



Lack of Cross-Sector and Cross-Level Policy Coherence and Consistency Limits Urban Green Infrastructure Implementation in Malawi

Stavros Afionis^{1,2}, David D. Mkwambisi³ and Martin Dallimer^{1*}

¹ School of Earth and Environment, Sustainability Research Institute, University of Leeds, Leeds, United Kingdom, ² School of Law and Policy, Cardiff University, Cardiff, United Kingdom, ³ MUST Institute of Industrial Research and Innovation, Malawi University of Science and Technology, Limbe, Malawi

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*Correspondence:

Martin Dallimer
m.dallimer@leeds.ac.uk

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The quality, quantity and accessibility of urban greenspaces and green infrastructure offer multiple benefits for city dwellers, the environment and urban sustainability. Green infrastructure provides a wide range of environmental, social, cultural, climate change adaptation, and mitigation benefits. However, for green infrastructure to do so, it needs to be integrated into national policy and city-planning strategies in ways that recognize its value and importance. Consequently, consistency and coherence between policy sectors and levels is essential. The more prominent urban green infrastructure is in national level policy, the easier it will be to ensure coherence and consistency between sectors and levels, as well as avoid national and local initiatives hindering each other's effectiveness. Integrating urban green infrastructure into planning processes should be a priority for all cities, but even more so for those in sub-Saharan Africa, which are undergoing rapid expansion. Here we focus on Malawi, one of the most rapidly urbanizing countries in sub-Saharan Africa. We collated and reviewed national-level and city-level policies and strategies, ranging from housing to transport to biodiversity, in order to determine, based on vertical and horizontal integration processes, whether urban greenspaces and green infrastructure have been incorporated into planning and management priorities. We found little evidence that urban greenspaces and green infrastructure are incorporated into national-level decision-making processes. In contrast, promoting and enhancing urban greenspace and green infrastructure was a priority in planning and strategy documents produced by the Lilongwe and Mzuzu City Councils. Better institutional coordination and policy coherence across national level sectors that affect urban greenspaces and green infrastructure is required if their multiple benefits are to be realized.

Keywords: urban greenspace, urban green infrastructure (UGI), policy analysis, ecosystem services, sub-Saharan Africa, Malawi, urban bluespace

INTRODUCTION

Cities are central to securing sustainable futures (Barnett and Parnell, 2016). Ensuring that urban areas are engines of sustainable structural transformation and economic growth is a cornerstone of the post-2015 United Nations (UN) sustainable development agenda, which includes a dedicated goal for cities: “to make cities and human settlements inclusive, safe, resilient, and sustainable” (Sustainable Development Goal (SDG) 11; United Nations, 2018). For these commitments to be implemented, enabling policy frameworks, integrated policy approaches, as well as enhanced coordination and coherence across sectors and between scales are essential (Kacyira, 2017). However, achieving policy coherence is often elusive. Policymakers and planners usually operate in silos and there can be substantial funding and capacity challenges, especially at regional and municipal levels of government (England et al., 2018). Further, policymakers tend to lack the necessary tools and skills that could allow them to identify interventions that are most likely to achieve policy objectives. Finally, evidence to help them monitor how particular interventions and policies help or hinder progress toward their goals is frequently unavailable (Nilsson et al., 2016).

Although urbanization presents fundamental challenges to biodiversity conservation and the provision of ecosystem services (du Toit et al., 2018), it also offers a wide range of opportunities for countries to enhance the resilience of towns and cities. For instance, one key measure that is widely recognized as essential to urban living is the provision of high quality, accessible urban greenspaces and green infrastructure (O’Farrell et al., 2012). Urban green infrastructure (UGI) has become an increasingly important concept in urban environmental planning due to the wide range of ecosystem services it provides to urban dwellers, including the contribution it can make to climate change adaptation and mitigation (Pulighe et al., 2016). Kambites and Owen (2006, p. 484) define urban green infrastructure as the “connected network of multifunctional, predominately unbuilt, space that supports both ecological and social activities, and processes.” In urban areas many different features may be part of green infrastructure, such as “street trees, private and public gardens, parks, riparian zones along urban drainage lines, undeveloped ridges, and a variety of urban agricultural spaces such as food- and community-based gardens” (Schäffler and Swilling, 2013, p. 247). The UGI concept therefore covers urban greenspaces, and frequently overlaps with, or contains bluespaces (defined as any natural or modified water surfaces such as rivers, streams, canals, ponds, lakes, and wetlands).

Rapidly expanding cities need to pay urgent attention and acknowledge the broader socio-economic opportunities of urban ecosystems. This is especially the case in sub-Saharan Africa, which is urbanizing faster than any other continent (OECD/SWAC, 2020). The dawn of this “urban age” is manifest not only in the growth of sub-Saharan Africa’s megacities, but also in the rapid increase in urban population concurrently taking place in smaller towns and cities (Kalantari et al., 2018). Africa’s urban population is projected to double to over 1.2 billion by 2050, with the majority of this increase occurring in slums and informal settlements (United Nations, 2018). This growth

has resulted in both the conversion of surrounding agricultural lands and the loss/degradation of existing urban greenspace (Seto et al., 2012). Urban expansion therefore needs to be managed sustainably, and in a manner that ensures human well-being is prioritized and maximized. Urban green infrastructure could be a key component of sustainable urbanization. Many sub-Saharan African cities are, however, currently struggling to cope with the detrimental consequences of rapid, unplanned, and unsustainable growth (see e.g., Cobbinah et al., 2015).

UGI can positively contribute to wider urban development processes through the provision of multiple ecosystem services, such as flood risk and temperature mitigation, water regulation, pollution reduction, biological carbon storage, food provision, habitat for biodiversity, and cultural/spiritual value (Elmqvist et al., 2015). UGI was developed as a planning and design approach and has been promoted across all policy sectors in the European Union (Rolf et al., 2020). Nevertheless, even in the European context policies are not always integrated. This can present challenges in, for example, how urban agriculture might be included in UGI strategies for cities (Rolf et al., 2020). Similarly, the important role UGI can play in supporting the delivery of multiple ecosystem services is infrequently considered in sub-Saharan Africa policy, planning, and development processes. However, a key difference may be that in sub-Saharan Africa socio-economic issues, such as poverty alleviation or job creation take overwhelming precedence, while the provision of UGI is often “...treated as something nice to have instead of providing critical ecological and social functions” (Schäffler and Swilling, 2013, p. 247).

Lack of recognition, strategic planning, funding, and policy coherence, which hinder the governance of urban greenspaces, is a common theme that emerges from a number of studies based in sub-Saharan Africa (Bobbins and Culwick, 2015; Jorgensen et al., 2016; Brill et al., 2017; Esmail and Geneletti, 2017; Douglas, 2018). One result of weak systems of formal government and planning is infringement of urban development upon greenspaces as the rapidly expanding sub-Saharan urban centers adjust to accommodate increased human populations (du Toit et al., 2018). Accelerated consumption of natural resources, increasing fragmentation of open space and rapid displacement by new land-use developments are all increasingly exerting great pressure on UGI (Titz and Chiotha, 2019).

Ecosystem services have gained recognition by environmental and other organizations, plus academia, as important assets for sustainable development that supply life-supporting services of great value. However, advancing from theory to implementation requires not only further advances in the science of ecosystem services, but also recognition at all levels of government of their multiple monetary and non-monetary benefits to society and human well-being (Daily and Matson, 2008; Young, 2013). It is with the latter area that this study is concerned, as scholarly work has indicated that little knowledge exists about the extent to which ecosystem-based approaches to environmental protection have been integrated or mainstreamed into national, but especially municipal planning (Pasquini and Cowling, 2015; Wamsler and Pauleit, 2015; Brzoska and Späge, 2020). This is particularly the case with regards to sub-Saharan Africa, as the

bulk of research focuses on European urban centers, followed by Asia and the Americas (Brzoska and Späge, 2020). Furthermore, most of the work to date in sub-Saharan Africa has been centered on South Africa, leaving substantial knowledge gaps through the rest of the continent (Botzat et al., 2016).

Mainstreaming the environment into overarching policy documents, from local to national levels, as well as associated plans and budgets, has long been advocated as an essential condition for the effective pursuit of sustainable and more equitable development. Environmental mainstreaming, therefore, effectively refers to the integration of environmental objectives into non-environmental sectors and the “greening” of public policies (Benson et al., 2014). The literature on environmental mainstreaming distinguishes between two major approaches for realizing integration: vertical and horizontal. These, however, have been understood differently by different scholars (see Adelle and Russel, 2013; Di Gregorio et al., 2017). One group of scholars understands horizontal policy integration as the relationship between policies at the same level of governance and vertical policy integration as that between policies located at different spatial scales of governance (see e.g., Urwin and Jordan, 2008). Other scholars follow Lafferty and Hovden’s (2003) understanding of the two terms. Here we follow this latter definition of horizontal and vertical policy integration. Horizontal integration therefore refers to the extent to which a comprehensive cross-sectoral approach or strategy for environmental mainstreaming has been developed by a central authority, be it the government itself or an inter-ministerial or other body “which has been entrusted with an overarching responsibility for sustainable development” (Lafferty and Hovden, 2003, p. 14). Evidence of effective horizontal policy integration includes, among others, the mainstreaming of the environment into national/overall plans, investments, programmes and policies, the presence of timetables, and targets for environmental policy, as well as the existence of a specific authority mandated to supervise, coordinate and implement the integration process. Vertical integration, on the other hand, takes place within sectors and refers to whether a specific sectoral ministerial authority has adopted procedures that facilitate the “greening” of its policy domain. Evidence of effective vertical policy integration includes, among others, the formulation and implementation of sectoral plans with well-specified targets, timetables, and reporting requirements (Di Gregorio et al., 2017).

