The interviewees from the local NGOs complained that the public consultation process is impaired and often has a showy character in the last phase. Moreover, warning signs related to different preferences and the distribution of benefits are already signaled by the local activists yet ignored by the municipal officials. Several stakeholders suggested in our interviews that municipal greening along with new investments is likely to lead to ecogentrification.

The Challenge of Urban Environmental Stewardship and Procedural Justice in Street Tree Planting and Reforestation in New York City

In 2007, the City of New York (NYC) launched the MillionTreesNYC (MTNYC) campaign as part of Mayor Michael Bloomberg's sustainability initiative, PlaNYC, a

Table 7. ENABLE filters mediating the flow of benefits from GBI to potential beneficiaries translated into an analytical framework for the assessment of GBI-related initiatives—in the case of street tree planting and reforestation in New York City.

	Infrastructures	Institutions	Perceptions
Barriers		Poor involvement of residents, insufficient measures to involve them	
Enabling factors (potential)		Improved assessments of supply and demand for ecosystem services (still needed)	
Trade-offs		Trade-offs between reaching all stakeholders and the feasibility and costs of the project	
Environmental justice	Objectives set with regard to providing trees and their services where most needed (environmental justice) but failed to change the situation because of inadequate implementation	Problems with involving residents in critical decision making (where to plant and why)	Differing beliefs, attitudes, and awareness of the campaign played a key role in creating a sense of responsibility and tree survival

framework for making NYC "greener and greater" by 2030 (City of New York 2007). The goal of MTNYC was to plant one million trees over 10 years to address federal air quality standards and heat risk exacerbated by climate change. The primary organizers of MTNYC, the NYC Department of Parks and Recreation (NYC Parks), the New York Restoration Project (NYRP), and the U.S. Forest Service (USFS), specifically committed to a goal of targeting neighborhoods of "great need," identifying six areas with fewer average street trees and high asthma rates among the youth, referred to as "Trees for Public Health" (TPH) neighborhoods. To implement the program, NYC Parks used a block planting strategy to fill as many available areas with trees as possible using the public right-of-way (e.g., sidewalks and traffic medians), in addition to working with the USFS on reforesting city parkland. Although the city accepted requests for trees from residents, the MTNYC planners primarily used a block-by-block strategy, attempting to plant street trees "equally" to address concerns of gentrification and obstruction of storefronts from local businesses and property owners (MillionTreesNYC 2014).

Although successful in many respects, a post-analysis of the campaign revealed that the majority of trees (83%) were planted in existing parks and 17% in public right-of-way areas. Only 6% of the total million trees were planted in TPH areas (Garrison 2019). The TPH neighborhoods, in particular, are communities that have disproportionately less park space and a long history of disinvestment in open and green space more generally (Pearsall and Anguelovski 2016). Thus, by planting the majority of trees in existing parks located outside of TPH areas, the campaign was ultimately not able to achieve its goal of distributive environmental justice. The logistical and legal constraints of planting trees in the public right-of-way were also a key challenge. Due to citywide requirements for tree pits to be a certain size and meet current zoning standards, the majority of street trees were installed by licensed and insured City contractors. The exclusion of residents in directly planting trees on their own blocks coupled with a lack of involvement in key decision-making processes played a key role in undermining shared responsibility for tree stewardship (Young and McPherson 2013). Researchers also noted that a combination of biological, social, and physical urban design factors, such as soil compaction, traffic volume, vandalism, and evidence of prior or active community stewardship, impacted street tree mortality, with an overall survival rate of 74.3% in a post-assessment conducted on 13,405 of the trees planted (Lu et al. 2011), with the majority of surviving and healthy trees (82.7%) located in one-to-two family residential areas. Research on reforestation efforts shows issues with competition between tree seedlings and native and non-native plant species (McPhearson et al. 2011).

Using the ENABLE framework, we see that MTNYC benefited from strong institutional support from the city authorities (Table 7). However, although the MTNYC planners invited advocacy groups to several town halls, environmental justice organizers considered much of this a symbolic form of participation because communities were not fully involved in critical decision making about where to plant trees and why (Rosan 2012). This issue of procedural justice is further challenged by the time needed to accomplish good procedural justice work and how planning often moves at a faster rate (a clear trade-off). The reliance on outside contractors to plant the majority of street trees without residents' knowledge or participation is representative of this issue. Furthermore, the primary mechanism to identify areas of "great need" relied on a tree canopy assessment in addition to data on asthma rates and air quality. It may not have been sufficient in representing social need or vulnerability in some neighborhoods, and it signals a potential supply–demand mismatch of urban ES (Grove et al. 2006, NYC Parks 2010, Herreros-Cantis and McPhearson 2021). In particular, they might have benefited from an approach that leverages multi-functional GBI to provide multiple ES in areas of unequal street tree or park density, which are predominantly located in low-income communities of color.

