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1 Untangling the motivations of different stakeholders for 2 urban greenspace conservation in Sub-Saharan Africa

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9 10 11 12 13 **Abstract**

14 Urban expansion is threatening ecosystem service delivery, especially in sub-Saharan Africa where
15 urbanisation rates are among the fastest globally. Greenspaces offer opportunities to prioritise
16 ecosystem services for city residents. However, the success of greenspace conservation is more often
17 driven by their acceptability to a range of stakeholders than by scientific evidence, highlighting the
18 need to acknowledge multiple perspectives when implementing greenspace conservation activities.

19 We used the Q-methodology to describe and compare the viewpoints of three stakeholder categories
20 for the services and disservices provided by greenspaces in two fast-growing Ghanaian cities.
21 Ecosystem services were generally valued, however there was strong heterogeneity in viewpoints
22 among respondents. The main concerns included regulating services, heritage aspects and

23 contributions to economic development. Comparisons between viewpoints revealed both substantial
24 differences between stakeholder categories and consensus around specific ecosystem services.

25 Recognising shared viewpoints and areas of disagreement may increase the acceptability of
26 greenspace implementation measures. Furthermore, addressing the disservices brought about via
27 greenspace degradation is crucial. Our study shows that, in fast-growing cities in Ghana, a forerunner
28 of urban development in Sub-Saharan Africa, specific ecosystem services such as shade provision, play
29 a pivotal role in promoting greenspace conservation.

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33 **Highlights**

- 34 - Greenspaces in two African cities were generally valued across stakeholder categories
- 35 - There were many disagreements on the relative values of ecosystem services
- 36 - User viewpoints were very diverse and some dismissed the benefits of greenspaces
- 37 - Addressing disservices arising from pollution is crucial
- 38 - Emphasizing services valued by all, such as shade, could be useful for conservation

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41 **Keywords** ecosystem services; perceptions; Q-methodology; Ghana; green infrastructure; disservices

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44 **1. Introduction**

45 Urbanisation has reached unprecedented levels, with more than half of the world population living in
46 towns and cities, compared to 30% in 1950 (DESA, 2015). This rapid increase in the urban population

47 is coupled with urban sprawl, whereby the geographical extent of land, which is built on is expanding
48 twice as fast as the number of urban dwellers (Angel et al., 2011). Such fast land cover change has
49 substantial negative impacts on ecosystems, including encroachment on protected areas and
50 biodiversity hotspots (Seto et al., 2012) as well as an appropriation of resources from a much larger
51 region than the physical area a city occupies (Folke et al., 1997).

52 Although urban areas can substantially alter natural ecosystems, urban greenspaces (herein defined
53 as all vegetated areas within the urban environment; Taylor and Hochuli, 2017) play a considerable
54 role in delivering ecosystem services, including air purification, flood protection and food provision,
55 alongside recreational, health and social benefits (e.g. Elmqvist et al., 2013). Losing such urban
56 ecosystem services would affect the cities' resilience as well as urbanites' health and well-being
57 (McPhearson et al., 2015; Tzoulas et al., 2007). Retaining or retrofitting greenspaces within urban
58 areas is crucial to the delivery of ecosystem services and, therefore, to the long-term sustainability of
59 cities (United Nations, 2015).

60 In Sub-Saharan Africa, urban areas are some of the fastest-growing worldwide (DESA, 2015), with
61 destructive effects reported on the surrounding landscape (Seto et al., 2012). Urbanisation in this
62 region is mainly taking place in smaller towns (DESA, 2015; Elmqvist et al., 2013) and is not always
63 associated with economic growth (Turok and McGranahan, 2013). Informal settlements with limited
64 infrastructure and service delivery are widespread and their inhabitants experience high levels of
65 poverty (Elmqvist et al., 2013; UN-Habitat, 2016).

66 Those arguments that do exist for the implementation and management of urban greenspaces for
67 ecosystem service provision are largely based on work carried out in the Global North, with a lack of
68 locally relevant, context specific evidence and research for Africa (Botzat et al., 2016; Luederitz et al.,
69 2015). Even within the continent, research has thus far centred on South Africa (Cilliers et al., 2013;
70 du Toit et al., 2018). Further, the research carried out in African cities mostly estimated monetary
71 values of ecosystem services, something which is not always compatible with different local value

72 systems (Wangai et al., 2016). The few studies on how ecosystems are perceived and understood
73 suggest limited awareness or knowledge of the benefits of conserving urban greenspaces across
74 stakeholders (Gwedla and Shackleton, 2015; Kaoma and Shackleton, 2015).

75 Stakeholder categories with an interest in, or influence over, the way in which urban greenspaces are
76 managed or are converted to other uses are diverse. Experts such as urban planners or NGOs play a
77 key role in the Global North, as they are frequently the ones leading greenspace conservation or
78 ecosystem management programs (Riechers et al., 2017). However, studies in Sub-Saharan Africa
79 indicate that experts could also have a strong negative impact by being largely unaware of the role of
80 urban greenspaces for sustainable development and so prioritising economic growth (Gwedla and
81 Shackleton, 2015; Schäffler and Swilling, 2013), with potential long term negative consequences for
82 the liveability of cities for their residents (UN-Habitat, 2016). Local residents are frequently the main
83 beneficiaries of greenspaces (Johnson et al., 2004), which they use to improve their living conditions,
84 for instance through urban agriculture or recreational use of public parks (e.g. Adekunle et al., 2013;
85 Shackleton et al., 2015). How residents influence what happens to greenspaces is, however, unclear.
86 Individually they have little influence on city greening plans even though participation of local
87 communities is known to be crucial for the success of conservation initiatives (Andrade and Rhodes,
88 2012) and urban residents could have a strong impact by joining forces into groups (Reed et al., 2009).
89 However, in general, little consideration is given by policy-makers to the opinions and perceptions of
90 city residents, leading to a disengagement regarding decisions about how greenspaces are used,
91 managed and converted into other land uses (Mensah, 2014). Consequently, another key stakeholder
92 category consists of the people in position of authority within the community, but without direct
93 interest in urban planning and/or greenspaces, such as political parties, the media or churches.
94 Indeed, they could pose both a substantial risk and an opportunity for greenspace conservation, as
95 their opinions will likely be widely spread amongst urban residents (Reed et al., 2009). As such, should
96 they choose to take a stand on greenspaces, they would have the opportunity to rally the population
97 to achieve positive change, or instil the notion that greenspaces should be removed. Additionally, they

98 could be key to creating a link between residents and experts. However, to our knowledge, there is
99 no research available on their perceptions of urban greenspaces. Consequently, understanding the
100 differences and similarities of perceptions by different stakeholders of urban greenspaces and
101 ecosystem services in Sub-Saharan Africa could help implement successful greenspace conservation
102 programs with long-term benefits for urban residents.

103 Here, we investigate the viewpoints of three categories of stakeholders on the services and disservices
104 provided by urban greenspaces in two small-sized cities in Sub-Saharan Africa. We also examine how
105 those viewpoints compare and contrast with each other, hypothesising that stakeholders involved in
106 the planning of urban greenspaces will have viewpoints that differ from both urban residents using
107 such greenspaces, and people with the power to influence community perceptions. Finally, we explore
108 how such agreements and divergences in viewpoints could offer opportunities for successful
109 conservation of urban greenspaces and ecosystem services.

