

1 **Title: The public's perspectives of urban sustainability: a comparative study of two urban**
2 **areas in Ghana**

3 **Highlights**

- 4 • Differences and similarities exist in the public's perceptions of the interactions between
5 urbanisation and sustainability in large and smaller urban areas of Ghana.
- 6 • The perceptions of the public in the context of urban sustainability are mainly shaped
7 by socio-economic considerations, sometimes at the expense of environmental
8 concerns.
- 9 • The public are willing to adopt pro-sustainability practices under the right conditions.

10

11 **Abstract**

12 In response to ongoing rapid urbanisation in Ghana, research has emerged to improve
13 understanding of the urbanisation process. However, empirical evidence on the interactions
14 between urbanisation and sustainability from the perspective of the public in Africa is limited.
15 This study, through a face-to-face survey, comparatively explores the perceptions and attitudes
16 of the public in two urban areas (Kumasi and Obuasi) in Ghana towards dimensions
17 representing urban sustainability. This is important for improving understanding of the impacts
18 of urbanisation in the context of sustainability. The results confirm both similar and diverging
19 perceptions that are held by the public in Kumasi and Obuasi based on their priorities, values,
20 and diversity; and also, the results show that the perceptions of the public are mainly influenced
21 by socio-economic considerations compared with environmental concerns. Furthermore, the
22 results highlight how the public is likely to adopt pro-sustainability practices under the right
23 conditions (e.g., well-resourced recycling schemes). Overall, this study provides authentic
24 insights into urban sustainability in Ghana and by extension, Africa, based on the experiential

25 knowledge of the public, and it highlights the exigency of sufficiently engaging urban residents
26 and incorporating their values and preferences into sustainability policy-making and planning.

27

28 Keywords: public; sustainability; sustainable development; urbanisation; Africa; Ghana.

29

30 **1. Introduction**

31 As one of the most significant megatrends of modern times, urbanisation has led to the
32 concentration of over 50% of the global population in urban areas (United Nations, 2018).

33 While urbanisation promotes socio-economic growth, and provides opportunities for improved
34 standards of living in urban areas, the urbanisation process is also known to contribute to the
35 unsustainable use of natural resources, alteration of land cover and land use, and the deepening
36 of socio-economic inequalities (Cui et al., 2019). As a result of the complex inter-relationships
37 between urbanisation and the associated economic, social, and environmental processes,
38 urbanisation is seen as critical to achieving sustainable development (or sustainability) which,
39 in simple terms, describes development that balances economic, social, and environmental
40 considerations (Jeronen, 2013), in urban areas. This assertion is reinforced by suggestions
41 made by the United Nations at the World Urban Forum held in Abu Dhabi (United Arab
42 Emirates) in February 2020 that urban areas must be ‘at the heart’ of sustainable development
43 (United Nations, 2020). Therefore, it is necessary to provide a scientific basis for the promotion
44 of urban sustainability. This is especially important in the context in which developed countries
45 tend to stress the ‘sustainable’ (social+economic+environment) aspects of sustainability
46 compared with less-developed countries where there is a tendency to stress the ‘development’
47 (social+economic) aspects at the expense of environmental aspects (Zhang et al., 2018).

48

49 Aside from the policies and programmes rolled out by governments and relevant organisations
50 to promote sustainable development, it has been argued that the success of sustainable
51 development initiatives is highly dependent on the support of the public, or the lack thereof
52 (Laurian & Crawford 2016; Swann, 2017). The public can influence and contribute to
53 sustainability in urban areas in diverse ways. For example, as the most important recipients and
54 beneficiaries of sustainability-related programmes, the public can contribute to sustainability-
55 related policies and decision-making through local government processes such as voting for
56 representatives (Berry et al., 2019). Also, the public can contribute to sustainability by making
57 choices and adopting behaviours that promote sustainability, such as participation in recycling
58 activities (Barr, 2003). Therefore, to achieve urban sustainability, it is important for
59 sustainability-related programmes, policies, and processes to reflect the needs and preferences
60 of the public. However, although achieving urban sustainability is strongly dependent on the
61 support, actions, choices, and behaviours of the public (Barr, 2003; Laurian & Crawford 2016;
62 Swann, 2017; Berry et al., 2019), the paucity of data on urban areas in Sub-Saharan Africa
63 (SSA) (Smit & Parnell, 2012) means that how the public perceives and behaves towards
64 dimensions that represent sustainability, as a consequence, are poorly understood.

65

66 In Ghana, past and current urbanisation has resulted in a more urban (51%) than rural populace
67 since 2010, and predictions show that over 70% of Ghanaians will live in urban areas by 2050
68 (Cobbinah et al., 2015). Thus, although Ghana's urbanisation could accrue positive benefits,
69 the rapid pace evidenced above could undermine the capacity of urban managers to deal with
70 the attendant demographic and landscape transitions, thereby potentially creating negative
71 impacts that could erode positive outcomes. This makes it necessary to conduct research that
72 explores the interactions between urbanisation and sustainability. In this regard, research has
73 emerged to improve understanding of urbanisation in Ghana. Critically, however, the scope

74 and objectives of previous research have led to a dominant focus on aspects of urbanisation
75 such as land cover and land use change, urban sprawl, etc. (e.g., Stow et al., 2016; Acheampong
76 et al., 2017), at the expense of a public perspective and a wider sustainability context.
77 Furthermore, geographically, existing research on urbanisation in Ghana has concentrated on
78 the large urban areas (such as Accra and Kumasi) at the expense of a comparative context that
79 captures both large and smaller urban areas (e.g., Korah, 2020). Finally, considering the reality
80 that mineral resource extraction, especially (gold) mining, significantly contributes to Ghana's
81 economy, the limited literature on the interlinkages between mining and urbanisation has been
82 acknowledged by scholars (e.g., Gough & Yankson 2012). This has been attributed to the
83 scenario where both concepts have mainly been considered separately by scholars in the
84 respective fields (Gough & Yankson 2012; Gough et al. 2019). In this regard, the wider
85 literature alludes to how the benefits (especially monetary) associated with mining does not
86 always translate into positive urban sustainable development in mining communities. For
87 example, some scholars (e.g., Gollin et al., 2013; Jedwab, 2013; Cavalcanti et al., 2014) suggest
88 that significant natural resource exports positively enhance urbanisation, especially when the
89 financial rewards accrued are used to provide urban goods and services to the populace.
90 However, others (e.g., Turok & McGranahan 2013) have also shown that natural resource-
91 based economies are not naturally urban-oriented. The factors highlighted above make it
92 relevant that research explores the intricacies between mining and urbanisation in the context
93 of sustainability. Therefore, in an attempt to address the identified gaps in literature, the aim of
94 this study is to improve understanding of the interactions between urbanisation and
95 sustainability in Ghana by presenting a comparative case study that considers two urban areas
96 (Kumasi and Obuasi) and uses a face-to-face-survey to analyse the perceptions of the public
97 based on selected statements that represent the economic, social, and environmental

98 dimensions of sustainability, as well as statements representing urbanisation. Furthermore, the
99 extent to which the public is willing to engage in pro-sustainability behaviour is also explored.
100

101 The proposition and subsequent adoption of international agreements such as Goal 11 of the
102 United Nations' Sustainable Development Goals (SDGs), which seeks to: "*make cities and*
103 *human settlements inclusive, safe, resilient, and sustainable*" (United Nations, 2015, p. 1), is
104 evidence that governments and international organisations across the world are increasingly
105 debating the best ways of managing urban growth into sustainable outcomes. On its part, the
106 Ghanaian Government launched a National Urban Policy (NUP) in 2012, in response to the
107 need to promote the sustainable development of the country's urban areas (MLGRD, 2013).
108 However, Ghana's NUP, in its current form, does not explicitly address the perspectives and
109 roles of the public in the context of sustainability in the country's urban areas. Therefore, this
110 study contributes to the important debate on urban sustainability, especially in the context of
111 the perspectives, experiences, and roles of the public in Ghana. Furthermore, the expectation
112 is that this study would potentially serve as a wider model for how the public perceives the
113 interactions between urbanisation and sustainability in SSA because like Ghana, most African
114 countries: (i) are experiencing rapid urbanisation; (ii) are natural resource dependent
115 economies; and (iii) have a paucity of data on urban areas. Following this introductory section
116 which has already established the gaps in literature that this paper attempts to address, the rest
117 of the paper proceeds in five sections and is organised as follows. Section 2 provides a critical
118 review of literature in a way that guides and establishes the area of research, and provides a
119 foundation based on which the interactions between sustainability and urbanisation from the
120 perspective of the public can be constructively understood. Section 3 provides a description of
121 the study sites and explanations of the methods used in collecting and analysing data for the

122 study. Section 4 presents the results of the study. Section 5 provides a discussion of the results,
123 as well as policy implications and recommendations. Section 6 concludes the paper.

124

125 **2. Literature review**

126 2.1 (Urban) Sustainability

127 Despite being highly contested due to the manifold definitions that have emerged,
128 sustainability and sustainable development (used interchangeably) as concepts are underpinned
129 by the central idea that meeting the needs of the present generation warrants the concurrent
130 protection of the needs and interests of the future generation (Jabareen, 2008; Jeronen, 2013;
131 Stokes & Seto, 2018). As highlighted in the introductory parts of this paper, over half of the
132 world are urban residents, thereby making the sustainable development of urban areas a
133 prominent feature on the agenda of governments, international organisations, and scientists
134 (United Nations, 2018; Puchol-Salot et al., 2021). This, in turn, makes research that explores
135 ways of enhancing urban sustainable development relevant as urban sustainability is critical to
136 achieving wider global sustainability (Bugliarello, 2006). Like other derivatives of
137 sustainability / sustainable development, urban sustainability is difficult to define due to the
138 complex interactions between the diverse facets of urban systems (Puchol-Salot et al., 2021).
139 Nevertheless, in its simplest terms, and relevant to the Ghanaian context of this paper, urban
140 sustainability is defined as managing the urbanisation process and “*developing a built*
141 *environment that meets people’s needs whilst avoiding unacceptable social or environmental*
142 *impacts*” in urban areas (Hamilton et al. 2002, p.1). In terms of assessment, a variety of
143 indicators tools and systems (e.g., Global City Indicators) have been advanced and used in
144 countries and cities across the globe to measure sustainability (McCarney, 2014). Crucially,
145 however, the extant literature is dominated by studies from developed countries (e.g., Tanguay
146 et al. 2010), and research that attempts to measure wider urban sustainability in the global

147 South (e.g., Turok & Borel-Saladin, 2014) is limited. The situation elaborated above is
148 sometimes justified based on the lack of data in developing nations (Cloete 2015). The
149 implication for African countries (including Ghana), as Cloete (2015) argues, is that effective
150 assessment of sustainability is currently unrealistic as countries in SSA lack baseline
151 sustainability data, both at the local and national levels. This makes research that contributes
152 to the literature by exploring the experiential knowledge of the public in the context of
153 sustainability relevant.

154

155 2.2 Perceptions and sustainability

156 Perception has been defined as “*the organisation, identification and interpretation of sensory*
157 *information to represent our environment*” (Xiao et al., 2016, p.258). It is recognised that the
158 perceptions of stakeholders provide useful constructs for the exploration of organisational
159 behaviour (Delmas & Toffel, 2004). Accordingly, the exigency to promote sustainability across
160 all spheres, including in urban areas, has prompted the proliferation of research in diverse
161 disciplines on the perceptions and attitudes of the public in the context of sustainability. From
162 an urban sustainability perspective, Macke et al. (2018) have studied the subjective quality of
163 life in a smart city by exploring the perceptions of the public in a Brazilian case study. They
164 found that the overall perception of the respondents about the main elements characterising
165 Curitiba as a smart city implied their low level of satisfaction. They concluded that exploring
166 the perceptions of the public helped to deconstruct the interconnected facets of quality of life
167 domains in the context of smart cities. Worth noting here is the fact that such studies have
168 either focused on the perceptions of sustainability in disciplines like higher education, or when
169 conducted in the context of urban sustainability, they have mainly focused on places outside
170 SSA.

171

172 According to Moganadas et al. (2013), people differ in their views, priorities, and motives with
173 regards to sustainability. While conditions such as the prevailing local economy may shape the
174 wider experience (Davidson & Arman, 2014), the perception literature suggests that other
175 factors may be at play. These factors have been highlighted to include demographic factors
176 such as age and gender (Olsson & Gericke, 2016), socio-economic status, and education
177 attainment (Aina et al., 2019). For example, Narducci et al. (2019) found significant differences
178 based on age, education, political ideology, and gender in respondents' perceptions of
179 ecosystem services in their study which evaluated the implications of urban growth and
180 farmland loss for ecosystem services in western United States. Also, Tuncer (2008) found
181 significant differences in the perceptions of female and male respondents in a sustainable
182 development survey of students. The general literature (e.g., Voon, 2012) also shows that
183 diverse economic and psychological influences shape individual perceptions. The inference is
184 that, differences in demographic characteristics and socio-economic conditions among others,
185 potentially shape the perceptions of the public. In other words, two individuals could face the
186 same wider economic conditions but have different perceptions about the impacts of the
187 economic conditions due to differences in demographic and socio-economic characteristics.
188 Overall, exploring the subjective experiences of the public by examining their perceptions is a
189 powerful way through which the public can provide information about the characteristics of
190 their environment (Hsieh, 2012).