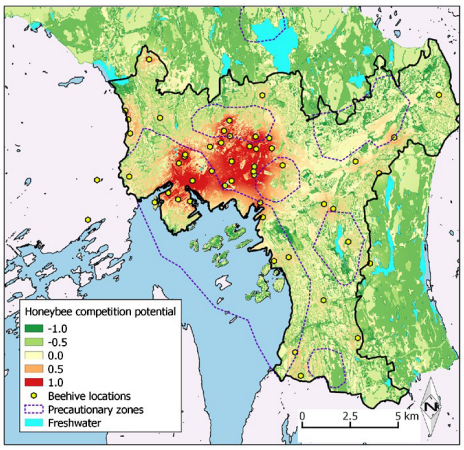
Years after the millionth tree was planted, there are still lingering questions about the MTNYC campaign's impact and its ability to establish a long-term stewardship model. The absence of continued funding is, of course, a primary factor, but so, too, are the ways in which planners approached distributive, procedural, and recognition justice concerns, devised platforms for inclusive community participation, and addressed biological and urban design challenges throughout the implementation and post-maintenance of the project. In further research on tree mortality and stewardship, the different beliefs, attitudes, and levels of awareness of the campaign played a key role in cultivating shared

responsibility toward street tree stewardship (Lu et al. 2011, McPhearson et al. 2011). In particular, researchers noted that there were improved rates of street tree survival in areas with evidence of prior care, as well as in areas where there was an understanding of residents' diverse beliefs and attitudes around the street trees (Moskell and Allred 2013). In the case of MTNYC, residents did not find uniform value in the ES of street trees, with some requesting a tree, whereas others refused or removed trees, citing concerns over the additional maintenance, gentrification, and obstruction of storefronts. Although distributional justice was a focus, improved spatial techniques and evaluative tools for locating areas of "great need" that integrate demands for both ES and environmental justice concerns may offer greater insight. Using the ENABLE filters helps us recognize that multiple strategies for addressing environmental and distributive justice must be done together alongside a consideration of the structural barriers and systems that have contributed toward the disinvestment of TPH communities (Kelly and Adger 2000, O'Brien et al. 2007).

Trade-offs in Renaturing the City: Pollinator Habitat and Green Roof Planning in Oslo

Norwegian legislation stipulates that government bodies such as the Oslo municipality must act to safeguard against the loss of both species and habitat types, with particular emphasis on rare and threatened species. As a precautionary measure to guard against negative effects that high honeybee densities could have on nationally and internationally important biodiversity, the Oslo Urban Environmental Agency established eight "precautionary zones" within the municipality, within which placement of honeybee hives is strictly regulated. The zones include 1 km buffers around known locations of rare bee and butterfly species (from recorded observations), as well as sites containing biologically important flowering meadows (Fig. 4).

Fig. 4. Map of the relative resource demand of foraging honeybees, accounting for the floral resource availability of the Oslo municipality landscape. Precautionary zones represent areas proposed by Oslo Urban Environmental Agency to protect potentially sensitive populations of red-listed wild bee species from competing with domestic honeybees.



Meanwhile, since 2012, Oslo has experienced a surge in urban beekeeping and a steadily growing number of registered beehives. In 2016, nearly half of Oslo's beehives fell within these precautionary zones. Oslo's Urban Environmental Agency presented the precautionary zones primarily as a tool for evaluating future applications for beehive permits, and it did not express the intention of demanding the removal of hives that fell within precautionary zones. Yet, the overlap between the zones and the present location of so many beehives presents a potential for conflicting interests. Both the agency and Oslo's beekeeping community have been keen to find ways to objectively evaluate the boundaries of and recommendations within the precautionary zones (Stange et al. 2017). New applications to place beehives on municipal land (parks, cemeteries) within the precautionary zones are currently rejected, but the municipality cannot prohibit beekeeping on private land, even within the precautionary zones, as long as beekeepers fulfill the Norwegian Food Inspectorate's (*Mattilsynet*) sanitation requirements and have their neighbors' consent. Oslo Municipality also provides incentives for urban beekeeping as part of its promotion of urban agriculture. The local urban beekeeping association (ByBi) advises members against beekeeping on rooftops where they fall within the precautionary zones; rather, it promotes the planting of flowering plants by the public in the urban core in a pollinator passage project (http://bybi.no/the-pollinator-passage/).