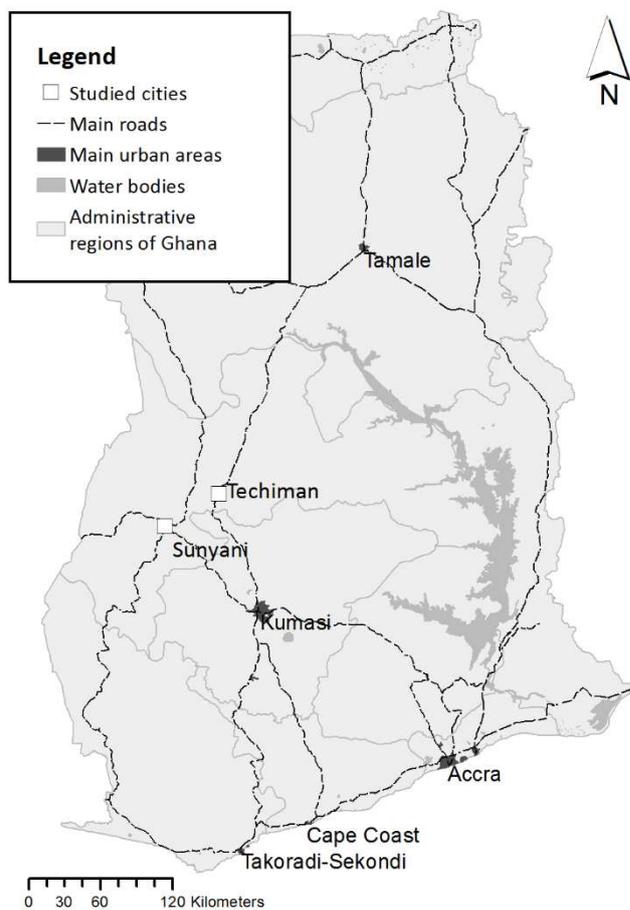
110 **2. Methods**

111 **2.1. Study location**

112 Ghana is at the higher end of urban growth rates in Africa (DESA, 2015) and has been praised as an
113 example of economic development due to its efficient health and education systems, and democratic
114 system of government (Lenhardt and Rocha Menocal, 2015). Understanding how urban greenspaces
115 are viewed and managed in small Ghanaian cities could thus serve as a useful forerunner of what could
116 arise as a result of the further urbanisation of neighbouring countries and provide an opportunity for
117 sharing best practice in a rapidly urbanising Africa.

118 We carried out our study in Sunyani and Techiman, Ghana (Fig. 1). The cities are both located in the
119 Brong Ahafo region and span four districts. In 2010, Sunyani and Techiman had a total population of
120 162765 and 123971 respectively (Ghana Statistical Services, 2013). As such, they are considered small
121 cities by global standards, similar to the cities hosting 48% of the African urban population (DESA,
122 2015). Both cities are located at the fringe of the moist semi-deciduous Guinean Forests of West Africa,

123 a biodiversity hotspot threatened by urban expansion (Ghana Statistical Services, 2013; Seto et al.,
124 2012). Their rapid development is being encouraged as part of the Sunyani Urban Network, which is
125 intended to ease the expansion pressures on the two largest Ghanaian cities, Accra and Kumasi
126 (Government of Ghana, 2015). As a result, Techiman is one of the 10 fastest-growing cities of Ghana
127 (Government of Ghana, 2015). Sunyani, the regional capital, is described as a one of the best-planned
128 and cleanest cities of the country, although rapid and uncontrolled expansion means it is on the verge
129 of losing this status (Adu-Gyamerah, 2016; Yaro, 2015).



130

131 **Fig. 1.** The two study cities of Sunyani and Techiman within Ghana.

132 **2.2. Methods**

133 We used the Q-methodology to investigate the different viewpoints on ecosystem services and
134 disservices held by three stakeholder categories (Experts, Authorities and Users; see “2.2.2 Selection
135 of the participants”). Q-methodology is a bottom-up approach used to discern people's perceptions

136 of their world and provide an insight into different subjective views on a research topic (McKeown
137 and Thomas, 2013). It uses a quantitative approach to collect and statistically analyse qualitative data,
138 thus combining the strength of both approaches (ten Klooster et al., 2008). In general, data collection
139 involves the sorting, by the participants, of a set of 40-60 statements into a forced normal distribution,
140 such as from the most to the least agreed statement (McKeown and Thomas, 2013; Watts and
141 Stenner, 2005). To better understand sorting patterns, the Q-methodology can be complemented by
142 information on the socio-demographic background of participants, and in-depth interviews, which
143 allow researchers to capture motivations for how statements were sorted, particularly those
144 statements placed at the extremes of the forced normal distribution (Milcu et al., 2013). The Q-
145 methodology has the advantage of providing numerical results to support the interpretation of
146 viewpoints (Zabala et al., 2018). While the *a priori* aim of Q-methodology is not to compare the views
147 across different categories of participants, this can be done by using similar Q-sets across participant
148 categories and analysing their sorts separately (Watts and Stenner, 2012).

149 2.2.1. Statement creation

150 In this study, we used 45 statements covering all sections and divisions of ecosystem services from
151 the CICES classification relevant to non-coastal locations (Haines-Young and Potschin, 2013). We
152 included 12, 18 and 15 statements for provisioning, regulating and cultural services respectively. Of
153 these, 35 were framed as services and ten statements were framed as disservices (Table 1).
154 Statements were developed based on interviews with experts and local greenspace users, online
155 searches of Ghanaian newspaper content (e.g. Graphic Online, The Chronicle, BA News Ghana),
156 Ghanaian policy document analysis regarding urban development and/or biodiversity (e.g. National
157 Biodiversity Strategy, National Urban Policy Framework), international agendas and ecosystem
158 assessments and scientific literature (Table S1 and S2). Statements were generated in English and,
159 following best practice, double-translated to Twi (i.e. translated to Twi, then back to English by
160 someone else, with consistency of meaning between the two English versions verified by the
161 researcher, Brislin, 1970). Pilot-testing of statements with four stakeholders from the different

162 categories and in both languages confirmed a clear understanding of the statements by the
 163 participants. Participants could choose to conduct the interview in English or Twi, and statements
 164 were read aloud for illiterate or visually impaired participants.

165 **Table 1.** The 45 statements presented to participants as part of the Q-sorting exercise. Statements are
 166 organised according to the CICES sections and divisions (Haines-Young and Potschin, 2013). The
 167 positive or negative framing of the statement, i.e. whether they describe an ecosystem service (+) or
 168 disservice (-), is indicated by + and - signs. Original wording and sources are available in Table S2.

Section	Division	Framing	Statements
Provisioning	Energy	+	Urban trees are an important source of wood and charcoal fuel.
	Materials	+	Converting urban parks and reserves to ecotourism facilities is essential to make them profitable.
		+	Livestock in cities is important as it provides manure to improve soil fertility.
+		The job opportunities and incomes that could be earned from the development of urban parks, gardens and green spaces are significant.	
+		The presence of trees and plants that heal is crucial in a city, as traditional medicine is an economical and trusted form of health care.	
-		Backyards and parks should be cleared to provide space for businesses and accommodation for the ever increasing urban population.	
-	Cities are centres of employment, trade and job creation, green spaces are not needed.		
Nutrition	+	Backyard gardens are important to supplement incomes by selling roots and tubers, vegetables and fruits.	
	+	Produce from our gardens are available when we are in dire need of them because they are scarce on the market.	
	+	Small livestock in urban environments can make a big difference to nutrition and health.	
	-	Cattle in urban areas can be dangerous if it is not properly enclosed.	
	-	Vegetables grown in the city are contaminated through chemicals and dirty water use.	
Regulation and maintenance	Maintenance of physical, chemical, biological conditions	+	Brong Ahafo used to be a forest so now we should be planting trees to recreate this natural environment.
		+	Greenspaces are essential for recycling the nutrient into the soil, conserving soil quality for backyard gardens.
		+	Keeping greenspaces in the city allows natural predators of pests to stay and decrease the pests' impacts.
		+	Open green spaces in the city are important to protect our waterways, essential for the provision of clean water.
		+	Parks and open green spaces offer me an opportunity to exercise to stay healthy.
		+	The insects can help produce more fruits through pollination so we can get to eat fresh fruits from our backyard gardens.

