

Implementing green-blue infrastructure policy; on what budget?

Exploring the relationship between spatial planning and financing

Tara OP DE BEEK, University Antwerp, Belgium

Tom COPPENS, University Antwerp, Belgium

Abstract

Cities worldwide are facing the impacts of climate change. Adaptation measures such as Green-Blue Infrastructure (GBI) are being put forward as a go-to policy strategy to make cities more resilient. However, implementation is proving to be a challenge, as local governments are working on a tight budget, with little extra room for GBI. In this paper, we explore the relationship between GBI policy making, implementation, and financing based on research of 13 central Flemish cities. Through an analysis of policy documents and public budgets we discovered that Flemish Cities aren't yet fully prepared to implement successful GBI to create more resilient urban environments. Through the lens of three transition perspectives we examine the necessary transformation of public space and learn that the planning process leading to implementation can be described as a path-dependent endeavour. We learn that GBI in policy documents are viewed as static entities, that expenditures related to public space go largely towards grey-infrastructure and that implemented GBI are realised in a fragmented way. We argue that a shift or transition in spatial planning is needed to view public space as an active resource in adapting to the effects of climate change.

Keywords

Green-blue infrastructure, climate change adaptation, urban transformation, spatial planning

1. Introduction

Cities today are already facing the negative impacts of climate change. From heat stress and droughts to peak rainfall and flooding, these impacts have damaging effects. Cities around the world are rolling out policies regarding adaptation to protect against these disastrous effects. These policies strongly advocate nature-based solutions as measures with both mitigating and adaptive properties (Kabisch, Korn et al. 2017, Zwierchowska, Cortinovis et al. 2022). From green roofs to larger landscape parks, there are different types and scales of interventions, each providing ecosystem services and thus contributing to the resilience of the urban environment. In Flanders, the northern region of Belgium, several policy documents, such as the Strategic Vision Spatial Policy Plan Flanders (2018) and the Flemish Energy and Climate Plan refer to Green-Blue Infrastructure (GBI) as an important nature-based solution. Not surprising, given that the landscape and resulting urban landscape of Flanders is marked by the delta structures of Scheldt, Meuse, and Yser.

Like many other European cities, Flemish cities are starting to pay more attention to climate adaptation. Most cities have or are currently drawing up climate adaptation plans, including GBI policies, many related

to transforming the cities infrastructures and public space. As the realisation of GBI is dependent on the local context, the transition to a climate-adaptive city is largely dependent on local government. Municipalities thus face a huge challenge to transform (often) existing grey public spaces to become more adaptive.

In this paper we employ a transitions perspective to the implementation of GBI in Flemish cities. In the literature the barriers and drivers towards implementing GBI are well documented, uncovering different kinds of path-dependencies (Dorst, Van Der Jagt et al. 2022). In this paper we aim to further this research by specifically focusing on the role of local spatial planning in transforming. With a focus on public space, we examine the city's public finances and their expenditures aimed at realising GBI policies. We argue that the implementation of GBI requires transitions in multiple systems, and that spatial planning plays an important role within each of these systems.

The paper is structured as follows; in the first part the concept of GBI is introduced, we then continue by describing the shift towards public GBI employing a transitions perspective. In the third part the methodology is explained followed by the results. We then discuss the results connecting them to the necessary transitions and the role of planning and end with the conclusion.

2. Implementing public green-blue infrastructure

GBI comes in different shapes and sizes, and there have been several attempts in the literature to identify categories of GBI, although at the same time the question is being raised if categorization is helping advance the implementation of GBI (Mell and Whitten 2021). Mell and Whitten (2021) describe the following typologies: greening streets, urban parks, private gardens, river/river corridors, woods, green roofs and walls, ponds, allotments,... but also mention that this list is anything but complete. We recognize that the impact of climate change is all-encompassing, and cooperation between private and public entities (in the broadest sense) is crucial to developing resilient cities, but in this paper we chose to focus on public green. We focus on public space as transformations of these spaces require local government to take on an (pro)active role (Lindholm 2017). In many countries, including Belgium (and Flanders), the design and maintenance of public space fall to the local government. Seeing as adaption measures are highly context dependent, it falls to local municipalities to assess the risk of climate change within their territory (this is often done under the guidance of the provinces), develop policy, and act accordingly. Local government administration and specifically spatial planning play a crucial role in this; from putting GBI policy on the agenda to making resources available to implement these policies.

