frontiers in Environmental Science

ORIGINAL RESEARCH
published: 02 June 2021
doi: 10.3389/fenvs.2021.591512

Unpacking Stakeholder Perceptions of the Benefits and Challenges Associated With Urban Greenspaces in Sub-Saharan Africa

Solène Guenat[1,2], *Gabriel Porras Lopez*[1,3], *David D Mkwambisi*[4] *and Martin Dallimer*[1]*

[1]*Sustainability Research Institute, School of Earth and Environment, University of Leeds, Leeds, United Kingdom,* [2]*University of Stuttgart, Institute of Landscape Planning and Ecology, Stuttgart, Germany,* [3]*Lincoln Law School, University of Lincoln, Lincoln, United Kingdom,* [4]*MUST Institute of Industrial Research and Innovation, Malawi University of Science and Technology, Limbe, Malawi*

Urban greenspaces underpin ecosystem service provision in cities and are therefore indispensable for human well-being. Nevertheless, they are increasingly disappearing from cities in Sub-Saharan Africa. Understanding how the stakeholders influencing urban greenspace management perceive the benefits provided by urban greenspaces and the challenges to its conservation and management is critical for reversing this trend. Using Malawi's capital city, Lilongwe, as a case study, we conducted 44 semi-structured interviews to explore the profiles and perceptions of stakeholders who currently hold influence over greenspace planning, conservation and management. Stakeholders with influence over urban greenspace management described the main focus of their organisation as relating to urban planning, natural resources protection and management, development work, or the hospitality business sector. Critically, only a third of all stakeholders focused on natural resources protection and management. Stakeholders had nuanced and varied appreciations of the benefits that greenspaces provide. Regulation and maintenance ecosystem services, as well as cultural services were frequently mentioned. However, provisioning services were mostly mentioned by those in development work. Stakeholders also identified an additional suite of societal benefits that do not directly map onto ecosystem service frameworks, such as the generation of financial income and the provision of employment opportunities. Challenges identified as hampering the planning, conservation and management of greenspaces included inappropriate urbanisation, lack of coordination and participation, and population growth. Lack of coordination was however not widely acknowledged among those focusing on natural resources protection, who conversely identified population growth more often than any other groups. Highlighting how stakeholders with varying priorities perceive ecosystem services a first step towards improving greenspaces management both for their better acceptation and for improving their potential for biodiversity conservation. Specifically, we bring attention to need for stakeholders working with natural resources protection to recognise more the need for collaborations and engagement. Additional research is also necessary to understand how those different

OPEN ACCESS

Edited by:
Riccardo Buccolieri, University of Salento, Italy

Reviewed by:
Rieke Hansen, Hochschule Geisenheim University, Germany
Alexis Vásquez, University of Chile, Chile

***Correspondence:**
Martin Dallimer
m.dallimer@leeds.ac.uk

Specialty section:
This article was submitted to Land Use Dynamics, a section of the journal Frontiers in Environmental Science

Received: *04 August 2020*
Accepted: *17 May 2021*
Published: *02 June 2021*

Citation:
Guenat S, Porras Lopez G, Mkwambisi DD and Dallimer M (2021) Unpacking Stakeholder Perceptions of the Benefits and Challenges Associated With Urban Greenspaces in Sub-Saharan Africa. Front. Environ. Sci. 9:591512. doi: 10.3389/fenvs.2021.591512

perspectives might be integrated into ongoing processes and procedures to manage greenspaces in Sub-Saharan Africa.

Keywords: ecosystem services, Malawi, urbanisation, urban planning, urban bluespace, green space, bluespace

INTRODUCTION

Natural components of cities, such as urban greenspaces, contribute many benefits to people, including maintaining biodiversity (Aronson et al., 2014), helping to mitigate urban heat island effects (Rizwan et al., 2008; Li et al., 2021; Wang et al., 2021) and improving residents' living conditions and health (Hartig et al., 2014; Nawrath et al., 2021). Effective conservation and management of greenspaces is therefore critical. Indeed, due to this diversity of benefits, greenspace conservation and management is increasingly included in urban planning strategies (Wilker et al., 2016; Afionis et al., 2020). However, this is not universal and as cities continue to expand across the world, greenspaces are often given a low priority by urban planners, policy and decision makers. This is particularly apparent in regions, such as sub-Saharan Africa, where urbanisation rates are faster than elsewhere (Seto et al., 2012). Here we define greenspace conservation and management to include any actions that could 1) retain greenspaces as cities expand; 2) ensure that existing greenspaces are not built on; or 3) restore or enhance the ability of greenspaces to contribute benefits to people or biodiversity. The breadth of these actions therefore means that a multitude of stakeholders are involved in, and impacted by, urban greenspaces conservation and management, such as non-governmental organisations (NGOs), businesses, and community organisations (Ernstson et al., 2010). Proper recognition of whether and how the benefits provided by urban greenspaces are perceived, in both monetary and non-monetary terms, by all stakeholders and might differ from the policy-makers' perceptions is essential for improving the acceptability of and the support for greenspace management (Elmqvist et al., 2015).

The ecosystem services concept (Haines-Young and Potschin, 2018) is widely used to communicate the benefits of greenspaces (Luederitz et al., 2015). However, this concept has largely emerged from discourses within Western academia and can, therefore, be perceived by practitioners as irrelevant to their context (Lindley et al., 2018). This is exacerbated by the fact that in some regions, including sub-Saharan Africa, there is still limited context-specific evidence that can be used to underpin the utility of the ecosystem services concept within urban areas (Du Toit et al., 2018).

Sub-Saharan Africa is also under-researched in terms of stakeholders involvement in urban greenspace planning, conservation and management (Fors et al., 2015), or the multiple values or health benefits of urban greenspaces (Botzat et al., 2016; Nawrath et al., 2021). The challenge of improving African greenspace conservation and management is, therefore, not only reliant on improving the evidence-base surrounding benefits, but on how we might alter planning and decision-making processes in order to integrate the needs and perceptions of all stakeholders while placing greater emphasis on the retention of high quality, accessible greenspaces. However, we do know that there tends to be low levels of cooperation from urban residents (Mensah, 2014) and a lack of holistic planning and insufficiently coordinated governmental systems and departments (Du Toit et al., 2018).

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 reasons depending on the local context, the socio-economic status of the population and the extent to which the population actively uses the greenspaces (Shackleton et al., 2015; Guenat et al., 2019). In common with high-income countries, cultural ecosystems services, such as space for recreation and aesthetics, are considered important (Adekunle et al., 2013), though residents hold different values for greenspaces that are perceived to have different functions, such as playgrounds or nature parks (Tibesigwa et al., 2020). Provisioning services, including urban agriculture or wood provision, can take on greater significance in some contexts (Shackleton et al., 2015; Du Toit et al., 2018), while regulating and maintenance services, such as shade provision and urban heat island mitigation are particularly prominent (Dumenu, 2013; Guenat et al., 2019). As there is such a diversity of viewpoints understanding which stakeholders perceive which benefits and how to best target them for involvement is critical.