		<ul style="list-style-type: none"> + Trees within the city are important to provide me with natural shade. - Greenspaces in the city are not good for health because they attract malaria-carrying mosquitoes. - Many plants and animals found in urban green spaces and parks can cause allergies. - Urban greenspaces can harbour animals that are aggressive towards humans.
	Mediation of flows	<ul style="list-style-type: none"> + In the city, trees are natural windbreaks which protects me from storms. + We need the trees in our cities to help reduce the impact of climate change. + With grass and trees in the city, when the rain comes, it just flows down and sinks into the ground instead of flooding the city. - Trees in cities risk to fall on me or my house during storms.
	Mediation of wastes, toxics and other nuisances	<ul style="list-style-type: none"> + A key component of urban green spaces is to reduce the level of noise. + Greenspaces are useful for dumping refuse. + The purpose of a green space is to reduce air pollution within the city. + Urban livestock can consume agricultural and household waste products, converting them into human food.
Cultural	Physical and intellectual interactions with biota, ecosystems, and landscapes [environmental settings]	<ul style="list-style-type: none"> + Green spaces in school yards help to inculcate in our children good environmental practices and awareness, to become environmentally responsible adults. + Greenspaces provide me with recreational opportunities. + Growing cities should not affect the traditional norms of keeping the environment green and clean, which was taught by parents in the community. + Parks are the heartbeats of all social gatherings. + The gardens and scented flowers along the roads are making the city more attractive and beautiful. + The variety of flowers and grass in the gardens acts as magnets that pulls the youth to snap pictures. + Trees bring me peace and tranquillity. + Urban greenspaces are a key driver of the film and advertising industry. - Buildings make the environment more beautiful than trees and flowers. - Green spaces and parks are often been taken over by lunatics, gangs and robbers, so I feel afraid to go there.
	Spiritual, symbolic and other interactions with biota, ecosystems, and landscapes	<ul style="list-style-type: none"> + Because I live in the city and will not go to the bush to see the plants and animals, I want to see them in the city. + By conserving greenspaces in cities, we are continuing the work of God, who created all species to live with us. + Ghanaian cities must increase their green spaces to give residents a sense of pride. + Urban forests and parks are good places for religious activities, prayers and meditation.

	+	Urban forests should be preserved for the present generation and generations yet unborn.
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169

170 *2.2.2. Selection of the participants*

171 We interviewed 76 people from three different categories: Experts, Authorities and Users. Each
172 represented a category with different levels of interest and influence in greenspace planning and
173 management.

174 The Experts (n=22) were defined as having both influence on the wider population in regards to
175 greenspaces and/or urban planning and interest in the subject, making them key players to target for
176 any urban conservation initiative (Reed et al., 2009). Experts included people working for various
177 government offices related to land-use planning, greenspace management and environmental
178 services, as well as representatives of the traditional authorities (the main land-owners in Ghana who,
179 in total, own about 80% of the land; Kasanga and Kotey, 2001), estate developers and environmental
180 outreach NGOs. Though experts have a strong influence on greenspaces, they have an intellectual and
181 planning approach to greenspaces, and only some of them directly interact with, or spend time in,
182 greenspaces on a regular basis. We ensured that Experts had this intellectual and planning approach
183 to greenspaces by selecting them through snowball sampling, which specifically targeted Experts
184 working on land-use or greenspaces planning. Initially, participants were identified by visiting
185 government offices whose official aim is to carry out urban planning or greenspace management.
186 Participants within those offices were then asked to identify other stakeholder groups who could be
187 approached. By asking for groups such as organisations and institutions rather than individuals, we
188 limited the impact of the initial participants on the sample. We also diversified the sample by
189 contacting potential participants not directly part of the initial participants' network.

190 The Authorities (n=27) were stakeholders with high influence on the wider population but little
191 interest in greenspaces and/or urban planning. Their viewpoints are important to take into
192 consideration for urban greenspace conservation initiatives as their influence can be both a threat or

193 an opportunity for its success (Reed et al., 2009). Authorities included representatives of the main
194 political parties, the media, the education system and religious groups. Their relationship with
195 greenspaces was in general even more distant than that of Experts, as they had an influence on the
196 population rather than on greenspaces directly. Authorities were identified by the same snowball
197 sampling method as that of the Experts.

198 Users (n=27) were defined as stakeholders with an interest in urban greenspaces, but with little
199 influence as individuals on the city-wide implementation of greenspaces through policies, planning or
200 management. Users included urban farmers (both crop and livestock), owners of gardens and active
201 users of public greenspaces. As opposed to the two other groups, users experience a more direct
202 relationship with greenspaces, interacting with, or spending time in, them daily. This relationship was
203 captured by a different sampling method, targeting urban farmers, owners of private domestic
204 gardens and those actively using greenspaces in public areas. As the Q-methodology requires a variety
205 of opinions rather than a representative sample (Watts and Stenner, 2012), we aimed to capture the
206 diversity of user viewpoints by targeting people from a variety of neighbourhoods, using different
207 types of greenspaces, as well as of different demographics, by for instance including a balance of
208 genders, adult participants from all age groups, with varying levels of education and Ghanaians as well
209 as migrants.

210 *2.2.3.Data collection*

211 Interviews took place in locations familiar to the participants, such as their offices or properties. During
212 each interview, participants were first asked to describe in their own words what they understood by
213 greenspaces. This ensured that they had an understanding of the subject and allowed a verification of
214 the consistency or inconsistency of definitions. Participants were then presented with the 45
215 statements and asked to do a first classification by dividing them in three piles according to whether
216 they agreed, disagreed, or neither agreed nor disagreed with each statement. They were then asked
217 to further this classification by ordering them from the most agreed to the most disagreed on a grid

218 representing a quasi-normal distribution of nine steps (Fig. S1), resulting in a 'Q-sort' of the different
219 statements for each participants. This sorting exercise was followed by a discussion on the reasons
220 underlying decisions made in the sort, as well as some details of their socio-demographic background.
221 Interviews were recorded and transcribed for analysis. Data collection was conducted in the same way
222 for each stakeholder category.

223 *2.2.4. Analyses*

224 The description of greenspaces by the participants were quantified to take the same approach as the
225 Q-methodology, which analyses qualitative data quantitatively. We classified the descriptions into
226 three classes emerging from the interviews, namely a description of greenspaces (1) through the
227 benefits they bring to society, (2) through their physical characteristics and (3) through how land is
228 managed. Based on the different descriptions, each of those classes were then sub-divided into 10,
229 three and three sub-classes respectively. We quantified the number of mentions of each of those
230 classes and sub-classes by each stakeholder category. This allowed us to illustrate the diversity and
231 similarities in the descriptions of greenspaces, while being able to discuss their implications
232 qualitatively.

233 Statistical analysis of the individual Q-sorts identifies common and diverging viewpoints by grouping
234 the participants according to the rank they assigned to each statement (Watts and Stenner, 2005).
235 The sorts were analysed by applying a principal component analysis and a varimax rotation within the
236 R package "qmethod" (Zabala, 2014). Individual Q-sorts were automatically assigned to a viewpoint
237 according to how representative of a viewpoint their ranking of the statements was. The scores of the
238 Q-sorts assigned to a viewpoints were then used to reconstruct a hypothetical Q-sort for each
239 viewpoint by calculating the scores of each statements. Distinguishing and consensus statements were
240 also identified (Zabala, 2014). The viewpoints were interpreted by examining the distribution of the
241 distinguishing statements within each hypothetical Q-sort, considering the statements in the extremes
242 of the hypothetical Q-sorts and relating them to the interviews of the participants whose Q-sorts had

243 been assigned to the viewpoint in question. Consensus statements were used to understand the
244 commonalities across all viewpoints. Sorts from the three stakeholder categories were analysed
245 independently, with the number of viewpoints extracted determined by having at least one
246 distinguishing statement and two participants per viewpoint (Coogan and Herrington, 2011).