Lafferty and Hovden (2003) use the term “vertical” in a “functional sense” in that vertical integration “mandates, roles and interactions within the responsibility of one sectoral ministerial authority or within one policy domain such as forestry or climate change” (Di Gregorio et al., 2017, p. 37). They do not, in other words, employ this term to look into the extent to which local and regional authorities have integrated environmental concerns into their operations (as per the aforementioned alternative approach). As they note, they “prefer to treat the latter problematic within the discourse on “subsidiarity,” rather than to confuse policy integration with different levels of policy responsibility” (Lafferty and Hovden, 2003, p. 14).

Against this background, this paper adopts a case-study approach and poses the following question: to what extent are

urban greenspaces and green infrastructure, and the ecosystem services they supply, mainstreamed into Malawian urban policy, planning, and development processes at the national and city levels? We use the aforementioned framework of vertical and horizontal organizational arrangements for policy integration in order to determine whether there is a strong national-level policy commitment to mainstreaming urban greenspace and green infrastructure. We then explore whether there is a coherent approach to planning at the local level.

METHODS

Study System

Sub-Saharan Africa is urbanizing rapidly, resulting in a loss of non-urban land uses surrounding cities (Seto et al., 2012), and of vegetated surfaces within cities (Yao et al., 2019). The processes of urbanization, including greenspace loss, vary across the continent (Yao et al., 2019), but are notably different from patterns seen in high-income countries, as it is happening faster (Seto et al., 2012), mostly in smaller cities (DESA, 2015) and is not always associated with economic growth (Turok and McGranahan, 2013). Research carried out in high-income contexts cannot, therefore, be assumed to be directly relevant to sub-Saharan African cities (McHale et al., 2013). Indeed, across sub-Saharan Africa, the available evidence suggests that greenspaces, and their associated ecosystem services, can be valued by urban populations for a variety of purposes depending on the local context, the socio-economic status of the population and the extent to which the population actively uses the greenspaces. In common with high-income countries, cultural ecosystems services, such as aesthetic appreciation and providing space for recreation, are important (e.g., Tibesigwa et al., 2020). However, provisioning services, including urban agriculture, can take on greater significance in some contexts (du Toit et al., 2018), while shade provision and urban heat island mitigation are particularly relevant (Guenat et al., 2019a).

Malawi itself is urbanizing at a rate of about 5% per year, with the share of national population residing in urban areas having progressively increased from 6.4% in 1964 to almost 20% in 2018. By 2050, around half of Malawians will be living in towns and cities (Government of Malawi, 2019). In common with many countries in sub-Saharan Africa, this rapid urbanization has meant cities are struggling to facilitate integrated economic development and planning in order to address the multitude of development challenges they are faced with, of which the provision of high quality and accessible UGI is among the most pressing. Malawi’s urban centers are experiencing a loss, and degradation in the quality, of green infrastructure, such as (i) removal of trees and degradation/loss of natural forests due to construction and brick molding; (ii) degradation and loss of wetlands and water bodies due to sand mining and agriculture-related activities; and (iii) loss of riparian vegetation due to development and agricultural uses (World Bank, 2017; Government of Malawi, 2019). Although around half of the administrative area of Lilongwe and Mzuzu is currently covered by non-built land-uses, the space reserved for green infrastructure has been subject to increasing pressures

for both formal and informal construction, with long-term implications for flood risk, rising temperatures, and further ecosystem degradation. Thus far, however, weak enforcement, inadequate resources for capacity building, and the fragmentary nature of policy development and review have limited the inclusion of UGI within urban expansion plans (UN Habitat, 2011a).

For our city-level analyses, we focussed on Lilongwe and Mzuzu, the capital city and a medium-sized city, respectively, in order to provide a broader representation of the country than focussing on the capital city alone (**Figure 1**). Lilongwe has witnessed rapid population growth ever since becoming the country's capital in 1975. From about 20,000 inhabitants in 1966, the population grew to about 700,000 in 2008, with projections for 2030 of over a million (UN Habitat, 2011a). Similarly, Mzuzu, Malawi's third largest city, saw its population increase from about 16,000 in 1977 to more than 220,000 currently (UN Habitat, 2011b). Historically, greenspaces played an important role in the development strategies of Lilongwe. Developed as the country's capital in the mid-1970s, the city is often referred to as a "garden city," not least because its original design was based on the same principles that underpinned the garden city movement in the UK (Ward, 2005). Both cities contain a variety of habitat types, including forests, savannah, parks and botanical gardens, rivers and, in Mzuzu in particular, large areas of wetlands. In both cities, there are extensive areas of formal and informal small-scale agriculture. Urban greenspaces in these two cities, therefore, broadly belong to three different types: (a) amenity land, a greenspace managed for aesthetic or recreational purposes, typically lawns, trimmed hedges, cleared vegetation, or wooded areas; (b) farmed/forested sites, a greenspace managed for agricultural or wood production, including mixed-crop gardens and farms; and (c) informal greenspaces, which are vegetated areas receiving minimal to no management, such as fallows or abandoned sites (cf. Guenat et al., 2019b; Munyati and Drummond, 2020).

Document Analysis

To identify the extent to which UGI is included in national and city level policies, planning documents, and strategies, we examined a range of documents linked to its role in cities (**Table 1**). To identify which policies to review we adopted a 2-fold approach. Firstly, we selected policies bearing direct relevance to the known benefits of ecosystem services, the management and implementation of UGI and the sectors that influence land use. We included here both the forestry and agriculture sectors, not least because urban agriculture (defined as "...an industry located within (intra-urban) or on the fringe (peri-urban) of a town, an urban center, a city or metropolis, which grows or raises, processes and distributes a diversity of food and non-food products, re-using mainly human and material resources, products and services found in and around that urban area, and in turn supplying human and material resources, products and services largely to that urban area"; Mougeot, 2001), is often a particularly important component of cities in sub-Saharan Africa for its role in enhancing food security and providing livelihoods (Zezza and

Tasciotti, 2010). Further, climate change is a prominent issue in national policies. Given some of the stated benefits of UGI relate to climate change adaptation and mitigation, we included in our analysis relevant national level documents such as Malawi's National Adaptation Programmes of Action (NAPA) and Malawi's Nationally Determined Contribution (NDC) to the Paris Agreement. Secondly, policy documents included sections outlining how they linked with other policies that were already in place when they were written. We followed these links and searched for the policy documents in question until as many as possible had been identified.

Policies and documents were reviewed by SA using thematic analysis, a data analysis method for identifying, analyzing, organizing, describing, and reporting themes and patterns of meanings across a dataset in relation to a particular research question(s) (Bryman, 2016). In order to conduct our thematic analysis, we went through several different steps as per Nowell et al. (2017). First, all documents were carefully read in order to familiarize ourselves with the depth and breadth of their content. Second, documents were coded, which refers to identifying all pieces of data within the entire dataset that are deemed as relevant to answering the research question(s). According to Braun and Clarke (2013, p. 207), "a code is a word or brief phrase that captures the essence of why you think a particular bit of data may be useful." Data were coded manually, because of the "greater control and ownership of the work that comes from manually handling qualitative data" (Pasquini and Cowling, 2015, p. 1126). Analyses centered on determining the extent to which text recognized the need to promote and enhance UGI. In particular, documents were reviewed and coded for references to urban sustainability, with the latter term referring here "to the healthy biological functioning of the city region, both the urban and the rural parts" (Robinson and Song, 2018, p. 3). Third, all the potentially relevant coded data extracts were sorted and collated into themes (e.g., urban agriculture, urban forests, flood prevention, recreational benefits) and those that were relevant to ecosystem services, greenspaces, or green infrastructure were recorded. We also included in our coding any mention of bluespaces (defined as all visible natural outdoor water surfaces such as rivers, streams, ponds, canals, wetlands), as these frequently overlap with greenspaces and green infrastructure. We coded mentions of ecosystem services according to four categories (provisioning, regulating, supporting, and cultural; Millennium Ecosystem Assessment, 2005). Fourth, we reviewed the coded data extracts for each theme to ensure that there were no inadequacies that would require any changes.

RESULTS

National Level—Urban Green Infrastructure

Only a small number of the 24 policies and documents reviewed (**Table 1**) acknowledged some role for UGI in facilitating the transition toward sustainable urban development. The Malawi Growth and Development Strategy (MDGS III) prioritizes the building of "sustainable cities that enrich urban and rural lives alike" and refers explicitly to green infrastructure as being key for improved land use planning and management (Government