191

192 2.3 Attitudes and behaviour towards sustainability

193 Kalsoom (2019) has deconstructed the concept of 'attitude' from a sustainability perspective.
194 The author describes 'attitude' as a reflection of the degree to which people value sustainability
195 and its several dimensions. The author shows that attitude may be evaluated along the lines of
196 the extent to which an individual favours a particular action, and that may be positive, neutral

197 or negative. The author further shows that attitude is not observable but may be inferred from
198 what an individual says, intends, or does. Finally, the author expands on the link between
199 attitude and behaviour; and argues that attitude is a proxy measure of people's behaviour, and
200 inserts a caveat that positive attitudes do not always translate to behaviour.

201

202 The reverberation of sustainability as a concept has led to the promotion of practices such as
203 recycling, as well as sustainability-related programmes and policies, in order to influence
204 stakeholders to embrace sustainability. However, the consensus within the literature is that
205 sustainability cannot be achieved without a corresponding change in attitude across all levels,
206 including at the national level and at the level of the public (Kalsoom, 2019). In this regard,
207 Fairfield et al. (2011), in their study of the influences on organisational implementation of
208 sustainability, argue that how organisations prioritise various sustainability issues will strongly
209 determine the extent to which specific sustainability practices are implemented. The arguments
210 above accentuate the need to gauge the interests of stakeholders like employees in the uptake
211 of these sustainability practices (Velazquez et al., 2005). Furthermore, according to Pappas &
212 Pappas (2014, p.12), "*individual behaviour creates the foundation for action in social,*
213 *economic and environmental sustainability, and potentially guides human ability to work with*
214 *one another to make life-affirming decisions*". They conclude that when the day-to-day
215 behaviour of individuals is aligned to well-stated values, the potential for greater sustainable
216 community action is enhanced. Essentially, a consensus within the sustainability literature is
217 that community (public) support is a strong predictor of the extent to which cities are committed
218 to sustainability (e.g., Laurian & Crawford, 2016; Swann, 2017). This makes it critical to
219 explore the extent to which people are willing to partake in or promote pro-sustainability
220 behaviour and practices based on the idea that pro-sustainability behaviour could help mitigate
221 sustainability-related problems such as climate change impacts (Balunde et al., 2019). Against

222 this backdrop, a working definition for pro-sustainability behaviour in this paper is one that
223 describes private (e.g., recycling) or public actions (e.g., environmental movements) that
224 promote sustainability by preventing harm and safeguarding the environment (Steg & Vlek,
225 2009; Hadler & Haller, 2011; Balunde et al., 2019).

226

227 2.4 Urban challenges in Ghana

228 Rapid urbanisation provides benefits, but also poses intractable challenges to achieving
229 sustainable development in Ghana's urban areas. In a socio-economic context, the urban-biased
230 nature of development in Ghana, facilitated by globalisation, may have concentrated higher
231 levels of economic opportunities (including jobs) in urban areas compared with rural areas.
232 However, urban unemployment is widespread, a situation that is compounded by the increasing
233 proportion of migrants moving from Ghana's rural to urban areas in search of better but,
234 sometimes, non-existent opportunities for improved living standards (Ofori, 2009; Osei-
235 Boateng & Ampratwum, 2011). Essentially, the increasing urban population in Ghana means
236 that there is an inadequate supply of formal jobs (Ofori, 2009; Osei-Boateng & Ampratwum,
237 2011). As a consequence, informality, which broadly refers to a range of activities that exist
238 beyond the regulative ambit of metropolitan authorities (Porter, 2011), is a dominant feature of
239 Ghana's urban economic space. This situation is succinctly captured by Gillespie (2016) whose
240 research on the struggles in Ghana's urban space in Accra (Ghana's capital city) shows the
241 existence of a large 'informal proletariat' kept out of formal waged employment and housing
242 provision. Also, urban poverty is prevalent, and from a gender perspective, the literature (e.g.,
243 Awumbila, 2006; Danquah & Ohemeng, 2017) suggests that urban poverty is sometimes
244 determined by gender, and may be shaped by cultural factors such as social status assigned to
245 men and women. As a result, the level of poverty experienced by women in Ghana's urban
246 regions tends to be more severe than men. Furthermore, Yeboah and Obeng-Odoom (2010)

247 have suggested that urbanisation has outpaced planning provisions in Ghana. As a
248 consequence, the increasingly urban population has placed pressure on existing socio-
249 economic facilities such as housing, education, etc. For example, reflecting on the reported
250 national housing deficit of 1.7 million units (Daily Graphic Online, 2018), Yakubu et al. (2014)
251 have observed that the housing situation in most Ghanaian cities is characterised by supply
252 difficulties, deteriorating conditions, and overcrowding.

253

254 In an environmental context, the challenges facing the Ghanaian urban populace range from
255 air pollution issues to ecological resource degradation. For example, Dionisio et al. (2010) have
256 reported on the poor air quality in Accra due to high levels of particulate matter (PM_{2.5}). Also,
257 urbanisation has resulted in the destruction and replacement of natural vegetation by urban
258 development (e.g. Coulter et al., 2018). Furthermore, numerous documented examples exist of
259 pressure being brought to bear on land owners to convert fragile land cover types such as water
260 bodies and wetlands to urban use due to the high demand for land in Ghana's urban areas (e.g.,
261 Wiegleb, 2016; Amo et al., 2017). For example, Amo et al. (2017) investigated the acquisition
262 and development of wetlands in Ghana and established that wetlands were increasingly being
263 converted into residential and commercial uses in Kumasi due to rapid urbanisation. In Ghana's
264 mining areas, air and water pollution due to mining activities have also been reported
265 (Amponsah-Tawiah & Dartey-Baah, 2011; Foli et al., 2012). Essentially, the review of Ghana's
266 urban development challenges highlights how rapid urbanisation and sustainable development
267 processes in Ghana create a tension between environmental protection, economic productivity,
268 and social equity.

269

270

271

272 3. Case area and methods

273 3.1 Study sites

274 Two urban areas in Ghana (Kumasi and Obuasi) were selected for the survey (see Fig. 1). The
275 first case study site, Kumasi, is the capital of the Ashanti region (located in central Ghana), and
276 it is the second biggest city in Ghana after Accra, the capital city. Due to the inexorable process
277 of urbanisation, Kumasi's population has expanded from 496,628 in 1984 to 2,105,382 in 2019,
278 according to data published by the Ghana Statistical Service (GSS 2014a; GSS 2014b; GSS,
279 2019). Also, published research (Anarfi et al., 2020) shows that urbanisation has transformed
280 Kumasi's landscape beyond the physico-administrative boundaries as its urban landcover
281 expanded from 43.2 km² in 1986 to 509.2 km² in 2018, representing a change of 1105% within
282 the period. The choice of Kumasi as a case study site is significant because: (i) published
283 research (e.g., Toure et al., 2018) shows that the city is the fastest growing big city in Ghana,
284 expanding at an average annual rate of about 6% between 2000 and 2010; and (ii) Kumasi's
285 status as a regional capital and its primacy as a big city, mean that it wields significant
286 administrative and political influence, as well as a relatively higher concentration of socio-
287 economic opportunities which, in turn, place enormous pressures on the city's capacity to cope
288 with the forces of urbanisation (e.g., intra- and inter-regional migration), thereby impacting
289 sustainable development.

290

291 Obuasi (about 56 km from Kumasi), the second case study site, is also located in the Ashanti
292 region. The urbanisation process in Obuasi has seen its population increase from 60,617 in
293 1984 to 203,554 in 2019 (GSS 2014a, GSS 2014c, GSS 2019). Evidence from the literature
294 (Anarfi et al., 2020) highlights the extensiveness of urban expansion due to urbanisation in
295 Obuasi as its urban landcover increased from 23.60 km² in 1986 to 57.68 km² in 2018,
296 representing a change of 144% within the period. Obuasi represents an important case study

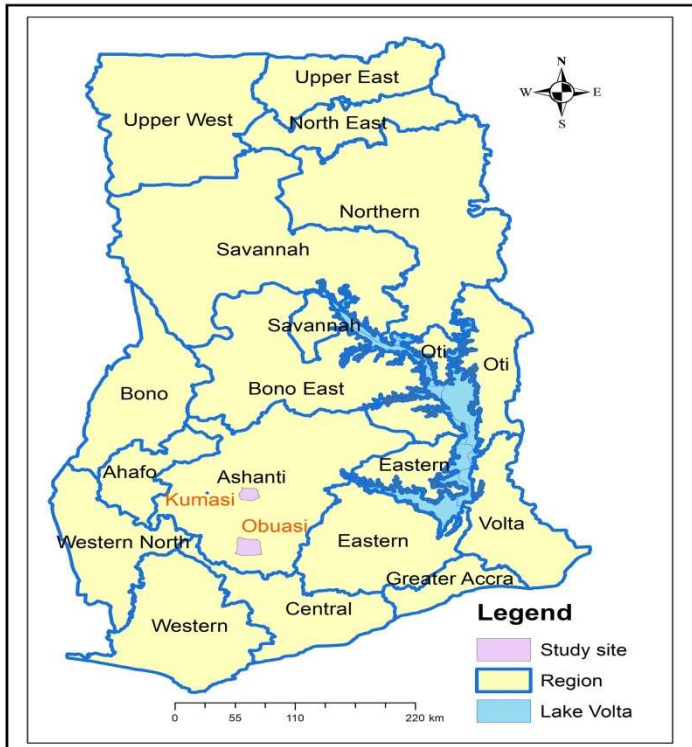
297 for three main reasons: (i) the town is an important one in the mining landscape of Ghana as
298 gold mining activities have been undertaken in Obuasi for over one hundred years, however,
299 there was a down-turn in the operations of the major large-scale mining company AngloGold
300 Ashanti between 2014 and 2019 (Ghana Chamber of Mines, 2019); (ii) gold mining and related
301 activities in Obuasi have led to increased opportunities for improved standard of life, as well
302 as reported cases of environmental degradation, which have influenced the urbanisation and
303 sustainable development processes; and (iii) scholars (e.g., Gough & Yankson, 2012) have
304 acknowledged the lack of holistic research on mining and urbanisation in Ghana. Therefore,
305 Obuasi provides an interesting aspect to the current conversation on urban sustainability,
306 especially in the context of a resource-based city. This is particularly important as the economy
307 of Ghana, like others in the wider SSA region, significantly relies on natural resource
308 commodity export (Adu, 2018).

309

310 Overall, it is argued that the selection of Kumasi and Obuasi as study sites is appropriate
311 because both urban areas face similar challenges of rapid urbanisation, and they have broadly
312 consistent historical and policy settings. Essentially, it is worth noting that official
313 mainstreaming of urban sustainability-related policies or programmes in Ghana is nascent (as
314 evidenced by the recent nature of Ghana's National Urban Policy launch in 2012). This
315 situation is made worse by the top-down nature and limited decentralisation of administrative
316 and financial decision-making powers in Ghana (Anarfi et al., 2020). Taken together, the
317 scenarios above have ensured that the capacity of urban areas such as Kumasi and Obuasi to
318 introduce and implement tailored urban sustainability programmes and policies is limited, if
319 existent at all. Nevertheless, Kumasi and Obuasi differ in key dimensions such as population
320 size, administrative status, and local economic characteristics, which may potentially influence
321 the experience, perceptions, and attitudes of the public in the context of sustainability. In sum,

322 it is expected that the comparative approach to the case study analysis will help to show the
323 similarities and differences while generating place-based research results.

324



325

326 **Fig. 1: Map of Ghana showing study areas** (Adapted from Anarfi et al. 2020).

327

328 3.2 Research methods

329 In order to assess the perceptions and attitudes of the public, a method was needed, which
330 facilitates authentic insights into the respondents' sustainable development experiences within
331 the timeframe and budgetary resources of the wider research project that this study is part of;
332 a quantitative survey was deemed as appropriate. The choice of a quantitative survey was to
333 help minimise bias and ambiguity (see Choi & Pak, 2005). Considering the technical nature of
334 sustainability as a concept, the reality that local respondents may not possess the needed
335 literacy and proficiency to self-complete the survey, as well as the logistical difficulties of
336 conducting a postal, telephone or online survey in Ghana, the survey was conducted in a face-

337 to-face manner in order to ensure that respondents clearly understood the content of the survey,
338 and also to maximise response rates. Furthermore, consistent with notions about the fuzziness
339 and contested nature of sustainability (Jabareen, 2008), general difficulties in solving
340 sustainability-related questions include the availability and appropriateness of indicators or
341 related data for sustainability assessment (Cloete 2015). These difficulties are more visible in
342 the African context due to the paucity of data (Cloete 2015), as earlier mentioned. Due to time
343 and financial resource restrictions, the development of a complete new set of indicators to
344 measure progress towards sustainability in the study sites was beyond the scope and focus of
345 this study. Therefore, prior to the main survey in 2018, a pilot study was conducted in Kumasi
346 in October 2016, where thirty respondents were asked to use their current life situations to rank
347 proxies representing the dimensions of sustainability. This process helped to streamline the
348 proxies to be used as indicators for sustainability assessment and formed the basis for the design
349 of a questionnaire for the main survey. Essentially, the proxies representing the dimensions of
350 sustainability were the authors' own construct based on the synthesis of extant literature that
351 measured urban sustainability in both developing and developed nations (e.g., Tanguay et al.,
352 2010; Shen et al. 2011; Turok & Borel-Saladin, 2014).