Here we describe the perceptions that stakeholders with influence over greenspace conservation and management the rapidly expanding city of Lilongwe, Malawi hold for urban greenspaces. Specifically, we explore the stakeholders' profiles in term of the main focus of their work, their different roles and the levels of influence they have on greenspace planning, conservation and management. We go on to examine the main challenges and benefits that these stakeholders associate with urban greenspaces, and discuss how their understanding could be harnessed to improve the integration of greenspaces into planning and decision making.

RESEARCH DESIGN AND METHODS

Study area

Africa is urbanising rapidly, resulting in a loss of non-urban land uses surrounding cities (Seto et al., 2012), and of greenspaces within cities (Yao et al., 2019). Here, we define greenspaces to include bluespaces, and therefore to consist of all areas within towns and cities that are covered by vegetation or water (Taylor and Hochlui 2017). The processes of urbanisation, including greenspace loss, vary across the continent (Yao et al., 2019), but are notably different from patterns in high-income countries. Africa is urbanising faster than elsewhere (Seto et al., 2012) and

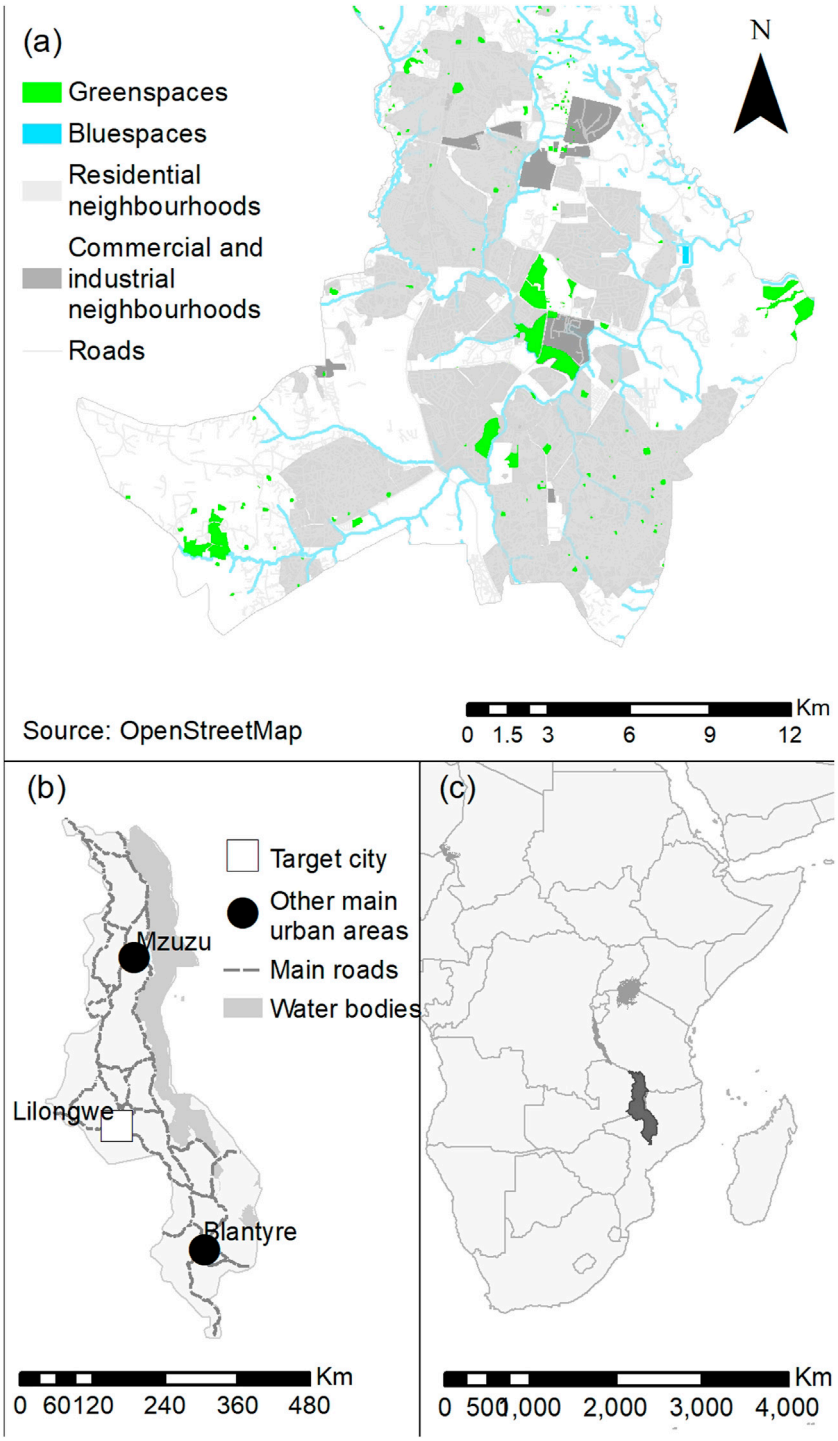

FIGURE 1 | The city of Lilongwe, showing neighbourhoods and greenspaces **(A)**; the location of Lilongwe within Malawi **(B)**; and the location of Malawi in Africa **(C)**.

changes in land use and population sizes is mostly concentrated in smaller cities (DESA, 2015). Further, recent urbanisation has not always been associated with economic growth (Turok and McGranahan, 2013). Therefore, research carried out in high-income contexts cannot be assumed to be directly relevant to African cities (McHale et al., 2013).

Malawi is urbanising at a rate of about 5% per year. The share of national population residing in urban areas has 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 urbanisation has led to many urban development challenges, of which access to, and the provision of, high quality urban greenspaces is among the most pressing. The difficulty of retrofitting greenspaces once urbanisation has occurred emphasises the need to incorporate an understanding of their multiple benefits into urban expansion plans (White et al., 2017). However to date, weak enforcement, inadequate resources for capacity building, and the fragmentary nature of policy development and review have limited the inclusion of urban greenspaces within urban expansion plans (UN-Habitat, 2011).

Lilongwe, the largest city in Malawi (**Figure 1**), has an annual growth rate of 4.3%. The city has witnessed rapid population growth since becoming the country's capital in 1975. From about 20,000 inhabitants in 1966, the population grew to around 700,000 in 2008 The population is projected to increase to over a million by 2030 (UN-Habitat, 2011), making it one of the fastest growing cities in Africa. Since becoming the capital, Lilongwe has had an accelerated and disorganised pattern of urban growth. This is exemplified by the fact that around three-quarters of Lilongwe's population lives in informal settlements (UN-Habitat, 2011).

Lilongwe's greenspaces are diverse and are threatened by environmental degradation, pollution and uncontrolled urban development taking place on protected parklands and river buffer zones (UN-Habitat, 2011; IIED and UNEP-WCMC, 2015). The city's greenspaces include, amongst other land uses/covers, forests, savannah woodlands, wetlands, botanical gardens, cemeteries, parks and recreational grounds as well as rivers and their associated riparian zones. With growing pressure on space, the areas in the city that have historically been reserved for greenspace have increasingly been at risk from both formal and unplanned or informal urban development. To address these current patterns of loss and degradation, part of the solution is to identify the potential for enabling a stakeholder engagement process that could underpin a change in how planning, conservation and management of Lilongwe's greenspaces takes place.

