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ORIGINAL PAPER

From informal settlements to environmentally sustainable communities: Lessons from Kumasi

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Abstract

Kumasi, Ghana's fastest growing city, attracts migrants of various backgrounds from both within and outside Ghana. This has contributed to uncontrolled lateral expansions, resulting in informal settlements with inadequate services and facilities. Urban planning is reported to have ensured environmental sustainability in cities of the global north. It however remains unclear the extent of influence of urban planning initiatives in ensuring environmental sustainability of informal settlements. Using two major informal settlements in Kumasi (Aboabo and Sawaba) as cases, the paper thus examines: (i) environmental sustainability literacy of respondents; (ii) existing issues that threaten environmental sustainability; and (iii) urban planning responses toward ensuring environmental sustainability of the settlements. The paper adopts secondary data, household surveys, observation, focus group discussions, and agency interviews to achieve its objectives. The findings generally show a very good understanding of environmental sustainability among respondents. The presence of the communities has both positive and adverse implications on the environmental sustainability of the wider city. Contrary to the dominant narrative that urban informal settlements are often neglected and not considered in formal planning schemes, this study showed otherwise. Despite the many urban planning efforts, the environmental conditions of the communities are fast deteriorating due to a myriad of factors which threatens sustainability. The study makes suggestions to effectively promote the environmental sustainability of urban informal settlements through urban planning and participatory community efforts.

Keywords Environmental sustainability · Kumasi · Informal settlement · Sustainability · Urban planning

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Introduction

Although urbanization is regarded as a transformative tool helping millions of people, businesses and countries increase employment opportunities, investment in infrastructure and services and productivity in order to escape poverty; there exists enormous challenges in the urban areas (Fischler 2012). In 2014, the United Nation indicated that 54% of the world's total population were living in cities. Further projections of urban population indicate that globally, population in the urban area is expected to increase by an additional 2.5 billion people in 2050, with Asia and Africa receiving close to 90% of the upsurge (United Nations 2014). Consequently, the urbanization process has led to the movement of majority of the population in rural areas to urban and suburban areas (Heymans et al. 2019) in search of jobs and improved standard of living. Urban population in Africa has also been on the increase at a very high rate, increasing from 1.0 billion in 2010 to peak at 1.6 billion in 2030 (Mubila 2012). The increase in urban population coupled with limited land resources and weak development control, present several adverse implications.

Ghana, similar to many African countries, has experienced phenomenal urbanization over the last four decades. However, growth in urban population is concentrated in few cities indicating how rapid urbanization is occurring in traditional metropolitan areas due to their potential for economic growth. Although in many countries, rapid urbanization seems to have coincided with GDP growth, increase in human capital, expanded opportunities and improved living conditions; the phenomenon has been associated with uncontrolled lateral expansion of cities, resulting in informal settlements with inadequate provision of housing and basic social services. There exists a number of contributing factors to the emergence of informal settlements, namely, rural–urban migration and population growth coupled with absence of affordable housing, occurrence of natural disasters, climate change and dislocation caused by conflict (Sandoval and Sarmiento 2020). In the context of the global south, the growth and expansion of these informal neighbourhoods are often not planned for (Asibey et al. 2021), where it is further reported that approximately 62% of informal dwellers are in sub-Saharan Africa (UN-Habitat 2013). Satterthwaite (2014) further reported that between 30% and 60% of the urban population in developing countries live in informal settlements. This situation triggers the expansion of informal settlements with its associated deteriorating environmental conditions, which adversely affects the attainment of the Sustainable Development Goals (SDGs), specifically, goal 11 aimed at making cities and human settlements inclusive, safe, resilient and sustainable.

Environmentally, in urban Africa, many informal settlements emerge in or around ecologically sensitive and unapproved areas such as wetlands, major dump sites, old and/or abandoned industrial areas, and unused state lands (UN-Habitat 2013; Adamtey et al. 2018). In some cases, such neighbourhoods result from displacement of communities affected by natural disasters or forced eviction by the state. Several examples of these informal settlements can be mentioned in major Ghanaian cities such as Old Fadama, Agbogbloshie, Glefe, Chemuna,

Gbegbeyise and Avenor in the city of Accra (Ministry of Inner-City and Zongo Development 2019); European Town in Sekondi-Takoradi (Adamtey et al. 2018); and Anloga, Aboabo and Asawase in Kumasi (Takyi et al. 2020). Most of these settlements experience frequent flood events and have been threatened with eviction or demolition by their respective city authorities.