353

354 *3.2.1 Data collection and study sample*

355 A questionnaire (see S1. In Supplementary Information attached in Appendix A) was designed
356 which required participants to express their agreement or disagreement with 5-point Likert-
357 scale questions, as well as close-ended questions which required 'yes', 'no' or 'maybe'
358 answers. The draft questionnaire was discussed with a local university academic and a
359 professional planner in Ghana, after which it was pre-tested with five residents in Ayeduase (a
360 suburb of Kumasi). The pre-testing process was performed to ensure clearer understanding and
361 coherency in the questionnaire, and it helped to reduce the answerable items on the

362 questionnaire from 35 to 28. The questionnaire consisted of five parts which: collected
363 demographic information; asked respondents about the extent to which they agreed or
364 disagreed on statements representing the economic, social and environmental dimensions of
365 sustainability, as well as statements on the local urbanisation process; and ascertained the
366 willingness of respondents to engage in selected pro-sustainability behaviour. Here, consistent
367 with the observation made earlier about the limited official mainstreaming of sustainability
368 policies and programmes, pro-sustainability behaviour is explained as any actions by the
369 respondents which directly or indirectly protect the wider environment and promote
370 sustainability of the urban areas (see Balunde et al., 2019). A 'further comments' section was
371 provided at the end of the questionnaire which captured any concerns of respondents that were
372 not directly addressed by the main survey questions. Essentially, relevant urban sustainability
373 literature, including ones that covered the specific urban sustainable development challenges
374 in Ghana, were considered in the design of the questionnaire in order to ensure that the
375 respondents' understanding and experience of local sustainable development and urbanisation
376 issues were adequately captured.

377

378 A stratified random sampling approach was adopted to solicit responses in Kumasi and Obuasi.
379 Therefore, in both areas, the project was explained and the consent of a prospective respondent
380 was sought before proceeding. The questionnaire was only administered to the public who were
381 18 years or older, and had lived in the respective local areas for at least two years as it was
382 considered that any period below two years is possibly inadequate for a respondent to be fully
383 conversant with the local sustainable development situation. In Kumasi (where the
384 administrative system was organised around nine sub-metropolitan areas until 2019),
385 respondents were approached from all nine sub-metros, and based on local knowledge, low-,
386 middle- and high-income areas were covered. In Obuasi (which existed as a single municipality

387 consisting of suburbs until 2019), responses were solicited in the five closest suburbs from the
388 centre of town, and places such as mining estates were characterised as high-income areas,
389 while all other areas were characterised as low- or middle- income areas. However, in both
390 urban areas, the general approach was to target every other household along the main streets
391 of any suburb. A summary of the geographical distribution of the survey is attached in Table
392 S1. (see S2. In Supplementary Information attached in Appendix A). In all, a total of 624
393 questionnaires were administered (Kumasi, n=321; Obuasi, n=303) between January and
394 March 2018, and each survey lasted for 30–40 minutes. However, a total of 4 (Kumasi, n=3;
395 Obuasi, n=1) questionnaires were deemed as invalid and excluded from analysis due to missing
396 values.

397

398 *3.2.2 Data analysis*

399 The data obtained from the face-to-face survey was organised in Microsoft Excel software and
400 transferred into the IBM SPSS (version 20.0) statistical software package for further analysis.
401 While the general data collected were presented as percentages in frequency distribution tables
402 and bar charts, a key aspect of this study was to explore group differences in perception (e.g.,
403 based on gender, age, etc.) amongst respondents. Therefore, Mann-Whitney U test for two
404 independent variables (University of Sheffield, 2019), and Kruskal-Wallis H test for more than
405 two independent variables (Statistics Solutions, 2019), were conducted to assess differences in
406 responses due to ‘gender’, ‘age’, ‘economic status’ and ‘level of education’ in survey
407 statements which fulfilled the respective test assumptions for which: (i) the groups being
408 examined must be independent; and (ii) the dependent variable must be continuous. Statements
409 were deemed to have statistically significant differences in responses when p is < 0.05 . The
410 hypotheses tested for the non-parametric tests are presented in Table S2. (see S3.
411 Supplementary Information attached in Appendix A).

412 4.Results

413 4.1 Sample characteristics

414 A valid total of 620 survey responses (Kumasi, n=318; Obuasi, n = 302) were analysed and the
415 sample characteristics are presented in Table S3. (see S4. in Supplementary Information
416 attached in Appendix A). From Table S3., it is apparent that a slightly higher proportion of the
417 population in both Kumasi and Obuasi were female, with the rest being male. Also, there was
418 a slightly higher education attainment in Kumasi compared with Obuasi. Overall, the statistics
419 from the survey are comparable to the demographic distributions recorded in the 2010 Census
420 for the study sites (GSS 2014a; 2014b; 2014c).

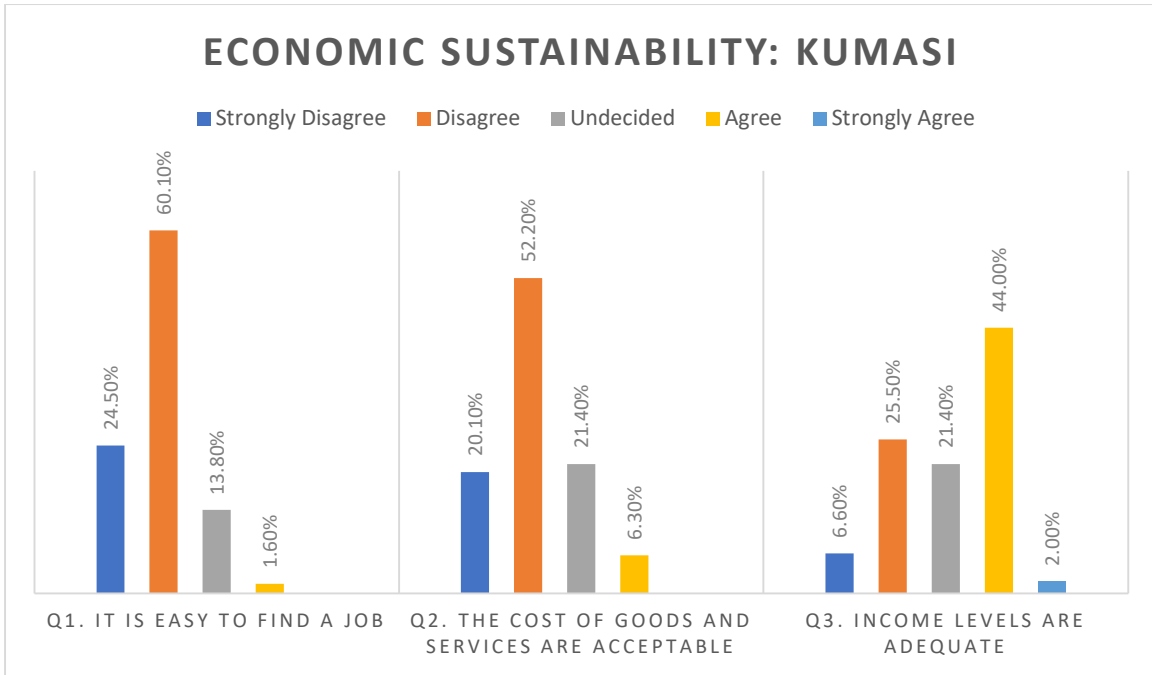
421

422 4.2 Perceptions of sustainability and urbanisation

423 4.2.1 *Perceptions on economic sustainability*

424 Fig. 2 (Kumasi) and Fig. 3 (Obuasi) show the distribution of responses given to the statements
425 on economic sustainability. The dominant observation made from Fig. 2 and Fig. 3 is that the
426 perceptions of respondents on dimensions representing economic sustainability in both Kumasi
427 and Obuasi are negative. For example, in terms of ease of finding a job (Q1), an overwhelming
428 majority of respondents (Kumasi= 84.6%; Obuasi= 88.7%) disagreed or strongly disagreed
429 with the statement.

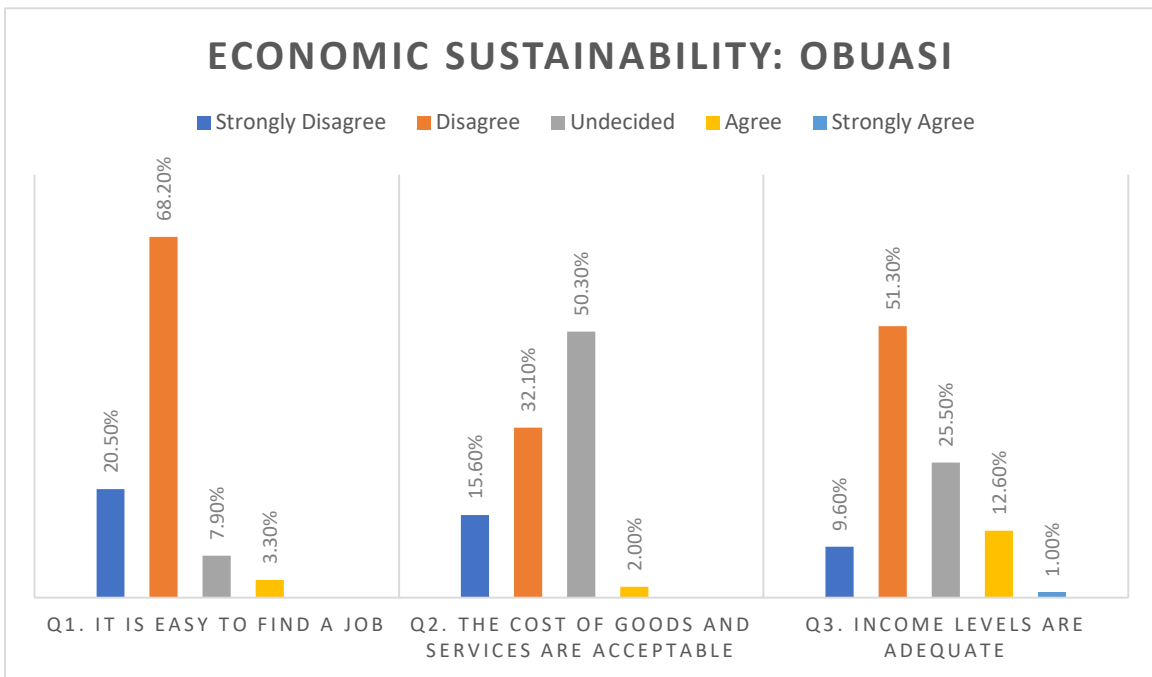
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431

432 **Fig. 2: The distribution of economic sustainability responses in Kumasi.**

433



434

435 **Fig. 3: The distribution of economic sustainability responses in Obuasi.**

436

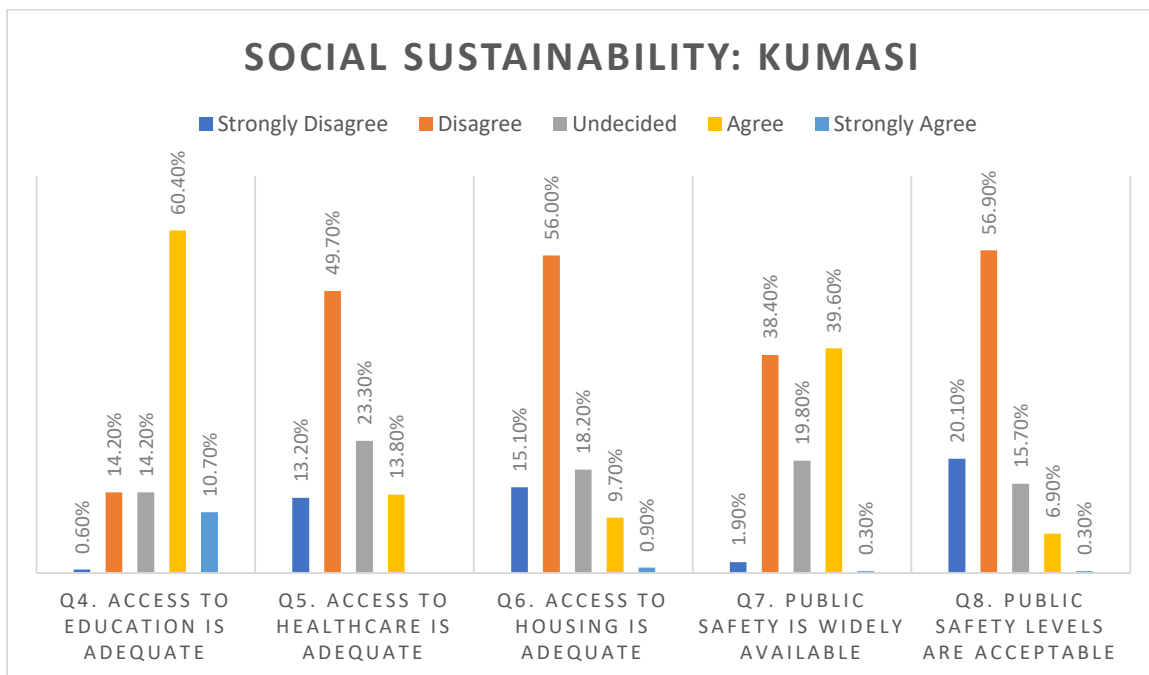
437

438

439 4.2.2 Perceptions on social sustainability

440 Respondents were asked about their perceptions on statements which centred on the adequacy
 441 of access to education, healthcare, transport, housing, as well as their views on the level of
 442 public safety. Fig. 4 (Kumasi) and Fig.5 (Obuasi) show the distribution of responses given to
 443 the statements representing social sustainability. Responses were mixed; however, notable
 444 observations were made. For example, 73.2% of respondents in Obuasi agreed or strongly
 445 agreed that public safety levels were acceptable, compared with 7.2% in Kumasi. Also,
 446 compared to variables like healthcare and housing where less than 15 % of respondents in both
 447 locations agreed or strongly agreed (Kumasi= 13.8% and 9.7% respectively, Obuasi= 12.0%
 448 and 13.6% respectively), a significant proportion of respondents (Kumasi= 71.1%, Obuasi =
 449 36.0%) agreed or strongly agreed with the statement on access to education (Q4).