Data Collection

Participants were sampled across five stakeholder categories whose official aims were related to greenspaces, bluespaces and/or urban planning. These categories were: 1) Businesses; 2) Community Groups; 3) NGOs; 4) members of municipal/national authorities (Public Administration Bodies); and 5) Public Service Providers, such as land, housing and water. Participant recruitment was carried out through a snowball approach, taking multiple starting points within each category. For instance, for Public Service Providers we began with relevant contacts in both the housing and utilities sectors, ensuring, as far as is feasible, that we were able to reach stakeholders with a broad remit.

We were interested in participants own perceptions on urban greenspace conservation, management and planning. To capture this, we carried semi-structured interviews using a mix of closed and open form questions. Participants had the option to take part in the interview in either English or Chichewa, but all elected to carry out the interview in English. Snowball sampling was integrated into the interview protocol. Participants were asked to name as many other organisations who they thought had or influence over greenspace planning, conservation and management. We defined "influence" for the participants as both direct, e.g., a person who can impact what happens with greenspaces and land, and indirect, e.g., a person who can change what others do with greenspaces (Schiffer and Hauck, 2010). All organisations who were mentioned more than once were contacted by email or phone. If an organisation agreed to take part in the research, semi-structured interviews were then carried out. If no response was received, two follow up emails or phone calls were made before that organisation was not contacted further.

The remainder of the interview explored participants' perspectives on the challenges and benefits associated with urban greenspaces in Lilongwe. Firstly, participants were asked to profile their own organisation by providing the main roles that the organisation was involved in. We defined roles as any activities that the organisation officially undertook. Participants drew on mission statements, official documents and their own understanding of operational activities. Next, participants evaluated their own perception of the strength of influence on greenspace planning, conservation and management of their organisation, measured on a four-point scale (very little influence, a little influence, some influence, a lot of influence), each of which was qualitatively defined for the participant. To understand participants' perceptions on the challenges and benefits associated with urban greenspaces, participants were asked to describe, in their own words 1) the challenges facing greenspace planning, conservation and management; and 2) the benefits that greenspaces provide for wider society.

Ethics

Ethics approval for the research was granted by the University of Leeds ESSL, Environment and LUBS (AREA) Faculty Research Ethics Committee.

Data Analysis

Prior to analysis, all responses were anonymised. Data were analyzed using a mixed-method approach based on quantitative and qualitative techniques (Johnson et al., 2007), which helped us to generate unique insight into complex social phenomenon (Bhattacherjee, 2012). In particular, for open form questions we used a strategic perspectives analysis (Reed et al., 2009) to classify and categorise participant statements regarding the roles of their organisation, the challenges facing greenspace planning, conservation and management and the benefits that greenspaces provide for wider society. Classifications were discussed and agreed by the research team, and participants had the opportunity to comment on the accuracy of the classifications attributed to their, and other, organisations.

Participants' perceptions of the role of their organisations, and the perceived challenges to greenspace planning, conservation and management were deductively coded based on the language

TABLE 1 | Number of participants, organisations and examples of organisation types for each stakeholder category.

Stakeholder category	Number of individual participants	Number of organisations	Examples
Business	6	6	Hotels, plant nurseries, architecture companies
Community group	6	6	Education, sports, community farms, endowment trusts
Non-governmental organisation (NGO)	13	11	Advocacy, research, capacity building, conservation
Public administration body	12	7	Malawi government ministries, national park management, lilongwe city council
Public service provider	7	4	Housing, water
Total	44	34	

that the participants themselves used. These data were quantified by reporting the frequency with which the different codes were mentioned, with the importance of each role adjusted by the number of roles each participant mentioned. Responses to the levels of influence question were averaged across each stakeholder category. Data on the perception of the benefits provided by urban greenspaces were divided into ecosystem services {defined as "the contributions that ecosystems, [i.e. living systems] make to human well-being"; Haines-Young and Potschin, (2018)} and other societal benefits. Ecosystem services were further deductively coded and classified into the three sections and 13 of the divisions of the Common International Classification of Ecosystem Services (CICES; https://cices.eu/) framework (Haines-Young and Potschin, 2018). CICES differentiates between the ecosystem services themselves, (e.g. pollination) and the goods and benefits that are obtained from the services, (e.g. contributions to the yield of fruit crops). However, it is increasingly recognised that many such benefits might not easily fit within any ecosystem service framework (De Vreese et al., 2019). For instance, a societal benefit might be given as "improved health", but if the participant was not able to state whether the pathway to this benefit was thought to be *via* a Regulation and Maintenance service, such as pollution reduction, or a Cultural service, such as recreation then it is not possible to assign this benefit to an ecosystem service. Our analyses therefore retain the distinction between ecosystem services and "other societal benefits." We report the frequency with which the different ecosystem services, and the other societal benefits were mentioned.

RESULTS

Snowball sampling identified a total of 73 individuals, representing 68 organisations, (e.g. different departments within the same Public Administration Body or NGO) with some influence over greenspace planning, conservation and management. Of these, 48 were mentioned more than once and were contacted. Forty-four individuals, from 34 organisations, agreed to take part of in the study (**Table 1**). Of those that were mentioned a single time, all were either from NGOs or Public Administration Bodies, many of whom were different names from organisations that were already included in the research.

Stakeholder Profiles

Out of the 44 stakeholders who took part, over half worked either in an NGO (n = 13) or within a Public Administration Body (n = 12). Stakeholders from Public Service Providers (n = 7), Community Groups (n = 6) and Businesses (n = 6) made up the sample (**Figure 2**). Self-identified levels of influence varied. Public Administration Bodies were the stakeholder group with the highest number of participants self-identifying as having a lot of influence, whereas half of the community groups stated that they had very little influence (**Figure 2**).

Based on the organisation name and stakeholder descriptions of their organisations' roles, we classified each organisation into four categories according to their main focus. This focus was then used as a grouping for the rest of the analysis, hypothesising that stakeholder perspectives will vary according to their roles. The highest number of stakeholders (n = 15) worked for organisations focusing on urban planning. Those organisations mainly consisted of Public Services Providers (n = 6), Public Administration Bodies (n = 5) and Businesses (n = 3) (**Figure 2**). These organisations were mainly responsible "to provide land, housing and urban development services to the general public [and] to ensure that physical developments take place in an orderly and sustainable manner" (Public administration 3). As such, except for a handful who directly managed/created parks or other greenspaces, their impact on greenspaces was not direct, relating instead to how land is, or is not, allocated to urban greenspaces.

