Environmental worldviews and attitudes of public-sector urban planners in shaping sustainable urban development: the case of South Africa

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Public-sector urban planners are essential role-players in the development of sustainable cities. However, there is relatively little understanding of their perceptions of sustainability generally and how or where they obtain information and knowledge around urban sustainability, especially in the Global South. This study, therefore, adopted a mixed-methods approach, employing both an online survey (34 valid respondents) and eight in-depth interviews (together spanning 31 different municipalities), to assess the knowledge, attitudes, and worldviews (based on the New Ecological Paradigm scale) of public-sector planners in South Africa. Generally, the planners held ecocentric worldviews and acknowledged the importance of sustainable urban development and the need to understand urban ecological dynamics and principles in planning and urban greening. However, they also identified a range of factors that hinder their ability to plan for sustainable futures, including institutional flaws, politics and misaligned development goals. Most felt that the extent and distribution of urban green infrastructure in their municipality was below what they deemed as ideal, although the majority were unaware of national guidelines in this respect. Consequently, perceptions and worldviews appeared to be misaligned with what is prioritized and implemented. Therefore, environmental issues and ecological principles need to be better communicated to public-sector urban planners.

KEYWORDS

ecosystem services, sustainable development, urban ecology, urban green space, urban planning

1 Introduction

Urban planning theory and practice are at the forefront of creating sustainable cities for the future (Jabareen, 2006). What is a planned today is likely to be around for decades, if not centuries, to come. Hence, it is necessary that urban planners are aware and make use of the latest knowledge and frameworks around urban sustainability. On the one hand, this is a daunting requirement because the field of urban sustainability is a rapidly developing discipline (Wu, 2014), yet on the other hand it is rewarding because urban planners are able to contribute to a more sustainable future.

A central facet of urban sustainability relates to the interdependence of the social, economic and environmental spheres. Historically, the environmental dimensions of urban sustainability were focused on brown issues, such as air and water pollution, waste disposal and sanitation (Childers et al., 2015). This has shifted over the last two to three

decades with a rapidly growing acknowledgement that green issues are equally important for urban sustainability and human health (Wu, 2014; Childers et al., 2015; Puchol-Salort et al., 2021). Green issues relate to the extent, accessibility and quality of urban blue-green infrastructure (UGI) to provide for human-nature interactions and ecosystem services, which are crucial for human physical and mental health (Konijnendijk et al., 2023), ecosystem functioning and urban biodiversity (Wu, 2014).

The recognition of the vital roles played by UGI and the ecosystem services it provides for urban sustainability is transforming urban planning theory and practice (Childers et al., 2015; Cilliers et al., 2021; Puchol-Salort et al., 2021). For example, the development and use of planning principles to better incorporate UGI into urban planning (Monteiro et al., 2022), or nature-based solutions, such as for stormwater management (Zölch et al., 2017). However, the rate at which it is doing so is variable between and within different regions of the world (e.g., Lam and Conway, 2018). This is partially a result of variable knowledge levels and visions of urban planners, as well as the mandates and visions of the urban authorities for whom they work. For example, van Zyl et al. (2021) argue that low ecological literacy amongst urban planners in South Africa hinders the development of any urban planning practice founded on ecological imperatives. Similar situations have been reported in Finland (di Marino et al., 2019) and Italy (La Rosa, 2019), whilst Wang et al. (2016) argue the need for "ecological wisdom" amongst planners to drive planning for sustainability. The integration of urban ecology principles and UGI into urban planning practice is particularly challenging in situations of rapid urban growth (Cilliers et al., 2021). Rapid urban growth, as seen in many Global South cities and towns, undermines the ability to plan proactively, resulting in rapid land transformation, frequent loss of UGI, urban sprawl and informal settlements.

Despite the benefits of UGI and its associated ecosystem services being increasingly emphasized, UGI has declined in many countries (e.g., Lin et al., 2015; Cobbinah and Darkwah, 2016; Nazombe and Nambazo, 2023). Cobbinah and Darkwah (2016) argue that there has been a global decline in the provision and maintenance of UGI as it is converted to other land uses to meet the needs of increasing urban populations. Semeraro et al. (2021) attribute the lack of integration of UGI into urban planning to insufficient knowledge of its benefits, costs, and impacts. This is particularly marked in Global South regions experiencing very rapid rates of urban growth, including South Africa. Lindley et al. (2018) argue that the disparity between sustainability priorities and incorporating sustainability principles between the Global North and Sub-Saharan African countries results from insufficient capacity within Global South countries. Furthermore, conceptual principles and examples in the literature are based on the Global North and, therefore, not necessarily suited to the reality of the Global South (Lindley et al., 2018; van Zyl et al., 2021).

In this respect, our study builds on that of van Zyl et al. (2021) in South Africa, who recently assessed the worldviews of urban planners (80% of whom were from the private sector), reporting that they had predominantly ecocentric worldviews, meaning they accept an ethical responsibility to conserve nature and promote environmental sustainability. However, the planners had limited knowledge about ecological concepts, dynamics and principles, despite emphasizing the importance of planning for ecosystem services. Furthermore, they found that the concept of ecosystem services was rarely included in private-sector planning activities. However, the planners indicated that recommendations by specialists such as urban ecologists were influential in consideration of ecological approaches. Yet, private-sector planners have different resources and mandates to public-sector ones, which is not reflected in the van Zyl et al. (2021) study. Therefore, we build on the work on van Zyl et al. (2021) by determining public-sector, urban planners' knowledge, attitudes, and worldviews concerning contemporary environmental challenges and sustainable urban development and how these may vary across different urban contexts and respondent attributes. This was achieved through addressing three research questions: (1) From what sources are public-sector urban planners informed about sustainable urban development? (2) What are the priorities of public-sector urban planners in different urban contexts? (3) What are the knowledge, worldviews, and attitudes of public-sector urban planners regarding the importance of urban greening, biodiversity, ecosystem services, human wellbeing, and sustainable urban development in the face of contemporary environmental challenges? In this study, public sector relates to urban planners that are employed by local, metropolitan or district governments, whereas private sector planners are employed in organizations other than government (such as businesses, consultancies, civic organizations, etc.).