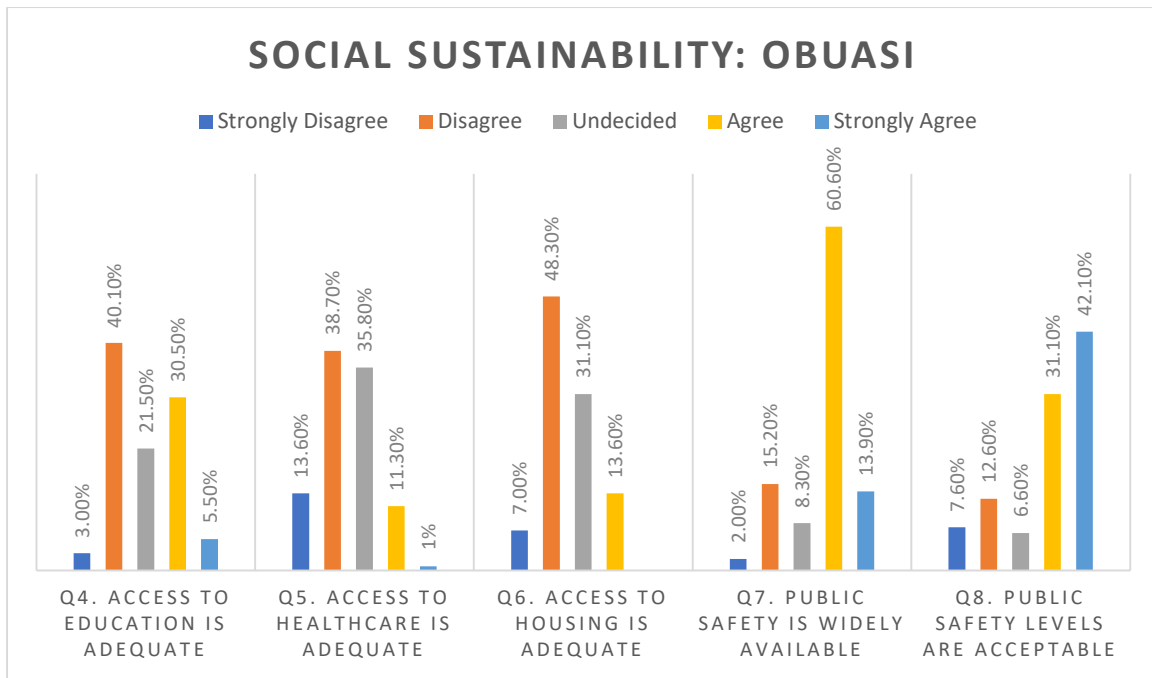
450



451

452 **Fig. 4: The distribution of social sustainability responses in Kumasi.**

453



454

455 **Fig. 5: The distribution of social sustainability responses in Obuasi.**

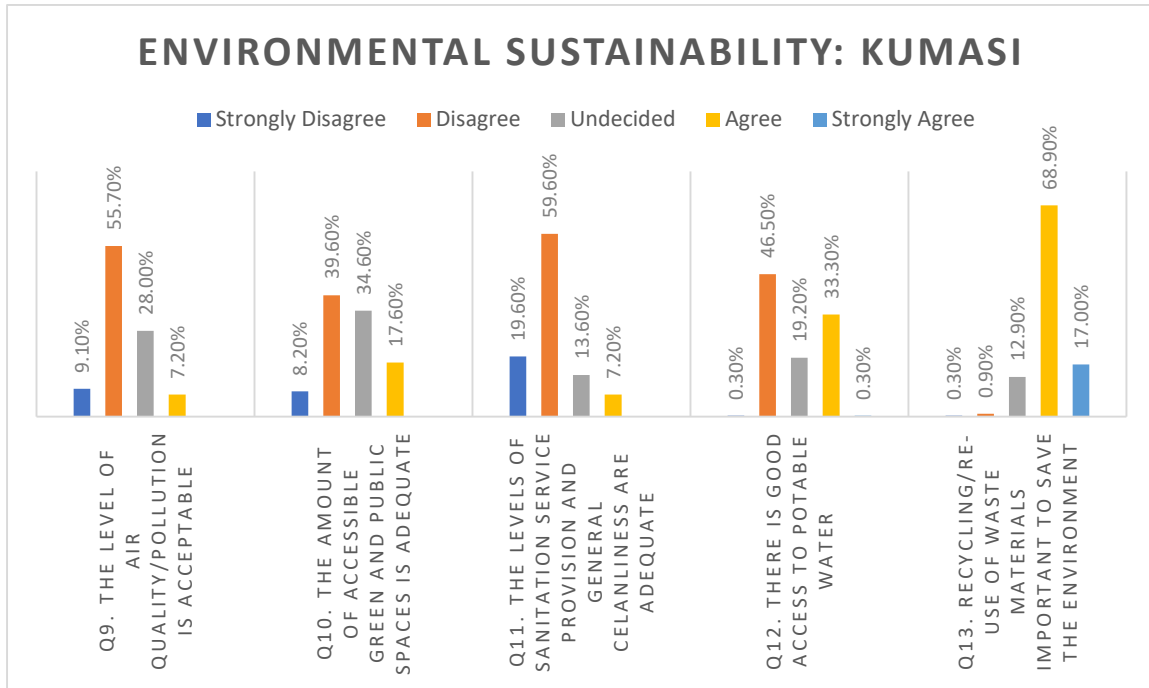
456

457 *4.2.3 Perceptions on environmental sustainability*

458 Respondents were asked about their perceptions on statements which centred on the adequacy
 459 of access to potable water, sanitation, and green spaces, as well as their views on air pollution
 460 and recycling. Fig. 6 (Kumasi) and Fig. 7 (Obuasi) show the distribution of responses given to
 461 the statements that represent environmental sustainability. Responses were mixed; however,
 462 notable observations were made. For example, a tiny proportion of respondents (Kumasi=
 463 7.2%, Obuasi= 4.0%) agreed or strongly agreed on the acceptability of air pollution levels (Q9);
 464 however, as an indication of the degree of seriousness of the situation in either place, 9.1% of
 465 respondents in Kumasi strongly disagreed compared with Obuasi where a notably higher
 466 number of respondents (32.1%) strongly disagreed. Similarly, there were disparities in
 467 responses from Kumasi and Obuasi with respect to access to potable water (Q12). For example,
 468 a combined 5.6% (Obuasi) and 33.6% (Kumasi) expressed agreement or strong agreement with
 469 the statement on access to potable water, compared with 79.8% (Obuasi) and 46.8% (Kumasi)
 470 who expressed disagreement or strong disagreement. The prominence of the disparity between

471 the two cities is the level of strong disagreement, where 0.3% of respondents in Kumasi
 472 expressed strong disagreement compared with 22.5% in Obuasi.

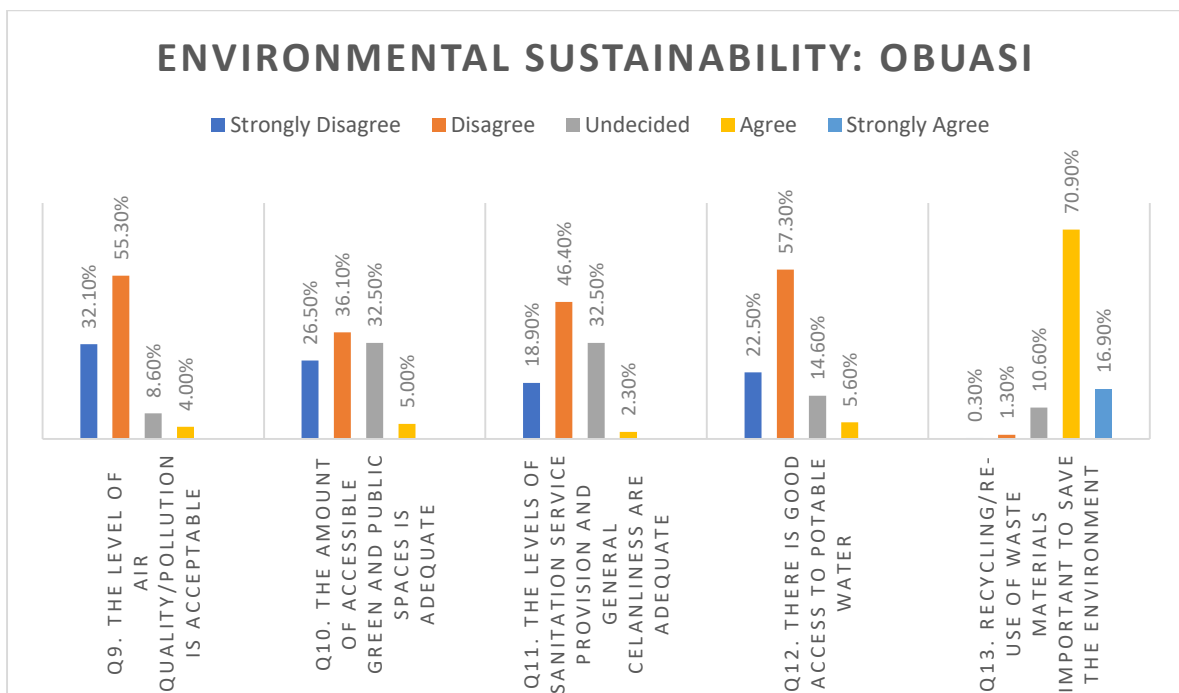
473



474

475 **Fig. 6: The distribution of environmental sustainability responses in Kumasi.**

476



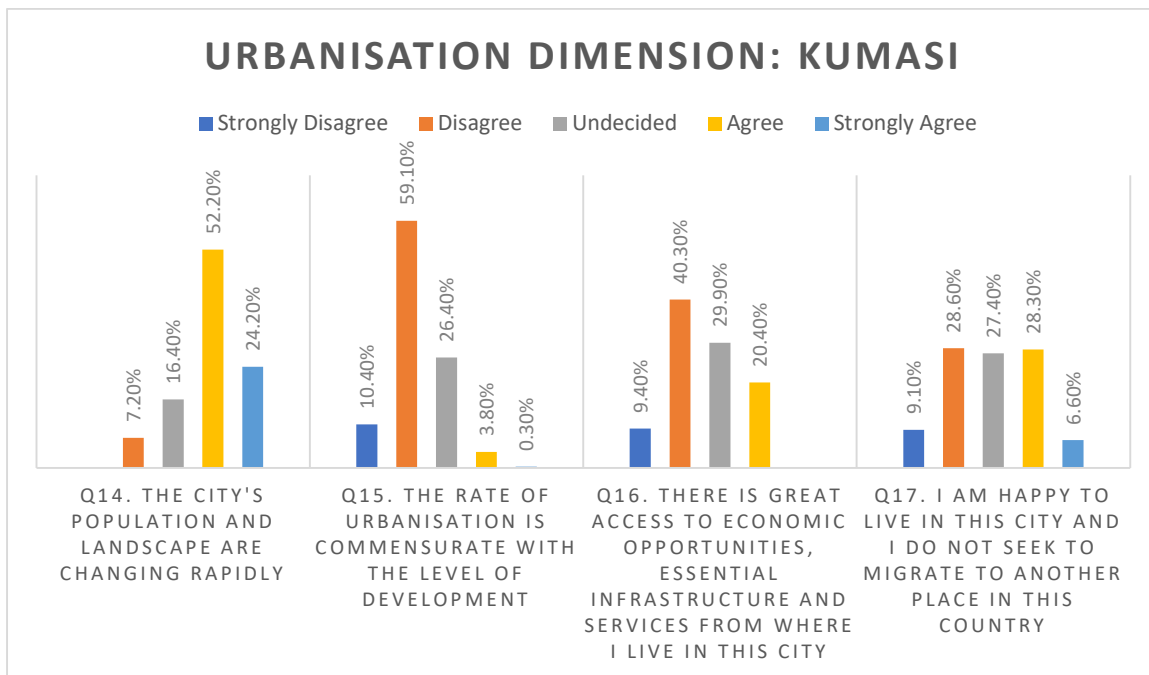
477

478 **Fig. 7: The distribution of environmental sustainability responses in Obuasi.**

479 4.2.4 Perceptions about the urbanisation process

480 The respondents were asked about their perceptions on statements which centred on the
 481 urbanisation process, whether it is commensurate with the level of development, how it has
 482 affected their access to socio-economic opportunities, and whether they were content with
 483 being in their current city. Fig. 8 (Kumasi) and Fig. 9 (Obuasi) show the distribution of
 484 responses given to the statements on urbanisation. There was a general awareness among
 485 respondents about the urbanisation process as over 45% of respondents in both Kumasi and
 486 Obuasi agreed or strongly agreed with the statement on the rapidly changing urban landscape
 487 (Q14); while over 60% of respondents in both areas did not think that urbanisation rates were
 488 commensurate with the level of development (Q15). With respect to access to socio-economic
 489 opportunities (Q16), a combined 49.7% (Kumasi) and 54.0% (Obuasi) of respondents
 490 disagreed or strongly disagreed, and at the same time, a combined 24.4% (Kumasi) agreed to
 491 the statement compared with Obuasi where 9% of respondents agreed.