Fourteen stakeholders described their organisation's main focus as relating to natural resources protection and management. Most organisation with such focus were NGOs (n = 6) and Public Administrative Bodies (n = 4), though stakeholders from all categories were included (**Figure 2**). Such organisations clearly stated that they are "committed to conservation of wildlife and other natural resources as well as promotion of land management practices that are not detrimental to the environment" (NGO4). Their work encompasses conservation in urban areas, where they "ensur[e] the co-existence of human beings and nature" (NGO 4) and was conducted in a variety of ways. Example include outreach,

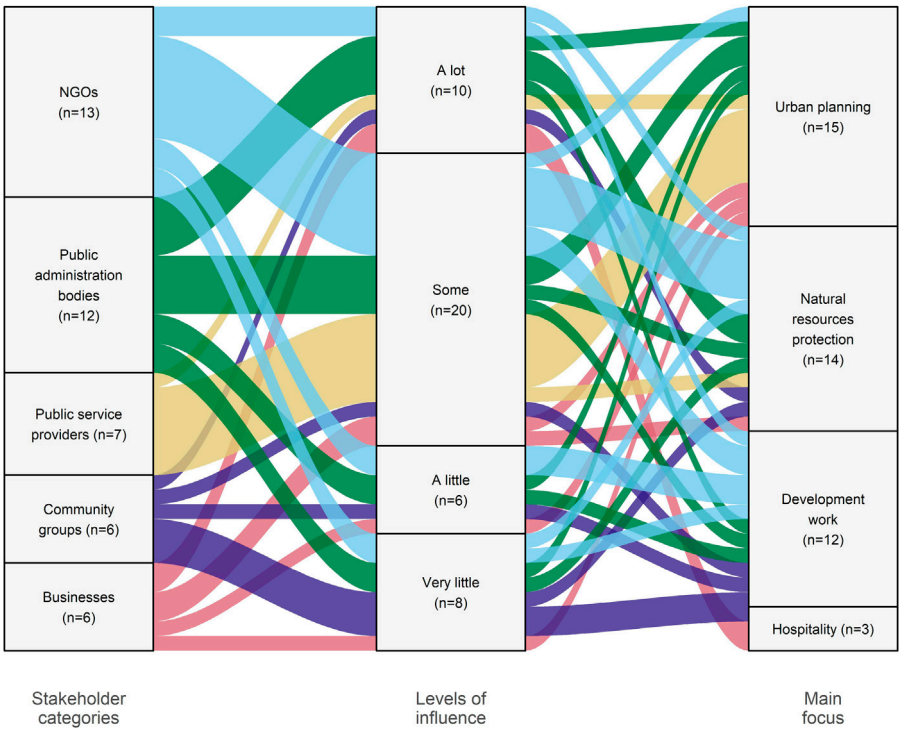

FIGURE 2 | Stakeholders' profiles, including their category, self-assigned level of influence and the main focus of their organisation. Colours of the flows are representative of the stakeholder categories.

with organisations "creating awareness of the importance of wildlife" (Public administration 6), to funding, with some of them responsible for "administer[ing] the endowment fund and other funds on behalf of the people of Malawi in order to provide sustainable support for improved environmental management" (Community Group 6), sales of plants or policy implementation, policy development and implementation, as one NGOs stated that their "previous goal was policy development, but they switched to implementation as they realised that good polices exist which are never put into action" (NGO 6).

Development work was the third main focus identified, with 12 stakeholders, half of whom were from NGOs (n = 6). No business was identified as doing development work. Such organisations focused on improving democracy and inclusion, as well as providing community empowerment and capacity building. Their work impacted urban greenspaces when working with initiatives on urban farming to "promot[ing] food security and income generation through the use of Malawi's local native food and resources" (Community 4), when devising disaster risk reduction strategies or when managing the socio-economic impact of climate change.

Finally, a small portion of the identified stakeholders were working in the hospitality sector (n = 3). Those stakeholders consisted of businesses (n = 2) managing hotel facilities and a community group (n = 1) promoting golf. As such, their impact on urban greenspaces was mainly related to their capacity to manage land directly.

Challenges for Greenspace Planning, Conservation and Management

The challenges associated with greenspace planning, conservation and management identified by the participants covered issues that pertain to the negative impacts of those greenspaces on surrounding human populations, such as pollution, crime and environmental degradation, as well as the challenges associated with ensuring that greenspaces are not lost or degraded in the face of increased urban development pressures. Challenges were classified into seven themes. These were: 1) pollution, with examples such as "solid waste is disposed of directly into streams and rivers; industries dispose of waste with little oversight" (NGO 6); 2) inappropriate urbanisation defined as urban development during which planning rules are not being followed; 3) population growth, leading to situations in which "trees are cut to provide space for new settlers" (Public Administration Body 6); 4) climate change; 5) lack of coordination, participation and public engagement, resulting in part from the fact that "there isn't much commitment from the government [. . .] which will lead to [greenspace] depletion in the long run" (NGO 5); 6) encroachment, as "if someone comes and settles in designated areas, it is not very easy to regularise that person" (Public Service Provider 3) and 7) demand for resources such as fuelwood, sand or water.

The challenge identified by the highest number of participants was "inappropriate urbanisation" (**Figure 3A**). Most challenges were identified by participants across stakeholders with all

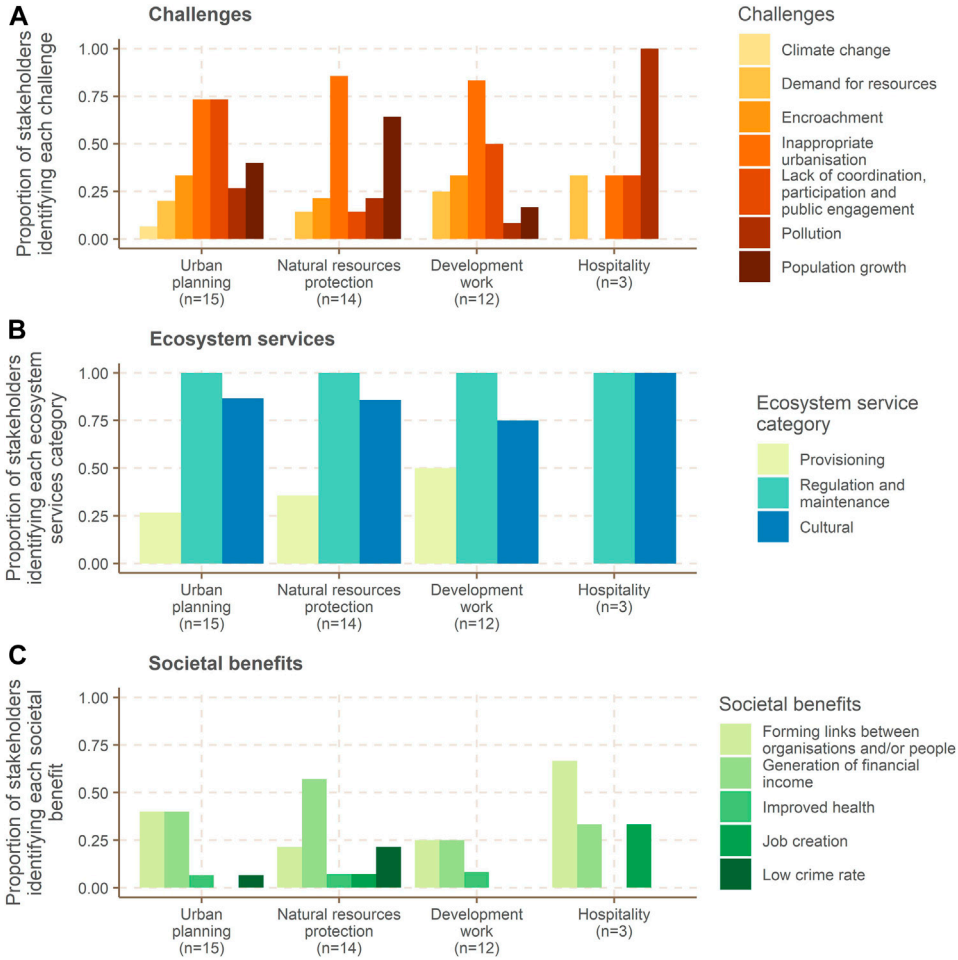

FIGURE 3 | Proportion of stakeholders with each focus identifying **(A)** challenges threatening appropriate greenspace management, **(B)** ecosystem services and **(C)** societal benefits provided by urban greenspaces. Stakeholders could report multiple challenges, ecosystem services and benefits.