In urban environments (both in Flanders and worldwide) realising new or strengthening existing GBI is quite a challenge. Space is a scarce resource and GBI are often up against numerous competing interests (mobility, housing, (public) facilities, production spaces, recreational space, etc.). Conflicting spatial interests are only one of many barriers towards implementation that are mentioned in the literature. The most common barriers described (Kabisch, Frantzeskaki et al. 2016, Wamsler, Wickenberg et al. 2020, Back and Collins 2022, Dorst, Van Der Jagt et al. 2022)) are the following: cooperation with other authorities both horizontally and vertically, lack of knowledge, scarcity and 'conflicting' spatial interests, insufficient resources (and capacities), lack of involvement of the private sector, a challenge to involve citizens. These barriers are also recognizable in Flanders. Spatial planning can play an important role in overcoming many of these barriers (Bush & Doyon, 2019) but financing (or sufficient resources) remains a challenge (Kabisch et al., 2016; Toxopeus & Polzin, 2021).

To understand how cities in Flanders are dealing with GBI policy and the necessary financing to transform their public spaces to become more adaptive, we examine their GBI policy and expenditures related to GBI

(fig 2.). By doing this we wish to better understand the following research questions; How is GBI as a concept reflected in policy documents? What expenditures are allocated towards transforming the public domain? What expenditures are being linked to GBI policies? Which GBI concepts are being prioritized in policy, and realised through funding? The aim of this research is to establish an understanding of the barriers in Flemish cities, with a specific focus on financing.



Figure 1. Transformation requires policy/vision, design/plans, resources and support throughout the process towards implementation. In this paper we focus on policy and resources related to public GBI. Source: author

Shifting towards resilient public GBI

To better understand the path-dependencies and lock-ins related to the implementation gap and the innovation needed to successfully realise public GBI (Barnett et al., 2015; Matthews et al., 2015), we apply a transitions perspective. We believe a transitions perspective can help conceptualize the necessary transformation needed, as current practices in planning, design and maintaining public space in Flanders are very path-dependent often resulting in grey-infrastructure, or GBI without adequate adaptive qualities (e.g the greening of a square without fully exploiting the ecosystem services it could provide). A shift, or transition, is needed to view public space as an active resource in adapting to the effects of climate change.

We use the perspective of three traditions of literature on the idea of transitions and transformations to conceptualize the implementation gap of GBI in an urban context. We argue that GBI as a concept and in practice is part of the socio-ecological system, that public space where transformation is needed is part of the socio-technical system and that the needed financing for implementation is part of the financial system (Geddes & Schmidt, 2020) or belonging to a socio-institutional transitions approach (Loorbach et al., 2017).

In the literature each of these perspectives deals with transitions and transformations in their own way. We argue that in an urban context to realise and maintain GBI spatial planning requires an understanding of all three perspectives (fig. 2). In practice the three perspectives are overlapping and interlinked, they are each multi-disciplinary and multi-scalar in nature.