2 Methods

2.1 Study area

South Africa has a population of just over 60 million people, of which 67% are considered urban (O'Neill, 2022). The proportion living in urban centers has increased markedly since the early 1990s after the end of the former apartheid regime with its race-based laws that restricted movement and residency of Black South Africans (Bakker et al., 2020). It is growing at ~2% per annum (compared to the national growth rate of ~1.4% p.a.). There are 240 urban areas across South Africa, 238 of which have a population exceeding 15,000 (City Population, n.d.). In 2015 the poverty level in South Africa was reported to be 55% (Statistics South Africa, 2017). Furthermore, in 2019, 13% of households were reported to live in informal settlements (South African Government, n.d.), with it being marginally higher in metropolitan areas (17%) (South African Government, n.d.).

Berrisford (2011) and van Zyl et al. (2021) highlighted the importance of South Africa's colonial and apartheid histories underpinning inequitable urban development, as well as affecting urban planning practices since 1994 (van Zyl et al., 2021). Since the end of apartheid and the beginning of a democratic dispensation, national urban planning initiatives have focused on strengthening economic development to improve equity and equality within the country (South African Government, n.d.). Such programs include the Reconstruction and Development Program (RDP, 1994), Urban Renewal Program (Donaldson et al., 2013) and

the National Development Plan (National Planning Commission, 2012). The latter two programs highlight sustainability as necessary to achieve the desired outcomes. However, the legacies of racially-based planning remain, with most Black South Africans living in low-cost (or informal) housing neighborhoods, whilst most White South Africans reside in middle- to high-income ones. The same applies with respect to urban green spaces and infrastructure (e.g., street trees), with them being significantly lower in low-income areas occupied by Black South Africans, than more affluent areas (Venter et al., 2020). Many low-income neighborhoods have no or few formal urban green spaces or street trees (McConnachie and Shackleton, 2010; Kuruneri-Chitepo and Shackleton, 2011) despite the national government guideline of a minimum of 0.4 ha of park space per 1,000 residents, and neighborhood parks within a maximum of 1.5 km (20-min walk) (Department of Human Settlements, 2019). Moreover, at a national scale, the disparity in green space per capita has not decreased under democracy but has actually increased over the last two decades (Venter et al., 2020).

2.2 Data collection

Data collection occurred in two phases. For Phase 1, 122 local municipalities out of the 278 local municipalities in the country were randomly selected. Emails were then sent to 214 planners, planning departments or directors describing the project along with a request to complete and return an attached questionnaire. Recipients were also encouraged to share the questionnaire with any other public-sector planners that they might know. Additionally, the project and questionnaire were posted and advertised on the Facebook page of the professional planner's body (South African Council for Planners; SACPLAN). Two reminders were sent, each 2 weeks apart. Thirty-six responses were received, representing a 16.8% response rate [similar to the 15% response rate reported by van Zyl et al. (2021)], of which two were discarded due to inadequate information (1) or the respondent not being a public-sector planner (1). The survey obtained information pertaining to priorities of planners, perceptions toward and knowledge of sustainable urban development, urban ecology, urban greening, and ecosystem services using Likert scale questions and short responses, as well as attributes of the respondents (such as age, gender, qualifications, number of years as a public-sector planner). Information regarding sources that planners use to stay informed regarding trends in sustainable urban development was also requested. The environmental worldviews of respondents were assessed via the New Ecological Paradigm scale (Dunlap et al., 2000). The NEP scale is made up of 15 statements, to which respondents rated their level of agreement using a Likert scale, with unevenly numbered statements presenting ecocentric worldviews and evenly numbered statements presenting anthropocentric worldviews (van Zyl et al., 2021).

Phase 2 consisted of in-depth, qualitative discussions with a small sample of public-sector planners. A convenience sampling technique was used by contacting all 31 local municipalities in the Eastern Cape province (in which we live), via the contact details on the municipal websites or those from Phase 1 who chose to share their contact details. Qualitative discussions with eight planners were held, with 12 discussion pointers being used to initiate and direct the discussions. The topics included knowledge and perceptions toward sustainable urban development in South Africa, development challenges, urban greening, ecosystem services and climate change. Interviews spanned 90–120 min and were conducted in English, with language not posing any known barrier. Ethics approval for both phases of the research was granted by Rhodes University Human Ethics Committee (approval no. 2022-5581-6750).