247 Comparisons of viewpoints across stakeholder groups in Q-methodology is usually carried out by
248 analysing them separately and qualitatively comparing the results (Watts and Stenner, 2012). An index
249 to quantify those comparisons has been developed (Giannichi et al., 2017), allowing a more precise
250 detection of differences amongst all, or a subset of, statements between two viewpoints. We used an
251 adapted version of this index to account for the fact that all our participants were exposed to the exact
252 same set of statements. This index was defined as:

$$253 \quad (1) \quad CI(\{S\}) = \frac{\sum_{i \in S} |V_i - W_i|}{C_S}$$

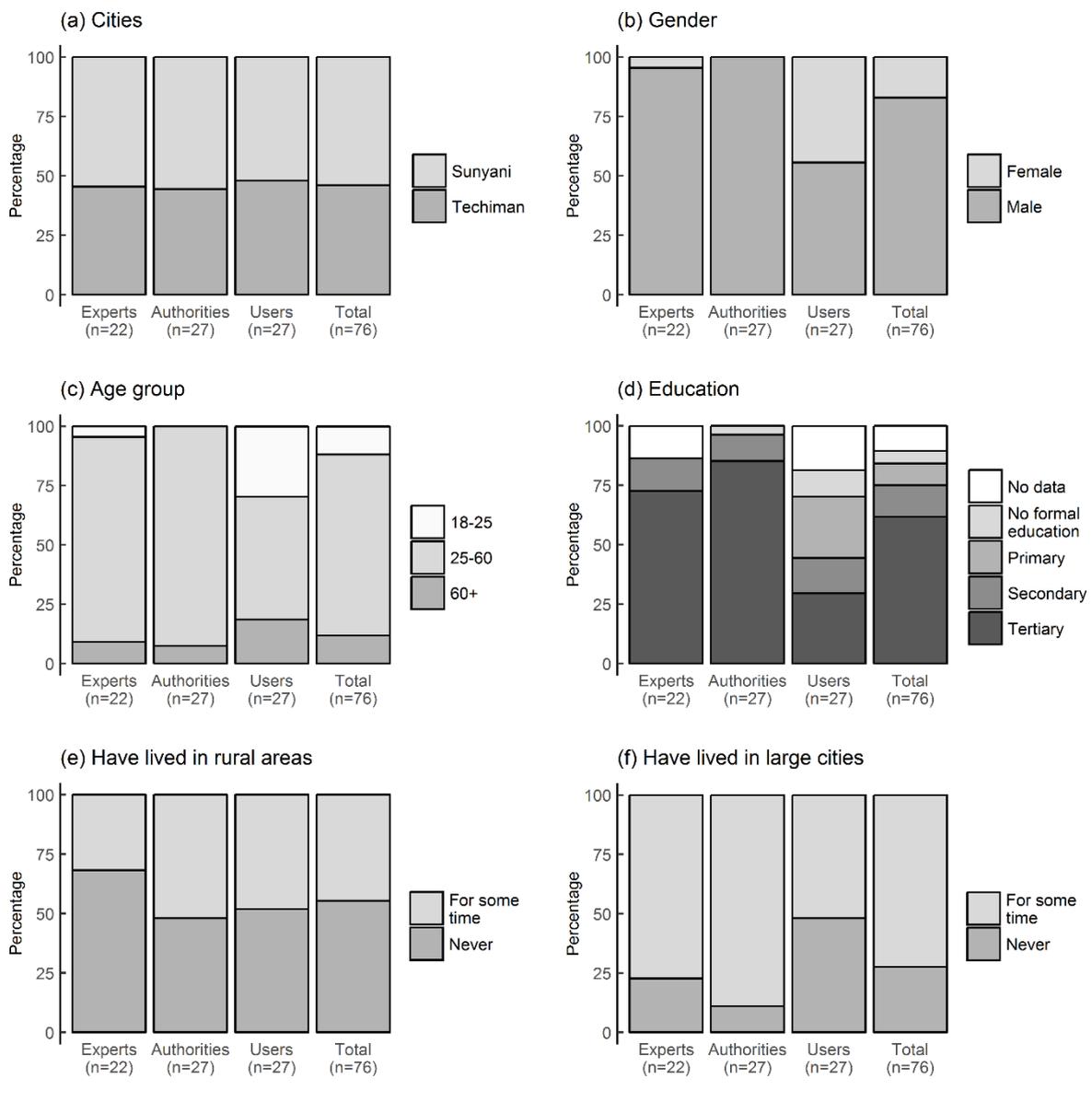
254 where V_i and W_i are the factor rankings (zsc_n) for statement i for the two compared viewpoints and
255 C_S is the maximum potential $\sum_{i \in S} |V_i - W_i|$ for the subset of statements within the given Q-set
256 (here, $C_{Total}=164$, $C_{Provisioning}=84$, $C_{Regulating}=112$ and $C_{Cultural}=100$). C_S ensures that the comparison
257 index (CI) ranges from 0 to 1, with zero representing the most agreement and one the most
258 disagreement between the compared viewpoints. With this index, we quantified the differences in
259 viewpoints within and between stakeholder categories, for all statements and separately for the
260 subsets of statements covering the three ecosystem services sections (provisioning, regulating and
261 cultural, Table 1).

262 **3. Results**

263 Participants were between 18 and 87 years old. Around a third had spent a portion of their lives in
264 rural areas, while half had lived in a larger city such as Accra or Kumasi. Participants in the Experts and
265 Authorities categories were relatively homogenous, while we were able to select a more diverse

266 sample of Users. Experts and Authorities were overwhelmingly male and more likely to have had
 267 tertiary education and be of working age (25-60 years) compared to Users (Fig. 2).

268



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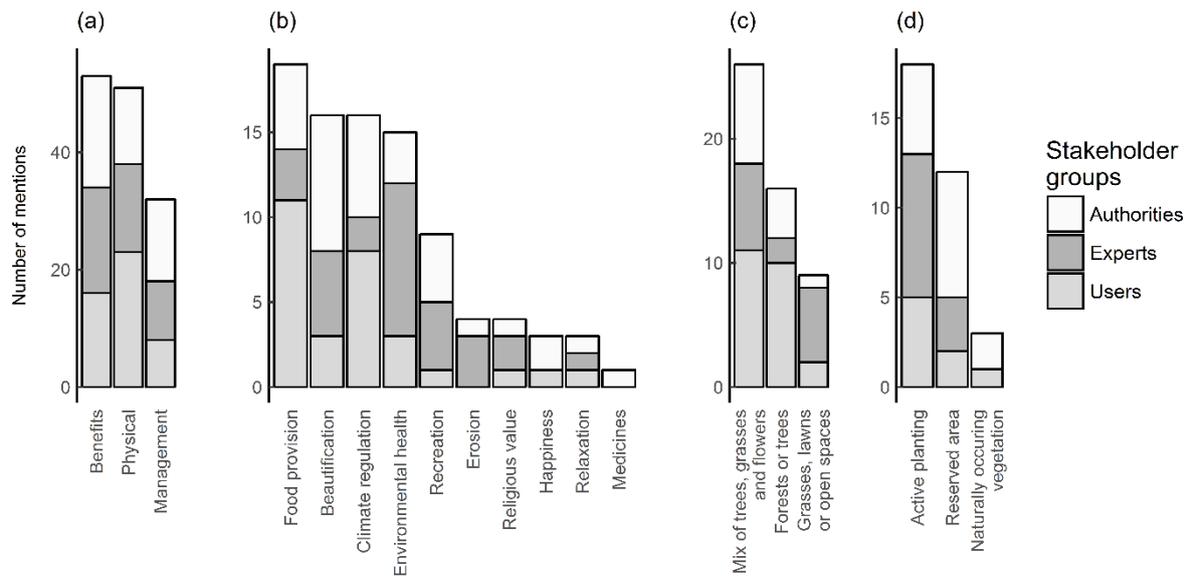
270 **Fig. 2.** Socio-demographic characteristics of the 76 participants, divided into three categories. Experts
 271 had both influence on the wider community and interest in urban greenspaces and/or planning,
 272 Authorities had influence on the wider community, but no specific interest in urban greenspaces
 273 and/or planning. Users had an interest in urban greenspaces but no influence over their conservation
 274 or implementation at a city scale. See Table S3 for socio-demographics per viewpoints.

275

3.1. Understanding of greenspaces

276 When asked to define what they understood by urban greenspaces, 53 out of 76 participants
277 described them by the benefits they bring to humans (e.g. food provision, shade), 51 by their physical
278 characteristics (e.g. trees, mix of trees of grasses) and 32 by the management practices leading to their
279 presence (e.g. setting aside land from development, deliberately planted sites; Fig. 3a). Eleven
280 participants mentioned all the three aspects in their understanding, and 25 participants only
281 mentioned one of the aspects (10, 13 and two for benefits, physical characteristics and management
282 respectively).

283 Benefits mentioned were varied (Fig. 3b). The three most common were food provisioning through
284 urban gardening or fruit trees (n=19), climate regulation (including both macro- and micro-climate,
285 n=16), improvement of the city's aesthetics (n=16) and general environmental health (n=15). Amongst
286 those describing greenspaces by their physical characteristics, the most common description of
287 greenspaces included stating that they contained a mix of different vegetation types ranging from
288 trees to flowers and lawns (n=26). Fewer descriptions only mentioned trees or forest (n=16). Nine
289 participants described greenspaces as being open spaces with only grasses (Fig. 3c). When describing
290 greenspaces through the management practices leading to their presence, active plantation (through
291 agriculture, tree nurseries or decorative planting, n=18), setting land aside to protect it from physical
292 development (n=12), and remnant patches of naturally occurring vegetation (n=3) were mentioned
293 (Fig. 3d).