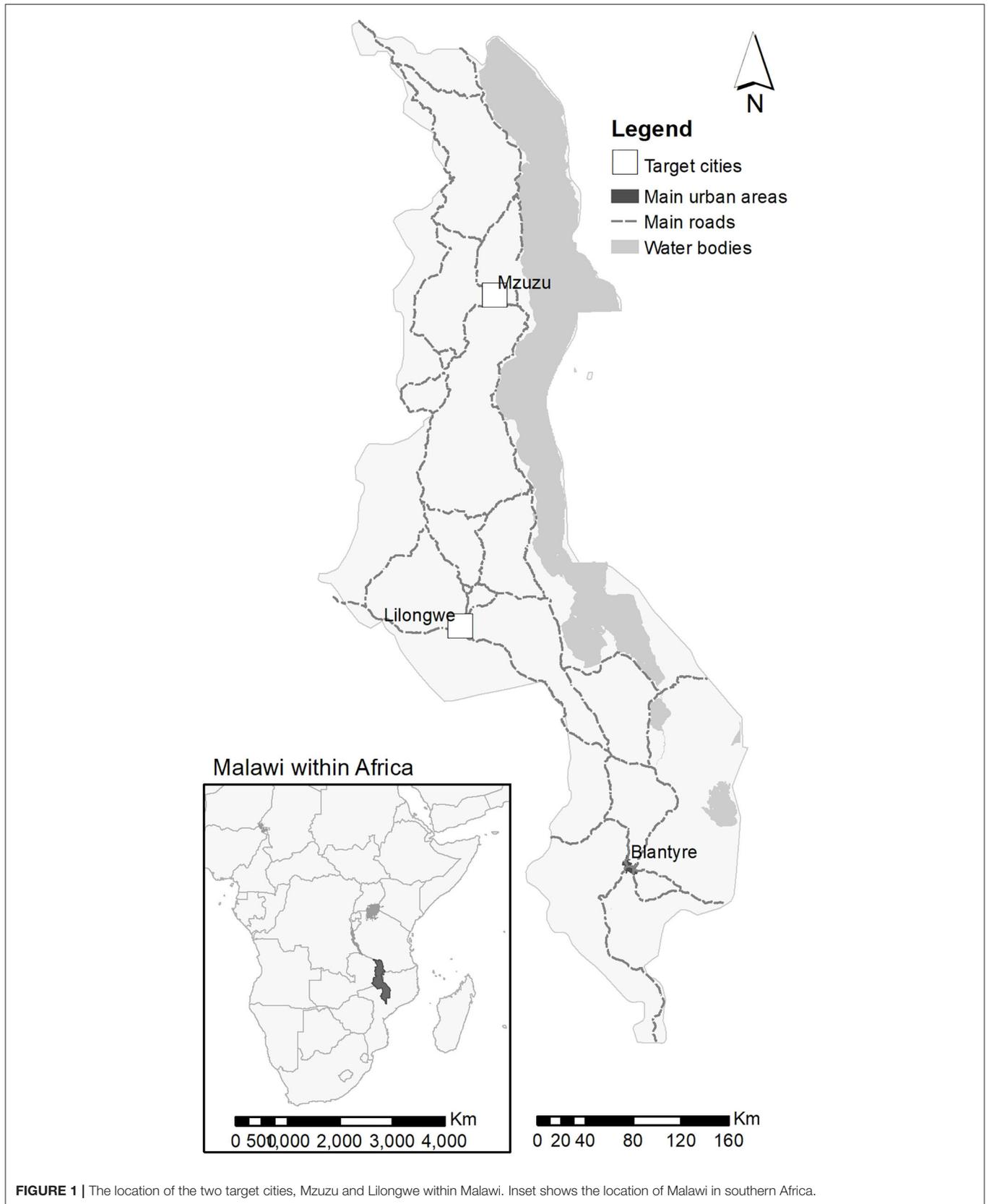


TABLE 1 | Summary of the extent to which policies and documents at the National and City level for Malawi, Lilongwe, and Mzuzu include explicit mention of urban greenspaces, green infrastructure, and associated ecosystem service provision.

Policy level	Policy/document name	Specific content related to urban greenspaces, green infrastructure or ecosystem services	Ecosystem service classification (if mentioned)	Comments
National	National Environmental Policy (2004)	None	NA	<ul style="list-style-type: none"> The policy does mention topics of direct relevance to cities and urban greenspaces: (i) importance of environmental education; (ii) economic value of natural resources; (iii) importance of tax incentives for retention and planting of trees, and; (iv) importance of rainwater harvesting
National	National Land Policy (2002)	Loss of open spaces for recreation	Recreational benefits (Cultural service)	<ul style="list-style-type: none"> Notes the importance of protecting open spaces within cities in the context of illegal use/development
National	The Malawi Growth and Development Strategy (MGDS) III	Promote green infrastructure and zoning in the cities for aesthetic, recreational and climate proofing benefits	Aesthetic and recreational benefits (Cultural service) Climate proofing (Regulating service) Natural hazard regulation (Regulating service)	<ul style="list-style-type: none"> Notes the need to promote the development of sustainable and resilient cities and urban centers Calls for incorporating disaster risk reduction measures in urban and rural land-use development zoning and planning
National	Malawi's Nationally Determined Contribution	None	Flood prevention and control (Regulating service) Climate proofing (Regulating service)	<ul style="list-style-type: none"> Calls for the promotion of sustainable and resilient cities and urban centers via the development and implementation of climate related building codes/standards Calls for the revision of existing building standards in line with climate change
National	Malawi's Nationally Appropriate Mitigation Actions (NAMAs)	None	NA	
National	Malawi's National Adaptation Programmes of Action (NAPA)	None	NA	
National	Malawi's Vision 2020	None	NA	
National	Strategic Plan—Ministry of Education, Science and Technology (2015–2020)	None	NA	
National	National Agricultural Policy (2016)	None	NA	
National	National Biodiversity Strategy and Action Plan II (2015–2025)	None	NA	<ul style="list-style-type: none"> Recognizes the valuable ecosystem services provided as a result of biodiversity conservation, without using of the term “ecosystem services” Urges district councils to integrate biodiversity in their development plans, without mention of cities
National	National Climate Change Management Policy (2016)	None	NA	

(Continued)

TABLE 1 | Continued

Policy level	Policy/document name	Specific content related to urban greenspaces, green infrastructure or ecosystem services	Ecosystem service classification (if mentioned)	Comments
National	National Disaster Risk Management Policy (2015)	None	Natural hazard regulation (Regulating service)	<ul style="list-style-type: none"> • Mentions that sustainable management of the environment and natural resources can reduce underlying risk factors in urban centers • Mentions aligning disaster risk reduction to climate change adaptation
National	National Energy Policy (2018)	None	NA	
National	National Forest Policy (2016)	Notes that "urban forests" can be useful as Industrial Forest Plantations. It notes that such industrial plantations should enhance the management of watersheds Notes that forests could help urban communities. It discusses the need to promote sustainable production and utilization of biomass fuels No other mentions of other roles urban forests could play	Natural hazard regulation (Regulating service) Fuel production (Provisioning service)	Does not make the link with urban ecosystem services
National	National Health Policy (2018) and Health Sector Strategic Plan II (2017–2022)	None	NA	
National	National Irrigation Policy (2016)	None	NA	
National	National Population Policy (2012)	None	NA	
National	National Transport Policy (2015)	None	NA	<ul style="list-style-type: none"> • Mentions the need for transport policy to align with Malawi's environmental policy, without specifying how • Notes that there can be habitat destruction and water pollution associated with transport infrastructure, but it does not provide details regarding actions to be taken to address such issues
National	National Urban Policy (2019)	Urban greenspaces are acknowledged to some extent through the use of terms such as "green infrastructure" and "urban agro-forestry." The policy also recommends the creation of parks and open spaces within cities Acknowledges challenges in cities and urban centers, which include topics relevant to urban greenspaces, such as sustainable urban planning, urban sprawl, informal settlements, environmental degradation, and weak urban resilience to climate change, disasters risks and shocks Notes that susceptibility to disasters is exacerbated, <i>inter alia</i> , by "urban design that fails to consider disaster risks and weak development control mechanisms" (p. 3). However, the policy does not include urban greenspaces and infrastructure as potential solutions	Aesthetic value and recreation opportunities (Cultural services) Food production (Provisioning services) Natural hazard reduction (Regulating services)	
National	National Water Policy (2005)	None	NA	<ul style="list-style-type: none"> • Includes a generic mention of water harvesting • Notes generically that "water resources buffer zones" should be properly managed (p. 17)

(Continued)

TABLE 1 | Continued

Policy level	Policy/document name	Specific content related to urban greenspaces, green infrastructure or ecosystem services	Ecosystem service classification (if mentioned)	Comments
National	National Resilience Plan (2016)	None	NA	<ul style="list-style-type: none"> Notes that catchment protection and management, as well as reducing effects of floods and occurrence of droughts, are among the top priorities Mentions the need to invest in rainwater harvesting technologies
National	National Education Policy (2013) and National Education Sector Plan (2008–2017)	None	NA	
National	National Housing Policy (2018)	Notes the need to incorporate climate change and disaster risk management in housing and human settlement planning and development Calls for the promotion of re-forestation and re-vegetation among communities, for housing development	Natural hazard reduction (Regulating service) Climate change mitigation (Regulating service)	<ul style="list-style-type: none"> Notes that environmental issues have not been mainstreamed in housing policy Re-vegetation and re-forestation, climate change and natural disaster risk management are mentioned. But no further details are provided
City (Lilongwe)	Traffic Planning (2014)	None	NA	
City (Lilongwe)	Land Use and Housing Development (2015)	Prominent statements of the status of Lilongwe as the “Garden City” greenspaces are discussed as a priority. Document details required standards to ensure that new housing developments include greenspaces The roles of greenspaces in providing benefits to residents and society are mentioned, without use of the term ecosystem services	Aesthetic value and recreation opportunities (Cultural services)	<ul style="list-style-type: none"> Notes the need to keep separation distance between buildings in order to provide adequate light and air, reduce fire hazards and protect privacy. It is not, however, explicit about the exact nature of these resulting open spaces It calls for the creation of open space sufficient for planting/vegetation (especially backyard green) so that the urban ecological system can effectively work. But it does not provide further details
City (Lilongwe)	Urban Utilities and Environment (2014)	Urban greenspaces and relevant ecosystem services are widely discussed, including flooding and storm water management, the role of constructed urban wetlands, the importance of erosion prevention and the role of “green belts” to conserve water courses	Natural hazard reduction (Regulating service) Erosion prevention (Regulating service) Water conservation and management (Regulating service) Disease regulation (Regulating service)	
City (Lilongwe)	Lilongwe City Development Structure Plan (2014)	Urban greenspaces and relevant ecosystem services are widely discussed Particular focus on the need to regulate urban agriculture, undertake urban afforestation, and the importance of conservation and rehabilitation of wetlands, water courses, and riparian zones	Aesthetic value and recreation opportunities (Cultural services) Food production (Provisioning service) Water conservation and management (Regulating service)	