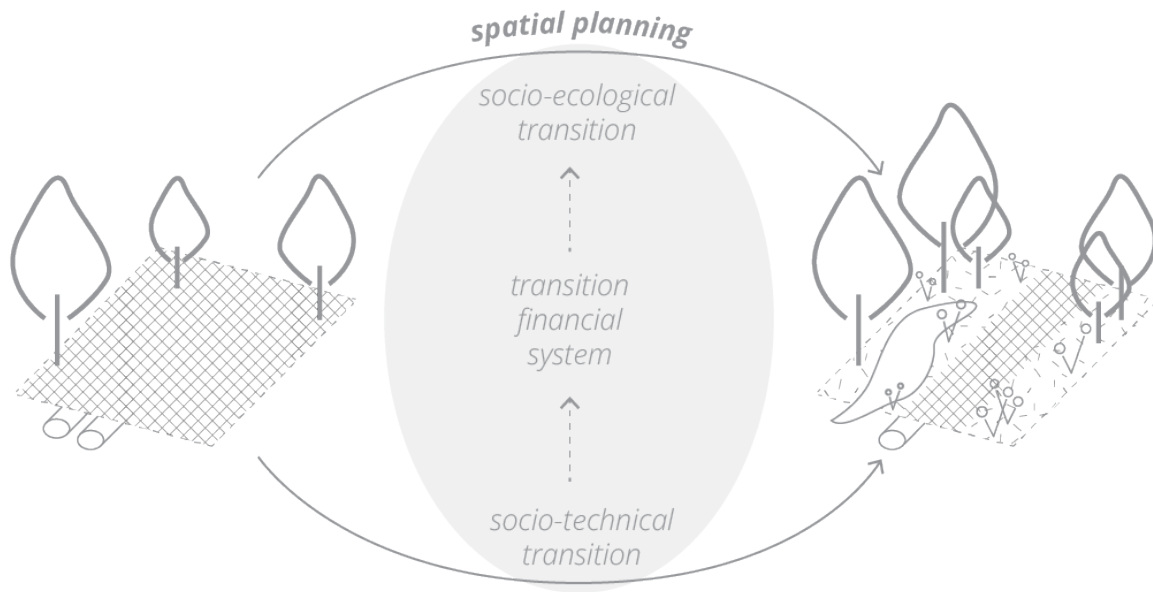


Figure 2. Spatial planning requires an understanding of the three transitions perspectives to successfully implement public GBI. Source: Author.

Socio-ecological systems thinking comes from the merging of environmental sciences and social science. It links the understanding of ecological dynamics of the biophysical system with the context of social systems including the historical, political and economic (Boyd and Juhola 2015). Resilience is a key-concept within this perspective, originally introduced by Hollings (1973), it is defined as the capacity of a system to absorb disturbances, re-organize and adapt while undergoing change, so as to retain its functioning (Folke, 2006). The impacts of climate change are forcing us to view the urban system, and more specifically GBI through the lens of resilience. GBI today is very much perceived as static, where flows can be controlled to maintain an equilibrium (Folke, 2006). Creating resilient urban environments thus requires not only much needed spatial transformations (introducing more GBI), but a systems-transition geared towards adaptability that takes the biophysical context into account. This implies an adaptive capacity of the social domain to respond and shape ecosystems in an informed way (Berkes et al., 2003, Folke, 2006).

Socio-technical systems literature focuses on technological development and innovation, how processes of change take place and which dynamics incite change. We view the context of public space, or more broadly public infrastructure as part of a socio-technical system. Introducing new GBI within public space requires a transition in thinking about infrastructure related to mobility, water, waste, energy, etc. to facilitate the adaptive capacity of public space. In addition these more technical public infrastructures lay a strong spatial claim with which GBI must compete (Geels & Kemp, 2007; Matthews et al., 2015).

Finally, the **financing systems** of local municipalities and urban transformations or development can be described as part of the financial or socio-institutional regime, where the investment to create new GBI is heavily dependent on public budgets (Mell, 2018) while at the same time there is a tendency towards neo-liberal project planning in which private development is facilitated often at the expense of GBI (Colenbrander & Barau, 2019; Droste et al., 2017).

Using GBI as a nature-based solution to mitigate the negative effects of global warming requires spatial planning to have a sufficient understanding of these systems (their path dependencies; lock-ins, elements of positive feedback, and self-reinforcing mechanisms) (Wise et al., 2014). A thorough understanding of

these systems that shape the development of public green will help planners more accurately understand where innovation is needed within GBI-projects led by local government.

Methodology

Our research focuses on the role of local government in the realisation of GBI and takes the 13 central cities of Flanders as case studies. Central cities were defined by Flemish government policy as larger cities that play an important economic role within their region (Van Meeteren et al., 2016). Six of the thirteen were then further analysed in depth. In addition to having active adaptation policy, cities in Flanders have developed a strong urban planning tradition over the past years and are familiar with more experimental and innovative ways of working.