294

295 **Fig. 3.** Descriptions of urban greenspaces by stakeholders (n=76). (a) General description of
 296 greenspaces; more detailed by a differentiation of (b) the benefits they are perceived to offer, (c) their
 297 physical characteristics and (d) the way they are managed. Totals exceed 76 as participants were not
 298 restricted to reporting a single aspect.

299 3.2. Experts

300 The Q-methodology revealed that consensus amongst Experts focused on the need for greenspaces
 301 in cities despite development pressures, but that they should be well maintained and pose no health
 302 risks. Experts also considered that conserving greenspaces was part of their religious duty. Shade
 303 provision was the main motivation for greenspace conservation (Table 2). Four different viewpoints
 304 were identified:

305 3.2.1. *Greenspaces for environmental regulation*

306 This group of Experts highly valued greenspaces for their regulating functions as provided when in a
 307 “natural” state. They saw a need to plant urban forests to keep services such as such as flood
 308 prevention, waterway protection, nutrient recycling and adaptation to climate change in the city: “We
 309 can bring it back if conscious efforts are done because we have grown and realised the relevance of
 310 trees on the lives of mankind”. They also considered greenspaces to be at risk of disappearing in the

311 face of development, partly because of the *“intangible aspects”* of those services: *“it was a planned*
312 *forest but they pulled down all those trees and they are now building a hotel or something there so*
313 *that is an issue we are facing currently”*.

314 3.2.2. Greenspaces for well-being

315 Experts sharing this viewpoint highly valued greenspaces for the peace and tranquillity they provide,
316 offering a place for people to be quiet, away from the noise of the city: *“Trees, they don’t talk, they*
317 *only whistle and [...] you hear the trees singing their own song peacefully. [...] Every man wants peace*
318 *and tranquillity and harmony and trees will offer that.”* Greenspaces therefore were seen to offer
319 opportunities to relax but also to be a place for social interactions and exercise: *“When it is warm*
320 *people like to go under the tree – for the shade, because it’s cool, but not only. They play games [...]*
321 *meet and get social”*.

322 3.2.3. Greenspaces as source of danger

323 What differentiated these Experts was their fear of potential dangers from greenspaces, such as the
324 health hazards from urban farming (through vegetables contaminated by dirty water use, disease
325 transmissions and attacks by livestock) or the criminals that vegetation can help to hide: *“if somebody*
326 *wants to trap you, the person can hide on the tree or in the bushy area”*. They saw crime as a reason
327 to keep greenspaces well maintained, rather than destroying them and replacing them by housing or
328 other buildings: *“If the urban centres are being over-populated, clearing the backyard gardens will not*
329 *resolve the problem. There should be other social policy interventions that will [...] decongest the city.”*
330 They also highly valued the education potential of urban greenspaces: *“you want to inculcate [...] the*
331 *spirit of cultivation and maintenance among the school children”*.

332 3.2.4. Greenspaces for income and socialisation

333 For these Experts, the value of greenspaces originated in the income they provide, for instance
334 through backyard farming: *“[backyard gardens] are necessary for providing food”*. They also
335 appreciated the space they provide for recreation and social interaction: *“In my leisure time, maybe I*

336 *will call my colleagues, if they want to play a local game like draughts, you need [...] a place that is*
337 *having shade so we can go there and enjoy our game”.* However, they also mentioned that business
338 and accommodation is more important in cities and should take priority over greenspaces.

339 3.3. Authorities

340 Authorities highly valued greenspaces and saw it as their religious duty to conserve them. They were
341 not concerned about any health impacts from greenspaces and acknowledged other benefits such as
342 the role of greenspaces for improving the appearance of a city, the provision of traditional medicine,
343 protection against flooding and the importance of urban animal husbandry on both human nutrition
344 and soil fertility. Three distinct viewpoints were identified:

345 3.3.1. *Greenspaces as a legacy*

346 People holding this viewpoint had a long-term worldview in which greenspaces were perceived as part
347 of their heritage, to be passed on to future generations through education. They considered that
348 urban greenspaces should be conserved and replanted as source of pride for residents: *“we have to*
349 *plant trees to get our lost glory, so the environment must be recreated again. [...] anybody who gets*
350 *here will admire [the city]”.* As part of this desire to conserve greenspaces, they were also aware of
351 the pressures greenspaces face and tried to think strategically about it: *“there is competition in terms*
352 *of the use of any piece of land that is available for development in urban space. So in order to actually*
353 *stay in competition, you should look at [...] how we can also generate directly income from whatever*
354 *parcel of land we are deliberating on.”*

355 3.3.2. *Greenspaces for their multi-functionality*

356 For this group, the multi-functionality of greenspaces was thought to be their main value. They highly
357 valued them for climate regulation, provision of household incomes, partly through urban farming (*“if*
358 *I have [crops] at the back of my house, I will not need money to buy them at the market”^{*1}*), and the

¹ Quotes indicated with a * were translated from Twi

359 social interactions they help facilitate (*“it can serve for weddings [...] and it can serve as a nice place*
360 *for recreation”*).

361 3.3.3. Greenspaces for religion

362 People with this viewpoint thought that greenspaces play two roles in their faith. Firstly, it was their
363 religious duty to conserve greenspaces for future generations and secondly, greenspaces offered them
364 the opportunity to exercise their faith: *“Anything that can bring about peace and unity is good. To be*
365 *able to meet and discuss about God and worship him”**. Additionally, greenspaces were thought to
366 play a role in both education and in beautifying the city.

367 3.4. Users

368 There was less consensus amongst greenspace Users compared to the two other categories. Users
369 only agreed on four statements, compared to nine and ten for Experts and Authorities respectively,
370 and not all Users were in favour of increasing urban greenspace cover. Nevertheless, they were all in
371 agreement that the shade provided by urban greenspaces is very important. They also acknowledged
372 that greenspaces can be positive for the aesthetics of the city and highly disapproved of littering. Four
373 distinct viewpoints were identified:

374 3.4.1. Greenspaces as cultural heritage

375 This group of Users saw forests as a defining aspect of the region, which should be maintained in the
376 city for their heritage value: *“Every city has its heritage, something that marks it out there. And Brong*
377 *Ahafo, we are known for forests reserves, but now [...] we are losing all our [forest reserves] for*
378 *buildings.”*. Greenspaces were also valued from a religious aspect: *“In the beginning, God created trees*
379 *and grasses and bushes on the earth. [...] If they were not important, God could have designed the*
380 *earth with terrazzo or tiles.”*, and for the protection they offer against harsh climatic conditions. They
381 also recognised and valued the contribution that urban farming can make to household food supplies,
382 although they did not necessarily farm as a full-time job: *“Originally it started like just fun, so just to*

383 *see things, so just plant them and keep watering them. And now they became a major source of*
384 *vegetables.”*

385 *3.4.2. Greenspaces for children*

386 Users sharing this viewpoint regretted the disappearance of trees in the landscape, which some
387 remembered fondly from their childhood: *“When I was a kid, we used to have all these places full of*
388 *trees and other stuff. We used to climb there, play around there.”* They thought replanting and
389 conserving trees was important for the children, both to provide them with places to play and as a
390 legacy from their elders. They also valued the complementary income that greenspaces can bring to
391 the poor through food and fuel, and the flood protection greenspaces offer. While greenspaces were
392 not perceived as a source of danger, they were not a source of peacefulness either.