2.3 Data analysis

The data from the 34 valid survey responses were analyzed using descriptive statistics to determine frequencies of responses to the Likert-scale questions. A chi-squared test was used to compare responses estimating the ideal and current percentages of UGI and mean distance from UGI. NEP scale scores were analyzed using methods outlined by Dunlap et al. (2000) and van Zyl et al. (2021). Unevenly numbered statements, presenting ecocentric views were scored from one to five, with 5 = Agree, 4 = Mildly Agree, 3 = Neutral, 2 = Mildly disagree, and 1 = Disagree. The scores for the evenly numbered statements presenting with anthropocentric views were inverted. Scores were then totaled out of 75. The higher the total score, the more ecocentric a respondent's worldview. A Mann-Whitney test of significance was used to determine statistically significant relationships, whilst a Chi-squared analysis examined significant differences between categorical measures. Whilst the total sample size of survey responses was low, the proportional response rate is similar to previous studies (e.g., van Zyl et al., 2021), and being over 30 is deemed adequate for the few basic statistical analyses mentioned above, especially when complemented with the in-depth interviews. Data obtained from the in-depth interviews was analyzed by deductive thematic analysis to identify recurring themes (Kiger and Varpio, 2020). This involved reading the interview transcripts several times to fully appreciate the subject matter. Thereafter, the content and particular points of interest were coded. This was repeated three times. Subsequently, the phrases and content expressing similar sentiments were grouped together. Those groups with sufficient material and clear identity were given a theme name. The unique nature and cohesiveness of each theme was then reassessed and revised if necessary. Quotes were extracted from both the survey responses and in-depth interviews to illustrate and substantiate our analysis. Each survey response was assigned a unique number, as were the in-depth interview responses running on sequentially from the survey numbers. These numbers are reported after each quote to attribute its origin. In integrating the results across the online questionnaire and the in-depth qualitative interviews, we refer to participants in the former as "respondents", and in the latter as "discussants".

3 Results

3.1 Respondent profile

Of the 34 responses to the questionnaire, eight were received from planners in large metros and 26 were from district or local municipalities. Reponses were received from eight of the nine

TABLE 1 Importance of contemporary urban development challenges as perceived by public-sector urban planners.

Contemporary development challenges	Level of importance (% of respondents)					Mean score
	Not	Slight	Moderate	Very	Extreme	
Housing	0.0	0.0	0.0	26.5	73.5	4.7
Improved social wellbeing	0.0	2.9	5.9	32.4	58.8	4.5
Improving built environment so human potential can be realized	0.0	0.0	8.8	38.2	52.9	4.4
Waste disposal	3.0	0.0	24.2	9.1	63.6	4.3
Climate change	0.0	11.8	11.8	20.6	55.9	4.2
Economic development	0.0	2.9	17.6	35.3	44.1	4.2
Urban expansion with loss of agricultural land	0.0	5.9	20.6	26.5	47.1	4.2
Urban greening	6.1	3.0	12.1	27.3	51.5	4.2
Traffic congestion	2.9	2.9	14.7	44.1	35.3	4.1
Biodiversity loss	2.9	14.7	11.8	26.5	44.1	3.9

provinces in South Africa (none from the Free State), ranging between one and eight per province. Thus, there was a good geographic coverage. Responses from male planners were in the majority (65%). All had a postgraduate qualification, most commonly a Masters degree. Most (58.8%) had been working in their current positions for between 0 and 5 years, with 17.6% of respondents being at their post for 6–10 years, 20.6% for 11–20 years and only 2.9% for more than 20 years. The age of respondents ranged between 24 and 56 years. Two-thirds of respondents (67.6%) relied on professional networks to stay informed about urban planning issues, with conferences and webinars also being widely used (64.7%). Other key sources included popular media (38.2%), research articles (47.1%), word of mouth (20.6%), books (2.9%) and YouTube channels (2.9%).

TABLE 2 Perceived priorities of public-sector urban planners.

Priorities	% of responses
Integrated and sustainable settlements	70.6
Economic development	50.0
Infrastructure delivery	47.1
Housing	29.4
Rural upliftment	17.6
Waste management	17.6
Climate change	14.7
Urban greening	11.8
Biodiversity loss	2.9

3.2 Sustainable urban development challenges and priorities

The survey considered public-sector planners' perceptions of sustainable urban development, contemporary development challenges and priorities as well as their worldviews. Alongside this, the in-depth qualitative interviews identified seven themes, including (1) contemporary development issues, (2) institutional constraints, (3) social and economic concerns, (4) institutional failures and politics, (5) policies and legislative setbacks and advances, (6) environmental concerns, and (7) the value of ecosystems services and green spaces.

Nearly all the respondents rated all the listed development challenges as important, but ones rated as extremely important were the provision of housing (73.5%), waste disposal (63.6%), improved social wellbeing (58.8%), and climate change (55.9%) (Table 1).

Although housing was rated as the greatest development challenge (Table 1), it was only the fourth highest development priority according to the respondents (Table 2). Most (71%) public-sector planners considered the attainment of integrated and sustainable settlements as a high priority, followed by economic

development (50%) and then infrastructure delivery (47%). Although "sustainable settlements" can be construed as addressing or minimizing environmental concerns, the more overtly environmental issues of climate change, greening and biodiversity were all afforded low priority. The discussants indicated that environmental issues were accommodated in planning via the legislative requirement of environmental authorization and Environmental Impact Assessments (EIA) for all development projects. Specialist EIA consultants played a role in alerting planners to any environmental sensitives that should be noted with regards to a specific project. However, discussants indicated that environmental risks and issues were not a huge concern, specifically in the local and rural municipalities. They felt that climate change also was not deemed as a critical concern in most municipalities, although they were aware of some municipalities that were developing climate change mitigation frameworks. They did acknowledge, however, that the recent severe drought in several regions of the country, and very intense in the Eastern Cape, was raising awareness and concerns about climate change. In urban areas, the issue of drought was worsened by aging and poorly maintained grey infrastructure.