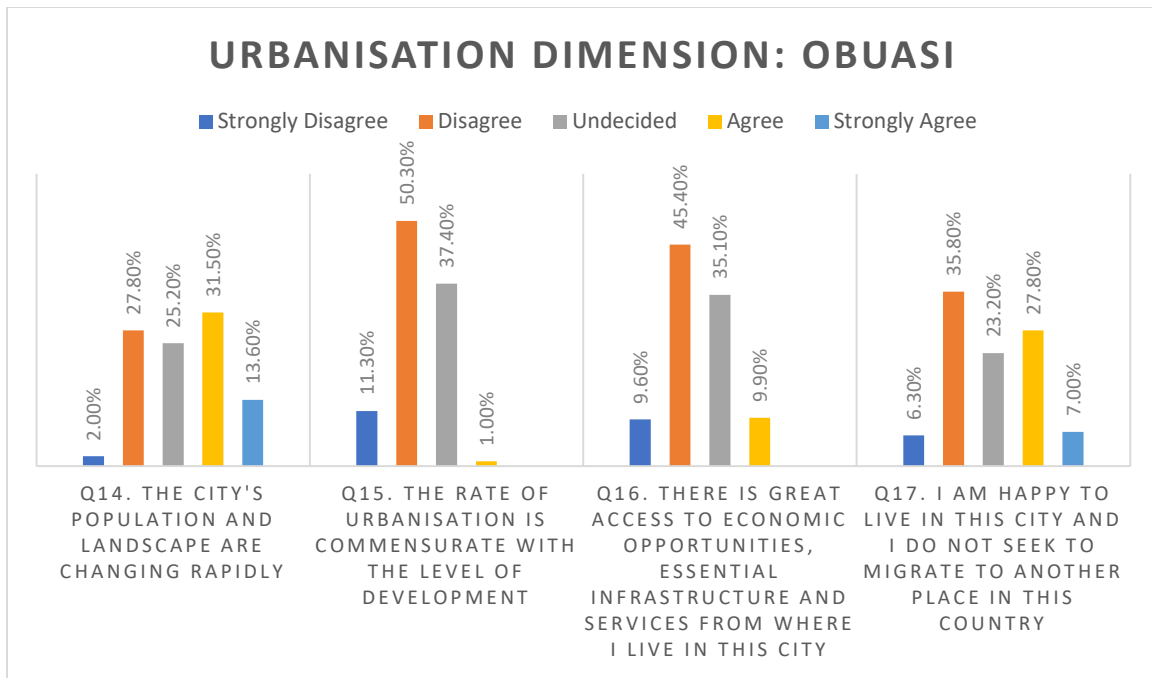
492



493

494 **Fig. 8: The distribution of urbanisation perception responses in Kumasi.**

495



496

497 **Fig. 9: The distribution of urbanisation perception responses in Obuasi.**

498

499 *4.2.5 General comments by respondents*

500 Details of the comments made by the public which were recorded in the extra space provided
 501 at the end of the questionnaire are presented in Table S4. (see S5. in Supplementary Information
 502 attached in Appendix A). Overall, fifteen of the ‘further comments’ (six in Obuasi and nine in
 503 Kumasi) provided by the participants were deemed relevant to the current conversation in this
 504 paper. The statements highlighted how socio-economic considerations dominantly shaped the
 505 perceptions of the public, sometimes, at the expense of environmental considerations.

506 For example, a participant in Obuasi (ID: O304) said that *“I used to engage in ‘galamsey’*
 507 *[illegal small-scale mining] but there has been a clamp down by the government and the*
 508 *company (AngloGold Ashanti) due to environmental concerns and the fact that the land*
 509 *belongs to the company. But what should we do since there are no jobs? I know ‘galamsey’*
 510 *destroys the land and water [environment] but what choice do we have when ‘galamsey’ is the*
 511 *only means through which we can survive”.*

512 Similarly, a participant in Kumasi (ID: K727) said that “*I understand the fact that you are*
513 *sensitising us on the things we could do to promote good development. However, if we want to*
514 *recycle our waste where do we send it? We can only do it if adequate provisions are made.*
515 *These days, in order to be able to go to work you must buy a car if you can afford it. The*
516 *‘trotro’ [public transport] is unreliable and you spend a lot time waiting it”.*

517

518 *4.2.6 Group differences in perception of respondents*

519 *4.2.6.1 Gender differences in perception*

520 The Mann-Whitney U test was used to assess the null hypothesis that no statistical differences
521 existed in responses to statements based on gender roles. The Mann-Whitney U test results for
522 responses in Kumasi are given in Table S5. (see S6. in Supplementary Information attached in
523 Appendix A), and these show that the null hypothesis was rejected for three of the statements
524 that fulfilled the test assumptions, and these were: Q5 (Access to healthcare is adequate); Q11
525 (The levels of sanitation service provision and general cleanliness are adequate); and Q15 (The
526 rate of urbanisation is commensurate with the level of development). The corresponding p-
527 values and mean ranks are: Q5 (p=0.019; mean rank, male=147.38 and female=169.79); Q11
528 (p=0.023; mean rank, male=147.73 and female=168.50); and Q15 (p=0.029; mean rank,
529 male=148.73 and female=168.65). This shows that there were statistically significant
530 differences in the responses of males and females in Kumasi for questions on healthcare,
531 sanitation and urbanisation rate, with females contributing more to the differences than males.
532 However, in Obuasi, the results in Table S6. show that the null hypothesis was accepted for all
533 the statements that fulfilled the test assumptions. This means that there were no statistically
534 significant differences based on gender in the responses collected in Obuasi.

535

536

537 4.2.6.2 Perceptions based on economic circumstances (employment status) of respondents.

538 The Kruskal-Wallis H test was used to evaluate the null hypothesis that no statistical
539 differences existed in responses to statements based on employment status. The results for the
540 Kruskal-Wallis H tests on responses in Kumasi are given in Table S7. (see S7. in
541 Supplementary Information attached in Appendix A), and these show that the null hypothesis
542 was accepted for all the qualifying statements except for two statements, which were: Q1 (It is
543 easy to find a job; $p < 0.001$); and Q2 (The cost of goods and services are acceptable compared
544 to elsewhere in Ashanti; $p = 0.004$). This means that employment status influenced responses
545 relating to Q1 and Q2 in Kumasi, and as seen in Tables S8.1.- S.8.6., even within employment
546 groups in Kumasi, differences in responses were affected more by the perceptions of the
547 'Unemployed'. As shown in Table S9., in Obuasi, the null hypothesis was rejected for two
548 statements, and these were: Q1 (It is easy to find a job; $p < 0.001$); and Q16 (There is great
549 access to economic opportunities, essential infrastructure and services from where I live in this
550 city; $p = 0.005$). Thus, the responses to Q1 and Q16 in Obuasi were differentiated by the
551 employment status of respondents, and as seen in Tables S10.1.–S10.6., the differences in
552 responses for Q1 and Q16 were influenced more by the perceptions of the 'Unemployed' group
553 in Obuasi.

554

555 4.2.6.3 Perceptions based on age group (in years) of respondents.

556 The Kuskal-Wallis H test for differences in responses based on age group (in years) in Kumasi
557 is presented in Table S11. (see S7. in Supplementary Information attached in Appendix A).
558 The results show that the null hypothesis was rejected for only one out of the thirteen statements
559 that fulfilled the test assumptions and this was: Q17 (I am happy to live in this city and I do not
560 intend to migrate to another place in this country; $p < 0.001$). This means that there was a
561 statistically significant difference in perceptions about Q17 based on age group. Further tests

562 shown in Tables S12.1. – S12.12. show that all age group pairings contributed to the differences
563 in responses. However, the effect size ($= H/n-1$) calculation shown in Table S13. shows that
564 the interactions between the youngest age group ('18 – 30') and the eldest age group ('> 60')
565 contributed most (18%) to the differences in responses. Critically, in Obuasi, the results in
566 Table S14. show that the null hypothesis was accepted for all the statements which fulfilled the
567 test assumptions, thereby indicating that no statistically significant differences in responses
568 were found for those statements.

569

570 4.2.6.4 Perceptions based on education attainment (level) of respondents.

571 The Kruskal-Wallis H test was used to evaluate the null hypothesis that no statistical
572 differences existed in responses to statements based on education attainment. The results
573 presented in Table S15. (Kumasi) and Table S16. (Obuasi) (see S7. in Supplementary
574 Information attached in Appendix A) show that the null hypothesis was accepted for all the
575 statements which fulfilled the test assumptions. This implies that there were no statistically
576 significant differences in responses both in Kumasi and Obuasi based on education attainment.

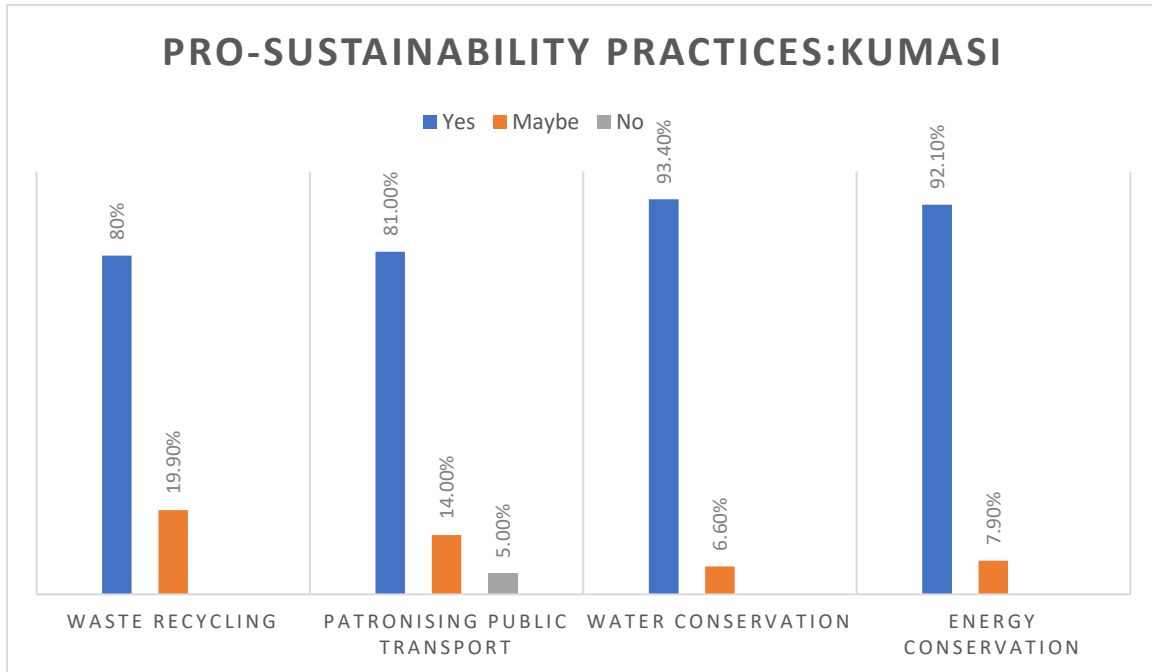
577

578 4.3 Attitudes towards pro-sustainability practices

579 In order to explore the roles and opportunities for promoting urban sustainability in the context
580 of the urban populace, the attitudes of respondents, in terms of willingness to commit to widely
581 accepted practices that promote sustainability, such as waste recycling, patronising public
582 transport and resource (water; energy) conservation, were examined. The results presented in
583 Fig. 10 (Kumasi) and Fig. 11 (Obuasi) show that there is a clear trend of positive attitudes
584 towards pro-sustainability practices in both Kumasi and Obuasi. In terms of differences in
585 responses between Kumasi and Obuasi, the results show that the respondents were marginally
586 more willing to recycle waste in Obuasi than in Kumasi. However, in terms of patronising

587 public transport and conserving water and energy, the responses in Kumasi were marginally
588 higher than Obuasi.

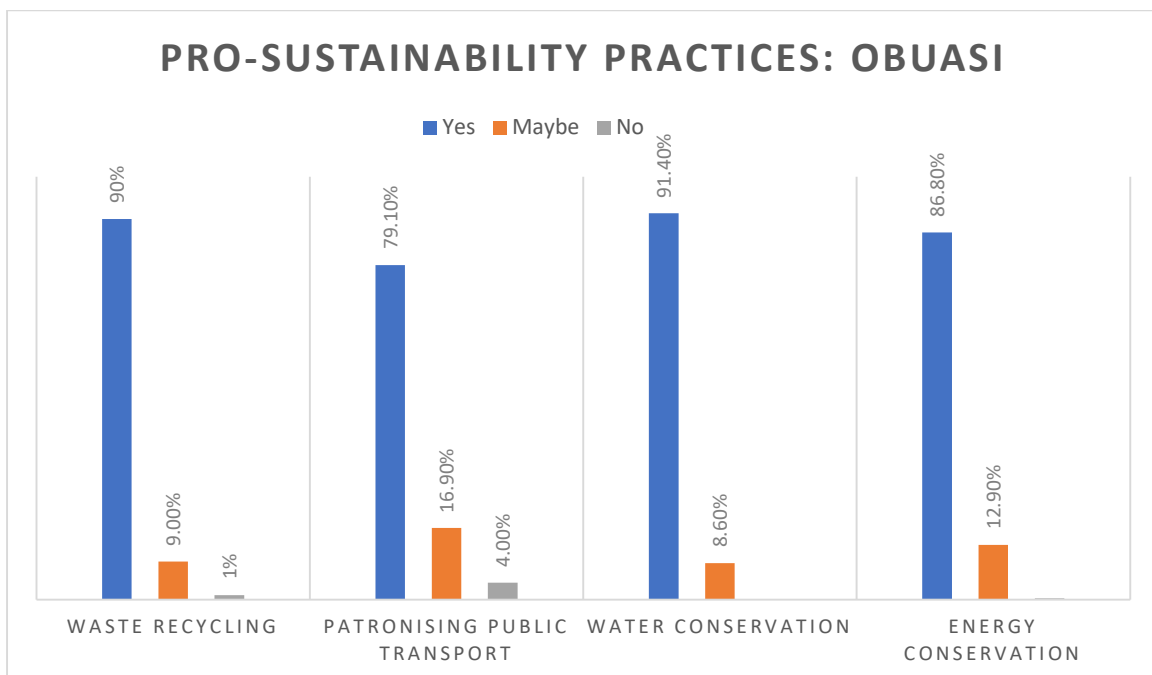
589



590

591 **Fig. 10: Attitudes towards pro-sustainability practices in Kumasi.**

592



593

594 **Fig. 11: Attitudes towards pro-sustainability practices in Obuasi.**

595 **5. Discussion**

596 A decade since more than half of Ghana's population was characterised as urban, this
597 comparative study of Kumasi and Obuasi provides a fundamental starting point to understand
598 how the impacts of the interactions between urbanisation and sustainability are perceived by
599 the public at the local urban level, especially in the context of large versus smaller urban areas.