393 *3.4.3. Greenspaces for beauty and cleanliness*

394 For this group of Users, greenspaces were highly valued for their cleansing properties, providing fresh
395 air and purifying waterways, and the role they play in providing protection against the weather. Their
396 beauty was perceived as important for promoting the city to the outside world, in order to attract
397 people and profitable businesses: *“Flowers beautify cities more than buildings. Buildings also play a*
398 *role in beautifying the cities, but flowers are really the key element of city beautification.”** However,
399 in comparison with other user viewpoints, they were more concerned about the detrimental effects
400 of retaining greenspaces for economic and social development and the problems they might create,
401 such as serving as hideouts for criminals. They acknowledged the presence of urban agriculture but
402 did not value it, wary of the impact of urban pollution on the quality of city-grown crops, thinking that
403 urban livestock are dangerous for residents, and dismissing regulating services linked to farming, such
404 as nutrient cycling and pollination.

405 *3.4.4. Greenspaces for development*

406 These Users typically thought that housing and commercial enterprises should be allowed to expand
407 and be prioritised over greenspaces: *“It is appropriate to eliminate backyard gardens to build houses*

408 *for people to live in*". Yet they still valued greenspaces for their provision of resources such as fuel,
409 and their provision of serenity, by reducing the noise and providing a space for meditation. They
410 thought that greenspaces should be free and accessible for all and insisted on intensive management
411 to maintain them: *"It does makes the town beautiful. Visitors can appreciate the cleanliness of the*
412 *people living there."*. Despite valuing greenspaces for their part in increasing the city's beauty, they
413 also thought that buildings can sometimes be more aesthetic than greenspaces. They gave little value
414 to regulating services such as flood protection, storm protection, nutrient recycling or protection of
415 waterways.

416 **Table 2.** Factor rankings for each statement for the hypothetical Q-sort (i.e. Q-sort reconstituted for each viewpoint from the factor scores), ranging from 4
417 (most agree) to -4 (most disagree). Bold scores indicate consensus amongst viewpoints within each stakeholder category and asterisks indicate that the
418 statement is a distinguishing statement for the viewpoint in question within the stakeholder category. For instance, all authorities agreed on the relative
419 importance of “Livestock in cities is important as it provides manure to improve soil fertility”, rating it as slightly negatively (score of -2). However, “Urban
420 trees are an important source of wood and charcoal fuel” was distinguishing for the Authority viewpoints on *greenspaces for multi-functionality*, meaning it
421 was more important for them than for the others, with a statistically higher rating of -1 as compared to -3 than for both the other Authority viewpoints. See
422 Table S4 for the z-scores, Table S5 for the statistical significance of distinguishing and consensus statements and Table S6 for the factor loadings per
423 participant.

Section		Statements	Factor ranking									
			Experts				Authorities			Users		
			Environmental regulation	Well-being	Source of danger	Incomes and socialisation	Legacy	Multi-functionality	Religion	Cultural heritage	Children	Beauty and cleanliness
Provisioning	Urban trees are an important source of wood and charcoal fuel.	-1	-4	-4	-1	-3	-1*	-3	-3	1*	-4	4*
	Converting urban parks and reserves to ecotourism facilities is essential to make them profitable.	0	0	3	2	1*	0*	2*	0	0	2*	-2*
	Livestock in cities is important as it provides manure to improve soil fertility.	-2	-1	-2	-1	-2	-2	-2	-2	1	-1	1
	The job opportunities and incomes that could be earned from the development of urban parks, gardens and green spaces are significant.	1	0	-1	1	1*	3*	-2*	0	-1	-3*	0
	The presence of trees and plants that heal is crucial in a city, as traditional medicine is an economical and trusted form of health care.	2*	0	-1	-2*	0	0	0	2	1	3	0
	Backyards and parks should be cleared to provide space for businesses and accommodation for the ever increasing urban population.	-4	-4	-4	2*	-4*	-3*	0*	-4	-2	-4	-1
	Cities are centres of employment, trade and job creation, green spaces are not needed.	-4	-4	-4	-4	-4	-4	-4	-4	-4	-2*	-1*

	Backyard gardens are important to supplement incomes by selling roots and tubers, vegetables and fruits.	0	1	2	4	0*	3	2	0	4	-1	2
	Produce from our gardens are available when we are in dire need of them because they are scarce on the market.	0	0	1	-2*	-1	1*	-1	3*	-1	0	-1
	Small livestock in urban environments can make a big difference to nutrition and health.	0*	-2	-2	-1	-1	-1	0	1	-1	0	-2
	Cattle in urban areas can be dangerous if it is not properly enclosed	1	-1	4*	0	0	1	2	-1	1	3	0
	Vegetables grown in the city are contaminated through chemicals and dirty water use.	-2	-2	3*	-4	-1	-2	-1	-2*	-1	2*	1
Regulation and maintenance	Brong Ahafo used to be a forest so now we should be planting trees to recreate this natural environment.	4*	2	2	2	3	0*	3	4	3	-2*	3
	Greenspaces are essential for recycling the nutrient into the soil, conserving soil quality for backyard gardens.	2*	0	0	0	1	1	1	3	2	-1*	-3*
	Keeping greenspaces in the city allows natural predators of pests to stay and decrease the pests' impacts.	-2	-1	-3	-2	-2	-1	-1	-1	-2	-1	1*
	Open green spaces in the city are important to protect our waterways, essential for the provision of clean water.	2	2	0	2	0	-1*	2	-1*	2	3	-3*
	Parks and open green spaces offer me an opportunity to exercise to stay healthy.	1	3	1	1	1	1	-1*	1	2	1	-1*
	The insects can help produce more fruits through pollination so we can get to eat fresh fruits from our backyard gardens.	1	-1	-2*	0	0	2*	0	1	1	-3*	2
	Trees within the city are important to provide me with natural shade.	3	2	4	1	2	3	4	3	2	3	3
	Greenspaces in the city are not good for health because they attract malaria-carrying mosquitoes.	-3	-3	-3	-3	-3	-3	-4	-3*	-1	-2*	-1
	Many plants and animals found in urban green spaces and parks can cause allergies.	-2	-2	-2	-1	-2	-3	-2	-2*	-3*	-1*	1*
	Urban greenspaces can harbour animals that are aggressive towards humans.	-3	-3	-2	-3	-3	-1*	-4	-3	-2	0	-1
	In the city, trees are natural windbreaks which protects me from storms.	4	1	3	3	2*	4*	1*	2	1	4*	0*
	We need the trees in our cities to help reduce the impact of climate change.	4	3	1	0	4	4	1*	4	3	0	1

	Urban forests and parks are good places for religious activities, prayers and meditation. Urban forests should be preserved for the present generation and generations yet unborn.	1	-1	0	4*	2*	0*	4*	2	0	1	3
		3	4	1*	3	4	2	4	3*	4*	0*	-3*

425 3.5. Comparisons

426 The comparison analysis highlighted strong differences between the viewpoints of three stakeholder
427 categories when considering all sections of ecosystem services (comparison indexes (CI) up to 0.71; with
428 one indicating total disagreement; Table 3.a). However, the main disagreements were found between
429 the User viewpoint *greenspaces for development* and the other viewpoints (CI from 0.60 to 0.71) and,
430 to a lesser extent, between Users perceiving *greenspaces as a source of cleanliness* and the other
431 viewpoints (CI from 0.41 to 0.66). Both were quite different from each other (CI=0.7), but more
432 accepting than other viewpoints to the possibility of actively prioritising urban expansion over
433 conserving greenspaces. Aside from these, viewpoints were generally in agreement (most CI under 0.5).
434 Comparisons between stakeholder categories highlighted a higher level of similarity between Experts
435 and Authorities (maximum CI of 0.46) than between Users and the other two stakeholder categories
436 (max. CI=0.71 with Experts and 0.70 with Authorities). One viewpoint from each category, namely the
437 Experts for *regulation*, the Authorities for *legacy* and the Users for *cultural heritage* were in high
438 agreement with each other (CI of 0.21 to 0.24). All emphasised the importance of regulating ecosystem
439 services and the heritage value of greenspaces. Within stakeholder category variation was relatively low
440 for Experts and Authorities (max. CI=0.49 and 0.48 respectively). Users were the most heterogeneous
441 category (max. CI=0.79), mirroring the socio-demographic backgrounds of the stakeholder groups.

442 No single ecosystem service section underpinned all of the disagreements between viewpoints. There
443 were similar agreement levels within provisioning and regulating services (average CI=0.25 for both),
444 and only slightly more disagreements for cultural services (average CI=0.28). However, (dis)agreement
445 patterns for both provisioning and cultural services were relatively representative of the agreement
446 patterns found when considering all categories of ecosystem services, whereas regulating services
447 showed a slightly different picture.