TABLE 3 Perceptions toward sustainable development (% of respondents).

Question	Importance level				
	Not	Slight	Moderate	High	Extreme
Importance of greening to their municipality's approach to sustainable development	5.9	5.9	23.5	35.3	29.4
Understanding local urban ecology is important to informing sustainable urban development	2.9	11.8	11.8	35.3	38.2
Street trees are an important component for urban sustainability	0	2.9	2.9	40.0	54.3

All the discussants affirmed that social and economic issues were the key priorities within all municipalities, and even more so in the more rural towns. Some discussants indicated that there was a need to develop traditional and more rural spaces so that they are not left behind because they have a lot of potential to provide economic opportunities. The highlighted social concerns included taking a town planning approach that incorporates a safety by design approach to reduce crime. Other key issues included reducing the extent to which cities and towns are divided along racial lines, developing areas with mixed land use options to improve social and economic circumstances, and making cities or metros more pedestrian-centered. Several planners also indicated their concerns about achieving social and economic development goals, with indications that citizens should be innovative and develop avenues to produce revenue.

> "We are trying to untap the potential and improve the social and economic profile of such rural areas" (#37)
>
> "I have noticed that developments are key drivers in uplifting the country's economy thereby reducing the level of unemployment within the country" (#39)

Two additional development concerns and priorities that were not evident in the questionnaire responses were aired during the in-depth discussions. The first was the need for development funding and planning in more rural towns. This was highlighted several times because small, rural towns are growing but have low economic bases and so cannot accommodate the current levels of in-migration from rural villages and farms. The discussants opined that this was exacerbating underdevelopment and poverty in these towns. The second issue was the challenge of transforming the apartheid racially based-spatial divide between black and white residents, which coincides with the divide between rich and poor.

> "Poor quality housing and transforming the apartheid spatial planning" (#42)
>
> "This isn't geared for urbanisation. It's a case of all cities, all across the world, when urbanisation happens, the places get overwhelmed" (#36)

3.3 Perceptions of sustainable urban development and environmental worldviews

Most (82.3%) the respondents offered a definition of sustainable urban development (SUD). The majority of the definitions (20)

were indicative of holistic development and integrating social, economic, and environmental concerns. Seven were focused on only economic and social development, whilst one was unrelated to SUD. Illustrative responses in these categories are provided below:

> "Urban development that addresses socio-economic challenges while containing environmental impact through the use of environmentally friendly tools to strategies. e.g. renewable energy. developing urban form that minimises the use of powered transportation, etc." (#12)
>
> "A spatially integrated city that doesn't discriminate based on race and income levels" (#28)
>
> "Maximum utilisation of urban infrastructure to provide sustainable economic and social development" (#4)

Respondents were requested to indicate any necessary steps that should be integrated into urban planning to promote sustainable development. A small majority (55.9%) indicated that improved co-ordination of transport infrastructure, land use, and open space planning should be integrated to promote sustainable development. This was followed with 17.6% of planners indicating that urban containment and densification toward a compact city space was necessary. A few (11.8%) indicated that waste minimization and management was necessary, whilst 8.8% of respondents specified preserving agricultural land for local and rural use was important. Preserving both blue and green infrastructure, was rated the lowest (5.9%).

Table 3 presents the cumulative percentages of perceptions toward sustainability. Greening was considered important to municipalities' approaches to sustainable development. Similarly, understanding local ecology was also rated important, with the greatest percentage of the respondents (38.2%) indicating that it was extremely important. Street trees were also rated as extremely important components for urban sustainability.

The highest score for the NEP-scale was 68 and the lowest was 36 (out of 75). The average score was 51.5, indicating that respondents leant toward more "ecocentric views". The cumulative percentages for the NEP scale statements are displayed in Table 4. The mean scores for the 15 statements ranged between 2.3 and 4.5 out of five. The unevenly numbered statements portrayed an "ecocentric" view with average scores for those questions ranging between 2.9 and 4.5. The evenly numbered questions portrayed an "anthropocentric view" indicated lower scores (ranging between 2.3 and 3.8), thereby also reflecting a more "ecocentric view". Females presented with a slightly higher ecocentric ranking, with a mean of 56.3 on the NEP scale, compared to 51.5 for male, but not significantly so ($Z = 1.62$ $p = 0.10$).

TABLE 4 Cumulative percentages for NEP-scale scores amongst public-sector urban planners.

NEP-scale items	Cumulative percentage					
	Agree	Mildly agree	Neutral	Mildly disagree	Disagree	Mean Score
1. We are approaching the limit of the number of people earth can support.	15.2	21.2	27.3	15.2	21.2	2.9
2. Humans have the right to modify the natural environment to suit their needs.	18.2	12.1	18.2	33.3	18.2	3.2
3. When humans interfere with nature. it often produces disastrous consequences.	42.4	24.2	18.2	12.1	3.0	3.9
4. Human ingenuity will ensure that we do NOT make the earth unliveable.	18.2	21.2	36.4	15.2	9.1	2.8
5. Humans are severely abusing the environment.	48.5	36.4	12.1	0	3.0	4.3
6. The earth has plenty of natural resources if we just learn how to develop them.	43.8	21.9	12.5	9.4	12.5	2.3
7. Plants and animals have as much right as humans to exist.	63.6	18.2	15.2	0	3.0	4.4
8. The balance of nature is strong enough to cope with the impacts of modern industrial notions.	6.1	12.1	15.2	33.3	33.3	3.8
9. Despite our special abilities humans are still subject to the laws of nature.	57.6	33.3	6.1	3.0	0	4.5
10. The so-called ecological crisis facing humankind has been greatly exaggerated.	6.1	12.1	24.2	27.3	30.3	3.6
11. The earth is like a spaceship with very limited room and resources.	12.1	36.4	27.3	18.2	6.1	3.3
12. Humans were meant to rule over the rest of nature.	9.1	15.2	24.2	24.2	27.3	3.5
13. The balance of nature is very delicate and easily upset.	24.2	39.4	21.2	12.1	3.0	3.7
14. Humans will eventually learn enough about how nature works to be able to control it.	15.2	24.2	33.3	15.2	12.1	2.9
15. If things continue their present course we will soon experience a major ecological catastrophe.	57.9	14.7	17.6	8.8	2.9	4.2