The study uses two types of data; data from the municipal 'public policy and management cycle' (PPMC) to examine the expenditure of cities and policy documents that mention GBI. First, the PPMC data of the 13 central cities is quantitatively analysed to obtain a general scope of GBI expenditure. Subsequently, 6 central cities are analysed in depth. For these 6 central cities, the PPMC data is combined with a qualitative content analysis of policy documents relating to GBI. The combination of both types of data allows us to gain an understanding of how GBI policy is developed and subsequently translated to financial resources (and implementation) to help understand how the transformation of public space is taking place today.

PPCM-data expenditures can be classified according to many categories, but for our research we focus on expenditures based on their 'spending purpose'. Spending purposes are made up out of 10 policy domains, each further divided into sub-domains and policy fields. Because GBI is not defined in Flanders it can't be allocated to a specific policy domain or policy field. Furthermore cities are free to choose which policy field they link an expenditure to. We have thus chosen to analyse a combination of policy fields related to the public domain. The table below lists the policy domains and policy fields that were included in the analysis.

| Policy domain | Policy field |
|---------------------------------------|---|
| 2 Getting around and mobility | 0200 Roads |
| 3 Nature and environmental management | 0310 Stormwater and wastewater management |
| | 0319 Other water management |
| | 0320 Remediation of soil contamination |
| | 0329 Other reduction of environmental pollution |
| | 0340 Purchase, establishment and management of nature, green spaces and forests |
| | 0341 Erosion control |
| | 0349 Other protection of biodiversity, landscape and soil |
| | 0350 Climate and energy |
| 6 Housing and spatial planning | 0381 Integrated environmental protection |
| | 0600 Spatial planning |
| | 0610 Area development |
| | 0680 Green space |

In order to have a better understanding of investments in GBI, we take a closer look at 6 cities. Policy, regulatory documents and other actions related to GBI are examined and compared with the PPMC data. For these 6 cities, a combination of quantitative research on the available PPMC-data and a qualitative content analysis of available policy documents is performed. The six chosen cities are: Antwerp, Aalst, Kortrijk, Genk, Mechelen, Turnhout. These 6 cities were chosen as they represent certain levels of investment (ranging from smaller to larger sums), they represent a variety in number of inhabitants

(Turnhout having the smallest and Antwerp the largest) and are sufficiently geographically spread throughout Flanders.

For these six cases, policy mentioning GBI was subject to content analysis using manifest content analysis that remains close to the text (Krippendorff, 2018). The following types of policy documents were reviewed:

- Spatial policy plans: Spatial structure plan (or spatial policy plan)
- Climate policy plans: Climate plans (with focus on adaptive measures, if present)
- Thematic policy plans: Green Plan (if present), Water Plan (if present), Nature Development Plans (if present)

In addition regulatory planning instruments (zoning plans and other regulations) concerning GBI were analysed. As well as other types of spatial interventions regarding GBI, such as strategic projects not mentioned in policy documents or generic actions (such as tree planting actions, unpaving actions, actions concerning greenery on façades, etc.).

For each of these cities, the PPMC data was reviewed again. The following quantitative analyses were done (for the period 2014 to 2020);

- Analysis of operating and investment expenditures for the above-mentioned policy fields
- Analysis of investment expenditure per year for each policy field
- Targeted analysis based on search terms for investment expenditure (for years 2019 and 2020). The search terms are determined based GBI (measures) in the policy documents that were frequently mentioned.

By combining the policy documents and PPMC data we set out to answer the following questions: How is GBI as a concept reflected in policy documents? What expenditures are allocated towards transforming the public domain? What expenditures are being linked to GBI policies? Which GBI concepts are being prioritized in policy, and realised through funding?

Results

GBI concept in policy plans

Policy for GBI and related actions are mostly related to the cities' first spatial structure plans, dating from before 2010. More recently adaptation policies have been developed, mostly under the impetus of the Covenant of Mayors Adapt (2014), and often adopt the same actions for GBI.