Individuals' motivations for being a beekeeper in Oslo include producing honey, as well as social interactions and learning within the beekeeping community. Many, if not most, are also concerned about reports of pollinator decline, and they seek opportunities to increase their own knowledge about urban nature and pollinators (Stange et al. 2018). Owners of residential, office, and hotel buildings show growing interest in establishing green roofs with pollinator-friendly flowering species. In some cases, building owners promote rooftop beekeeping as part of green public relations and for the benefit of employees. With continued urban densification that decreases bees' access to flower meadows, the main surface area available in the precautionary zones for renaturing the city is rooftops, most of which are private property. Oslo's Urban Environment Agency has developed a Green Roof Strategy, which has been submitted to a Public Hearing (as of January 2021) before eventual city council approval. The Strategy places emphasis on multiple ES that are provided by green roofs, including pollinator habitats, with incentives to encourage voluntary conversion of existing roof space.

Looking at this case through the ENABLE filters, we see that green roofs may be a potential infrastructural solution to the lack of pollinator habitat, but that they require proper institutional support incentives for voluntary implementation and changes in the local preferences (Table 8). Taking a systems perspective makes it possible to see the interconnectedness between the social and the ecological, with counterintuitive system responses to some of the actions undertaken or potentially undertaken by the actors. For example, some building owners have been surprised that urban beekeeping—which they believed to be unconditionally positive for the environment—could potentially have negative effects on wild bee species in some parts of the city. The degree to which green roofs (and walls) are a solution to limited pollinator habitat in Oslo depends as much on green roof design as on the extent of available roofs. The most common

Table 8. ENABLE filters mediating the flow of benefits from GBI to potential beneficiaries translated into an analytical framework for the assessment of GBI-related initiatives—in the case of pollinator conservation initiatives in Oslo.

	Infrastructures	Institutions	Perceptions
Barriers	Limited influence on private property owners	Insufficient integration of knowledge on wild pollinators into planning	Insufficient understanding of the conflict between native pollinators and honeybees Need for changes in human inhabitants' preferences in favor of rare and threatened species
Enabling factors	Promoting green roofs and precautionary zones	The blue–green factor as a tool supporting green and blue infrastructure (although it needs amendments) The Green Roof Strategy	Collaboration with stakeholders, multiple actors, most notably urban beekeeper association ByBi
Trade-offs	Providing habitat for wild pollinators (protecting their habitat) vs. increasing urban honeybee population (installing new beehives) Renaturing existing vs. new roofs		Supporting preferences toward wild pollinators vs. preferences toward honeybees and urban beekeeping
Environmental justice			Interspecies justice (non-human)—human-introduced species vs. native ones

solutions currently are sedum roofs (which, together with peat roofs, presently account for only about 1% of Oslo's roofs). These are not particularly species-rich and do not provide a continuous supply of flowers through the growing season. A limitation for implementing the Green Roof Strategy is the lack of data on the carrying capacity of existing roofs. The institutional support included not only the Green Roof Strategy, but also the blue–green factor (BGF), a norm adopted in 2019 that requires a minimum number of blue–green structures in new residential developments. The BGF method scores and values a number of blue and green infrastructure surfaces and structures in new housing developments. However, BGF scoring is biased toward stormwater regulation as it does not preferentially score specific endemic species and flower-rich garden roofs. Finally, the inhabitants' preferences regarding the protection of pollinators and green roofs have not been studied, except for a general public hearing on the Green Roof Strategy.

Municipal planning policies to control densification face a struggle due to population, political, and commercial pressures to develop new housing. Urban "land taking" is still one of the main causes of biodiversity loss. Without seeing the connections between these pressures, policies, and planning instruments, the focus on the plight of declining populations of wild pollinators in Oslo may fall on urban beekeeping, disregarding other planning and zoning measures. The "danger" in not integrating planning and knowledge production on urban pollinators, and "blaming" urban beekeepers for wild pollinator decline, is the potential alienation of one of the most active groups in Oslo's civil society working for the greening of the city. Furthermore, zoning measures to protect wild pollinators in remnant habitats in the built zone should be seen in connection with strategies (green roofs) and policy instruments (BGF) to promote GBI. Finally, although the importance of existing roof surfaces is recognized as the largest available renaturing surface area in the inner city, there are fewer incentives for rehabilitating/renaturing existing roofs than there are for blue–green design in new developments. The BGF norm discussed above only concerns new buildings. In addition to the lack of incentives, there may be competing incentives for other uses of roof space, such as subsidies offered by Oslo Municipality for the installation of photovoltaics.