3.4 Perceptions of public urban green space and ecosystem services

Respondents were requested to indicate the current proportional area of public green space in their respective municipalities, along with a value that they would consider as ideal. Currently, slightly more than one-quarter did not know what the proportional area of public green space was in their municipality (Figure 1). For most, the ideal was significantly higher than the current ($x^2 = 39.2$; $p < 0.0001$). Moreover, 53% said that their municipality did not have any guidelines as to what the proportional area of public green spaces should be and 18% said that they did not know if there was a guideline. These numbers were inverted when asked about what the national guideline was, with 53% saying that they did not know and 21% saying that there wasn't a national guideline. A similar picture evolved when asking about the current and ideal distance from a resident's home to the nearest public urban green space (PUGS). One-fifth did not know what the mean distance was, and the highest response rate was for the 751–1,000 m option. In contrast, the highest response regarding the ideal distance was the 251–500 m option, with a

significant difference between current and ideal ($x^2 = 28.2$; $p < 0.0001$).

The majority of responses about ecosystem services provided by PUGS related to regulating services (28), such as stormwater attenuation, air purification and urban heat island reduction. This was followed by mentions of supporting (8), cultural (8) and provisioning services (7). However, the term ecosystem services was not well-known to many of the respondents, as 47% said that they did not know what the question was asking, or that there were no ecosystem services provided by PUGS, or the nature of their answer did not relate to ecosystem services at all. Although many respondents were unfamiliar with the term "ecosystem services" most agreed or strongly agreed that PUGS provided a variety of benefits (Table 5). Most of the listed benefits presented to them were given high ratings, suggesting that public planners are aware of the ecological and environmental benefits provided by PUGS. However, reduced crime, traffic calming and protection for street vendors were rated less important, with half or less of respondents stating that they "strongly agreed" or "agreed" that they were a benefit. A majority of respondents (77.4%) indicated that the importance of PUGS varied between different neighborhoods. Respondents elaborated with the following:
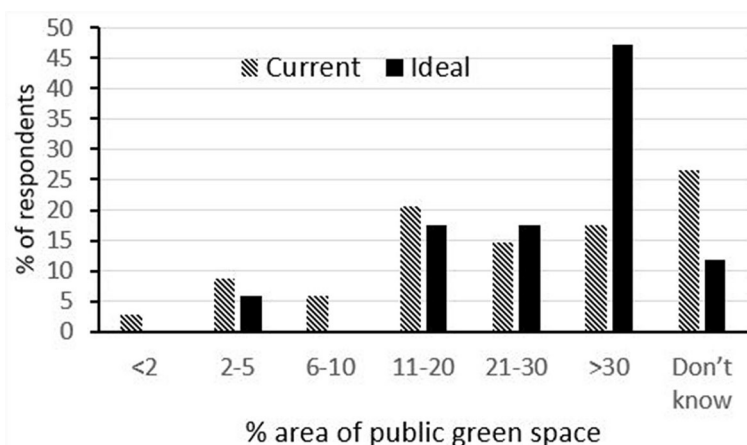
FIGURE 1
Planner's estimates of the current and what they regard as the ideal proportion (%) of public urban green spaces in their municipalities.

"Township areas are focused more on the basic needs (infrastructure services and housing) and greening of spaces is rather perceived as a luxury" (#9)

"All high-density residential developments are encouraged next to existing public open spaces or parks, if not a developer is required to provide open space within the development. In the CBD people come for certain services and do no come to enjoy the green spaces within, as such urban greening in the CBD is not prioritised like the residential areas" (#15)

"Most municipalities are still behind on the issues of urban green spaces. And it had not yet been incorporated into their by-laws" (#18)

Despite recognizing that PUGS offer a variety of ecosystem services a recurring observation during the in-depth discussions was that many PUGS are not well used due to one or more of (i) the public not being aware of the benefits, (ii) crime or (iii) lack of maintenance. The discussants also felt that a relatively narrow suite of ecosystem services was planned for in developing and maintaining PUGS, which may not accord with local residents' needs. This was particularly so in relation to provisioning services. One attributed this to a loss of indigenous knowledge regarding the uses of different plants. Larger municipalities seemed more aware of the environmental benefits of PUGS, with one respondent highlighting an ecosystem services valuation system.