600

601 5.1 Perceptions of the public on dimensions that represent sustainability and urbanisation

602 In general, the results align with suggestions about how people differ in their views, priorities
603 and motives in the context of sustainability (Moganadas et al., 2013). From an economic
604 perspective, the results confirm the precarious economic conditions prevalent in Ghana's urban
605 areas, especially in the context of employment (Ofori, 2009; Osei-Boateng & Ampratwum,
606 2011). This is because the responses denote a general pessimism for the economic dimension
607 statements, and in the context of employment, the prevailing opinions were that difficulties
608 exist in securing employment in both Kumasi and Obuasi. However, the results suggest that
609 differences in perceptions about the economy seem to exist in the context of income levels, as
610 more people in Kumasi agreed that levels were acceptable than in Obuasi. These differences
611 could be explained by the respective local economic contexts. For example, in Obuasi, where
612 mining activities have given an impetus to urbanisation, the down-turn in operations of
613 AngloGold Ashanti could translate into dwindling economic fortunes for the public whose
614 sustenance depend on mining (Ghana Chamber of Mines, 2019). The marginally positive
615 responses about income levels in Kumasi could, however, be due to the reality of how its higher
616 administrative hierarchy and political influence potentially allows it to attract and concentrate
617 a higher quantity of economic opportunities, including better paying jobs. Critically, the results
618 resonate with suggestions in the literature (David & Arman, 2014) about how the local
619 economic context influences the sustainability impacts of urbanisation. From a social

620 perspective, although the responses were mixed, they are consistent with studies that suggest
621 urbanisation has outpaced planning in Ghana (Yeboah & Obeng-Odoom, 2010). In this regard,
622 a greater majority of respondents in Kumasi and Obuasi who perceived healthcare as
623 inadequate reflects the pressures that the increasing populations in both areas (due to
624 urbanisation) have brought to bear on the provision of social goods such as healthcare. The
625 disparities in access to social goods such as education between Kumasi and Obuasi could,
626 however, be attributed to the earlier mentioned effect of how the higher administrative size and
627 political influence in Kumasi allows it to concentrate more socio-economic opportunities
628 compared with smaller areas such as Obuasi. From an environmental perspective, the results
629 highlight the unmistakably clear negative perceptions held by respondents in Obuasi about
630 aspects such as air pollution and access to potable water. Essentially, the results are consistent
631 with observations in the literature (Amponsah-Tawiah & Dartey-Baah, 2011; Foli et al., 2012)
632 about the insidious incidence of air pollution and the contamination of water bodies in mining
633 areas, and they reflect the peculiarity of sustainability challenges faced by urban mining
634 communities in Ghana. In Kumasi, the highly negative perceptions about air pollution also
635 resonates with suggestions about the prevalence of air pollution (e.g., particulate matter PM_{2.5})
636 in Ghana's big urban areas (Dionisio et al., 2010), while the perceived lack of potable water
637 could, in part, be attributed to the conversion of water bodies and wetlands into urban land use
638 (Amo et al., 2017). Furthermore, the results generated three key observations about the
639 respondents' perceptions of the urbanisation process. A greater majority of the respondents in
640 both Kumasi and Obuasi did not believe that current urbanisation is commensurate with levels
641 of development, and also, the majority of respondents in both areas held views that rapid
642 urbanisation undermined their ability to access socio-economic opportunities and
643 infrastructure. However, the results showed that respondents in Obuasi were more likely to
644 seek to migrate elsewhere than in Kumasi. These observations provide indirect evidence to

645 suggest that despite the rapidly changing landscape and population boom in both areas,
646 urbanisation has not happened in a way such that its sustainability impacts accrue maximum
647 positive benefits for the public.

648

649 Overall, although common interpretations of sustainability are premised on the balanced
650 integration of the different environmental, social and economic dimensions (e.g., Jeronen,
651 2013), by juxtaposing the main survey responses with the extra comments recorded for some
652 respondents, the results suggest that the respondents' perceptions are dominated by socio-
653 economic concerns, sometimes, at the expense of environmental concerns. Therefore, while
654 there is certainly no basis for generalisation, it could be argued that the perceptions of the urban
655 public in Ghana, in the context of the dimensions of sustainability, are primarily influenced by
656 socio-economic circumstances, rather than an urgency to witness any defined description of
657 sustainability where environmental, social and economic goals are balanced. Critically, the
658 results reinforce views about how the prevailing local economy influences sustainability
659 (Davidson & Arman, 2014), and also align with suggestions about how the environmental
660 dimensions of sustainability tend to be side-lined in less-developed countries in subservience
661 of socio-economic aspects (Zhang et al., 2018).

662

663 5.2 Factors influencing differences in perceptions of respondents

664 Generally, gender differences in responses in Obuasi were weaker than Kumasi as no
665 statistically significant interactions were found for all the statements tested in Obuasi.
666 However, in Kumasi, female respondents were more likely to disagree with the idea that access
667 to healthcare was adequate, compared with males. While the scope of the survey did not include
668 finding causal relationships, the gender differences in responses could be explained by reasons
669 established in the literature (e.g., Awumbila, 2006; Danquah & Ohemeng, 2017) which include,

670 but are not limited to, poverty, cultural beliefs and traditions linked to gender-role expectations
671 in Ghana. Essentially, the results provide empirical support for the dominant idea in gendered
672 sustainability literature (Tuncer, 2008; Olsson & Gericke, 2016; Aina et al., 2019) that societal
673 gender relations shape the extent to which people experience sustainable development and
674 suggest that gender must be considered when making urban sustainability decisions.

675

676 The statistically significant responses in Kumasi (ease of finding a job and cost of goods &
677 services) and Obuasi (ease of finding a job and access to economic opportunities) show that a
678 person's economic status could affect their perception judgements, thereby reinforcing
679 arguments in the literature about how socio-economic characteristics strongly contribute to
680 perceptions on sustainability (Voon, 2012; Aina et al., 2019). Furthermore, while age group
681 did not stimulate differences in perceptions in Obuasi, to a certain extent, it influenced
682 perceptions in Kumasi. In this regard, the older generation (>60) seemed to be more content
683 and were not seeking to migrate, compared with the youngest generation (18-30) who seemed
684 to be discontent with the overall state of urban development in Kumasi. This could be explained
685 by how the precarious employment situation in urban Ghana (Ofori, 2009; Osei-Boateng &
686 Ampratwum, 2011) affects sections of the youngest generation (18-30) who may not be in
687 employment, education or training, and thereby may be actively seeking to migrate elsewhere
688 in order to access better opportunities. Therefore, the results align with assertions about how
689 age mediates perceptions about sustainability (Olsson & Gericke, 2016; Narducci et al., 2019).
690 It is worth noting, however, that the results did not establish any statistically significant
691 differences in perceptions in Kumasi and Obuasi due to education attainment.

692

693

694

695 5.3 Attitudes towards pro-sustainability practices

696 The results suggest that there is an inclination to engage in pro-sustainability behaviour in both
697 Kumasi and Obuasi, as over 90% of respondents gave a favourable response to the questions
698 posed. While the survey did not examine factors that may affect the public's ability to engage
699 in pro-sustainability behaviour and actual actions, the results suggest a generally favourable
700 attitude towards sustainability. Considering Ghana's urban development challenges
701 highlighted in the literature section, where urban poverty and inequality are pervasive, slums
702 exist, and there is a scarcity of basic socio-economic infrastructure, a situation that is further
703 exacerbated by rapid urbanisation; one might question the reasons underpinning the reported
704 willingness of the respondents to engage in pro-sustainability behaviour. However, consistent
705 with the idea that urbanisation has outpaced planning provisions (Yeboah & Obeng-Odoom,
706 2010), it could be argued that the respondents were willing to conserve water and energy
707 (electricity) because the provision and availability of these social or environmental resources
708 are limited or scarce. In this context, the high willingness to patronise public transport could
709 be due to public transport often being the only reliable available option (if available at all).
710 Essentially, the results are consistent with the assertion by Pappas & Pappas (2014) that there
711 is the potential for sustainable action when the day-to-day behaviour of individuals are aligned
712 to well-stated values. Overall, although the study did not explore the reasons why respondents
713 would choose to engage in pro-sustainability behaviour, and considering the well-documented
714 urban challenges in Ghana which were confirmed by respondents' answers to selected
715 statements on sustainability, the results imply that the need to promote urban sustainability by
716 engaging in pro-sustainability behaviour currently resonates well with respondents. The
717 implications of the scenario above is that, the public may potentially engage if conditions
718 permit.

719

720 5.4 Policy implications and recommendations

721 The results have policy implications in the context of public engagement for sustainability. The
722 evidence of the study is an indication of the subjective experiences of the public, and the results
723 suggest that the perceptions of the public on urban sustainability are dominated by socio-
724 economic considerations, sometimes, at the expense of environmental ones. In general, the
725 results suggest that how the public perceives statements about urban sustainability in a
726 particular urban area depends, to a considerable extent, on how that urban area has enabled
727 them to maximise their potential in terms of access to socio-economic opportunities and
728 services such as jobs, housing, education, income, as well as access to an environment with
729 minimal negative impacts. Against this backdrop, the results are an indication that the
730 government and other relevant stakeholders must formulate sustainable development
731 programmes that protect the environment, and concurrently deliver adequate good jobs,
732 improved healthcare, and other socio-economic infrastructure.

733

734 The results also showed differences in the perspectives of the public based on gender, age and
735 economic factors. This was demonstrated by how males and females, age groups, and socio-
736 economic groups responded differently to some urban sustainability statements. Consequently,
737 to align with the egalitarian nature of sustainable development as a concept, and to ensure that
738 the capacities of diverse members of society to achieve a sustainable and quality standard of
739 living are not undermined, these factors must be considered during sustainability decision-
740 making. This makes it imperative to sufficiently engage the urban public and incorporate their
741 values, diversity and preferences in sustainability policy-making and planning. Furthermore,
742 the evidence of the study relating to respondents' positive attitudes towards pro-sustainability
743 practices in Kumasi and Obuasi also have implications for the role of the public in steering
744 Ghana's urban areas onto trajectories of sustainability. Clearly, the results highlight the

745 opportunity to formulate policy, or if such is already available, to implement policies aimed at
746 transforming these positive attitudes into normative sustainability behaviour in Ghanaian urban
747 areas. This would require setting the necessary preconditions for the public to actively engage
748 in pro-sustainability behaviour. The necessary preconditions include, but are not limited to,
749 providing basic infrastructure such as kerbside recycling schemes, and public transport systems
750 (such as BRT).

751

752 **6. Conclusion**

753 Research that provides the public's perspectives on the holistic interactions between
754 urbanisation and sustainability in Ghana seems to be incipient and scant when compared with
755 the relatively higher number of studies that have considered aspects of urbanisation such as
756 land cover change, urban sprawl, etc. Therefore, recognising the exigency of achieving urban
757 sustainability, the urban development challenges in Ghana, and the corresponding lack of urban
758 data in the wider SSA context, this paper draws upon a comparative, face-to-face survey of the
759 public in two urban areas in Ghana (Kumasi and Obuasi) in order to gather relevant knowledge
760 on the interactions between urbanisation and sustainability, based on the experiential
761 knowledge of respondents. The results confirm the variations in perceptions held by the public
762 in Kumasi and Obuasi, based on their priorities, values, and diversity. The results also suggest
763 that the public's perceptions were influenced more by socio-economic considerations
764 compared with environmental concerns, and also provided evidence of a clear alignment
765 towards pro-sustainability practices. On the basis of analysis of the data, it is concluded that
766 how the public perceives the interactions between sustainability and urbanisation is widely
767 shaped by their socio-economic circumstances, as well as factors such as gender and age, and
768 that there is a potential likelihood for the public to engage in pro-sustainability practices if the
769 necessary conditions are provided. Overall, this paper contributes to knowledge and the

770 ongoing debates on urban sustainability as it simultaneously explores the interactions between
771 urbanisation and sustainability in Ghana from the public's perspective, in the comparative
772 context of large versus smaller urban areas, and also in a mining context. The contribution of
773 this study is also important in the wider SSA context as the convergence of characteristics such
774 as rapid urbanisation, resource-based economy, paucity of urban data, etc., in Ghana is
775 common in most African countries.

776

777 **CRedit authorship contribution statement**

778 **KA:** Conceptualisation; Methodology; Formal analysis; Data curation; Writing – Original
779 Draft. **CS:** Conceptualisation; Writing – Review & Editing; Supervision. **RH:**
780 Conceptualisation; Writing – Review & Editing; Supervision.

781

782 **Acknowledgements**

783 The wider research project which this study belongs to, was supported by the University Vice
784 Chancellor's PhD scholarship. The authors also thank the Editor and the anonymous referees
785 for their valuable questions, comments, and suggestions.