Challenges to Project-based Greening: Greener Stockholm

"Greener Stockholm" is a policy with a set of guidelines for planning, implementation, and practical maintenance of the city's parks and nature areas adopted in 2017 (Stockholm Stad 2017). The guidelines express that the basis of future urban development and planning should consider the importance of all Stockholm residents having equal access to high quality urban green spaces to support wellbeing. "Greener Stockholm" assumes a user perspective where different people and groups have different GBI needs. The policy also aims to ensure habitat for biodiversity, as well as effective resource use in the face of ongoing urban densification and budget constraints, etc. One respondent reflected that this is a strategy by the city leaders to show that even if green spaces are lost in the densification process, they also care about them by investing in "upgrading" the remaining ones. One of the main implementation strategies of Greener Stockholm is to allocate 300 million SEK over 5 years to projects in targeted city districts, mainly on the outskirts. Several of these city districts are known as socioeconomically marginalized areas, where the city leadership needs/wants to show engagement. Compared with the central parts of the city, these areas have high availability of relatively extensive green spaces, but they are also subject to a decrease in smaller green spaces in between the houses due to in-fill densification. However, it is assumed that GBI access is lower there due to both physical and mental barriers, such as large freeways and lower awareness of GBI and its potential uses.

The implementation of projects takes place in three phases, and only the first one could be addressed in this study. The first phase of the initiative was, according to the respondents, planned under severe time pressure from politicians, who wanted to see change. The first projects selected were those already under consideration that fulfilled rather general criteria (e.g., bringing benefits to many inhabitants, strengthening green connections and wedges, and fitting into local development programs and local zoning plans (Stockholm Stad 2017)). The geographical distribution of

Table 9. ENABLE filters mediating the flow of benefits from GBI to potential beneficiaries translated into an analytical framework for the assessment of GBI-related initiatives—in the case of the Greener Stockholm policy.

	Infrastructures	Institutions	Perceptions
Barriers	Limited to addressing municipally owned/public green spaces	Limited involvement of residents Unclear mandate and working procedure of the cross-departmental steering group Unclear implementation guidelines	Limited time to engage with residents and their perceptions of the targeted GBI
Enabling factors	Available green spaces in the city districts	Extra financial investments Cross-departmental steering group Cross-scale implementation procedure	Implementation anchored in local development plans and local administrations closer to the residents
Trade-offs	Compensation by "upgrading" some local green spaces while building on others in densification processes—a decrease of availability Greening in already relatively green outer city districts (but socioeconomically disadvantaged) vs. greening in the less green city center (socioeconomically privileged)	Trade-offs between engaging all stakeholders and the feasibility and costs of the project Comprehensive policy and concrete implementation guidelines	
Environmental justice		Whose interests are considered and satisfied?	Prioritizing the assumed needs of the marginalized groups (in outer districts)—with limited knowledge about their needs

projects was not based on a mapping of GBI availability and/or accessibility, but rather on the political direction to include GBI measures into broader efforts of support in marginalized areas and the perceived feasibility of the project (e.g., not conflicting with other initiatives). The projects may have been grounded in the local knowledge derived from earlier interactions between the district officials and local residents, but the residents were not invited to suggest projects in this phase.

The policy is not explicit about problems that need to be solved, but it clearly presents goals to be reached. Being a thematic strategy, it is placed between the comprehensive plan and city district park plans. However, unlike its predecessors, and related to the institutional filter, it places a strong emphasis on the need for collaboration between different central departments within the city administration, between the central administration and the city district administrations, and with the residents (Table 9). The ambition is to both secure a multi-level stakeholder network working with GBI across the city and to recognize the local engagement in green spaces (about 70% of the suggestions from residents concern green spaces) (Stockholm Stad 2017).

The large investment called for the formation of a new cross-departmental steering group with responsibility for coordinating the implementation. According to one respondent, this was a new way of organizing GBI work within the city. However, the group still has an unclear mandate and working procedures, and the policy has been criticized for the lack of specific implementation guidelines. Several city officials have asked for clarifications about how to prioritize between densification, development, and conservation projects (key trade-offs for a greening initiative).

Another institutional change involved clear political directives for the central administrators to cooperate with the city district administrators, and to tailor the implementation projects to specific local challenges. A substantial part of the implementation was through investment projects, which is a different institutional format than allocating money to city districts to decide how to best use them (e.g., daily management, refurbishment, dialog platforms, or establishment of new green spaces/outdoor environments) within a specific period. This meant that the funding could not be used for long-term engagement or management. Finally, physical infrastructure projects dominate. These interventions are motivated by the assumption that they would lead to increased accessibility in terms of awareness about the sites, promotion of activities, and hence a variety of experienced benefits. However, as these projects were single investments, the management of the refurbished site needs to be covered with the ordinary budget of the city district, which is very limited. According to the respondents, there has been no evaluation of, e.g., increased perceived accessibility or attractiveness, as this was not part of the investment.

The city districts used their existing tools and contacts to engage people. Due to the time pressure, this was a rather rushed procedure dominated by targeted and interactive dialogs that took place at a late planning stage, where most frames for the projects were set. One respondent said that the residents questioned why such large investments were done in this particular green space when there were so many other needs and places in the district. They could not see how refurbishing a park could improve the challenges they experienced (discrimination, poverty, unemployment, criminality, insecurity, overcrowded apartments). In some cases, it was also difficult to attract the residents to engage in the discussions about a green space, and one respondent suggested that people are tired of dialogs because they seldom see their suggestions realized.