(Continued)

TABLE 1 | Continued

Policy level	Policy/document name	Specific content related to urban greenspaces, green infrastructure or ecosystem services	Ecosystem service classification (if mentioned)	Comments
City (Lilongwe)	Lilongwe Urban Profile (2011)	Main highlight is that the city council is “ <i>carrying out a major tree planting exercise, and is also creating awareness on the importance of tree planning by integrating tree planting lessons in the schools’ curriculum</i> ” (p. 22)	NA	<ul style="list-style-type: none"> • Mentions the need to adopt a proactive approach to disaster management by putting in place more disaster prevention measures. But does not explicitly link these to green infrastructure
City (Mzuzu)	Mzuzu council Strategic Plan (2014–2019)	Mentions the need to increase coverage by urban forest, maintain existing greenspaces but reduce the extent of urban agriculture	NA	<ul style="list-style-type: none"> • No mention of ecosystem services
City (Mzuzu)	Mzuzu City Structure Plan (2015–2030)	Recognizes the importance of urban greenspaces and mentions a number of ecosystem services they provide. For example, it is noted that the loss of vegetative cover increases the probability for landslides and floods. However, it also recognizes that the current inventory of urban greenspaces is under threat from development and degradation The importance of urban agriculture for food security is recognized, but notes that the extent of land within the city used for this purpose should be reduced Wetlands are viewed as imposing constraints on the development of the city	Aesthetic and recreational benefits (Cultural services) Water conservation and management (Regulating service) Food production (Provisioning service) Natural hazard reduction (Regulating service) Erosion prevention (Regulating service) Climate regulation (Regulating service)	
City (Mzuzu)	Mzuzu Urban Profile (2011)	Includes specific mention of urban greenspaces and the extent to which they are threatened by ongoing development pressures Highlights the intention of the city council to plant trees to mitigate flood risks	Natural hazard reduction (Regulating services)	

Ecosystem services are classified according to the Millennium Ecosystem Assessment (2005).

of Malawi, 2017, p. 30). Moving on, the National Land Policy of 2002, notes that the “*obstruction of watercourses, illegal development, and unplanned or unregulated buildings in urban settlements indicate a failure of development controls*” (p. 10). It then goes on to highlight the importance of open urban spaces for public activities, acknowledge that they “*are often abused or invaded by private developers to the disadvantage of the general public*” and put forward a series of measures for protecting them from illegal development and misuse (Government of Malawi, 2002, p. 35). The National Forest Policy of 2016 only makes a brief reference to urban forests and woodlots, noting, for instance, that the sustainable utilization of, *inter alia*, urban forests should enhance the management of watersheds.

Finally, the National Urban Policy of 2019 has as an overall goal the promotion of “*inclusive, competitive, sustainable, resilient cities, and other human settlements*” (Government of Malawi, 2019, p. 8). Within this policy, greenspaces, and green infrastructure form part of a potpourri of strategies aimed at promoting integrated urban planning, development, and management. For example, it identifies green infrastructure as a key aspect of integrated urban planning and an important tool for preventing the proliferation of informal settlements and illegal developments. It further calls for promoting the “*creation of public amenities including open spaces and parks*,” while facilitating the “*development and optimum use of green infrastructure*” (p. 12) is frequently highlighted throughout the text as a key policy objective (Government of Malawi, 2019).

National Level—Ecosystem Services

Except for MDGS III, none of the reviewed policies and documents at the national level explicitly acknowledged the potential of UGI to support ecosystem functions, conserve biodiversity, or provide ecosystem services that underpin human well-being. MDGS III acknowledges the need to “*enhance land use planning and human settlements to optimize ecosystem services to support key sectors such as energy, health, agriculture industry, and tourism*” (Government of Malawi, 2017, p. 55). A key measure put forward for doing so rests on the promotion of “*green infrastructure and zoning in the cities for aesthetic, recreational, and climate proofing benefits*” (Government of Malawi, 2017, p. 165).

Only a few policies and documents by sectoral ministerial authorities recognized, to differing degrees, the role that ecosystem services can play in wider social and economic development (Table 1). The National Forest Policy of 2016 notes that urban forests and woodlots could opportunities for the development of viable and robust forest-based small and medium scale industries, potentially contributing to green charcoal and firewood production. As is noted, this could contribute to energy security, given the “*increased demand of biomass as a source of energy especially in urban areas in Malawi with the increased unreliability in the supply of electrical energy*” (Government of Malawi, 2016, p. 23).

The National Environment Policy of 2004 and the National Biodiversity Strategy and Action Plan for 2015–2025 dedicated considerable attention to the multiple monetary and non-monetary benefits of ecosystems to society and human

well-being, but do not specifically refer to urban centers. The former policy document, for instance, stresses the need to:

“Develop mechanisms to ensure that the opportunity cost of using natural resources and the economic values of conserving natural resources are reflected in market prices or non-market mechanisms used to allocate or regulate their use and conservation” (Government of Malawi, 2004, p.8).

The latter document notes that “*biodiversity provides goods and services in the form of ecosystems, species, and genetic resources for human well-being and economic development*” (Government of Malawi, 2015a). It then goes on to acknowledge that in Malawi the ecosystem services provided by biodiversity are poorly understood and undervalued, making it therefore imperative that “*relevant sectors are aware of the value of biodiversity so that they are fully engaged to ensure protection, conservation and restoration of biodiversity*” (p. 26).

The National Disaster Risk Management Policy (Government of Malawi, 2015b) discusses the vulnerability of urban and rural populations to natural hazards and climate change and argues that the sustainable management of the environment and natural resources presents significant opportunities for disaster risk reduction and climate change adaptation. The document does recognize the role of the natural environment in managing risks:

“Reducing underlying risk factors involves, among other things, improving building safety and the protection of critical lifeline infrastructure, sustainable management of the environment and natural resources and aligning disaster risk reduction to climate change adaptation” (Government of Malawi, 2015b, p.8).

However, the concept of ecosystem services does not appear in the text. Similarly, there is no mention of managing risks of natural disasters within urban areas through the use of urban greenspaces, bluespaces or urban green or blue infrastructure, despite the now widely known potential for these features to play a role in flood risk mitigation (Kitha and Lyth, 2011; Derksen et al., 2017).

The National Urban Policy of 2019 also addresses the task of building urban resilience to climate change and natural hazards. In particular, it is recognized that susceptibility to disasters is exacerbated by “*climate change, poor urban land use planning, local authority capacity to manage disaster risk and climate change, rapid urbanization and urban design that fails to consider disaster risks and weak development control mechanisms*” (Government of Malawi, 2019, p. 3). However, the opportunities offered by UGI to enhance provision of ecosystem services, including their role in improving resilience to climate change and natural hazards, are not explicitly discussed.

Finally, the National Housing Policy of 2018 argues that in order to ensure adequate and sustainable housing for all Malawians, it is imperative that cross-cutting issues such as health, environment, climate change, and disaster risk reduction, are mainstreamed in housing and human settlement planning and development. As the document notes:

“To ensure adequate and sustainable housing for all Malawians it is important that cross-cutting issues such as capacity development, HIV/AIDS, gender, health, environment, vulnerable groups, technology, climate change and disaster risk reduction, are mainstreamed in housing delivery systems” (Government of Malawi, 2018, p.20).

To achieve this objective, it encourages the government and stakeholders to “ensure adequate and sustainable housing for all Malawians” by, *inter alia*, promoting reforestation, and revegetation among communities, within and surrounding housing developments. While urban greenspaces are not explicitly acknowledged, there are indirect references to the role that the natural environment can play for climate change and disaster risk reduction.

Lilongwe—Urban Green Infrastructure

In contrast to national level policies and documents, those from Lilongwe City Council highlight the important role of green infrastructure, even though the exact term is not used (Table 1). Driven primarily by rising urban population and economic growth, Lilongwe City Council is currently encouraging the implementation of urban densification policies, promoting for instance the construction of high-rise buildings in the central business areas. At the same time, however, policies and documents state the determination of local authorities to preserve the city’s existing green landscape, inherited partly due to the urban design legacy associated with its status as a “garden city,” and integrate biodiversity into planning decisions. “*The existing green spacious landscape of the City center,*” note the local authorities, “*should be preserved as a symbol of Lilongwe Garden city*” (Lilongwe City Council, 2015, p. 24).

However, with growing pressure on space, the areas in the city that have been reserved for greenspace have been increasingly at risk from development. Consequently, the reviewed documents, and in particular the Lilongwe City Development Structure Plan (2014), as well as the Land Use and Housing Development (2015) and the Urban Utilities and Environment (2014) guidelines and standards, include details as to how city planners aim to fulfill the political ambition of urban densification while simultaneously preserving and integrating urban greenspaces in the Lilongwe urban region. As the noted by the City Council, the goal is to:

“transform Lilongwe city into a ‘Compact City’, leading to an effective and efficient urban area with high environmental quality and amenity, in a way of inheriting and developing the Garden city of Lilongwe as Capital city of Malawi” (Lilongwe City Council, 2015, p.2).

Lilongwe—Ecosystem Services

While the term “ecosystem services” *per se* does not appear in the reviewed documents, the texts indicate extensive knowledge and awareness of the services provided by ecosystems, and the importance of conserving them for maintaining urban quality of life. Provisioning services, the products directly obtained from ecosystems, such as water, food, and fuel, are mentioned in

various national and city level documents¹. However, it is cultural and regulating services in particular that are highlighted.