"It's just a few people who are just using such open spaces" (#37)

"There aren't ecosystem services provided by the towns green spaces because they're mostly wild and overgrown" (#36)

"There are some environmental benefits because they find that there are some trees that are being planted there, so its green" (#37)

Seven of the eight discussants were of a fairly unanimous opinion that urban greening was considered a low priority in the public sector, and that it was not the responsibility of

planning departments. They all acknowledged that they had to develop spatial plans that included or allowed for greening, but asserted that parks departments then had to ensure the designated spaces were greened and managed as such. This often did not occur, which six felt it was due to inadequate budgets for staff and maintenance. There were general comments in support of urban greening, but it was perceived to be largely limited to the provision of parks and trees. Discussants (six) indicated a desire to improve environmental protection and increase green spaces, among other critical concerns for future measures. Larger municipalities were more inclined to demonstrate strategies to promote environmental protection, including preventing development beyond the urban edge, promoting the provision of green spaces, considering and actively conserving biodiversity, and incorporating green building and high-density options.

"In an environment where you can't afford anything, urban greening is like the last thing you do" (#36)

"It's important that open space is provided in urban areas, not only to counteract the negative impact on air pollution caused by noxious industries but also to increase the natural beauty if urban areas therefore improving the mental health of residents living in these areas" (#39)

3.5 Politics, policy gaps, institutional constraints

Policy gaps and institutional failures arose as a theme in several of the in-depth discussions. However, there was a noticeable divergence in perspectives, with five opining that policies and legislation were useful in guiding development to be more sustainable, whilst three felt that some policies hindered sustainable development, or that there was a policy vacuum. For example, one discussant was vocal on how outdated legislation, policies, and spatial development frameworks (SDF) posed a challenge to

TABLE 5 Level of agreement by public-sector urban planners with statements regarding urban greening providing particular benefits.

Benefits of urban greening	Proportion of respondents (%)					Mean score
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	
Climate change reduction	61.8	23.5	5.9	2.9	5.9	4.3
Air filtration	50.0	35.3	5.9	0.0	8.8	4.2
Improved biodiversity	47.1	41.2	2.9	0.0	8.8	4.2
Sense of place	50.0	38.2	0.0	5.9	5.9	4.2
Improved physical health	44.1	38.2	11.8	0.0	5.9	4.1
Cultural identity	44.1	26.5	20.6	5.9	2.9	4.0
Economic benefits	38.2	44.1	5.9	2.9	8.8	4.0
Improved mental wellbeing	36.4	39.4	15.2	6.1	3.0	4.0
Increased social cohesion	26.5	47.1	17.6	2.9	5.9	3.9
Social integration	29.4	47.1	14.7	2.9	5.9	3.9
Improved cognition for learners	20.6	52.9	14.7	8.8	2.9	3.8
Noise reduction	29.4	38.2	20.6	2.9	8.8	3.8
Stress reduction	20.6	50.0	17.6	5.9	5.9	3.7
Protection for street vendors	11.8	38.2	38.2	2.9	8.8	3.4
Traffic calming	11.8	44.1	26.5	11.8	5.9	3.4
Reduced crime	14.7	8.8	35.3	23.5	17.6	2.8

development. A lack of municipal bylaws also posed a challenge. This contrasted with other municipalities, where results suggested legislation was useful in fulfilling development goals. Spatial Planning and Land Use Management Act (SPLUMA) requirements were a challenge across a few municipalities, as they were unable to fulfil SPLUMA requirements due to the lack of budget and capacity. Other issues included concerns that legislation was unsuited to smaller towns in rural municipalities and that legislation was only valuable for larger urban areas, which was contradicted by some metro municipalities also having outdated legislation. A key constraint voiced regarding legislation and policy was a lack of sustainable options provided for low-income groups and small rural towns, posing a threat to sustainable development at larger scales. However, advances in legislation were noted, including the importance of the SDF for future planning and discussants also indicating active policy development. Examples of active policy considerations include housing, improved service delivery and climate-centered policies.

> "We're using outdated legislation, so that is also a challenges cause then we are not currently updated on what's really happening" (#35)
> "Our spatial development frameworks are also outdated; they are not aligned toward what SPLUMA requires" (#35)
> "There are currently laws and policies which do attempt to regulate climate change (National Environmental Management Act and Air Quality Act) these laws will have to be amended in future to provide stricter measures on new developments" (#39)

Whilst the discussants seemed to differ on the presence and efficacy of policies about sustainable urban development, there was

agreement that there was generally poor oversight or enforcement and implementation of frameworks, legislation, policies, plans and service delivery at all scales. This was not limited to the town planning departments, but across all government departments at local, district and provincial levels. This was ascribed to various dynamics, including political infighting and political interference that shaped town planning and development priorities and impeded development and implementation of municipal plans. Priorities were set by political role-players rather than citizens, and consequently in municipalities with an unstable political balance priorities changed on a regular basis. They argued that this was exacerbated by a common silo mentality or lack of integrated departments. This resulted in the blame often being shifted to another department or institution when a particular one failed to deliver on stated promises or targets. Five discussants also highlighted that corruption played a role in changing priorities and targets. Others mentioned that it was not just government departments that were not compliant with policies, but also the private sector. The discussants asserted that the public was either unaware of planning procedures and legislation or was unwilling to comply with municipal plans and standards. Informal settlements and illegal dumping were mentioned as key examples of such.

> "I think a lot of things are deterred because of corruption; it deters from the municipality doing the basics they need to do" (#35)
> "We're right in the faces of politics cause you talk to the community, they are right there with their ward councillors and its politics all the away and it's a hell of a lot of politics involved during the process" (#36)

Linked to poor oversight was the main institutional constraint of limited municipal budgets mentioned by all the discussants. This meant that there are insufficient funds to hire enough planners, especially experienced ones. This was most pronounced in smaller, more rural municipalities that struggle to attract skilled professionals. Consequently, planning departments are overwhelmed and therefore must prioritize the most crucial elements, which generally relate to public grey infrastructure. Even if green spaces are planned for, small municipalities rarely have staff or budgets to manage them.