DISCUSSION

In this section, we first offer an overview of the key issues that emerged from our case studies in light of the three filters approach. Then, in two separate subsections, we discuss the broader context

Table 10. ENABLE filters mediating the flow of benefits from GBI to potential beneficiaries translated into an analytical framework for the assessment of GBI-related initiatives—synthesis of key issues observed in our case studies.

	Infrastructures	Institutions	Perceptions
Barriers	Infrastructural solutions involve trade-offs between satisfying the needs of different stakeholders (Barcelona, Halle)	Authorities do not ensure full stakeholder participation (Barcelona, Halle, Lodz, New York City, Stockholm) Green and blue infrastructure is subject to institutional divisions rather than an ecosystem approach (Lodz, Halle, New York City, Stockholm)	Mental barriers related to the perception of greening vs. other needs of the inhabitants (Halle)
Enabling factors (potential)	-	-	-
Trade-offs	Greening in different parts of the city (Stockholm) Land-use patterns (greening, conservation, development, densification with green infrastructure components) (Lodz, Oslo, Stockholm)	Trade-offs between reaching all stakeholders and the feasibility and costs of the project (Barcelona, New York City, Stockholm)	Investing in green and blue infrastructure vs. investing in other ways of improving the image and quality of life (Halle, Stockholm)
Environmental justice	Ecogentrification (Barcelona, Lodz)	Whose interests are considered and satisfied? (Barcelona, Halle, Stockholm)	Perception of green and blue spaces depends on several other aspects of the perception of people's living environment, especially when compared with other parts of the city (Halle, Stockholm) Interspecies justice (non-human)—human-introduced species vs. native ones (Oslo)

of learning from (and dealing with) counterintuitive outcomes of GBI-related initiatives and the broader usefulness of our analytical framework.

Synthesis of Case Studies

The breadth of our examples may be representative of the broader current wave of greening and blueing initiatives in cities. The cases highlight different challenges, and our case-study cities are on a different level of GBI planning and management (Davies et al. 2015, Pauleit et al. 2019), representing different traditions of accounting (or not accounting) for environmental justice (Schlosberg 2003, Walker 2012, Low 2013). They span the most experienced and proactive cities (especially Stockholm, Oslo, and New York) to those struggling with basic issues and the nascent recognition of the role of GBI in urban development (Lodz). But all case studies indicate that even the best initiatives are not necessarily without unintended, negative consequences, and there is always scope for improvement.

Note that specific issues that seem to be missing from a particular strategy (the initiative presented as our case study) may not necessarily be missing from the case-study city in general. The analyzed documents fit into the broader institutional structure within each city and are part of a system of parallel projects, initiatives, and documents. The example from Stockholm is particularly relevant in this regard—the program may be assessed as forward looking and comprehensive, but there may be problems with the implementation of individual projects under its auspices (which could also be assessed individually through the lens of our analytical framework).

The analytical framework we used guides the interpretation of case studies and the synthesis of lessons learned (Table 10). Below, we specifically link to the key issues emerging with regard to infrastructures, institutions, and perceptions. First and foremost, the perspective of these three filters clearly indicates that greening and blueing initiatives need to be seen in the broader context of ongoing social–ecological processes in cities, in particular, regarding the respective trade-offs and environmental justice concerns. It is also evident, however, that the three filters are rarely considered altogether in the respective greening or blueing initiatives.

With regard to infrastructures, greening is not only a matter of arranging greenery in a small subset of formally recognized urban green and blue spaces. Public authorities typically limit the implementation of their GBI initiatives to the land under municipal ownership and, in this way, overlook the social–ecological complexity of urban GBI (as exemplified by the case studies from Lodz, New York, Oslo, and Stockholm). Other green and blue spaces typically remain unmanaged or managed by other actors with poor or no oversight of the public authorities. On the one hand, this may resemble picking low hanging fruit, but on the other hand, it links to institutional barriers, such as property rights and limited opportunities for public authorities to interfere with private land (although there are such opportunities, and some cities have already demonstrated good examples in this area (cf. Green et al. 2016)).

Covering all types of GBI in comprehensive strategies and new scientific knowledge should help identify trade-offs across policy sectors and reduce unexpected effects. One example is Oslo, where beekeeping advisories and green roof targeting are based on better knowledge of the competition effects between honeybees and wild pollinators. Additionally, as exemplified by the cases of Oslo and Lodz, another common problem with urban greening and blueing initiatives is the neglect of existing infrastructures and the focus

on new ones (neglecting or greening existing roofs in Oslo in favor of green roofs on new buildings; neglecting existing informal green spaces in Lodz, and focusing on newly introduced public green spaces). While so much attention is paid to the new, the old may be neglected. And indeed, the old may be disregarded and removed (as in the case of Lodz) in an attempt to reorganize green spaces. Meanwhile, especially from the perspective of ecosystems' capacity to deliver services, restoration is far more expensive than maintenance (Elmqvist et al. 2015). Such complexities of urban landscape management are particularly relevant in light of the ongoing simultaneous processes of densifying and regreening cities.