448 For provisioning services (Table 3.b), the highest disagreements were found between the viewpoints of
449 the Users valuing *greenspaces for beauty and cleanliness* and the Experts valuing *greenspaces for*

450 *income* (CI=0.44), with Users emphasising the risks of urban farming, while the Experts praised the
451 incomes it creates. In general, Authority viewpoints were in high agreement with each other (maximum
452 CI=0.21) as well as with the Experts (max. CI=0.26), but diverged more with some of the User viewpoints
453 (especially with the one for *beauty and cleanliness*, CI=0.36). The slightly higher agreement for the
454 overall classification between the User viewpoints *greenspaces for development* and *children* than with
455 the other viewpoints was explained mainly through a higher consensus on the role of provisioning
456 services (CI=0.20), mainly focusing on urban agriculture, highlighting both the benefits of crop farming
457 and the risks of urban livestock.

458 As opposed to the other services sections, the highest disagreements for regulating services (Table 3.c),
459 were systematically found between the User viewpoint on *greenspaces for development* and all other
460 viewpoints (CI from 0.38-0.43), followed by the Users seeing *greenspaces for beauty and cleanliness* to
461 all other viewpoints (CI from 0.21 to 0.37). Except for those two differing viewpoints, there was high
462 agreement between all stakeholders on the value of regulating services.

463 The disagreements regarding the relative valuation of cultural services (Table 3.d) were marginally larger
464 than for the other service sections. The highest disagreement was found between Users seeing
465 *greenspaces for development*, and Authorities appreciating their *multi-functionality*, with the former
466 dismissing the importance of legacy, focusing more on beautification and income-generating aspects,
467 whereas the later highly valued recreation, education and legacy.

468

469 **Table 3.** Comparison indexes (CI) contrasting the viewpoints both across and within the three stakeholder categories. (a) Overall comparison, (b) provisioning
 470 services, (c) regulating services and (d) cultural services. Light cells, closer to zero, represent agreement while darker cells, closer to one, represent
 471 disagreement.

		Experts			Authorities			Users				Experts			Authorities			Users			
		Well-being	Danger	Income	Continuity	Multi-functionality	Religion	Cultural heritage	Children	Filtration	Development	Well-being	Danger	Income	Continuity	Multi-functionality	Religion	Cultural heritage	Children	Filtration	Development
(a) All ecosystem services											(b) Provisioning										
Experts	Regulation	0.35	0.41	0.45	0.21	0.30	0.46	0.22	0.39	0.51	0.67	0.14	0.29	0.27	0.11	0.12	0.21	0.11	0.20	0.24	0.33
	Well-being		0.40	0.40	0.28	0.37	0.44	0.35	0.41	0.55	0.65		0.21	0.27	0.11	0.17	0.21	0.13	0.23	0.26	0.29
	Danger			0.49	0.37	0.40	0.41	0.41	0.54	0.41	0.71			0.37	0.23	0.26	0.21	0.30	0.32	0.21	0.38
	Income				0.43	0.44	0.43	0.50	0.44	0.56	0.65				0.24	0.23	0.23	0.36	0.24	0.44	0.35
Authorities	Continuity					0.37	0.40	0.24	0.41	0.51	0.63				0.15	0.15	0.14	0.21	0.25	0.30	
	Multi-functionality						0.48	0.32	0.43	0.56	0.70					0.21	0.20	0.18	0.36	0.31	
	Religion							0.43	0.43	0.49	0.63						0.25	0.20	0.24	0.31	
Users	Cultural heritage								0.46	0.54	0.71								0.29	0.27	0.39
	Children										0.66	0.60								0.35	0.20
	Filtration																				0.40
(c) Regulating											(d) Cultural										
Experts	Regulation	0.18	0.21	0.20	0.09	0.18	0.25	0.13	0.17	0.32	0.41	0.26	0.20	0.29	0.15	0.20	0.30	0.13	0.28	0.28	0.36
	Well-being		0.19	0.16	0.14	0.21	0.21	0.20	0.21	0.32	0.38		0.26	0.25	0.21	0.22	0.30	0.25	0.26	0.32	0.40
	Danger			0.15	0.15	0.21	0.22	0.19	0.25	0.26	0.40			0.33	0.25	0.20	0.24	0.21	0.34	0.20	0.40
	Income				0.16	0.21	0.23	0.21	0.26	0.21	0.41				0.32	0.29	0.25	0.28	0.23	0.31	0.31
Aut	Continuity					0.18	0.23	0.13	0.19	0.32	0.38				0.27	0.27	0.14	0.29	0.27	0.37	

	Multi-functionality			0.27	0.14	0.24	0.27	0.39			0.30	0.19	0.28	0.32	0.44
	Religion				0.23	0.21	0.36	0.39				0.23	0.30	0.20	0.34
Users	Cultural heritage					0.21	0.36	0.39					0.29	0.25	0.39
	Children						0.37	0.40						0.38	0.36
	Filtration							0.43							0.32

473 **4. Discussion**

474 By differentiating viewpoints on the values held for the suite of ecosystem services in relation to each
475 other, we obtained a rich picture of the varying viewpoints on urban greenspaces across multiple
476 stakeholders. We highlighted that, despite the existence of a diversity of viewpoints, greenspaces
477 were generally valued, providing opportunities for coordination and communication about the
478 benefits of urban greenspaces across stakeholders. However, strong divergences in regards to which
479 services were most valued, especially between stakeholders with more influence on policies and city-
480 wide implementation and those with more direct contact with greenspaces, emphasises the
481 importance of bottom-up approaches to greenspace conservation. Such understanding of the
482 diversity of viewpoints provides keys for better targeting urban greenspace conservation programs
483 either with different approaches for each stakeholder group or by concentrating on areas of
484 consensus.

485 4.1. Including viewpoints of urban residents

486 Given that uncooperativeness from residents and communication issues between stakeholders can be
487 major barriers to the conservation of greenspaces (du Toit et al., 2018), shaping discourses on the
488 promotion of greenspaces according to the values of the urban residents could help decrease
489 misunderstandings and increase engagement by urban residents. In Ghana, public participation in
490 urban planning has been promoted by the government as a way to gain a better understanding of
491 residents' values and develop cities in a more equitable and sustainable fashion (Andrade and Rhodes,
492 2012; UN-Habitat, 2016), yet its application remains limited (Government of Ghana, 2012). Such lack
493 of participation, together with the limited knowledge of urban residents' perceptions of greenspaces,
494 can lead to dissatisfaction from the urban population either about the lack of public greenspaces or
495 regarding how they are managed (Shackleton and Blair, 2013) and a disengagement of their part
496 (Mensah, 2014).

497 As such, framing discourses on urban greenspaces around benefits specifically valued by greenspace
498 Users, such as the reduction of air pollution or the beautification of the city, could help build support
499 among the general public for their retention. However, User viewpoints tended to be very diverse.
500 This higher diversity was to be expected due to the differences in sampling methods, as the snowball
501 sampling method used for Experts and Authorities can decrease the diversity of the participants
502 (Kirchherr and Charles, 2018); something which was apparent in our sample (Fig. 2). This diversity of
503 viewpoints amongst the Users is also likely to be more aligned with the variety of viewpoints held by
504 the wider urban society than that of the Experts or the Authorities, as their socio-economic situation
505 is more similar (Ghana Statistical Services, 2013). Additionally, acknowledging that services
506 detrimental to the long-term conservation of greenspaces, such as the provision on fuelwood, are
507 valued by some greenspace users could prompt Experts to help provide alternation solutions and thus
508 minimise extraction. If no effort is made to do so, there is a risk that the divergences in opinions
509 between greenspace Users and Experts, and the lack of both funds and political will to preserve
510 greenspaces (Schäffler and Swilling, 2013; Shackleton and Blair, 2013) could increase the lack of
511 support by the urban population and lead to a rapid decrease of urban greenspaces.