4 Discussion

Many Global South countries are faced with rapid rates of urbanization which makes urban planning challenging as planners and governments attempt to keep pace with the demand for built infrastructure, services and economic opportunities. In such contexts, environmental issues and sustainability often receive lower priority and hence less attention (Gwedla and Shackleton, 2015). Yet planners have the opportunity, and some might argue the obligation, to ensure that the plans they develop consider ecological imperatives and urban environmental issues, not just for the sake of the environment, but also for the sustainability and liveability of the cities, towns and neighborhoods that current and future urban citizens call home (Wu, 2014). Consequently, it is vital for researchers to consider the knowledge, attitudes and experiences of public-sector planners regarding sustainable urban development and urban ecology so that the environmental dimensions of sustainability are integrated into the social and economic ones (Cilliers et al., 2021).

The results of our study showed that the public-sector planners as a group in South Africa tended toward a more ecocentric view of the world and development than an anthropocentric one (NEP mean score of 52). This corresponds with findings of Wilhelm-Rechmann et al. (2014) who used the NEP scale to assess the worldviews of municipal officials and elected councilors in several municipalities in the Eastern Cape province (mean score was 56), and van Zyl et al. (2021) who sampled mostly private-sector urban planners across the country (mean score was 52). Wilhelm-Rechmann et al. (2014) found that municipal officials were more ecocentric than elected councilors (but this also interplayed with ethnicity and political party). However, examination of the priority development and planning concerns of public-sector planners in our study did not resonate with their ecocentric views. The development of grey infrastructure and economic development were ranked as more significant concerns than green and environmental needs. This needs to be interpreted within the context of high levels of poverty and unemployment in South Africa, and massive backlogs in housing and services such as sanitation, health care, transport services and the like. This was starkly illustrated in the significantly lower cover and accessibility (in terms of travel distance) of PUGS than what the planners deemed as ideal. Yet, ensuring that PUGS are available starts with urban planners. Local authorities and parks departments cannot green urban spaces that have not been planned and delineated as such. Moreover, whilst most public-sector planners felt that more

PUGS was required in their respective municipalities, more than 70% said that there was no guideline set by their municipality or they did not know if one had been set. Almost three-quarters (74%) said that there was no national guideline or, if there was, they did not know it. However, the national Department of Human Settlements (2019) guidelines do state a minimum area (0.4 ha of parks per 1,000 residents), and that it should be distributed such that residents are within a 1.5 km or 20-min walk of a neighborhood park. This national minimum target is well-below the minimum of 9 m^2/resident recommended by the WHO (2012) and far from the "ideal" of 50 m^2 also suggested by the WHO (2012). Although the area of PUGS per capita is highly variable in South Africa, poorer towns typically have far less than more affluent ones (McConnachie et al., 2008), and poorer neighborhoods within towns have far less than more affluent ones (McConnachie and Shackleton, 2010; Venter et al., 2020). The same patterns apply with respect to the distribution of street trees (Kuruneri-Chitepo and Shackleton, 2011; Gwedla and Shackleton, 2017).

When asked what ecosystem services are provided by PUGS in their municipality, most of the planners were unfamiliar with the term. This echoes the low ecological literacy amongst planners in Finland (di Marino et al., 2019), Italy (La Rosa, 2019), and mostly private-sector planners in South Africa (van Zyl et al., 2021). The authors of the latter study argue that low ecological literacy hinders the development of urban planning practice founded on ecological imperatives. Grunewald et al. (2021) found that many planners in Europe were unfamiliar with the term, and furthermore, it was often used interchangeably with related terms such as nature-based solutions and natural capital which diluted understanding and integration. However, in our study, when the term was explained, the planners were able to list a variety of ecosystem services, although some said that ecosystem services were not important to local citizens, or that their supply was compromised by poor or irregular maintenance of PUGS. The most-mentioned were regulating services [which was also found by van Zyl et al. (2021)], such as stormwater attenuation, air purification and urban heat island reduction. Provisioning services were the least mentioned, which is at odds with the widespread collection of wild foods, traditional medicines, firewood and flowers for home use or income generation from formal and informal PUGS in South African cities (Garekae and Shackleton, 2020; Sardeshpande and Shackleton, 2023), as well as urban agriculture in public and private spaces (Kanosvamhira, 2023). Such provisioning services are especially important for the urban poor (Shackleton, 2021), although increasingly threatened by urban growth and densification (Lindley et al., 2018). For example, Kaoma and Shackleton (2015) found that, on average, 20% of income (cash and non-cash) amongst low-income urban households (and 30% for the poorest) was from products collected from urban trees and bushes. Despite provisioning services being less mentioned than others in free-lists, when presented with a set list of benefits from PUGS, planners generally rated all of them highly, indicating their acknowledgment of the multifunctionality of PUGS. Together with the lack of municipal capacity and financial limitations, the poor awareness of the nature and benefits of ecosystem services provided by PUGS have been previously identified as hindrances to ecosystem services thinking being incorporated into urban

planning (du Toit et al., 2018; Cilliers et al., 2021; van Zyl et al., 2021). This interacts with a silo mentality or lack of coordination between departments that weakens the governance effectiveness (du Toit et al., 2018).