786

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795 **Appendix A. Supplementary data**

796 The following is Supplementary data to this article:

797 **Supplementary Information**

798 **S1. Questionnaire for field survey.**

CITY..... 799
ID:..... 800
LOCAL:..... 801
DATE:..... 802

803 **INFORMATION AND CONSENT SHEET FOR SURVEY PARTICIPANTS**

804 **PROJECT TOPIC: ‘An African perspective on urban sustainability: a comparative**
805 **study of two urban areas in Ghana’.**

806 This information sheet provides information about a survey for a research project that you are
807 invited to participate in, on urbanisation and the transition towards sustainable cities. Your
808 participation will help throw light on the nature of urbanisation in Sub-Saharan Africa and help
809 make informed contributions which will potentially steer the urbanisation process towards a
810 desired status of urban sustainability. The information from this survey will be confidential and
811 used solely for academic purposes. Participation in this survey is entirely voluntary and the
812 respondent may withdraw at any time without giving a reason for doing so.

813

814 **1. PURPOSE OF STUDY**

815 The study examines the nature of urbanisation in the study locations and to explore ways of
816 transforming urban systems towards sustainability.

817

818 **2. CHOICE OF PARTICIPANTS**

819 The study involves seeking views from urban residents on issues in concerning urbanisation,
820 the dimensions of sustainable development and urban sustainability.

821

822 **3. CONSENT**

823 a) The investigator has explained the purpose and nature of the research to me.

824 b) My doubts and questions have been answered satisfactorily.

825 c) I agree to participate based on assurances that I can voluntarily withdraw from the research
826 without any problems.

827 Signature:

Date:

828 **Part A: Demographic data**

1. Gender	Male [] Female []
2. Age (in years)	18-30 [] 31-45 [] 46-60 [] >60 []
3. Length of Residence (yrs)	<2 [] 2-5 [] 6-10 [] > 10 []
4. Level of Education	None [] Primary [] Secondary [] Tertiary []
5. Employment Status	Employed with wage [] Self-employed [] Unemployed / Retired []
6. Housing	Home Owner [] Tenant [] Family / Friends Housing []
7. Household Size	

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830 **Part B: Perspectives on Dimensions of sustainability**

831 Please indicate your level of agreement with the following statements:

Q.	<i>Economic Sustainability</i>	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
8	It is easy to find a job.	1	2	3	4	5
9	The cost of goods and services are acceptable (compared to elsewhere in Ashanti)	1	2	3	4	5
10	Income levels are adequate (compared to elsewhere in Ashanti)	1	2	3	4	5

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Q.	<i>Social Sustainability</i>	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
11	Access to education is adequate	1	2	3	4	5
12	Access to healthcare is adequate	1	2	3	4	5
13	Access to housing is adequate	1	2	3	4	5
14	Public transport is widely available	1	2	3	4	5
15	Public safety levels are acceptable	1	2	3	4	5

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Q.	<i>Environmental Sustainability</i>	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
16	The level of air quality/ pollution is acceptable.	1	2	3	4	5
17	The amount of accessible green and public spaces is adequate.	1	2	3	4	5
18	The level of sanitation service provision and general cleanliness are adequate	1	2	3	4	5
19	There is good access to potable water	1	2	3	4	5

20	Recycling/ re-use of waste materials are important to save the environment.	1	2	3	4	5
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835 **Part C: Perspectives on Urbanisation**

836 Please indicate your level of agreement with the following statements:

Q.		Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
21	The city's population and landscape are changing rapidly.	1	2	3	4	5
22	The rate of urbanisation is commensurate with the level of development.	1	2	3	4	5
23	There is great access to economic opportunities, essential infrastructure and services from where I live in this city.	1	2	3	4	5
24	I am happy to live in this city and I personally do not seek to migrate to another place in this country.	1	2	3	4	5

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838 **Part D: Attitudes towards urban sustainability**

839 Please indicate your level of agreement with the following statements:

Q.		Yes	Maybe	No
25	Would you willingly participate in a waste recycling scheme in order to promote sustainability in this city?	1	2	3
26	Would you willingly patronise means of transport like cycling and public transport provided they are safe, easily accessible and convenient, in order to promote sustainability in this city?	1	2	3
27	Would you willingly regulate direct water use in your household in order to promote sustainability in this city?	1	2	3
28	Would you willingly regulate direct energy use in your household in order to promote sustainability in this city?	1	2	3

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841 **Further comments:**

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852 **S2. Geographical distribution of survey**

853 **Table S1.** The locations randomly sampled in Kumasi and Obuasi

Urban Area	Suburbs sampled	Sub-metro/Sub-municipal
<i>Kumasi</i>	Kwadaso	Kwadaso
	Abrepo	Bantama
	Kaase	Asokwa
	Pankrono	Tafo
	KNUST area	Oforikrom
	Bremang	Suame
	Daban	Nhyiaeso
	Asafo	Subin
	Dichemso	Manhyia
<i>Obuasi</i>	Biney Estate	Obuasi Municipal
	Akaporiso	
	Bongobiri	
	Amangoase	
	Bedieso	

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855 **S3. Hypotheses**

856 **Table S2.** Hypothesis for non-parametric tests

<i>Factor</i>	<i>Hypothesis</i>
Gender	(i) H_0 : There is no statistical evidence of interaction between gender and the responses to a selected statement. (ii) H_1 : There is statistical evidence of interaction between gender and the responses to a selected statement.
Economic status	(i) H_0 : There is no statistical evidence of interaction between economic status and the responses to a selected statement. (ii) H_1 : There is statistical evidence of interaction between economic status and the responses to a selected statement.
Age	(i) H_0 : There is no statistical evidence of interaction between age and the responses to a selected statement. (ii) H_1 : There is statistical evidence of interaction between age and the responses to a selected statement.
Education level	i) H_0 : There is no statistical evidence of interaction between level of education and the responses to a selected statement. (ii) H_1 : There is statistical evidence of interaction between level of education and the responses to a selected statement.

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860 **S4. Demographic Summary**861 **Table S3.** Summary of demographic characteristics of respondents

Category	Location			
	<i>Kumasi</i>	%	<i>Obuasi</i>	%
<i>Gender</i>				
Female	172	54.10	157	52.00
Male	146	45.90	145	48.00
<i>Age (years)</i>				
18 - 30	139	43.70	126	41.70
31 - 45	113	35.50	97	32.10
46 - 60	51	16.00	57	18.90
> 60	15	4.70	22	7.30
<i>Length of Residence (years)</i>				
< 2	0	0	0	0
2 - 5	80	25.20	65	21.50
6 - 10	114	35.80	108	35.80
> 10	124	39.00	129	42.70
<i>Level of Education</i>				
None	8	2.50	11	3.60
Primary	101	31.80	141	46.70
Secondary	128	40.30	95	31.50
Tertiary	81	25.50	55	18.20
<i>Employment Status</i>				
Employed with wage	47	14.80	51	16.90
Self-employed	145	45.60	131	43.40
Unemployed / Retired	126	39.60	120	39.70

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870 **S5. ‘Further comments’ responses**871 **Table S4.** Summary of selected responses from the ‘further comments’ section of

872 questionnaire.

Location	ID	Comment
Obuasi	O107	<i>“The government must come to our aid. We have no jobs and the future looks bleak”</i>
	O304	<i>“I used to engage in ‘galamsey’ but there has been a clamp down by the government and the company (AngloGold Ashanti) due to environmental concerns and the fact that the land belongs to the company. But what should we do since there are no jobs? I know ‘galamsey’ destroys the land and water (environment) but what choice do we have when ‘galamsey’ is the only means through which we can survive”</i>
	O341	<i>“I am currently studying, but in the future, I think, I would love to move to Kumasi or Accra where I can find a good paying job to secure my future”</i>
	O349	<i>“I am not happy with my quality of life. Things have been hard since company halted operations. As a trader, people are not purchasing my items because there is no money”</i>
	O425	<i>“They (government and AngloGold Ashanti) say they will not allow us to engage in ‘galamsey’ because it destroys the land. But I was born here and within my lifetime I have seen the company’s mining operation destroy our river. What did they do about it then? Galamsey is risky, but people still want to do it because that’s how they can get money to cater for their families”.</i>
	O511	<i>“If I understand you well, you want to know whether we are happy with the level of development we are experiencing. I will ask you to look around, just look at the pot holes on the roads, the population is growing but the infrastructure has not changed significantly”.</i>
Kumasi	K115	<i>“I think Kumasi is the most cosmopolitan city in Ghana as many people from different tribes of the country have come here. But where are the jobs?”</i>

	K321	<i>“The last few years were uncomfortable as the energy (electricity) rationing was going on. So, the government must find a way to educate citizens to save energy”</i>
	K325	<i>“Kumasi has changed considerably over the years. I think it the city has exhausted the capacity of the people it can accommodate”</i>

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874 **S6. Mann-Whitney U test results**

875 **Table S5.** Mann-Whitney U test results for responses in Kumasi

Statement	Mean Rank		Test Statistic			H ₀ Decision
	Male	Female	U	Z	P	
Q1	152.44	165.49	11525.00	-1.442	0.149	Accept
Q2	154.70	163.58	11855.00	-0.936	0.349	Accept
Q5	147.38	169.79	10786.00	-2.336	0.019	Reject
Q6	156.34	162.18	12095.00	-0.625	0.532	Accept
Q8	158.00	160.77	12337.00	-0.299	0.765	Accept
Q9	160.21	158.90	12452.00	-0.142	0.887	Accept
Q11	147.73	168.50	10836.00	-2.279	0.023	Reject
Q12	156.25	161.32	12071.00	-0.531	0.595	Accept
Q15	148.73	168.65	10893.00	-2.189	0.029	Reject
Q16	154.97	163.35	11894.50	-0.854	0.393	Accept

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877 **Table S6.** Mann-Whitney U test results for responses in Obuasi.

Statement	Mean Rank		Test Statistic			H ₀ Decision
	Male	Female	U	Z	P	
Q1	148.94	153.86	11011.55	-0.596	0.551	Accept
Q5	144.58	157.89	10378.50	-1.402	0.161	Accept
Q6	149.14	153.68	11040.50	-0.488	0.625	Accept
Q9	142.56	153.68	10086.00	-1.1915	0.055	Accept
Q12	142.98	159.37	10147.00	-1.825	0.068	Accept
Q16	157.88	145.61	10458.00	-1.314	0.189	Accept

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881 **S7. Kruskal-Wallis H test results**

882 **Table S7.** Kruskal-Wallis H test results for group differences (economic) in responses in
 883 Kumasi.

Statement	Mean Rank			Test Statistic		H ₀ Decision
	<i>Employed with wage</i>	<i>Self-employed</i>	<i>Unemployed</i>	<i>H (X²)</i>	<i>P</i>	
Q1	188.07	181.01	124.09	40.694	<0.001	Reject
Q2	153.22	176.33	142.48	11.191	0.004	Reject
Q5	156.97	170.02	148.34	4.407	0.110	<i>Accept</i>
Q6	148.11	163.35	159.32	1.119	0.549	<i>Accept</i>
Q8	162.80	164.49	152.52	1.511	0.470	<i>Accept</i>
Q9	157.09	162.01	157.51	0.249	0.883	<i>Accept</i>
Q11	157.50	167.12	150.20	2.972	0.226	<i>Accept</i>
Q12	154.18	163.63	155.51	0.795	0.672	<i>Accept</i>
Q15	145.46	168.12	154.82	3.487	0.175	<i>Accept</i>

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 885 **Table S8.1.** Table showing ranks between ‘Employed with wage’ and ‘Self-employed’ in
 886 Kumasi
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Ranks			
	Employment Status	N	Mean Rank
It is easy to find a job.	Employed with wage	47	99.24
	Self-employed	145	95.61
	Total	192	
The cost of goods and services are acceptable (compared to elsewhere in Ashanti)	Employed with wage	47	86.13
	Self-employed	145	99.86
	Total	192	

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895 **Table S8.2.** Table showing test statistics between ‘Employed with wage’ and ‘Self-
 896 employed’ in Kumasi

Test Statistics^{a,b}		
	It is easy to find a job.	The cost of goods and services are acceptable (compared to elsewhere in Ashanti)
Kruskal-Wallis H	.209	2.463
df	1	1
Asymp. Sig.	.648	.117
a. Kruskal Wallis Test		
b. Grouping Variable: Employment Status		

897 **Table S8.3.** Table showing ranks between ‘Self-employed’ and ‘Unemployed in Kumasi
 898

Ranks			
	Employment Status	N	Mean Rank
It is easy to find a job.	Self-employed	145	158.40
	Unemployed/Retired	126	110.22
	Total	271	
The cost of goods and services are acceptable (compared to elsewhere in Ashanti)	Self-employed	145	149.47
	Unemployed/Retired	126	120.50
	Total	271	

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913 **Table S8.4.** Table showing test statistics between ‘Self-employed’ and ‘Unemployed’ in
 914 Kumasi

Test Statistics^{a,b}		
	It is easy to find a job.	The cost of goods and services are acceptable (compared to elsewhere in Ashanti)
Kruskal-Wallis H	32.688	10.918
df	1	1
Asymp. Sig.	.000	.001
a. Kruskal Wallis Test		
b. Grouping Variable: Employment Status		

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Table S8.5. Table showing ranks between ‘Employed with wage’ and ‘Unemployed in Kumasi

Ranks			
	Employment Status	N	Mean Rank
It is easy to find a job.	Employed with wage	47	112.83
	Unemployed/Retired	126	77.37
	Total	173	
The cost of goods and services are acceptable (compared to elsewhere in Ashanti)	Employed with wage	47	91.10
	Unemployed/Retired	126	85.47
	Total	173	

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925 **Table S8.6.** Table showing test statistics between ‘Employed with wage’ and ‘Unemployed’
 926 in Kumasi