From 2014 onwards, Flemish cities started identifying potential climate risks and vulnerabilities and how to adapt their territories. Then from 2018 onwards, the first cities started developing climate adaptation policies. These policy documents consist of two parts. A first part in which the negative climate effects are discussed in relation to vulnerable infrastructures and socio-economic groups. After that, the second part consist of mainly generic (non-spatially specified) measures to be taken (e.g. unpaving, greening, awareness-raising, etc.). These measures are rarely linked to specific areas and there is no indication of which measures need to be taken first. Measures that are linked to existing GBI are often GBI projects that were already up and running through other policy incentives such as the spatial structure plan (e.g. Stiemerbeekvallei in Genk or urban green area Marionettes in Kortrijk).

There are only a few cities where thematic plans have been developed supporting GBI. Thematic plans have been developed in Antwerp, Mechelen, Kortrijk and Genk. In Antwerp and Mechelen, these plans were drafted for the entire municipality. In Kortrijk and Genk, they are place-based plans for existing GBI.

Expenditures allocated to transforming the public domain

The 13 central cities spend more on exploitation (various forms of service provision) than investments. The expenditure on investments (in all kinds of infrastructure) is much smaller. When looking at the proportion of the total investment expenditures spent on policy fields relating to the public domain (and therefore possibly on GBI), we see a large variety in expenditure, both per year and between cities. In 2017 Turnhout, with 4% of its investment expenditure, spent the least on public domain policy fields, while the following year this increased to 55%. In 2015 Aalst spent the most on policy fields relating to the public domain with 59%, but the year after this dropped back down to 46%. The exploitation expenditures for public domain policy fields, on the other hand, are much more constant. For most cities the exploitation costs outweigh the investment costs (between 2014 and 2020).

Expenditures linked to GBI

Because GBI aren't 'defined' and encompass a broad concept, we examined a broad spectrum of policy fields related to the public domain to get a better understanding of the investment expenditure in GBI. In most cities, the policy fields '0200 Roads', '0310 Management of rainwater and wastewater' and '0610 Area development' constitute the largest investment expenditures, this in contrast to the policy fields '0340 Acquisition, layout and management of nature, greenery and forests' and '0680 Green space'. When we examine the policy field '0200 Roads' in more detail and isolate reported expenditures related to GBI in 2019 and 2020 (this data is only available for 2019 and 2020), the result is varied, again both between the cities and between the two years. In some cities, not more than 1% of the total investment expenditures for '0200 Roads' is spent on GBI in 2019, while the following year this increases to 68% (e.g. Aalst). It is therefore impossible to determine the exact amount that is being spent on GBI. On the basis of the available data, it would seem in any case, that only a limited proportion of the total investment expenditure goes towards the development of GBI.

If we zoom in on the policy field '0680 Green' (as the policy field most representative of GBI) and compare the investment expenditure with the exploitation expenditure for the 13 central cities, we see a substantial difference. The investment expenditure between 2014 and 2020 varies between 0 and 5 million euro, with most cities spending below 2 million euro per year, while the exploitation expenditure is often twice as much.

Implemented GBI

In both policy plans and expenditures we notice that GBI that are linked to other urban functions (such as housing, recreation,...) are mainly prioritized. In Aalst, Mechelen and Turnhout GBI is mainly linked to new housing developments, in Genk GBI is coupled to active forms of mobility (walking and cycling) and recreation, in Kortrijk and Antwerp there is a focus on GBI in relation to grey infrastructure (both waterways and highways). Larger scale GBI are also mentioned in the local policy plans, but often require cooperation of the Flemish Government to be initiated and realised.

Discussion

Below, we discuss and reflect on our findings through the three transitions perspectives.

Socio-ecological system

Understanding the biophysical system

The various policy plans regarding GBI in the 6 cities do not yet sufficiently take into account the ecological system of a city and the changes due to global warming. In all spatial structural plans GBI's were identified and categorized as important spatially structuring elements. They are described as part of the territories biophysical system, but none of the spatial structure plans mention climate change, or the adaptive role of GBI. Consequently, measures linked to the identified GBI (such as zoning plans or landscape designs) don't mention climate change or adaptation as a goal. Only two of the 6 cities (Antwerp and Kortrijk) are in the process of drawing up new spatial policy plans, but these are still in a conceptual phase. In this starting phase we do start to notice a shift in discourse, as climate change and the adaptive role of GBI are more prominently present.