focuses. The exceptions were for climate change and encroachment. Climate change was mentioned as a challenge by the fewest stakeholders, and only by those working in urban planning. Encroachment was not mentioned at all by stakeholders working in hospitality (**Figure 3A**). Most of the participants who stated that their organisation focused on natural resources protection did not identify the lack of coordination and public engagement as a challenge, despite some explicitly working on "coordinating sustainable management and conservation of the environment" (Public administration 6). Conversely, this challenge was perceived as important for a high proportion of participants whose organisation focused on urban planning and, to a lesser extent, on development work (**Figure 3A**). Overall, stakeholders working in urban planning perceived the most challenges associated with greenspaces. Out of the seven challenges identified, they named a median of three (range: 1–4) as compared to two for the others (ranges: 2-2 for hospitality, 2-3 for natural resources protection and 1-4 for development work).

Benefits of Urban Greenspaces

The challenges identified by participants were largely associated with poorly managed greenspaces, such as those suffering from a "lack of maintenance, [which] leads to issues of security" (Public Service Provider 3). In contrast, participants universally associated any benefits with well-maintained greenspaces, even if such maintenance was not always present.

Ecosystem services from all three sections of the CICES classification were identified. The most frequently identified ecosystem service section, mentioned by all stakeholders, was Regulation and Maintenance (**Figure 3B**). Examples included: greenspaces "act[ing] as carbon sinks, thereby mitigating impacts of greenhouse gases on the environment" (Public Service Provider 4) or bluespaces in particular having "importance [. . .] for the management of floodwater" (Business 1).

Cultural ecosystem services were also frequently mentioned by stakeholders with all focuses, though with slightly fewer mentions

TABLE 2 | Proportion of stakeholders with each focus identifying each CICES ecosystem services division. Light shading indicates proportions closer to zero, representing low recognition of the challenge, whereas darker shading indicates proportions closer to one, representing high recognition.

Ecosystem services			Main focus				
Sections	Divisions	Codes	Urban planning	Natural resources protection and management	Development work	Hospitality	Total
	Number of participants		15	14	12	3	44
Provisioning	Biomass	1.1	0.40	0.36	0.50	0.00	0.39
	Genetic material from plants, algae or fungi	1.2	0.33	0.00	0.00	0.00	0.11
	Other types of provisioning service from biotic sources	1.3	0.00	0.07	0.00	0.00	0.02
Regulation and maintenance	Transformation of biochemical of physical inputs to ecosystems	2.1	0.27	0.36	0.08	0.00	0.23
	Regulation of physical, chemical, biological conditions	2.2	1.00	0.93	0.92	1.00	0.95
	Other types of regulation and maintenance service by living processes	2.3	0.00	0.00	0.00	0.00	0.00
Cultural	Cultural services (unspecified)	3	0.00	0.00	0.08	0.00	0.02
	Direct, *in-situ* and outdoor interactions with living systems that depend on presence in the environmental setting	3.1	0.73	0.64	0.33	0.00	0.55
	Indirect, remote, often indoor interactions with living systems that do not require presence in the environmental setting	3.2	0.13	0.57	0.25	0.67	0.34
	Other characteristics of living systems that have cultural significance	3.3	0.00	0.07	0.00	0.33	0.05

by stakeholders focusing on development work (**Figure 3B**). Most emphasis was given to the direct interactions with the living environment. Greenspaces were seen to offer places for education, for instance to provide training or lessons on agroforestry practices or environmental issues with practical examples, for refuge, "a space for people to use if there is a crisis or disaster" (NGO 6), as a "tourist site [with] a unique touch which is more attractive than pavements and concrete" (Business 3) or as a space to "provide recreation to the general public" (Public Service Provider 2). Indirect interactions with greenspaces were also critical. Greenspaces were perceived to offer opportunities for education "create appropriate messaging to inform and promote collective action and responsibility" (Community Group 6).

Provisioning services were mentioned the fewest times (**Figure 3**). Half of the stakeholders focusing on development work recognised them as important, such as the provision of biomass through agriculture (division 1.1; **Table 2**), perceived critical to "promot[e] food security [. . .] through the use of Malawi's native foods and resources" (Community Group 4). In addition to the outputs of farming, products harvested included medicinal plants, honey, fish, fuelwood and "tree felling for construction" (Public Administration Body 2), even though some noted that "there should be alternatives [. . .] instead of cutting trees" (Public Administration Body 1). Only 25% of the stakeholders focusing on urban planning mentioned provisioning services, and no stakeholders working in the hospitality sector did so.

Although mentioned substantially less frequently, not all benefits identified by the participants fitted the CICES ecosystem services framework. Other societal benefits identified included job creation, generating financial income, decreasing crime rates, improving health, and forming and strengthening of links between organisations and people. In the CICES classification, improving health and forming/strengthening of links are considered as benefits derived from ecosystems, rather than ecosystem services in their own right. Out of the five societal benefits identified, generation of financial income was mentioned most frequently (**Figure 3C**). However, there were disparities as to how frequently it was identified, with more than half of those working on natural resources protection and management mentioning it, as opposed to only 25% percent of those focusing on development work (**Figure 3C**). This was followed by "forming and strengthening links between organisations/people", described as "coordinating all sectors that deal with the environment, natural resources, climate and pollution" (Public administration 6), mentioned 16 times.

Participants that identified the most benefits from urban greenspaces, both in terms of ecosystem services and other societal benefits, were the ones who stated their organisation had the lowest amount of influence and thus the fewest opportunities to promote or enhance such benefits. Overall, stakeholders working with natural resources protection and urban planning were those who perceived the most benefits from greenspaces. Indeed, out of the nine CICES ecosystem divisions (**Table 2**) and five societal benefits identified (**Figure 3C**), both groups identified a median of 4 (range: 1–6 for urban planning and 0–7 for natural resources), as opposed to 3 (range: 3–4) for those working in hospitality and 2 (range: 1–6) for those focusing on development work.