We found that the high rating given to a range of ecosystem services provides by PUGS to be at odds with the low rating of environmental issues and greening as development and planning priorities. If planners acknowledge the value of ecosystem services provided by PUGS, then we would expect greater planning emphasis to be given to greening and environmental issues, such as biodiversity loss and climate change. There was some indication that climate change is being considered by some municipalities, seemingly catalyzed by several severe droughts and floods in different parts of the country over the last few years. Discussants observed the need to improve water security through more dams, boreholes and water distribution infrastructure, i.e., the focus is on grey infrastructure to mitigate the effects of climate change rather than adaptation strategies or even nature-based solutions. Overall, climate change and its effects are still poorly mainstreamed in municipal spatial and development plans in South Africa (Santhia et al., 2018; Pieterse et al., 2021). Similarly, in Sweden, knowledge concerning climate change was rarely mobilized within the urban planning process. This was attributed to a lack of knowledge of urban climate and institutional issues such as unclear policies and a lack of integration between different departments and politicians (Eliasson, 2000). Similar results are evident in South Africa, with failure to implement climate adaptation strategies being attributed to institutional challenges, lack of resources and "development needs" being prioritized (du Toit et al., 2018).

The dissonance between the urban planners' generally ecocentric worldviews and their prioritization of economic and grey infrastructural development above green issues is likely to be due to a complex suite of factors. The first is the severe backlogs in housing and attendant social and economic infrastructure in most South African towns and cities (Chakwizira, 2019). This is a consequence of the historical legacies from the apartheid period, coupled with massive in-migration from rural areas over the last 2–3 decades that challenge even the best laid plans. This dynamic is further exacerbated by high unemployment and widespread poverty (Statistics South Africa, 2023), which means that most urban citizens rely on and look to their municipalities to improve their lives through built infrastructure and services. Consequently, elected councilors and political manifestos prioritize the development of built infrastructure and expect municipal officials to deliver. The high poverty rates also constrain the ability of many urban citizens to pay for the services they receive, thereby undermining municipal finances and budgets (Patji and Selepe, 2022). A number of studies have reported how municipal officials lament the lack of, or limited, funds for urban greening, such that they struggle to adequately maintain existing PUGS and street trees (e.g., Gwedla and Shackleton, 2015), let alone establish and maintain new ones as towns and cities expand. Added to this mix is the relatively low significance afforded to greening by municipal managers (Gwedla and Shackleton, 2015). This can result in the responsibility for PUGS being merged into other service departments (such as social services) rather than a dedicated parks department, and hence headed by officials who have no training or expertise in managing PUGS. Several discussants emphasized that these factors are far more troublesome in small towns in rural municipalities. This could be mitigated to some degree if district municipalities provided greater support to smaller local municipalities. Oddly, although the disparities between large and small municipalities regarding budgets, capacities and resultant greening were noted as needing attention, the same was not raised with respect to disparities within towns between poorer and more affluent neighborhoods. Numerous studies have exposed such intra-town inequities, both within South Africa (McConnachie and Shackleton, 2010; Kuruneri-Chitepo and Shackleton, 2011; Venter et al., 2020) and elsewhere (Shen et al., 2017; Gerrish and Watkins, 2018; Sathyakumar et al., 2019).

Despite planners' perceptions of sustainable urban development being aligned with contemporary definitions that include integrating social, economic, and environmental issues (Cobbinah and Darkwah, 2017), the results suggest that sustainable development goals were not being met within the municipalities. It was clear that economic development was the main development priority across all municipalities with responses indicating that environmental mandates were coming second. This indicated that although environmental and ecological concerns are perceived as important, they are not prioritized, and instead sustainable development is largely targeted from a socio-economic approach. This contrasts with previous studies that highlighted the importance of ecological considerations during the town planning decision-making process, such as urban ecology, use of UGI and ecosystem services (van Zyl et al., 2021). The incorporation of ecological considerations has proven to be a crucial strategy to improve quality of life, physical health, and wellbeing (Cilliers, 2019; van Zyl et al., 2021).

5 Conclusion

In conclusion, the study reveals that the worldviews of public-sector urban planners in South Africa tend to be ecocentric, with their perceptions being well-aligned with contemporary notions of sustainable urban development. Whilst their familiarity with terms like "ecosystem services" may be limited, they were nonetheless aware of the fundamental benefits of and necessity for sufficient and well-distributed UGI. However, despite their recognition of the integral importance of environmental components to urban sustainability, we found that the natural environment generally, and UGI specifically, is coming second as social and economic concerns are prioritized with regards to development goals and town planning decisions. Furthermore, little has been achieved in terms of the National Development Goals and sustainable urban development, which was echoed by planners in this study. In the context of rapid urbanization and high poverty, they felt that they have to prioritize the provision of housing and associated grey infrastructure and services, with urban greening regarded as a low planning priority. They argued that this is also demanded of them by city officials and elected councilors. This indicates the need for the benefits of UGI and ecological literacy to be more widely

disseminated amongst public-sector planners and also packaged in a targeted and accessible manner to city officials and councilors.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Rhodes University Human Ethics Committee (approval no. 2022-5581-6750). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

RR: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing—original draft. CS: Conceptualization, Formal analysis, Funding acquisition, Methodology, Project administration, Resources, Supervision, Writing—review & editing. GS: Conceptualization, Supervision, Writing—review & editing.

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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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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/frsc.2024.1342894/full#supplementary-material

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