The institutional perspective reveals that urban greening and blueing weaves into multiple other processes in cities, including existing socioeconomic changes and tensions, such as those related to changes in the housing market, city branding, and economic restructuring. The planning of greening and blueing initiatives is not always complemented by thoughtful consideration of potential side effects, but our examples from New York, Oslo, and Stockholm reveal that it is possible. Even though all the initiatives we studied saw strong institutional support from local authorities, it was never comprehensive enough to avoid problems. The selection of places for the introduction or upgrading of GBI depends on those other processes, but it also influences them. Selecting a given greening pattern satisfies some interests and sometimes harms other interests (as in the case of Passeig de Sant Joan in Barcelona), or —at least—on its own, it does not help to solve other pressing problems underlying poor use of green spaces by the local inhabitants (as in Halle Newtown).

Both Stockholm and New York highlight changing political circumstances. In Stockholm, rushed timelines meant adjusting the plans to new policy contexts, again and again, which made it difficult to keep track of new policy/institutional changes. In the case of New York, the issue of procedural justice was further challenged by the time needed to accomplish good procedural justice work and by the fact that planning often moves at a faster rate. There is a clear need for collaboration between those involved in GBI planning and management and other departments in the relevant city administrations, for example, those responsible for public participation, housing, and local treasuries, but also with multiple other stakeholders—which in reality is often lacking (Kronenberg et al. 2016). Our case studies indicate the need to adopt novel forms of urban environmental governance that would address many of the procedural and recognition justice issues by involving communities in decision making and creating shared ownership through bottom-up approaches that necessitate taking more time in planning processes (Heberlein 2012) and authentic recognition of their needs and preferences (Ernstson 2013).

This brings us to the third filter—perceptions—and to the importance of acknowledging their diversity and the role of the inhabitants in shaping GBI that would deliver the most needed benefits. Here, the examples from Halle and New York are particularly telling. The perceived lower status of Halle Newtown and its degraded green spaces, especially when compared with the landmark Saale floodplains, indicates that working with the inhabitants and their perceptions is particularly urgent. The less privileged may have fewer possibilities than the wealthier to develop place attachment, which, among other things, suggests that particular emphasis should be given to greening areas inhabited by such groups (Łaszkiewicz et al. 2018). However, this needs to be complemented by proper education and awareness raising regarding the importance of green spaces for the quality of life in the underprivileged neighborhoods themselves (i.e., working with perceptions), as well as with measures that prevent potential ecogentrification.

In New York, ignoring inhabitants' perceptions and neglecting their potential engagement resulted in extreme and seemingly absurd acts of destroying the newly planted trees. The identification of exclusion areas or neighborhoods of "great need" (as in Stockholm and New York, but also in Lodz and Halle) was based on top-down expert decisions, rather than through collaboration with the inhabitants, as were the ideas on how to improve the situation of such areas. Meanwhile, closer collaboration with the inhabitants, properly recognizing their preferences, and communication might have avoided some of the problems incurred by the studied initiatives. It might have avoided the misunderstandings that they involved. Indeed, Barcelona, for instance, has considerably enhanced its emphasis on inclusive, participatory decision making since the intervention of Passeig Sant Joan.

Learning from Counterintuitive Outcomes

Learning from what did not work out as expected is particularly useful in any intervention. It is one of the basic tenets of adaptive management (Magnuszewski et al. 2005, Williams 2011), and various management systems following the plan-do-check-act philosophy (Moen and Norman 2006). All of these concepts emphasize the importance of the feedback between learning and decision making. The best opportunities emerge when—upon realizing that something has gone wrong—the stakeholders enter into a dialog and work out new solutions together. This appears particularly relevant in light of our case studies, which demonstrate the need for close collaboration between all those involved in urban greening and blueing, not only for reasons of recognition and procedural justice, but also for the increased efficiency and efficacy of such processes. Furthermore, whereas social interventions in urban ecosystems yield potentially unpredictable ecological consequences, observing these interventions and their consequences provides an alternative to controlled experiments (Pickett et al. 2004, Felson and Pickett 2005). Our approach to studying the social–ecological systems context, as well as the specific interdependencies between the three filters, trade-offs, and environmental justice aspects, follows the idea that urban design can be seen as an experiment whose effects can be measured, mediated, and enhanced by introducing the relevant changes into the studied interventions.