DISCUSSION

Conserving urban greenspaces in regions undergoing significant levels of urbanisation, such as Sub-Saharan Africa, is paramount

as they underpin the provision of multiple ecosystem services. Here, we identify stakeholders with influence over urban greenspace planning, conservation and management in Lilongwe, Malawi. We untangle what benefits and challenges they perceive to be associated with urban greenspaces, and, therefore the potential implications for greenspace planning, conservation and management. Throughout, it is important to remember that stakeholders with varied priorities are omnipresent (Mills et al., 2014; Ferreira et al., 2020). It is also essential to involve a diversity of priorities in order to be able to implement socially just urban greenspace planning, conservation and management (Zuniga-Teran and Gerlak, 2019). Improving both environmental and societal outcomes thus requires a more complete understanding of the variety of perspectives of those involved (Reed et al., 2009).

Aligned with this general tenet, in Lilongwe, there were a wide variety of stakeholders who considered that they have some influence over urban greenspace planning, conservation and management. However, only a third of these had a primary focus of natural resources protection. Stakeholders with other main focusses often held views that could be at odds with the importance of urban greenspaces for ecosystem services provision. For instance, stakeholders doing development work primarily viewed greenspaces as a source of food production, while those in other sectors frequently mentioned the importance of income generation and job creation. This raises the prospect that greenspaces might be disregarded as decisions are made regarding how the city urbanises. This is compounded by the fact that, although the amount of influence different stakeholders think that they have varied considerably, most of those with high self-assigned influence levels did not have their main focus on natural resources protection.

Nonetheless, across all stakeholders, there was a broad understanding that urban greenspaces did provide benefits for wider society. We showed an overall understanding of regulating ecosystem services across stakeholders, especially air temperature regulation and water filtration services. This contrasts with some other African contexts in which these benefits were not well recognised (Gwedla and Shackleton, 2019). In general, the importance of regulating services in Sub-Saharan Africa are relatively well known compared to other ecosystem sections (Du Toit et al., 2018). Protection of regulating services might therefore provide a consensus message across the population (Guenat et al., 2019). Cultural services were also mentioned by most stakeholders. Cultural ecosystem services that were identified related to those aspects of greenspaces that involve directly spending time outdoors and interacting with the greenspaces. This reflects other results on the perceptions of urban ecosystem services in Sub-Saharan Africa (Adekunle et al., 2013; Dumenu, 2013), which highlight an increasing recognition of the value that residents in African cities place on greenspaces that they are able to use (Tibesigwa et al., 2020).

Despite some consensus, there were, however, discrepancies in the perceptions of ecosystem services. Provisioning services were only emphasised by those focusing on development work. Stakeholders in urban planning and hospitality, for instance, tended not to mention that greenspaces could be used for this purpose. This is particularly critical as urban agriculture is known to contribute to food security (Mkwambisi et al., 2011). As the impact of the hospitality sector was direct through greenspace management and that of the urban planners had a city-wide scope, their lack of recognition of provisioning services might put them at odds with development work, and potentially lead to a prioritisation of easily maintained greenspaces, leading to a homogenisation of urban greenspaces (Wheeler et al., 2017) as well as putting them at odds with organisations involved with development work who might speak for communities.

We highlighted that not all benefits perceived to be provided by urban greenspaces fit the ecosystem services framework. This indicates that there are discrepancies between the ecosystem service framework and stakeholders' perception of their natural environment (De Vreese et al., 2019). Some of the identified societal benefits, such as the "generation of financial income" provided by greenspaces, is commonly understood, for instance, through the provision of timber, minerals or tourism opportunities (Brown and Reed, 2000). Recognition of the generation of financial income from urban greenspaces, especially by those focusing on natural resources management, also points toward risks of prioritising economic growth over urban greenspaces, an issue which is leading to a substantial loss of urban greenspaces (Cobbinah and Darkwah, 2016). Financial considerations are a paramount issue in greenspace planning, conservation and management (Guenat et al., 2020; Munyati and Drummond, 2020), and prioritisation of economic growth will inevitably result in complex trade-offs with other societal and environmental benefits.

It was less clear the pathways though which other societal benefits, such as locations for holding events and bringing people together, were directly linked to ecosystem services *per se* beyond the fact that the greenspace provided a location for activities to take place, or a topic around which issues could be discussed. The additional societal benefits that were identified could further contribute to improving greenspace planning, conservation and management by illustrating a greater range of incentives to underpin stakeholder engagement and, therefore, strengthen greenspace planning, conservation and management (Costanza, 2000; Schmidt et al., 2016). For instance, crime tends to be associated with degraded and poorly maintained greenspaces, and negative perceptions of crime in greenspaces is common across Africa (Shackleton and Blair, 2013; Guenat et al., 2019). There is therefore a clear societal benefit of improving greenspace management so that perceptions of crime are subsequently likely to decrease. Additionally, some of the societal benefits reflect direct contributions of nature to human well-being such as security, health or good social relationships, that are recognised as benefits derived from ecosystem services, though not as ecosystem services themselves (Schmidt et al., 2016; Haines-Young and Potschin, 2018). This has the potential to broaden the common ground among stakeholders across multiple social goals, potentially leading to improved levels of collaboration. Indeed, the multi-functionality of the urban landscape, the level of human involvement and the diversity of potential pathways linking greenspaces to societal benefits

suggests that greater emphasis should be placed on studying these pathways through a socio-ecological systems perspective (Beichler et al., 2017).

The main challenges for urban greenspace management, which were identified across stakeholders, were: inappropriate urbanisation, population growth, and a lack of coordination, participation and public engagement. These are common challenges for many cities in Africa (Cobbinah and Darkwah, 2016). indeed in facing fast-growing urban areas prime land for urban development is often not protected (Herslund et al., 2018) (Zezza and Tasciotti, 2010). However, not all challenges were mentioned equally. For instance, although lack of coordination, participation and public engagement was seen as critical by urban planners, it was barely mentioned by those working on natural resources protection and management. This is despite the fact that participation in urban planning is included in relevant legislation in Malawi. Indeed the Malawian Land Policy promotes participation in the planning process (Ministry of Lands, 2002) and NGOs are routinely consulted during policy development. Further, the challenge of climate change was mentioned by the fewest stakeholders, and then only by those working in urban planning. This is despite the role that greenspaces could play in mitigating climate change, and the importance of mitigation activities in national and international policy agendas. There is, therefore, an opportunity for enhanced greenspace planning, conservation and management via improved alignment with climate change agendas, policies and strategies.

One route through which policy development can be influenced is environmental advocacy. This is considered an essential activity in Malawi, especially for addressing the lack of transparency and accountability related to land management (CEPA, 2016). Despite this, stakeholders who did describe that environmental advocacy was part of their work also tended to perceive that they had a relatively low level of influence on greenspace management. Many of these stakeholders were based in NGOs, so this could, in part, be attributed to the fact that the role of NGOs tends to be disregarded by those working in public administration who hold the ultimate responsibility for developing and implementing policy (Guenat et al., 2020). This disregard for the wider network of stakeholders, together with the fact that stakeholders also identified that there was a lack of coordination at the city level, can ultimately lead to exacerbating the situation whereby greenspaces are routinely excluded from, or undervalued in, policy and decision making. A further challenge for Malawi in particular is that there is limited accountability between political decision-making and the general public (Chasukwa et al., 2014).