From 2014 (Covenant of Mayors Adapt) onwards, Flemish cities started identifying potential climate risks and vulnerabilities and how to adapt their territories. Then from 2018 onwards, the first cities started developing climate adaptation policies. The adaptation measures in these plans are rarely linked to specific areas and there is no indication given to which measures need to be taken first. This lack of place-based actions makes it unclear where priorities in implementation should be made and creates a sense of non-commitment towards implementation.

Antwerp forms an exception, as their adaptation plan does regard GBI in a more systemic manner. They have a greater knowledge of the biophysical system of the city (soil, water and greenery) and better understand the spatial impacts of climate change. This is the result of two thematic plans, the green plan and water plan, and extensive studies to which they have also linked a monitoring system. We understand this as the start of a transition to a more adaptive planning approach (Boyd & Juhola, 2015; Kato & Ahern, 2008). A multidisciplinary approach in which spatial planning is actively making room for specific forms of scientific knowledge (Skrimizea et al., 2019), especially scientifically based modelling. The city of Antwerp is thus different than the other cities, as it is combining the place based knowledge of spatial planners with specific scientific knowledge within its new policy documents.

Static vs. dynamic and adaptive public space

The selected GBI's mentioned in the spatial structure plans are of course still present and relevant today. Their categorization as a spatial/landscape structure has protected them from additional development over the years. The selected GBI are mainly described in a static way as a separate morphological spatial entity. In the structure plan of Mechelen (2001) 'landscapes' (which we include as GBI) as spatially structuring elements are described as following;

...Landscapes are spaces that are specifically considered from a morphological point of view. The emphasis is on appearance... (Spatial Structure Plan Mechelen, 2001, p.75)

They are not described in a systemic way with respect to their context. Their role within an urban context or ecosystem services they provide are not mentioned. Furthermore, the impact of climate change or the role GBI can play (buffering capacity, cooling, biodiversity, etc.) to reduce risks is not mentioned. In cities that are switching to the new system of spatial policy plans (e.g. Concept Memorandum Antwerp), we start to see a shift in the discourse on GBI. GBI is no longer seen as separate entities, but as integrated within the urban landscape. In these new plans GBI is, conceptually, viewed as important relating to climate change and public health. GBI is being considered more strongly from a socio-ecological perspective with the goal of improving urban resilience.

As described above, the thematic plans for Antwerp, the green and water plan, formed the basis for a more systemic approach to GBI. In Mechelen the thematic 'parks and gardens plan' deals with the conservation and upgrading of existing parks and the creation of new parks (often linked to new developments). The parks and gardens mentioned in the plan are treated as separate projects. Again GBI is described in a more static manner and in relation to the (bio)physical system of the city. The site-based plans in Kortrijk and Genk focus on the role of GBI as a spatially structuring element and its relation to the changing climate. In both cities, this site-oriented approach deals with GBI in a systemic way as an integral part of the urban context and how the role of GBI can be strengthened. Both plans also give rise to GBI interventions outside the scope of the plan. These kinds of site-based plans with a systemic approach demonstrate a potential to incentives GBI measures throughout the city to further strengthen their role within the urban fabric.

Socio-technical system

Grey vs. green infrastructure

The analysis confirms that the socio-technical regime is more dominant than the socio-ecological regime in regards to the public domain in an urban context (Frank et al., 2017). The existing spatial structure and its infrastructures create a strong form of path dependency to continue opting for and investing in 'grey infrastructures' instead of nature-based solutions and GBI. In addition, it raises the question if there is sufficient political attention to GBI that translates policy to investments. This is evident when a word search was performed on the PPMC data to link frequently recurring GBI measures mentioned in the policy plans to reported expenditures. We can only conclude that insufficient resources are devoted to the pursued GBI policy. Especially when we consider that some GBI measures date back to the spatial structure plan (often more than 15 years ago), that these actions are repeated in adaptation plans and discover that limited to no resources are linked to them. The GBI expenditures most often mentioned in the PPMC data are those in combination with other urban facilities, such as housing, recreation, active travel, etc. GBI that has a multifunctional purpose or is developed together with other urban needs (such as housing, recreation,...) receives more investment (and are realised sooner) as multiple spatial interests can be brought together in a project. The study confirms the literature (Mell 2021) stating that cities and towns tend to develop GBI in conjunction with other urban functions (such as housing, recreation, sports, active travel...). The urgency to invest in climate adaptation, which is cited in the policy plans, is not present in the investment expenditure.