For cultural services, great emphasis is placed on the aspiration to build an “*aesthetically pleasant, well-coordinated, orderly, and efficient*” cityscape, characterized by harmonization of greenspace and buildings (Lilongwe City Council, 2014a, p. vi). An urban environment, in other words, in which “*people of all walks of life live, work and relax together in harmony, at a minimum cost in terms of time, effort and money*” (Lilongwe City Council, 2014a, p. vi). In the view of the city’s policies and documents, preserving Lilongwe’s garden city environment not only provides the public with nature-based opportunities for recreation, but also revitalizes urban areas and boosts tourism. Consequently, various interventions are outlined for enhancing the provision of such ecosystem services. For instance, considerable attention is devoted to the promulgation of standards for streetscaping and backyard greenspaces, as well as the necessity for excluding certain ecologically significant areas from the aforementioned densification plans². The need to regulate urban agriculture, focusing in particular on “*the size of plots, type and scale of agricultural uses, access and waste disposal details,*” and ensure it is integrated well with other land uses, like parks and urban forestry, is also flagged (Lilongwe City Council, 2014a, p. 27).

Turning to regulating ecosystem services, Lilongwe City Council highlights the importance of investing in urban afforestation projects, citing the potential of urban forests to generate “*not only environmental benefit but also other positive impacts such as water resource and landscape conservation*” (Lilongwe City Council, 2014a, p. 27). Other interventions include reducing illegal and informal settlement encroachment along flood-prone rivers and streams, and controlling erosion through vegetation enhancement. Significant attention is placed on the demarcation of buffer zones along rivers and streams to enhance “*preservation of biodiversity and protection of water resources*” (Lilongwe City Council, 2014b, p. 136). Promoting rainwater harvesting is also explored as an option for avoiding the use of expensive and scarce potable-piped water for non-potable uses. Special attention, however, is afforded to protecting wetlands, ponds and other water bodies, mainly due to their storm water management potential. As noted by the City Council:

“wetlands in Lilongwe must be protected because they 1) improve water quality by removing nutrients, chemical wastes and turbidity, 2) reduce flooding by infiltrating rainwater into soil (and possibly retaining rainwater), and 3) buffer erosive forces and hold sediments” (Lilongwe City Council, 2014b, p.129).

Despite the emerging importance of urban heat island effects, Lilongwe City Council documents make no mention of the role that UGI could play in temperature mitigation or the provision of shade.

¹Consequently, local authorities recommend that “*whenever development /construction works are to take place every effort should be made to preserve all naturally existing water bodies*” (Lilongwe City Council, 2014a, p. 27).

²According to the city council, “*separation distance between buildings is vital for promoting public health, safety, and welfare*” (Lilongwe City Council, 2015, p. 7).

Mzuzu—Urban Green Infrastructure and Ecosystem Services

A similar picture emerges from the analysis of the policies and documents produced by the Mzuzu City Council. Densification is the desired process of urban planning and development, viewed as essential in the development of a sustainable built environment. As with Lilongwe, Mzuzu City Council has identified the degradation of the natural environment as constituting a threat for water supply, biodiversity, and aesthetics, and is therefore keen to protect its existing greenspaces. Various ecosystem services are acknowledged in the reviewed documents, even though the actual term *per se* is again not employed. Developing eco-tourist facilities, planting of tree belts alongside roads, construction of new recreational facilities or provision of incentives to households to plant trees on their plots are among the initiatives undertaken by the city government in order to enhance cultural ecosystem services provision. As the City Council notes, conservation, and open spaces “*promote and enhance environmental quality and sustainability, scientific research, as well as also ... contribute to scenic beauty which is essential for the tourist industry*” (Mzuzu City Council, 2014, p. 99).

Looking forward, Mzuzu City Council is eager to limit loss of vegetative cover and support the capacity of urban ecosystems to provide regulating services. Interestingly though, bluespaces, such as wetlands and streams, are viewed in both positive and negative terms. On the one hand, the Mzuzu City Structure Plan (2015–2030) notes that wetland encroachment “*increases the likelihoods of climate related hazards especially flooding*” (Mzuzu City Council, 2014, p. 49). On the other hand, wetlands are concurrently viewed as presenting constraints to development, as several of them have “*very high water table which make many parts of the city liable to flooding*” (Mzuzu City Council, 2014, p. 65). Rivers and streams are also viewed as posing obstacles to development, as their high number means that road building incurs the additional expense of constructing bridges. As the local authorities note, there “*are many streams which means that road construction requires bridges without which the traveling is compromised in terms of connectivity, time, cost, and effort*” (Mzuzu City Council, 2014, p. 65).

Unlike Lilongwe, significant attention is paid to the potential of urban agriculture to provide a range of provisioning ecosystem services to the urban community. While acknowledging its current environmental side-effects, the Mzuzu City Council is of the view that an appropriately regulated urban agriculture sector has the potential to contribute to food security, income generation, and job creation. As noted, “*although urban agriculture has its side effects on the environment such as degradation of riverine areas, the need for increased productivity to ensure food security cannot be wished away especially considering the increasing urbanization of poverty in Malawi*” (Mzuzu City Council, 2014, p. 65). Consequently, Mzuzu’s structure plan for 2015–2030 provides detailed policy guidelines and targets for integrating urban agriculture into urban land-use and land management systems. For instance, according to the plan, “*urban agriculture plots shall be prepared and allocated on a 5-year lease subject to renewal.*” Furthermore, households “*shall be allowed to*

grow crops on the rear side of their plots (frontage is restricted for security, aesthetic, and driving visibility)” (Mzuzu City Council, 2014, p. 99).

DISCUSSION

Urban greenspaces and green infrastructure, and the ecosystem services that they underpin, are relevant to a range of different government stakeholders and agencies, including the health, education, tourism, agriculture, forestry, water, housing, and transport sectors (Nilon et al., 2017). However, enacting policies that support the implementation of UGI to underpin the provision of ecosystem services remains challenging. This is particularly so in sub-Saharan Africa, where systems of formal government are often insufficiently coordinated (du Toit et al., 2018). Policy coherence is a critical starting point for any national policy reform framework (England et al., 2018), not least because signaling a consistent message to key public and private stakeholders about development priorities is paramount (Fourie, 2018). Once a policy goal has been explicitly recognized, streamlining of public and private practices, coordination of policies, and capacity building can then follow (Turok and Parnell, 2009).

Regulatory barriers are not always perceived to be the most important factor in limiting the implementation of green infrastructure in cities in sub-Saharan Africa (Gashu and Gebre-Egziabher, 2019). Nevertheless, strategic coordination across policies is essential in delivering good conservation outcomes (Kubo et al., 2019). However, in Malawi we found that there is a demonstrated lack of appreciation in the national-level policies of the multiple synergistic benefits and ecosystem services delivered by UGI. A wide range of national-level government departments can, and should, be engaged in the process of creating and enhancing green infrastructure with the participation of city residents. However, as is common in many countries, restructuring of ministries, frequent transfer of technical experts between portfolios, and a weak relationship between research outputs and policymakers limit the development of evidence-based policy, hindering how policy, and policymakers engage with emerging issues (Pardoe et al., 2020). Facilitating effective environmental mainstreaming requires therefore that vertical and horizontal policy arrangements are combined (Lafferty and Hovden, 2003).

National Level—Horizontal Policy Integration

Efficacious horizontal integration depends on the center of policy development providing an overarching framework. Successful vertical integration is conditional on ministries being sufficiently “greened” to be able to develop their own strategies (Lafferty and Hovden, 2003). With respect to our case study, and starting with horizontal integration, there have been attempts in Malawi in recent years to improve policy coherence and therefore encourage more integrated planning. Brown (2011) reviewed Malawi’s 2006 National Adaptation Programme of Action (NAPA), as well as its 2006 Growth and Development Strategy (MGDS II), and posited that both documents failed markedly to

acknowledge “*rapid urbanization trends, the projected impacts of climate change in urban areas or urban disaster risk*” (p. 941). Our case study illustrates that this picture has changed. Currently, the primary two strategies adopted by the Malawian Government for addressing climate change adaptation and sustainable development are its 2015 Nationally Determined Contribution (NDC) to the Paris Agreement, which outlines Malawi’s contributions to the global climate change mitigation effort, and its 2017 Growth and Development Strategy (MGDS III), the country’s blueprint for advancing sustainable development (see Government of Malawi, 2015c, 2017, respectively). Both documents now recognize the strong connection between spatial planning and sustainable development. The former document, for example, calls for the promotion of sustainable and resilient cities and urban centers via the development and implementation of climate related building codes/standards, and also calls for the revision of existing building standards in line with climate change. The latter document, in turn, highlights the need for incorporating disaster risk reduction measures in urban and rural land-use development zoning and planning. In terms of horizontal integration, however, it is important that all the overarching policy documents of the Malawian Government explicitly recognize UGI as a cost-effective tool in climate adaptation. As Mell (2015, p. 134) notes, “urban greening can form a mainstream framework to facilitate a sustainable approach to urban expansion.”

In addition to the mainstreaming of the environment into national overall plans, further evidence of attempts at horizontal policy integration includes the establishment of specific authorities mandated to supervise, coordinate, and implement the integration process. For instance, the Environmental Affairs Department (EAD) is in charge of implementing the country’s cross-cutting National Climate Change Policy (England et al., 2018), while the Department of Disaster Management Affairs (DoDMA), within the Office of the President and Cabinet, is in charge of leading Malawi’s National Resilience Strategy. While institution-building has progressed, challenges have emerged that warrant policy attention. The EAD, for instance, has been described as being unable to push for changes in sectoral planning or policy development (England et al., 2018). Furthermore, overarching strategy documents are still mostly focused on the social and economic development needs of the country, thereby treating the environment as a peripheral concern. Malawi’s National Resilience Strategy, for example, targets food security and rural development, thereby failing to address rapid urbanization and the projected impacts of climate change in urban areas. This omission is clearly problematic, as significant segments of the population reside in urban centers, and urban contexts pose their own, particular challenges to building resilience to climate change. If created, nurtured, and enhanced, UGI can play a pivotal role in the planning and design of safe and resilient urban settlements. These aforementioned problems are also reflected in the national budget, whereby the environment ministry is less funded compared to its health, education, and agriculture counterparts (Government of Malawi, 2014).