CONCLUSION

Integrating the diversity of stakeholders' perceptions in urban greenspace planning, conservation and management is likely to considerably improve both the outcome of such management, and how acceptable resulting changes are. By detailing which ecosystem services and societal benefits are widely perceived to be important as well as differences according the stakeholders' main focus, we highlight that stakeholders value a broad diversity of services. However, we also identified that enhancing greenspaces for ecosystem service provision is not the main focus of most stakeholders. Nevertheless, identifying which ecosystem services do align with stakeholder goals is a first step toward enabling stakeholder engagement for improving the management of greenspaces, their related ecosystem services, and societal benefits. More research to understanding how this might be integrated into ongoing processes and procedures in Sub-Saharan Africa is required.

DATA AVAILABILITY STATEMENT

The anonymised summary data supporting the conclusion of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the ESSL, Environment and LUBS (AREA) Faculty Research Ethics Committee, University of Leeds. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MD, DM conceived the analysis and collected the data. GL and SG analyzed the data. All authors contributed to writing the paper.

FUNDING

Research was funded by grant number NE/R002681/1 from the United Kingdom government's Natural Environment Research Council (NERC).

ACKNOWLEDGMENTS

We thank all of our participants.

REFERENCES

Adekunle, M. F., M, F., Agbaje, V. O., B, M., Kolade, fnm., and V, O. (2013). Public Perception of Ecosystem Service Functions of Peri - Urban forest for Sustainable Management in Ogun State. *Afr. J. Environ. Sci. Technol.* 7, 410–416. doi:10.5897/AJEST201210.5897/ajest2012.1411

Afionis, S., Mkwambisi, D. D., and Dallimer, M. (2020). Lack of Cross-Sector and Cross-Level Policy Coherence and Consistency Limits Urban Green Infrastructure Implementation in Malawi. *Front. Environ. Sci.* 8, 558619. doi:10.3389/fenvs.2020.558619

Aronson, M. F. J., La Sorte, F. A., Nilon, C. H., Katti, M., Goddard, M. A., Lepczyk, C. A., et al. (2014). A Global Analysis of the Impacts of Urbanization on Bird and Plant Diversity Reveals Key Anthropogenic Drivers. *Proc. R. Soc. B.* 281, 20133330. doi:10.1098/rspb.2013.3330

Beichler, S. A., Bastian, O., Haase, D., Heiland, S., Kabisch, N., and Müller, F. (2017). Does the Ecosystem Service Concept Reach its Limits in Urban Environments? *Landscape. Online.* 51, 1–22. doi:10.3097/LO.201751

Bhattacherjee, A. (2012). *Social Science Research: Principles, Methods, and Practices*. Book 3 in Textbooks Collection, Global Text Project.

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

Brown, G., and Reed, P. (2000). Validation of a Forest Values Typology for Use in National Forest Planning. *For. Sci.* 46, 240–247. doi:10.1093/forestscience/46.2.240

CEPA (2016). *Centre for Environmental Policy and Advocacy. Advocacy Strategy 2016-2020*. Malawi: Linongwe.

Chasukwa, M., Chiweza, A. L., and Chikapa-Jamali, M. (2014). Public Participation in Local Councils in Malawi in the Absence of Local Elected Representatives-Political Eliticism or Pluralism? *J. Asian Afr. Stud.* 49, 705–720. doi:10.1177/0021909613509218

Cobbinah, P. B., and Darkwah, R. M. (2016). African Urbanism: the Geography of Urban Greenery. *Urban Forum* 27, 149–165. doi:10.1007/s12132-016-9274-z

Costanza, R. (2000). Social Goals and the Valuation of Ecosystem Services. *Ecosystems* 3, 4–10. doi:10.1007/s100210000002

De Vreese, R., Van Herzele, A., Dendoncker, N., Fontaine, C. M., and Leys, M. (2019). Are Stakeholders' Social Representations of Nature and Landscape Compatible with the Ecosystem Service Concept? *Ecosystem Serv.* 37, 100911. doi:10.1016/j.ecoser.2019.100911

DESA (2015). World Urbanization Prospects, the 2014 Revision. Available at: https://esa.un.org/unpd/wup/Publications/Files/WUP2014-Report.pdf (Accessed May 7, 2018). New York, USA: United Nations.

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

Dumenu, W. K. (2013). What Are We Missing? Economic Value of an Urban forest in Ghana. *Ecosystem Serv.* 5, 137–142. doi:10.1016/J.ECOSER.2013.07.001

Elmqvist, T., Setälä, H., Handel, S., van der Ploeg, S., Aronson, J., Blignaut, J., et al. (2015). Benefits of Restoring Ecosystem Services in Urban Areas. *Curr. Opin. Environ. Sustainability* 14, 101–108. doi:10.1016/j.cosust.2015.05.001

Ernstson, H., Barthel, S., Andersson, E., and Borgström, S. T. (2010). Scale-crossing Brokers and Network Governance of Urban Ecosystem Services: the Case of Stockholm. *Ecol. Soc.* 15, 28. doi:10.5751/es-03692-150428

Ferreira, V., Barreira, A., Loures, L., Antunes, D., and Panagopoulos, T. (2020). Stakeholders' Engagement on Nature-Based Solutions: A Systematic Literature Review. *Sustainability* 12, 640. doi:10.3390/su12020640

Fors, H., Molin, J. F., Murphy, M. A., and Konijnendijk van den Bosch, C. (2015). User Participation in Urban green Spaces - for the People or the parks? *Urban For. Urban Green.* 14, 722–734. doi:10.1016/j.ufug.2015.05.007

Government of Malawi (2019). National Urban Policy. Available at: http://finance.gov.mw/index.php/blog/documents/debt-aid?download=3:2019-april-national-urban-policy-signed (Accessed June, 2020).

Guenat, S., Dougill, A. J., and Dallimer, M. (2020). Social Network Analysis Reveals a Lack of Support for Greenspace Conservation. *Landscape Urban Plann.* 204, 103928. doi:10.1016/j.landurbplan.2020.103928

Guenat, S., Dougill, A. J., Kunin, W. E., and Dallimer, M. (2019). Untangling the Motivations of Different Stakeholders for Urban Greenspace Conservation in Sub-saharan Africa. *Ecosystem Serv.* 36, 100904. doi:10.1016/j.ecoser.2019.100904

Gwedla, N., and Shackleton, C. M. (2019). Perceptions and Preferences for Urban Trees across Multiple Socio-Economic Contexts in the Eastern Cape, South Africa. *Landscape Urban Plann.* 189, 225–234. doi:10.1016/J.LANDURBPLAN.2019.05.001

Haines-Young, R., and Potschin, M. (2018). Common International Classification of Ecosystem Services (CICES) V5.1 Guidance on the Application of the Revised Structure. Available at: www.cices.eu (Accessed October 24, 2018).