Grey infrastructure creates financial path dependencies

From the research we conclude that grey infrastructure forms the largest part of investment expenditures. From the PPMC data, we learn that investments in grey infrastructure, such as the (re)construction or maintenance of grey infrastructure, are included as recurrent investment expenditures, often linked to a more or less fixed budget. We did not find recurring investment expenditures related to GBI.

Financial system

Public vs. Private budgets

The financing of GBI in Flanders largely depends on the investment expenditure of local authorities, certainly for GBI realised in the public domain. GBI that have been realised are, as described above, mostly linked to other urban functions (such as housing, recreation,...), often in partnership with private stakeholders. The GBI realised is often a form of 'developer contribution' achieved through the negotiations of local planners with developers.

In addition GBI developed in cooperation with other governments (Flemish Government or Province) is implemented more swiftly. Furthermore when the Flemish Government (ANB, VLM or VMM) is involved, GBI is more likely to be focused on ecological functioning. The multifunctional character then often plays a subordinate role. This further confirms our understanding that GBI are often realised as a result of an opportunistic approach to financing, either in regards to other urban functions or in regards to cooperation with other governments (Mell, 2018).

Investment vs. exploitation

Investment expenditures towards the public domain vary year by year and between cities, while the exploitation costs are much more constant. For most cities the exploitation costs outweigh the investment costs (between 2014 and 2020), especially when we focus on the policy field '0680 Green'. Mayor, Toxopeus et al. (2021) refer to this phenomenon as the 'heartbeat model' for financing nature-based solutions. The focus of GBI business models is often on obtaining financing for the initial investment, for the realisation, but afterwards the constructed GBI needs to be maintained. In contrast to grey infrastructure, which decreases in value over time, the value of GBI only increases, as long as it is well maintained (Mayor et al., 2021). Taking this into account means rethinking business models for GBI, taking maintenance into account from the design phase and possibly considering other governance models for maintenance.

Project-logic

Finally, we notice that a project logic is predominantly applied to the development of GBI. This is clear from both the policy documents and the PPMC data. The tendency to develop GBI in combination with other urban functions or impose the implementation of GBI in the form of a developer obligation leads to a very fragmented approach to realising GBI. We question if this approach is suitable to the development of GBI in creating a resilient urban environment. GBI is characterized by a network logic and embedded within the socio-ecological system of the city, this fragmented and opportunistic approach is potentially using resources that could be employed more strategically.

Conclusion

In this paper we describe the process from policy making to implementation of GBI in the public domain as a transformational process that requires an understanding of the urban socio-ecological system and the socio-technical system that governs public infrastructure today. Throughout the paper we focused on the availability of resources as part of the financial system, as this is cited to be an important barrier for implementation (Deely et al., 2020; Dorst et al., 2022; Kabisch et al., 2016; Matthews et al., 2015; Measham et al., 2011; O'Donnell et al., 2017; Thorne et al., 2018; Toxopeus & Polzin, 2021; Wamsler et al., 2020), and one which spatial planning in Flanders doesn't (pro)actively take into account. We describe the transformation to a resilient climate-adaptive public space as being path-dependent, as each of these systems have inherent logics that impede transformation (Hölscher & Frantzeskaki, 2020; Loorbach et al., 2017).

We empirically examined the financing of GBI in Flemish cities, contributing to a growing literature on the financing of GBI. Spatial planning forms a key discipline in the development of GBI and more general towards adaption, so understanding the implementation of GBI through three transitions perspectives and the possible path dependencies and lock-ins, contributes to firstly overcoming the implementation gap and secondly realising successful GBI. The negative impacts of climate change, and increased risks are making transitions within each of the three perspectives to develop climate-adaptive cities increasingly urgent.

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ⁱ Public policy and management cycle (Beleids- en beheerscyclus in Dutch) is a tool in which local municipalities report their multi-year capital plans at the beginning of each legislature and report their yearly expenditures to the Flemish Government.