National Level—Vertical Policy Integration

Turning to vertical integration, the degree to which sectoral governance has been “greened” was found to be limited. Interestingly, our review of sectoral strategy documents reveals that the majority of governmental sectors have not mainstreamed environmental concerns into their portfolios of objectives. This can be viewed as a missed opportunity on the part of these governmental sectors, especially as far as urban greenspaces are concerned. For example, enhancing the quantity and quality of greenspaces in urban areas has been put forward as a promising and beneficial approach for enhancing public health (van den Berg et al., 2015). Not least because there is a substantial evidence-base that links living in greener environments with better mental health and lower all-cause mortality (Sandifer et al., 2015). Despite this, the National Health Policy of 2018 does not explore the potential for public health improvements associated with greater provision of high-quality accessible greenspace in the urban environment, even though it includes linkages with other policies, legislation, and guiding principles.

Similarly, the National Transport Policy of 2015 does not consider the potential benefits to urban centers of integrating transportation plans and green infrastructure programmes. Tardieu et al. (2013, p. 73) note that worldwide it is common practice for the impacts on ecosystem services of terrestrial transport infrastructure not to be assessed, thereby not “permitting a more efficient control of natural capital loss.” Equally ignored are opportunities for better integrating land use, ecosystem, climate change, and biodiversity concerns into transport policy and planning. For instance, vegetated drainage and porous materials in streets, alleys, rights of way, and parking lots can allow urban centers to increase their storm-water capacity and reduce flooding (Wade and McLean, 2014). Our findings with respect to the transport sector are not restricted to the national level, as Lilongwe’s transport planning policies were also silent when it came to the potential of integrating transport and green infrastructure.

Finally, Malawi’s education policies fail to mention environmental education, let alone consider the role that access to high quality greenspaces and green infrastructure in and near schools can play in improving educational attainment (e.g., Browning and Rigolon, 2019). However, the potential of environmental education programs to facilitate major societal change cannot be overstated. Indeed, successful integration of green and built infrastructure depends on governments fulfilling a facilitating role in education and empowering change and innovation among developers/builders and residents (Hostetler et al., 2011; Demuzere et al., 2014).

Better institutional coordination and policy coherence across national level sectors that affect urban greenspaces and green infrastructure is hence required. All government departments have a role to play in promoting urban greenspaces and green infrastructure, and it is imperative that relevant inter-ministerial and inter-departmental linkages are explored and forged. In this sense, the SDGs provide a window of opportunity for integrating urban greenspaces with the broader development agenda to deliver multiple benefits. Following the adoption of the UN’s

“2030 Agenda for Sustainable Development,” the need for wider efforts to promote policy coherence and integrated assessments has been recognized by the international community. As a result, various tools are being designed that could provide policymakers with the empirical knowledge necessary for mapping and addressing potential positive or negative policy spillovers across sectors (cf. Nilsson et al., 2016; McCollum et al., 2018).

Subsidiarity and the City Level

The policies and documents we examined from Lilongwe and Mzuzu do pay particular attention to prioritizing and encouraging ecosystem services provision underpinned by UGI. This contrasts with our findings for policies and documents at the national level. This mismatch is even more striking when considering that city and district councils are under the remit of the Ministry of Local Government, indicating a lack of coordination between levels of policy development. This shows that links between national and city level planning processes, which are vital to creating a step-change in green infrastructure planning, are not yet in place (Douglas, 2018). Indeed, it is these interactions between city and national level decision-makers that ultimately largely shape the ways in which cities develop. As Ayers et al. (2014, p. 48) note, “for mainstreaming to be sustainable, the object of mainstreaming should be national and sub-national level institutions and processes.” Turok and Parnell (2009), explain the reasons why by presenting a number of arguments regarding the need for national policies to complement and reinforce local strategies. Among others, they note that national governments are uniquely positioned to take the lead in articulating a shared vision for the country, set relevant norms and standards and formulate long-term spatial development frameworks.

Without national policies in place, both Lilongwe and Mzuzu policymakers are guided instead by a particular set of ideas for how their cities should develop. In particular, documents from both cities view urban densification as a tool to combat sprawl and achieve a number of long-term social and ecological benefits that are claimed to result from such planning practices, such as increases in walking, cycling and physical activity, greater use of public transport, and preservation of rural areas (Rérat, 2012). Such views have been influenced by development partners (e.g., for Lilongwe, JICA, 2010) providing external input into urban planning and policies³. Consequently, some doubt remains as to whether the city authorities themselves will be able to implement planning practices that prioritize UGI, especially without a supportive national level policy framework in place. Indeed, recent empirical work has demonstrated that combination of urban densification with high-quality greenspaces provision has

proven to be challenging, even in cities with more resources and better policy capacity (see e.g., Khoshkar et al., 2018).

Finally, with the exception of MGDS III, the concept of ecosystem services is not mentioned in any of the other national or city-level policy documents we reviewed. In relation to the national level, this finding links well with our discussion of horizontal/vertical integration, as the concept of ecosystem services is mentioned in an overarching strategy document, but not in the sectoral ones it is meant to influence. Turning to the city level, we find, as reported elsewhere in the literature (Pasquini and Cowling, 2015), that ecosystem services “buzzwords” have generally struggled to penetrate into local, public policymaking spheres. In our case, documents do capture the meaning of the concept by highlighting the benefits for people of protecting the natural environment and investing in UGI. Yet, more explicit engagement with advances in ecosystem services research could improve decision-making and operations at all levels of government (Petz et al., 2012). Analyzing, for instance, the ecologically, socially, as well as economically desirable effects of ecosystem services on human well-being could provide additional incentives for conservation and habitat protection. A further step could also be to consider incorporating economic and non-economic values of urban ecosystem services. Brzoska and Spägle (2020), note that exploiting the multiple benefits of urban ecosystems requires generating knowledge, expertise, and information on the multiple functions and services of urban greenspaces on different spatial scales. But, as they note, this is even more so the case when it comes to the small spatial scales where planned measures are realized.

CONCLUSION

We conducted a review of policy and strategy documents in order to explore whether urban greenspaces and green infrastructure have been incorporated into Malawian government planning and management priorities, as well as whether they were a strategic priority for local city governments, focusing on the Lilongwe, and Mzuzu City Councils. We found a satisfactory level of horizontal integration, as overarching strategy documents acknowledge the value of ecosystem services provided by urban greenspaces and green infrastructure. The same was not the case for vertical integration, as regardless of policy sector, sectoral level actors have not integrated greenspaces into planning practices. In contrast, city authorities are aware of the opportunities stemming from investing in urban greenspaces and infrastructure. Overall, institutional coordination and policy coherence are required across all levels of government if the wider environment and societal benefits of urban greenspaces and green infrastructure are to be maximized.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary materials, further inquiries can be directed to the corresponding author/s.

³Development partners have supported various national and local policies. For example, the National Climate Change Policy was supported by United Nations Development Programme (UNDP) and the Forest Policy by Japan’s International Cooperation Agency (JICA). Funders also allow other international experts to review the documents. In most consultative meetings, therefore, it is the development partners that take the lead in shaping the approach and even content of the policy documents. Consequently, in many cases local experts are not given the required space to influence the final shape of the policies. This can be true even when capacity to develop policy is in place, as funding is provided by development partners who, therefore, influence the overall policy direction outcome.

AUTHOR CONTRIBUTIONS

SA, DDM, and MD designed the research and wrote the paper. SA carried out the analysis. All authors contributed to the article and approved the submitted version.