Test Statistics ^{a,b}		
	It is easy to find a job.	The cost of goods and services are acceptable (compared to elsewhere in Ashanti)
Kruskal-Wallis H	22.393	.565
df	1	1
Asymp. Sig.	.000	.452
a. Kruskal Wallis Test		
b. Grouping Variable: Employment Status		

927 **Table S9.** Kruskal-Wallis H test results for group differences (economic) in responses in
 928 Obuasi
 929

Statement	Mean Rank			Test Statistic		H ₀ Decision
	<i>Employed with wage</i>	<i>Self-employed</i>	<i>Unemployed</i>	<i>H (X²)</i>	<i>P</i>	
<i>Q1</i>	202.38	153.38	128.18	38.487	<0.001	Reject
<i>Q5</i>	165.04	154.18	142.82	2.843	0.241	<i>Accept</i>
<i>Q6</i>	157.97	154.79	145.16	1.287	0.526	<i>Accept</i>
<i>Q9</i>	151.69	147.43	155.86	0.733	0.693	<i>Accept</i>
<i>Q12</i>	144.50	146.06	160.41	2.616	0.270	<i>Accept</i>
<i>Q16</i>	162.89	164.19	132.81	10.599	0.005	Reject

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941 **Table S10.1.** Table showing ranks between ‘Employed with wage’ and ‘Self-employed’ in
 942 Obuasi

Ranks			
	Employment Status	N	Mean Rank
It is easy to find a job.	Employed with wage	51	114.09
	Self-employed	131	82.71
	Total	182	
There is great access to economic opportunities, essential infrastructure and services from where I live in this city.	Employed with wage	51	90.38
	Self-employed	131	91.94
	Total	182	

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 944 **Table S10.2.** Table showing test statistics between ‘Employed with wage’ and ‘Self-
 945 employed’ in Obuasi

Test Statistics^{a,b}		
	It is easy to find a job.	There is great access to economic opportunities, essential infrastructure and services from where I live in this city.
Kruskal-Wallis H	19.400	.037
df	1	1
Asymp. Sig.	.000	.847
a. Kruskal Wallis Test		
b. Grouping Variable: Employment Status		

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957 **Table S10.3.** Table showing ranks between ‘Self-employed’ and ‘Unemployed in Obuasi.

Ranks			
	Employment Status	N	Mean Rank
It is easy to find a job.	Self-employed	131	136.35
	Unemployed/Retired	120	114.70
	Total	251	
There is great access to economic opportunities, essential infrastructure and services from where I live in this city.	Self-employed	131	138.25
	Unemployed/Retired	120	112.63
	Total	251	

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959 **Table S10.4.** Table showing test statistics between ‘Self-employed’ and ‘Unemployed’ in
960 Obuasi

Test Statistics^{a,b}		
	It is easy to find a job.	There is great access to economic opportunities, essential infrastructure and services from where I live in this city.
Kruskal-Wallis H	9.083	8.948
df	1	1
Asymp. Sig.	.003	.003
a. Kruskal Wallis Test		
b. Grouping Variable: Employment Status		

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967 **Table S10.5.** Table showing ranks between ‘Employed with wage’ and ‘Unemployed in
 968 Obuasi

Ranks			
	Employment Status	N	Mean Rank
It is easy to find a job.	Employed with wage	51	114.29
	Unemployed/Retired	120	73.98
	Total	171	
There is great access to economic opportunities, essential infrastructure and services from where I live in this city.	Employed with wage	51	98.51
	Unemployed/Retired	120	80.68
	Total	171	

969 **Table S10.6.** Table showing test statistics between ‘Employed with wage’ and ‘Unemployed’
 970 in Obuasi
 971

Test Statistics^{a,b}		
	It is easy to find a job.	There is great access to economic opportunities, essential infrastructure and services from where I live in this city.
Kruskal-Wallis H	31.772	5.504
df	1	1
Asymp. Sig.	.000	.019
a. Kruskal Wallis Test		
b. Grouping Variable: Employment Status		

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982 **Table S11.** Kruskal-Wallis H test results for differences in responses based on age (years)
 983 group in Kumasi

Statement	Mean Rank				Test Statistic		H ₀ Decision
	18 – 30	31 - 45	46 – 60	> 60	H (X ²)	P	
Q2	157.36	163.60	155.07	163.50	0.532	0.912	<i>Accept</i>
Q3	150.12	163.72	171.44	174.07	3.292	0.349	<i>Accept</i>
Q5	157.51	173.82	143.93	123.03	7.709	0.052	<i>Accept</i>
Q6	157.91	158.73	170.62	142.27	1.624	0.654	<i>Accept</i>
Q7	163.71	157.46	144.86	185.60	3.261	0.353	<i>Accept</i>
Q8	159.45	161.31	157.38	153.60	0.165	0.983	<i>Accept</i>
Q9	155.39	167.07	158.65	143.47	1.870	0.600	<i>Accept</i>
Q11	151.65	172.71	154.80	139.00	5.427	0.143	<i>Accept</i>
Q12	156.81	167.83	156.61	121.47	4.299	0.231	<i>Accept</i>
Q13	159.60	158.18	150.11	200.50	5.310	0.150	<i>Accept</i>
Q14	145.14	170.22	168.03	182.80	7.542	0.056	<i>Accept</i>
Q15	160.27	169.57	144.72	126.73	5.931	53.549	<i>Accept</i>
Q17	128.44	161.80	208.02	265.10	0.115	<0.001	<i>Reject</i>

984

985 **Table S12.1.** Table showing ranks between '18-30' and '31-45' in Kumasi

Ranks			
	Age (in years)	N	Mean Rank
I am happy to live in this city and I personally do not seek to migrate to another place in this country.	18 - 30	139	114.10
	31 - 45	113	141.75
	Total	252	

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996 **Table S12.2.** Table showing test statistics between '18-30' and '31-45' in Kumasi

Test Statistics^{a,b}	
	I am happy to live in this city and I personally do not seek to migrate to another place in this country.
Kruskal-Wallis H	9.707
df	1
Asymp. Sig.	.002
a. Kruskal Wallis Test	
b. Grouping Variable: Age (in years)	

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999 **Table S12.3.** Table showing ranks between '18-30' and '46-60' in Kumasi

Ranks			
	Age (in years)	N	Mean Rank
I am happy to live in this city and I personally do not seek to migrate to another place in this country.	18 - 30	139	82.83
	46 - 60	51	130.04
	Total	190	

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1001 **Table S12.4.** Table showing test statistics between '18-30' and '46-60' in Kumasi

Test Statistics^{a,b}	
	I am happy to live in this city and I personally do not seek to migrate to another place in this country.
Kruskal-Wallis H	29.515
df	1
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: Age (in years)	

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1003 **Table S12.5.** Table showing ranks between '18-30' and '>60' in Kumasi

Ranks			
	Age (in years)	N	Mean Rank
I am happy to live in this city and I personally do not seek to migrate to another place in this country.	18 - 30	139	71.51
	>60	15	133.03
	Total	154	

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1005 **Table S12.6.** Table showing test statistics between '18-30' and '>60' in Kumasi

Test Statistics^{a,b}	
	I am happy to live in this city and I personally do not seek to migrate to another place in this country.
Kruskal-Wallis H	27.813
df	1
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: Age (in years)	

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1007 **Table S12.7.** Table showing ranks between '31-45' and '46-60' in Kumasi.

Ranks			
	Age (in years)	N	Mean Rank
I am happy to live in this city and I personally do not seek to migrate to another place in this country.	31 - 45	113	74.70
	46 - 60	51	99.78
	Total	164	

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1021 **Table S12.8.** Table showing test statistics between '31-45' and '46-60' in Kumasi

Test Statistics^{a,b}	
	I am happy to live in this city and I personally do not seek to migrate to another place in this country.
Kruskal-Wallis H	10.708
df	1
Asymp. Sig.	.001
a. Kruskal Wallis Test	
b. Grouping Variable: Age (in years)	

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1023 **Table S12.9.** Table showing ranks between '31-45' and '>60' in Kumasi

Ranks			
	Age (in years)	N	Mean Rank
I am happy to live in this city and I personally do not seek to migrate to another place in this country.	31 - 45	113	59.35
	>60	15	103.33
	Total	128	

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1025 **Table S12.10.** Table showing test statistics between '31-45' and '>60' in Kumasi

Test Statistics^{a,b}	
	I am happy to live in this city and I personally do not seek to migrate to another place in this country.
Kruskal-Wallis H	20.184
df	1
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: Age (in years)	

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1031 **Table S12.11.** Table showing ranks between '46-60' and '>60' in Kumasi

Ranks			
	Age (in years)	N	Mean Rank
I am happy to live in this city and I personally do not seek to migrate to another place in this country.	46 - 60	51	30.20
	>60	15	44.73
	Total	66	

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1033 **Table S12.12.** Table showing test statistics between '46-60' and '>60' in Kumasi

Test Statistics^{a,b}	
	I am happy to live in this city and I personally do not seek to migrate to another place in this country.
Kruskal-Wallis H	7.744
df	1
Asymp. Sig.	.005
a. Kruskal Wallis Test	
b. Grouping Variable: Age (in years)	

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1035 **Table S13.** Effect size for age group differences in perceptions in Kumasi for Q17

Group Interaction	Effect Size
'18 – 30' and '31 – 45'	0.039
'18 – 30' and '46 – 60'	0.155
'18 – 30' and '> 60'	0.182
'31 – 45' and '46 – 60'	0.065
'31 – 45' and '> 60'	0.175
'46 – 60' and '> 60'	0.119

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Table S.14 Kruskal-Wallis H test results for differences in responses based on age group in Obuasi

Statement	Mean Rank				Test Statistic		H ₀ Decision
	18 – 30	31 - 45	46 – 60	> 60	H (X ²)	P	
Q1	147.96	147.29	161.41	164.64	2.471	0.480	<i>Accept</i>
Q3	155.23	150.16	148.07	144.95	0.549	0.908	<i>Accept</i>
Q6	165.51	145.23	136.65	149.52	6.984	0.072	<i>Accept</i>
Q7	155.17	140.10	163.54	149.52	3.854	0.278	<i>Accept</i>
Q8	148.97	144.77	162.66	166.73	2.555	0.465	<i>Accept</i>
Q9	147.74	154.65	150.47	161.80	0.845	0.839	<i>Accept</i>
Q10	156.34	150.11	151.90	128.86	2.101	0.552	<i>Accept</i>
Q11	148.51	146.69	159.16	170.02	2.177	0.537	<i>Accept</i>
Q12	155.08	136.27	171.11	147.34	7.630	0.054	<i>Accept</i>
Q13	145.33	159.05	154.80	144.98	2.441	0.486	<i>Accept</i>
Q14	142.30	165.75	149.11	147.59	4.380	0.223	<i>Accept</i>
Q15	153.56	142.90	169.06	132.16	5.369	0.147	<i>Accept</i>
Q16	146.06	147.80	156.63	185.68	4.911	0.178	<i>Accept</i>

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Table S15. Kruskal-Wallis H test results for differences in responses based on level of education in Kumasi

Statement	Mean Rank				Test Statistic		H ₀ Decision
	<i>None</i>	<i>Primary</i>	<i>Secondary</i>	<i>Tertiary</i>	$H (X^2)$	P	
Q1	123.56	168.04	153.27	162.24	3.596	0.309	<i>Accept</i>
Q3	192.19	149.68	160.98	166.18	2.955	0.399	<i>Accept</i>
Q5	150.50	167.36	156.07	156.01	1.291	0.731	<i>Accept</i>
Q6	152.88	171.54	149.62	160.75	4.012	0.260	<i>Accept</i>
Q7	160.75	169.68	152.81	157.25	2.251	0.522	<i>Accept</i>
Q9	174.88	158.88	158.88	160.17	0.305	0.959	<i>Accept</i>
Q10	174.50	146.33	167.78	161.35	3.769	0.288	<i>Accept</i>
Q12	148.63	163.70	155.54	159.58	0.647	0.886	<i>Accept</i>
Q13	172.06	151.47	166.27	157.57	2.476	0.480	<i>Accept</i>
Q14	156.94	170.41	157.48	149.35	2.953	0.399	<i>Accept</i>
Q16	126.56	152.05	174.78	147.90	7.247	0.064	<i>Accept</i>
Q17	148.75	168.99	158.83	149.79	2.246	0.523	<i>Accept</i>

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Table S16. Kruskal-Wallis H test results for differences in responses based on level of education in Obuasi

Statement	Mean Rank				Test Statistic		H ₀ Decision
	<i>None</i>	<i>Primary</i>	<i>Secondary</i>	<i>Tertiary</i>	$H (X^2)$	P	
Q5	134.64	149.12	151.01	161.82	1.441	0.696	<i>Accept</i>
Q6	166.09	142.71	154.59	165.78	3.896	0.273	<i>Accept</i>
Q7	164.09	155.39	154.22	134.31	3.545	0.315	<i>Accept</i>
Q9	141.77	150.26	150.47	158.39	0.653	0.884	<i>Accept</i>
Q10	138.27	149.64	157.59	148.40	0.942	0.815	<i>Accept</i>
Q11	133.09	155.37	145.93	154.89	1.436	0.697	<i>Accept</i>
Q12	163.77	152.00	150.65	149.24	0.336	0.953	<i>Accept</i>
Q13	134.18	143.59	157.76	164.44	5.150	0.161	<i>Accept</i>
Q14	137.68	142.57	157.24	167.23	4.246	0.236	<i>Accept</i>
Q16	173.95	152.58	149.33	147.98	1.041	0.791	<i>Accept</i>

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