Our examples indicate clear misunderstandings and ineffectiveness that result primarily from the fact that those who implemented an initiative did not necessarily consider comprehensively enough the infrastructures, institutions, and perceptions. As a result of our focus on what went wrong, Table 10 highlights barriers, and not a single enabling factor. In particular, as most of the initiatives were carried out in a top-down manner, the perceptions of all the different stakeholders were not necessarily considered. Such actor non-involvement and poor communication problems relatively frequently characterize different greening and blueing initiatives

throughout the world (Mabelis and Maksymiuk 2009, Battaglia et al. 2014, Kronenberg 2015, Kronenberg et al. 2016, Buijs et al. 2019), and they are often combined with a lack of willingness to acknowledge and respect conflicting ideas in a city, undermining the importance of environmental justice issues, in particular, regarding recognition and procedural aspects.

Environmental justice is just one of many potential concerns with greening and blueing initiatives that involve conflicting interests of the different actors, e.g., planners representing public interest vs. private actors, NIMBYism ("Not in My Backyard" opinions), and sometimes even a "clubification" of some goods (such as in the case of urban gardening and green roofs). Many greening and blueing projects respond to the needs of those who actively demand new or better managed green and blue spaces (giving the city authorities an opportunity to boast of doing something in response to the needs of society). Still, some are purposefully carried out not where the most active groups are (assuming that such groups can most probably arrange something themselves), but in "exclusion areas." They are generally deprived of green and typically also deprived of a voice, and the greening initiatives may be specifically carried out in such disenfranchised neighborhoods (as in our case studies from New York and Stockholm). However, in the latter circumstances, collaboration with local stakeholders in such areas is even more crucial for the success of such initiatives. Besides, although environmental justice is a growing concern, such issues are relatively difficult to incorporate, and in many countries and contexts, they have not been pronounced enough to be regularly taken into consideration by planners (Kronenberg et al. 2020). Even more surprisingly, in neoliberal settings, gentrification, including ecogentrification, may be seen as a positive sign of independently self-solving socioeconomic problems—but again, even more drastically ignoring the potential side effects (Kronenberg et al. 2020). Aligning plans with heterogeneous local community interests is a challenge in all cities, but particularly where the private sector is the biggest landowner and the main driver of urban development, such as in Oslo, with municipal planners having to negotiate public green space in return for building permission.

Our case studies indicate that one needs to consider the potential additional unexpected outcomes next to any intended consequences, similar to the notion of joint production (Faber et al. 1998, Baumgärtner et al. 2001). It is particularly important to consider who the addressee of the intended consequences is and who may suffer from unintended ones. Indeed, "intentionality" is a loose concept when consequences are decided by someone else's perception of the outcomes, and the assumed beneficiaries may disagree about the benefits or see other aspects of the outcomes as more relevant (as depicted in our case study from Barcelona). This is in line with previous research on ES trade-offs, which puts stakeholders' preferences and institutions at the forefront of the relevant analyses; however, the previous research on ES trade-offs largely overlooked the justice context (Turkelboom et al. 2018). Meanwhile, depending on who is affected by these unintended outcomes, the situation may get out of control and lead to social conflict. Still, the unintended effects may also sometimes turn out to be positive.

The Usefulness of the ENABLE Analytical Framework

The analytical framework we used offers a way to approach the above deficits in a specific and scale-sensitive/hierarchical way. The combination of filters and ES benefits provides a consistent and broadly relevant logic for improving policy consistency and devising holistic strategies that overcome traditional sectoral approaches. The idea that urban ES and the related benefits are mediated by factors such as infrastructure, social practices or perceptions, and the cultural or institutional contexts in which people experience human–environment relations is not new (Luederitz et al. 2015, Kremer et al. 2016). Still, most reports on the efficacy or efficiency of the delivery of benefits from urban ES refer to one of these factors only, and most notably to the properties of green infrastructures and ecosystem functioning (Taylor and Hochuli 2015) or the participation of the beneficiaries (Lovell and Taylor 2013, Andersson et al. 2014). The latter issues connect to the political ecology's emphasis on political power and institutions (Tubridy 2020). Our approach, which systematically addresses all three filters, allows for a better understanding of the different problems with urban greening and blueing.