REFERENCES

- Adelle, C., and Russel, D. (2013). Climate policy integration: a case of Déjà vu? *Environ. Policy Governance* 23, 1–12. doi: 10.1002/eet.1601
- Ayers, J. M., Huq, S., Faisal, A. M., and Hussain, S. T. (2014). Mainstreaming climate change adaptation into development: a case study of Bangladesh. *WIREs Climate Change* 5, 37–51. doi: 10.1002/wcc.226
- Barnett, C., and Parnell, S. (2016). Ideas, implementation and indicators: epistemologies of the post-2015 urban agenda. *Environ. Urban.* 28, 87–98. doi: 10.1177/0956247815621473
- Benson, E., Forbes, A., Korkeakoski, M., Latif, R., and Lham, D. (2014). Environment and climate mainstreaming: challenges and successes. *Develop. Pract.* 24, 605–614. doi: 10.1080/09614524.2014.911819
- Bobbins, K., and Culwick, C. (2015). Green growth transitions through a green infrastructure approach at the local government level: case study for the Gauteng city region. *J. Public Admin.* 50, 32–49.
- Botzat, A., Fischer, L. K., and Kowarik, I. (2016). Unexploited opportunities in understanding liveable and biodiverse cities: a review on urban biodiversity perception and valuation. *Glob. Environ. Change* 39, 220–233. doi: 10.1016/j.gloenvcha.2016.04.008
- Braun, V., and Clarke, V. (2013). *Successful Qualitative Research: A Practical Guide for Beginners*. London: SAGE.
- Brill, G., Anderson, P., and O'Farrell, P. (2017). Urban national parks in the global South: linking management perceptions, policies and practices to water-related ecosystem services. *Ecosyst. Serv.* 28, 185–195. doi: 10.1016/j.ecoser.2017.03.023
- Brown, D. (2011). Making the linkages between climate change adaptation and spatial planning in Malawi. *Environ. Sci. Policy* 14, 940–949. doi: 10.1016/j.envsci.2011.07.009
- Browning, M., and Rigolon, A. (2019). School green space and its impact on academic performance: a systematic literature review. *Int. J. Environ. Res. Public Health* 16:429. doi: 10.3390/ijerph16030429
- Bryman, A. (2016). *Social Research Methods*. Oxford: Oxford University Press.
- Brzoska, P., and Späge, A. (2020). From city- to site-dimension: assessing the urban ecosystem services of different types of green infrastructure. *Land* 9:150. doi: 10.3390/land9050150
- Cobbinah, P. B., Erdiaw-Kwasie, M. O., and Amoateng, P. (2015). Africa's urbanisation: implications for sustainable development. *Cities* 47, 62–72. doi: 10.1016/j.cities.2015.03.013
- Daily, G. C., and Matson, P. A. (2008). Ecosystem services: from theory to implementation. *Proc. Natl. Acad. Sci. U.S.A.* 105, 9455–9456. doi: 10.1073/pnas.0804960105
- Demuzere, M., Orru, K., Heidrich, O., Olazabal, E., Geneletti, D., Orru, H., et al. (2014). Mitigating and adapting to climate change: multi-functional and multi-scale assessment of green urban infrastructure. *J. Environ. Manage.* 146, 107–115. doi: 10.1016/j.jenvman.2014.07.025
- Derksen, M. L., van Teeffelen, A. J. A., Nagendra, H., and Verburg, P. H. (2017). Shifting roles of urban green space in the context of urban development and global change. *Curr. Opin. Environ. Sustain.* 29, 32–39. doi: 10.1016/j.cosust.2017.10.001
- DESA (2015). *World Urbanization Prospects: The 2014 Revision*. New York, NY: Department of Economic and Social Affairs, Population Division.
- Di Gregorio, M., Nurrochmat, D. R., Paavola, J., Sari, I. M., Fatorelli, L., Pramova, E., et al. (2017). Climate policy integration in the land use sector: mitigation, adaptation and sustainable development linkages. *Environ. Sci. Policy* 67, 35–43. doi: 10.1016/j.envsci.2016.11.004
- Douglas, I. (2018). The challenge of urban poverty for the use of green infrastructure on floodplains and wetlands to reduce flood

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- impacts in intertropical Africa. *Landscape Urban Plann.* 180, 262–272. doi: 10.1016/j.landurbplan.2016.09.025
- du Toit, M. J., Cilliers, S. S., Dallimer, M., Goddard, M., Guenat, S., and Cornelius, S. F. (2018). Urban green infrastructure and ecosystem services in sub-Saharan Africa. *Landscape Urban Plann.* 180, 249–261. doi: 10.1016/j.landurbplan.2018.06.001
- Elmqvist, T., Setälä H., Handel, S. N., van der Ploeg, S., Aronson, J., Blignaut, J. N., et al. (2015). Benefits of restoring ecosystem services in urban areas. *Curr. Opin. Environ. Sustain.* 14, 101–108. doi: 10.1016/j.cosust.2015.05.001
- England, M. I., Dougill, A. J., Stringer, L. C., Vincent, K. E., Pardoe, J., Kalaba, F. K., et al. (2018). Climate change adaptation and cross-sectoral policy coherence in southern Africa. *Regional Environ. Change* 18, 2059–2071. doi: 10.1007/s10113-018-1283-0
- Esmail, B. A., and Geneletti, D. (2017). Design and impact assessment of watershed investments: an approach based on ecosystem services and boundary work. *Environ. Impact Assess. Rev.* 62, 1–13. doi: 10.1016/j.eiar.2016.08.001
- Fourie, W. (2018). Aligning South Africa's national development plan with the 2030 Agenda's sustainable development goals: guidelines from the policy coherence for development movement. *Sustain. Develop.* 26, 765–771. doi: 10.1002/sd.1745
- Gashu, K., and Gebre-Egziabher, T. (2019). Barriers to green infrastructure development and planning in two Ethiopian cities: Bahir Dar and Hawassa. *Urban Ecosyst.* 22, 657–669. doi: 10.1007/s11252-019-00852-y
- Government of Malawi (2002). *National Land Policy*. January. Available online at: http://www.lands.gov.mw/phocadownload/land_policies_plans/national%20land%20policy%20january%202002.pdf (accessed March, 2020).
- Government of Malawi (2004). *National Environmental Policy*. June. Available online at: <http://faolex.fao.org/docs/pdf/mlw169499.pdf> (accessed March, 2020).
- Government of Malawi (2014). *Public Expenditure Review Report for Malawi's Environment and Disaster Risk Management Sectors*. Lilongwe: Ministry of Economic Planning and Development.
- Government of Malawi (2015a). *National Biodiversity Strategy and Action Plan for 2015-2025*. Available online at: <https://cepa.rmpportal.net/Library/government-publications/national-biodiversity-strategy-and-action-plan-ii-2015-2025/view#:~:text=This%20National%20Biodiversity%20Strategy%20and,to%20ensure%20their%20sustainable%20management> (accessed July, 2015).
- Government of Malawi (2015b). *National Disaster Risk Management Policy*. Available online at: https://www.preventionweb.net/files/43755_malawidrmpolicy2015.pdf (accessed March, 2020).
- Government of Malawi (2015c). *Republic of Malawi: Intended Nationally Determined Contribution*. Available online at: <https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Malawi/1/MALAWI%20INDC%20SUBMITTED%20TO%20UNFCCC%20REV%20pdf.pdf> (accessed October, 2020).
- Government of Malawi (2016). *National Forest Policy*. Available online at: <https://www.dof.gov.mw/storage/app/media/Policies%20and%20Strategies/National%20Forest%20Policy%202016.pdf> (accessed July, 2020).
- Government of Malawi (2017). *The Malawi Growth and Development Strategy (MGDS) III*. Available online at: <https://cepa.rmpportal.net/Library/government-publications/the-malawi-growth-and-development-strategy-mgds-iii> (accessed July, 2020).
- Government of Malawi (2018). *National Housing Policy*. Lilongwe: Ministry of Lands, Housing and Urban Development.
- Government of Malawi (2019). *National Urban Policy*. April. Available online at: <http://finance.gov.mw/index.php/blog/documents/debt-aid?download=3:2019-april-national-urban-policy-signed> (accessed March, 2020).