512 4.1. The impact of pressures to develop land

513 Many Users did not think that greenspaces should be retained at all, arguing instead that such areas
514 should be converted to buildings in order to generate income. Such pressures to develop land were
515 perceived as a threat to the provision of ecosystem services by many stakeholders from the Experts
516 and Authorities categories. This is a common feature throughout Sub-Saharan Africa, where economic
517 development and the provision of basic services is prioritised by policy-makers (Schäffler and Swilling,
518 2013). Policy guidelines do emphasize the importance of the built environment (Government of
519 Ghana, 2015), yet we highlighted that not all Ghanaian Experts, as individuals, valued businesses and
520 buildings at the expense of greenspaces, and that they mostly have a fair understanding of the
521 ecosystem services provided by greenspaces, in contrast with experts in other parts of the continent
522 (Gwedla and Shackleton, 2015).

523 Despite holding personal opinions on the value of retaining greenspaces, most of the Experts did not
524 tend to mention that their official roles actually included ensuring that greenspaces were retained as
525 economic development plans are implemented. Given that Ghanaian policy documents recognise the
526 unsustainable nature of conventional economic growth (Environmental Protection Council, 1988) and
527 legal frameworks exist for the retention of greenspaces (Government of Ghana, 2012), empowering
528 individuals to translate their own values into practice could result in substantial gains for urban
529 greenspace conservation.

530 4.2. Diversity of opinions

531 Discussions around the valuation of urban ecosystem services necessarily require an understanding of
532 the biophysical properties of greenspaces that underpin them. However, the greenspace concept is,
533 even within academia, defined only in very broad terms (Taylor and Hochuli, 2017). Similarly, the
534 description of greenspaces by our participants yielded a variety of definitions, of which some, but not
535 all, included a wide array of ecosystem services. Additionally, many descriptions centred on how
536 greenspaces are managed. Although such descriptions tended to indicate that the benefits of
537 greenspaces were recognised, many did not appreciate the variety of forms that greenspaces can take.
538 There was a general dismissal of naturally occurring urban vegetation, and an assumption that
539 greenspaces were either locations where vegetation is highly managed, such as in parks or urban
540 farms, or protected areas where natural processes could occur. However, remnant of native
541 vegetation can bring more ecosystem services than retro-fitted greenspaces (Mexia et al., 2018), while
542 also requiring lower management. Such differences in the conceptualisation of greenspaces and
543 dismissal of specific greenspace types need to be recognised and overcome if the full range of benefits
544 and types of urban greenspaces are to be retained as cities expand.

545 We also showed that even within relatively homogenous stakeholder categories such as the Experts
546 and Authorities and within a geographically homogenous region, different values could be identified.
547 However, the few studies examining the perceived benefits of greenspaces in Africa thus far have

548 focused on how the population as a whole perceived urban ecosystem services, with mixed findings
549 highlighting a variety of perspectives likely influenced by both the geographical location of the study
550 and the different stakeholders studied (Adekunle et al., 2013; Dumenu, 2013; Mensah et al., 2017;
551 Shackleton and Blair, 2013). Several of the perspectives highlighted by previous work were mirrored
552 in this study. For instance, Experts who valued *greenspaces for environmental regulation* had a similar
553 viewpoint to Ghanaian academics valuing regulating services provided by protected greenspaces such
554 as air quality regulation, shade or temperature reduction (Dumenu, 2013) despite dismissing the
555 opportunities of naturally occurring greenspaces to provide such services. Similarly, the Users
556 viewpoint *greenspaces for children* reflects the perception of some South African and Nigerian urban
557 residents who highly value greenspaces for recreation or relaxation (Adekunle et al., 2013; Shackleton
558 et al., 2015). This validates the importance of those viewpoints but also highlights the need to assess
559 their prevalence within the population.

560 4.3. Tackling disservices to improve acceptability

561 Though the value of greenspaces was recognised by most, not all stakeholders perceived them as
562 beneficial. Disservices such as providing locations for crime and antisocial behaviour or their polluted
563 state was a concern for some groups (e.g. Experts seeing greenspaces *as a source of danger*),
564 supporting findings from other parts of Africa (Shackleton and Blair, 2013; Shackleton et al., 2015).
565 Additionally, although greenspaces were recognised as being able to help regulate and remediate
566 biodegradable waste, there is a consensus within both Experts and User groups that the use of open
567 greenspaces for the disposal of waste is problematic and has a strong negative effect on their
568 attractiveness as well as raising contamination concerns.

569 The prevalence of disservices was also acknowledged regarding urban farming, with both Experts
570 seeing greenspaces as *a source of danger* and Users *for beauty and cleanliness* being wary of the effect
571 of pollution on the quality of food produced and the risks related to roaming livestock. Contamination
572 of urban farms is a real concern in the area (Amoah et al., 2005; Binns et al., 2003) and the overuse of

573 pesticides can affect production through decreasing pollinator abundances in urban farms (Guenat et
574 al., 2019). Urban agriculture can, nevertheless, help increase social equality by empowering women
575 (Orsini et al., 2013) and improve the livelihood of poor urban residents who are highly dependent on
576 greenspaces (Cilliers et al., 2013; Kaoma and Shackleton, 2015). Indeed, food provision through urban
577 agriculture was described by many Users as an important service provided by urban greenspaces (see
578 Fig. 3.b). Further, urban agriculture was central for several viewpoints (User viewpoint *greenspaces as*
579 *cultural heritage or for children*, Authorities for *multi-functionality* and Experts for *incomes and*
580 *socialisation*). Consequently, some of the highest disagreements between viewpoints were linked to
581 the risks and benefits of urban agriculture. Addressing the pollution of the urban environment,
582 including of greenspaces, water and vegetable production in African cities, and thus decreasing the
583 impact of ecosystem disservices, might be an important step to improve not only urban residents'
584 health but also the perception of greenspaces.

585 4.4. Regulating services and their place in the conservation discourse

586 Regulating services are often used in the urban conservation discourse (Luederitz et al., 2015), with a
587 relatively large body of research available on their valuation (du Toit et al., 2018). However, regulating
588 services were also the section for which disagreements between one of the Users viewpoints and
589 other viewpoints was consistently high. This highlights potential conflicts if regulating services were
590 to be emphasized due to the agreements between Experts and Authorities. The only regulating service
591 for which we found consensus across Users and another stakeholder category, the Experts, was the
592 provision of shade, being highly valued by both. This was also reflected in the description of
593 greenspaces by many participants as trees or forests, where high standing vegetation would provide
594 protection against the sun, and is mirrored in other African studies (Dumenu, 2013; Shackleton et al.,
595 2015). However, for some Authorities (*greenspaces for multi-functionality*), shade was not amongst
596 the most important services provided by greenspaces. Such mismatches in discourses from a
597 stakeholder category with high influence on the urban population could lead to a missed opportunity
598 for conserving urban trees.

599 In light of the lack of local, context specific knowledge that would help to integrate the diversity of
600 perspectives of the urban population and counteract uncooperative attitudes towards greenspaces
601 (du Toit et al., 2018; Mensah, 2014), we recommend assessing the extent to which shifting the focus
602 of arguments for greenspace conservation from regulating services as a whole to the few for which
603 there are consensus on their importance might help promote the retention of greenspaces within
604 cities.

605 **5. Conclusion**

606 Ghana has one of the highest urbanisation and economic growth rates in Africa. Understanding how
607 people value the multiple ecosystem services that urban greenspaces provide in one of the most
608 urbanised countries of the continent could provide insights that are relevant throughout Africa as
609 cities expand and economic growth progresses.

610 Ecosystem services provided by urban greenspaces were valued by all stakeholder categories. There
611 is therefore potential for conservation and retention measures to be implemented despite continuing
612 development pressures on land. However, not all ecosystem services were a source of agreement
613 either within or between stakeholder categories. Targeting discourses towards the audience and
614 ensuring that messaging is focussed on ecosystem services with as broad a consensus as possible
615 across stakeholders will be necessary if more widespread support for the retention of greenspaces
616 within fast growing cities is to be successful. We therefore caution against focusing communication
617 solely on ecosystem services consistently valued by Experts and Authorities, without taking into
618 consideration that the opinions and values held by those stakeholders frequently diverged from the
619 opinions of greenspace users.

620 Despite this, there are some areas of consensus between Users and Experts, such as the provision of
621 shade, whose benefits could, therefore, be emphasized to improve the dialogue around greenspace,
622 thus increasing their acceptance.

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