Hartig, T., Mitchell, R., De Vries, S., and Frumkin, H. (2014). Nature and Health. *Annu. Rev. Public Health* 35, 207–228. doi:10.1146/annurev-publhealth-032013-182443

Herslund, L., Backhaus, A., Fryd, O., Jørgensen, G., Jensen, M. B., Limbumba, T. M., et al. (2018). Conditions and Opportunities for green Infrastructure - Aiming for green, Water-Resilient Cities in Addis Ababa and Dar Es Salaam. *Landscape Urban Plann.* 180, 319–327. doi:10.1016/j.landurbplan.2016.10.008

IIED, and UNEP-WCMC (2015). *Stories of Change: Mainstreaming Biodiversity and Development*. London: IIED.

Johnson, R. B., Onwuegbuzie, A. J., and Turner, L. A. (2007). Toward a Definition of Mixed Methods Research. *J. Mixed Methods Res.* 1, 112–133. doi:10.1177/1558689806298224

Li, X., Stringer, L. C., and Dallimer, M. (2021). The Spatial and Temporal Characteristics of Urban Heat Island Intensity: Implications for East Africa's Urban Development. *Climate* 9, 51. doi:10.3390/cli9040051

Lindley, S., Pauleit, S., Yeshitela, K., Cilliers, S., and Shackleton, C. (2018). Rethinking Urban Green Infrastructure and Ecosystem Services from the Perspective of Sub-Saharan African Cities. *Landscape Urban Plann* 180, 328–338. doi:10.1016/j.landurbplan.2018.08.016

Luederitz, C., Brink, E., Gralla, F., Hermelingmeier, V., Meyer, M., Niven, L., et al. (2015). A Review of Urban Ecosystem Services: Six Key Challenges for Future Research. *Ecosystem Serv.* 14, 98–112. doi:10.1016/j.ecoser.2015.05.001

McHale, M. R., Bunn, D. N., Pickett, S. T., 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

Mensah, C. A. (2014). Destruction of Urban Green Spaces: A Problem beyond Urbanization in Kumasi City (Ghana). *American. J. Environment. Protection.* 3, 1–11. doi:10.11648/j.ajep.20140301.11

Mills, M., Álvarez-Romero, J. G., Vance-Borland, K., Cohen, P., Pressey, R. L., Guerrero, A. M., et al. (2014). Linking Regional Planning and Local Action: towards Using Social Network Analysis in Systematic Conservation Planning. *Biol. Conservation* 169, 6–13. doi:10.1016/J.BIOCON.2013.10.015

Ministry of Lands (2002). *Malawi National Land Policy*. Lilongwe.

Mkwambisi, D. D., Fraser, E. D. G., and Dougill, A. J. (2011). Urban Agriculture and Poverty Reduction: Evaluating How Food Production in Cities Contributes to Food Security, Employment and Income in Malawi. *J. Int. Dev.* 23, 181–203. doi:10.1002/jid.1657

Munyati, C., and Drummond, J. H. (2020). Loss of Urban green Spaces in Mafikeng, South Africa. *World Develop. Perspect.* 19, 100226. doi:10.1016/j.wdp.2020.100226

Nawrath, M., Guenat, S., Elsey, H., and Dallimer, M. (2021). Exploring Uncharted Territory: Do Urban Greenspaces Support Mental Health in Low- and Middle-Income Countries? *Environ. Res.* 194, 110625. doi:10.1016/j.envres.2020.110625

Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., et al. (2009). Who's in and Why? A Typology of Stakeholder Analysis Methods for Natural Resource Management. *J. Environ. Manage.* 90, 1933–1949. doi:10.1016/j.jenvman.2009.01.001

Rizwan, A. M., Dennis, L. Y. C., and Liu, C. (2008). A Review on the Generation, Determination and Mitigation of Urban Heat Island. *J. Environ. Sci.* 20, 120–128. doi:10.1016/S1001-0742(08)60019-4

Schiffer, E., and Hauck, J. (2010). Net-Map: Collecting Social Network Data and Facilitating Network Learning through Participatory Influence Network Mapping. *Field methods* 22, 231–249. doi:10.1177/1525822X10374798

Schmidt, K., Sachse, R., and Walz, A. (2016). Current Role of Social Benefits in Ecosystem Service Assessments. *Landscape Urban Plann.* 149, 49–64. doi:10.1016/J.LANDURBPLAN.2016.01.005

Seto, K. C., Güneralp, B., and Hutyra, L. R. (2012). Global Forecasts of Urban Expansion to 2030 and Direct Impacts on Biodiversity and Carbon Pools. *Proc. Natl. Acad. Sci.* 109, 16083–16088. doi:10.1073/pnas.1211658109

Shackleton, C. M., and Blair, A. (2013). Perceptions and Use of Public green Space Is Influenced by its Relative Abundance in Two Small Towns in South Africa. *Landscape Urban Plann.* 113, 104–112. doi:10.1016/j.landurbplan.2013.01.011

Shackleton, S., Chinyimba, A., Hebinck, P., Shackleton, C., and Kaoma, H. (2015). Multiple Benefits and Values of Trees in Urban Landscapes in Two Towns in Northern South Africa. *Landscape Urban Plann.* 136, 76–86. doi:10.1016/j.landurbplan.2014.12.004

Taylor, L., and Hochuli, D. F. (2017). Defining Greenspace: Multiple Uses across Multiple Disciplines. *Landscape Urban Plann.* 158, 25–38. doi:10.1016/j.landurbplan.2016.09.024

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

Turok, I., and McGranahan, G. (2013). Urbanization and Economic Growth: The Arguments and Evidence for Africa and Asia. *Environ. Urbanization* 25, 465–482. doi:10.1177/0956247813490908

UN-Habitat (2011). *Malawi: Lilongwe Urban Profile*. Nairobi, Kenya: United Nations Human Settlements Programme (UN-HABITAT).

Wang, X., Dallimer, M., Scott, C. E., Shi, W., and Gao, J. (2021). Tree Species Richness and Diversity Predicts the Magnitude of Urban Heat Island Mitigation Effects of Greenspaces. *Sci. Total Environ.* 770, 145211. doi:10.1016/j.scitotenv.2021.145211

Wheeler, M. M., Neill, C., Groffman, P. M., Avolio, M., Bettez, N., Cavender-Bares, J., et al. (2017). Continental-scale Homogenization of Residential Lawn Plant Communities. *Landscape Urban Plann.* 165, 54–63. doi:10.1016/j.landurbplan.2017.05.004

White, R., Turpie, J., and Letley, G. (2017). Greening Africa's Cities: Enhancing the Relationship between Urbanization, Environmental Assets and Ecosystem Services. Available at: www.worldbank.org (Accessed July 18, 2017). doi:10.1596/26730

Wilker, J., Rusche, K., and Rymsa-Fitschen, C. (2016). Improving Participation in Green Infrastructure Planning. *Plann. Pract. Res.* 31, 229–249. doi:10.1080/02697459.2016.1158065

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 Observation Geoinformation* 75, 44–53. doi:10.1016/J.JAG.2018.10.011

Zezza, 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

Zuniga-Teran, A., and Gerlak, A. (2019). A Multidisciplinary Approach to Analyzing Questions of Justice Issues in Urban Greenspace. *Sustainability* 11, 3055. doi:10.3390/su11113055

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.