- Guenat, S., Dougill, A. J., Kunin, W. E., and Dallimer, M. (2019a). Untangling the motivations of different stakeholders for urban greenspace conservation in sub-Saharan Africa. *Ecosyst. Serv.* 36:100904. doi: 10.1016/j.ecoser.2019.100904
- Guenat, S., Kunin, W. E., Dougill, A. J., and Dallimer, M. (2019b). Effects of urbanisation and management practices on pollinators in tropical Africa. *J. Appl. Ecol.* 56, 214–224. doi: 10.1111/1365-2664.13270
- Hostetler, M., Allen, W., and Meurk, C. (2011). Conserving urban biodiversity? Creating green infrastructure is only the first step. *Landscape Urban Plann.* 100, 369–371. doi: 10.1016/j.landurbplan.2011.01.011
- JICA (2010). *The Study on Urban Development Master Plan for Lilongwe in the Republic Of Malawi*. Japan International Cooperation Agency. Available online at: https://openjicareport.jica.go.jp/pdf/12003752_01.pdf (accessed March, 2020).
- Jorgensen, P. W., Trotter, D. C., and Hill, T. R. (2016). Ecosystem services assessments in local municipal decision making in South Africa: justification for the use of a business-based approach. *J. Environ. Plann. Manage.* 59, 263–279. doi: 10.1080/09640568.2015.1009626
- Kacyira, A. (2017). Urbanization: emerging challenges and a new global urban agenda. *Brown J. World Affairs* 23, 87–102.
- Kalantari, Z., Ferreira, C. S. S., Keesstra, S., and Destouni, G. (2018). Nature-based solutions for flood-drought risk mitigation in vulnerable urbanizing parts of East-Africa. *Curr. Opin. Environ. Sci. Health* 5, 73–78. doi: 10.1016/j.coesh.2018.06.003
- Kambites, C., and Owen, S. (2006). Renewed prospects for green infrastructure planning in the UK. *Plann Pract. Res.* 21, 483–496. doi: 10.1080/02697450601173413
- Khoskar, S., Balfors, B. and Wärnäck, A. (2018). Planning for green qualities in the densification of suburban Stockholm - opportunities and challenges. *J. Environ. Plan. Manag.* 61, 2613–2635. doi: 10.1080/09640568.2017.1406342
- Kitha, J., and Lyth, A. (2011). Urban wildscapes and green spaces in Mombasa and their potential contribution to climate change adaptation and mitigation. *Environ. Urban.* 23, 251–265. doi: 10.1177/0956247810396054
- Kubo, H., Wibawanto, A., and Rossanda, D. (2019). Toward a policy mix in conservation governance: a case of Gunung Palung National Park, West Kalimantan, Indonesia. *Land Use Policy* 88, 104108. doi: 10.1016/j.landusepol.2019.104108
- Lafferty, W., and Hovden, E. (2003). Environmental policy integration: towards an analytical framework. *Environ. Politics* 12, 1–22. doi: 10.1080/09644010412331308254
- Lilongwe City Council (2014a). *Lilongwe City Development Structure Lilongwe: Plan*.
- Lilongwe City Council (2014b). *Lilongwe City Development Guidelines and Standards: Urban Utilities and Environment. Final Draft (November)*. Lilongwe: Department of Planning and Development Management.
- Lilongwe City Council (2015). *Lilongwe City Development Guidelines and Standards: Land Use and Housing Development. Revised Draft (February)*. Lilongwe: Department of Planning and Development Management.
- McCollum, D. L., Echeverri, L. G., Busch, S., Pachauri, S., Parkinson, S., Rogelj, J., et al. (2018). Connecting the sustainable development goals by their energy inter-linkages. *Environ. Res. Lett.* 13:033006. doi: 10.1088/1748-9326/aaafe3
- McHale, M. R., Bunn, D. N., Pickett, S. T. A., and Twine, W. (2013). Urban ecology in a developing world: why advanced socioecological theory needs Africa. *Front. Ecol. Environ.* 11, 556–564. doi: 10.1890/120157
- Mell, I. C. (2015). Establishing the rationale for green infrastructure investment in Indian cities: is the mainstreaming of urban greening an expanding or diminishing reality? *AIMS Environ. Sci.* 2, 134–153. doi: 10.3934/environsci.2015.2.134
- Millennium Ecosystem Assessment (2005). *Ecosystems and Human Well-Being: Synthesis*. Washington, DC: Island Press.
- Mougeot, L. J. A. (2001). “Urban agriculture: definition, presence, potential and risks,” In *Growing cities, growing food-Urban agriculture on the policy agenda*, eds N. Barker, M. Dubbelling, S. Gindel, U. Sabel-Koschella, and H. De Zeeuw H (Eurasburg: DSE), 1–42.
- Munyati, C., and Drummond, J. H. (2020). Loss of urban green spaces in Mafikeng, South Africa. *World Dev. Perspect.* 19:100226. doi: 10.1016/j.wdp.2020.100226
- Mzuzu City Council (2014). *Mzuzu City Structure Plan 2015– 2030. Draft Plan Report Mzuzu*.
- Nilon, C. H., Aronson, M. F. J., Cilliers, S. S., Dobbs, C., Frazee, L. J., Goddard, M. A., et al. (2017). Planning for the future of urban biodiversity: a global review of city-scale initiatives. *BioScience* 67, 332–342. doi: 10.1093/biosci/bix012
- Nilsson, M., Griggs, D., and Visbeck, M. (2016). Map the interactions between sustainable development goals. *Nature* 534, 320–322. doi: 10.1038/534320a
- Nowell, L. S., Norris, J. M., White, D. E., and Moules, N. J. (2017). Thematic analysis: striving to meet the trustworthiness criteria. *Int. J. Qualit. Methods* 16, 1–13. doi: 10.1177/1609406917733847
- OECD/SWAC (2020). *Africa's Urbanisation Dynamics 2020: Africapolis, Mapping a New Urban Geography, West African Studies*. Paris: OECD Publishing.
- O'Farrell, P. J., Anderson, P. M. L., Le Maitre, D. C., and Holmes, P. M. (2012). Insights and opportunities offered by a rapid ecosystem service assessment in promoting a conservation agenda in an urban biodiversity hotspot. *Ecol. Soc.* 17:27. dx. doi: 10.5751/ES-04886-170327
- Pardoe, J., Vincent, K., Conway, D., Archer, E., Dougill, A. J., Mkwambisi, D., et al. (2020). Evolution of the national climate adaptation agendas in Malawi, Tanzania and Zambia: the role of national leadership and international donors. *Regional Environ. Change* 20:118. doi: 10.1007/s10113-020-01693-8
- Pasquini, L., and Cowling, R. M. (2015). Opportunities and challenges for mainstreaming ecosystem-based adaptation in local government: evidence from the Western Cape, South Africa. *Environ. Dev. Sustain.* 17, 1121–114. doi: 10.1007/s10668-014-9594-x
- Petz, K., Minca, E. L., Werners, S. E., and Leemans, R. (2012). Managing the current and future supply of ecosystem services in the Hungarian and Romanian Tisza River Basin. *Regional Environ. Change* 12, 689–700. doi: 10.1007/s10113-012-0284-7
- Pulighe, G., Fava, F., and Lupia, F. (2016). Insights and opportunities from mapping ecosystem services of urban green spaces and potentials in planning. *Ecosyst. Serv.* 22(Part A), 1–10. doi: 10.1016/j.ecoser.2016.09.004
- Rérat, P. (2012). Housing, the compact city and sustainable development: some insights from recent urban trends in Switzerland. *Int. J. Housing Policy* 12, 115–136. doi: 10.1080/14616718.2012.681570
- Robinson, G. M., and Song, B. (2018). Transforming the peri-urban fringe in China: the example of Xi'an-Xianyang. *Sustainability* 10:3932. doi: 10.3390/su10113932
- Rolf, W., Diehl, K., Zasada, I., and Wiggering, H. (2020). Integrating farmland in urban green infrastructure planning. an evidence synthesis for informed policymaking. *Land Use Policy* 99:104823. doi: 10.1016/j.landusepol.2020.104823
- Sandifer, P. A., Sutton-Grier, A. E., and Ward, B. P. (2015). Exploring connections among nature, biodiversity, ecosystem services, and human health and well-being: opportunities to enhance health and biodiversity conservation. *Ecosyst. Serv.* 12, 1–15. doi: 10.1016/j.ecoser.2014.12.007
- Schäffler, A., and Swilling, M. (2013). Valuing green infrastructure in an urban environment under pressure – the Johannesburg case. *Ecol. Econom.* 86, 246–257. doi: 10.1016/j.ecolecon.2012.05.008
- Seto, K. C., Güneralp, B., and Hutyrá, L. R. (2012). Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. *Proc. Natl Acad. Sci. U.S.A.* 109, 16083–16088. doi: 10.1073/pnas.1211658109
- Tardieu, L., Roussel, S., and Salles, J.-M. (2013). Assessing and mapping global climate regulation service loss induced by Terrestrial Transport Infrastructure construction. *Ecosyst. Serv.* 4, 73–81. doi: 10.1016/j.ecoser.2013.02.007
- Tibesigwa, B., Ntuli, H., and Lokina, R. (2020). Valuing recreational ecosystem services in developing cities: The case of urban parks in Dar es Salaam, Tanzania. *Cities* 106:102853. doi: 10.1016/j.cities.2020.102853
- Titz, A., and Chiotha, S. S. (2019). Pathways for sustainable and inclusive cities in Southern and Eastern Africa through urban green infrastructure? *Sustainability* 11:2729. doi: 10.3390/su11102729
- Turok, I., and McGranahan, G. (2013). Urbanization and economic growth: the arguments and evidence for Africa and Asia. *Environ. Urban.* 25, 465–482. doi: 10.1177/0956247813490908
- Turok, I., and Parnell, S. (2009). Reshaping cities, rebuilding nations: the role of national urban policies. *Urban Forum* 20, 157–174. doi: 10.1007/s12132-009-9060-2
- UN Habitat (2011a). Malawi: Lilongwe Urban Profile. Available at: <https://unhabitat.org/books/malawi-lilongwe-urban-profile/> (accessed March, 2020).
- UN Habitat (2011b). Malawi: Mzuzu Urban Profile. Available online at: <https://unhabitat.org/books/malawi-mzuzu-urban-profile/> (accessed March, 2020).

- United Nations (2018). *SDG 11 Synthesis Report 2018: Tracking progress towards Inclusive, Safe, Resilient and Sustainable Cities and Human Settlements*. Nairobi.
- Urwin, K. and Jordan, A. (2008). Does public policy support or undermine climate change adaptation? Exploring policy interplay across different scales of governance. *Glob. Environ. Change* 18, 180–191. doi: 10.1016/j.gloenvcha.2007.08.002
- van den Berg, M., Wendel-Vos, W., van Poppel, M., Kemper, H., van Mechelen, W., and Maas, J. (2015). Health benefits of green spaces in the living environment: a systematic review of epidemiological studies. *Urban Forestry Urban Green.* 14, 806–816. doi: 10.1016/j.ufug.2015.07.008
- Wade, R., and McLean, N. (2014). “Multiple benefits of green infrastructure,” in *Water Resources in the Built Environment*, eds C. A. Booth and S. M. Charlesworth (Chichester: Wiley Blackwell), 319–335. doi: 10.1002/9781118809167.ch24
- Wamsler, C., and Pauleit, S. (2015). Making headway in climate policy mainstreaming and ecosystem-based adaptation: two pioneering countries, different pathways, one goal. *Climatic Change* 137, 71–87. doi: 10.1007/s10584-016-1660-y
- Ward, S. (2005). *The Garden City: Past, Present and Future*. London: Taylor and Francis. doi: 10.4324/9780203973615
- World Bank (2017). *Greening Africa's Cities: Enhancing the Relationship Between Urbanization, Environmental Assets and Ecosystem Services*. Available online at: <http://documents.worldbank.org/curated/en/537541495770954232/pdf/115281-REVISED-P148662-GreenUrbanDevAfrica-web2.pdf> (accessed March, 2020).
- Yao, R., Cao, J., Wang, L., Zhang, W. and Wu, X. (2019). Urbanization effects on vegetation cover in major African cities during 2001–2017. *Int. J. Appl. Earth Observ. Geoinf.* 75, 44–53. doi: 10.1016/j.jag.2018.10.011
- Young, R. F. (2013). Mainstreaming urban ecosystem services: a national survey of municipal foresters. *Urban Ecosyst.* 16, 703–722. doi: 10.1007/s11252-013-0287-2
- Zeza, A., and Tasciotti, L. (2010). Urban agriculture, poverty, and food security: Empirical evidence from a sample of developing countries. *Food Policy* 35, 265–273. doi: 10.1016/j.foodpol.2010.04.007

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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