With the use of the proposed framework, we have been able to analyze the case studies and planning initiatives (and we continue this work as part of our ongoing engagement). In the case study from Barcelona, we highlighted the economic dynamics that might be critical to understanding especially longer-term outcomes regarding urban green space availability and accessibility. In Halle, we continue working with the mental maps of the local inhabitants and on how to use these perceptions to eventually remove the different personal barriers affecting the inhabitants' use of green spaces. In Lodz, we are studying the social structure at the dawn of ecogentrification that can potentially result from the introduction of the Green Polesie project, thus highlighting the temporal dynamics of environmental justice (Langemeyer and Connolly 2020). In Oslo, we keep developing a GIS-based approach to target existing buildings with the greatest potential for intensive green roofs with a deeper substrate; we are also developing proposals for further zoning based on the blue–green factor norms. In Stockholm, we emphasized the need for cross-scale approaches that compromise different goals at different scales in the face of social–ecological complexity and the relevance of scale (different people may demand different ES at different scales). In New York, we are using the framework in further work on environmental justice issues, combining them with urban resilience.

The three filters framework can still be refined and developed, especially with regard to differentiating the types of stakeholder interests and the needs associated with infrastructures, institutions, and perceptions. For example, the inhabitants, or ultimate beneficiaries, not only have perceptions as users, but they may also have roles as rule makers and owners. Owners and rule makers are not necessarily users. Non-overlapping interests in relation to the ENABLE filters can potentially offer a way to explain trade-offs. Not being aware of multiple roles and interests may be an explanation for unintended consequences. Additionally, perceptions in our analysis have been interpreted as current, whereas existing institutions and infrastructure represent embedded, path-dependent historical choices. Conflicts of interest, trade-offs, and other unintended consequences are the hallmark of any city, due to the continuous tension between the preferences of past planning and policy that are embedded in urban morphology and institutions, the perceptions of current inhabitants, and planners' expectations of their future preferences. Still, our framework could work equally well with

successful case studies—with an emphasis on enabling factors rather than barriers. Indeed, barriers and enabling factors are two sides of the same coin, and it is up to planners and managers to interpret and use them to the right end.

CONCLUSIONS

Following a simplistic and yet popular view, urban greening and blueing seems to be a safe area where anything that is done yields positive results. In reality, enabling the flow of benefits from GBI requires a thoughtful consideration of multiple issues. The proposed framework acknowledges the complexity of urban social–ecological systems, and it indicates the key parameters in these systems that can be regulated to enable the flow of ES benefits to urban inhabitants. Clearly, infrastructures, institutions, and perceptions need to be taken into account when designing and managing urban green and blue spaces, and when considering their equitable availability, accessibility, and attractiveness. As exemplified by our case studies, considering these filters in urban greening and blueing projects could help to avoid the misunderstandings and shortcomings that arose.

Responses to this article can be read online at:
https://www.ecologyandsociety.org/issues/responses.php/12445

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Data Availability:

The data for individual case studies are available upon request from the authors.

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APPENDIX 1

List of questions used as a guide for developing each case study.

- BACKGROUND: What was the rationale for undertaking the project or planning initiative? In particular, was there any social awareness of insufficient availability of GBI or insufficient accessibility of the selected GBI components? Was there a feeling of the inequitable division of the related benefits (opportunities for recreation, health benefits, noise mitigation, place attachment, etc.) for the different socioeconomic groups of urban inhabitants? How did it manifest? Was there community mobilization and resistance to the inequitable division of benefits? What is the relevant policy/planning response, and what are the measures undertaken?
- CASE STUDIES BRIEFLY ANALYZED WITH THE ENABLE FRAMEWORK: How have the three ENABLE filters been incorporated into the project or planning initiative? Has infrastructure been a problem or a solution in this case? How have the relevant institutions been used to solve the problem for which the project/initiative was launched? What institutional barriers might have prevented it from happening? How have the preferences of the inhabitants been taken into consideration? Have there been any studies regarding those preferences, or have the preferences been assumed by the decision-makers? Potentially link to procedural or recognition justice.
- LESSONS. CAVEATS. THINGS TO KEEP IN MIND. WHAT CAN GO WRONG GIVEN THE CURRENT SHAPE OF THE INITIATIVE – keeping in mind our knowledge on environmental justice regarding urban green space availability and accessibility (preferably relative to an "ideal" case, but at least relative to the aspirations and identified targets)? Unintended consequences resulting from the complexity of social-ecological systems and complexity – and specifically of the infrastructures, institutions, perceptions. Within these ENABLE filters, we can investigate specifically the externalities, spill-over effects, and trade-offs. Of course, there are issues that may span all three filters and yet others that go beyond any of our filters – please keep those in mind too. What are or may be the unexpected changes/outcomes of the initiative? These cases illustrate good intentions that may lead to unexpected outcomes. What should the decision-makers, experts try to avoid? What would we like to suggest to the decision-makers to keep in mind when developing this initiative further? Analyze not only the outcomes but also the process – how the initial intentions changed during the implementation, resulting in the fact that outcomes were different from the initial plans. Context matters – context is likely to change, and the initiatives often fit into existing contexts. What have the decision-makers considered as the context – did they consider the different circumstances that may change?
- What are the particular TRADE-OFFS that emerge in a given case study? What is at stake?