Further, informal settlement formation in cities often involves the alteration of wetlands, semi-natural and natural vegetation and agricultural lands into a developed environment (Acquah et al. 2019). The environmental sustainability of informal settlements is however of great relevance to urban planning scholarship (United Nations 2014; Söderlund and Newman 2015; Elrayies 2016; Deuskar 2019). The dominant narrative suggests that informality is and has become a common trait of the urban setting in the global south, resulting in several arguments on whether to plan for them or not. Over the years, governments and other key stakeholders have resorted to several ways of responding to informal settlement existence, emergence and expansion which are often unsustainable. Notable among them are eviction and reallocation, demolishing, and slum upgrading. An increasing call to address the menace of informality and challenges confronting informal settlement dwellers is adopting sound and sustainable urban planning interventions as a pathway.

The conventional literature shows that developing countries will continue to experience the emergence of informal settlements and expansion of existing ones with deteriorating conditions. Thus, based on best practices of developed countries, the adverse environmental impacts of urban expansion may largely be addressed by governments' adaptation of global propositions (the SDGs), and recognition of new information on the role of urban planning in the sustainable development discourse (United Nations 2015). Urban planning has thus become more popular and relevant in urban development and planning literature to achieve efficient and innovative ways of city living in the quest for more sustainable, resilient and livable urban environment. Considered as attempts (regulations, laws, actions and decisions) by national and city governments to address public concerns (Cobbinah et al. 2019), urban planning is seen by many scholars as a "winning urban strategy" needed to sustainably meet the demands of urbanites and address the many environmental challenges in cities, particularly urban informal neighbourhoods.

Owing to the ensuing debate, urban planning has gained much popularity in environmental management and sustainability discourse over the years. It is argued to be very significant in helping cities to achieve sustainable and environment-friendly solutions to address the adverse outcomes of urban expansion. It is a paradigm for city development and important to the unsustainable and deteriorating conditions of urban informal settlements. Urban planning initiatives are thus deemed central to the realisation of the SDGs, specifically, SDG1, SDG12, SDG9 and SDG11. In line with this and taking Kumasi, Ghana's fastest growing city, this paper inquires: if urban planning can be harnessed to promote the environmental sustainability of informal settlements. The paper specifically, seeks to: (i) examine the perception of informal dwellers and urban planning agencies on the concept of environmental sustainability; (ii) the state of existing environmental issues that threatens environmental sustainability; and (iii) the urban planning responses toward achieving environmental sustainability in informal settlements.

Materials and methods

Study setting

Geographically, the study was conducted in two major informal settlements (Aboabo and Sawaba) in the Asokore Mampong Municipality. The Asokore Mampong Municipality, which was carved out of the Kumasi Metropolis in 2012 with a population of 304,815 and a growth rate of 4.6%, higher than the national average of 2.5% (GSS 2014a). The population density of the Metropolis is estimated at 12,746.3 persons per square kilometer. The Municipality has 72,478 households with an average household size of 4.2 which is lower than the regional average of 4.3 (GSS 2014b). The increase in the Municipality's population is significantly linked to the rapid growth of the Kumasi Metropolis. The Asokore Municipal Area has strong physical and functional links with the Kumasi Metropolis where over 70% of the working population commute to and from the city daily to engage in socio-economic and other related activities at the city center (GSS 2014b). The Municipality has thus become one of the major 'dormitory' areas of the Kumasi Metropolis. Highlighting its influence on the Municipality, Asokore Mampong is currently one of the fastest growing areas in the Region and remains one of the two districts with all its towns urbanised in the Ashanti Region. Its location has brought with its physical development challenges including congestion, poor transport infrastructure, and pressure on housing, crime as well as encroachment on road reservations.

The rapid population growth coupled with high land values and rents have resulted in the development of some of the largest informal settlements (Aboabo and Sawaba) in Kumasi (Asibey et al. 2020, 2021). Hence, two informal settlements in the city of Kumasi—Aboabo and Sawaba—were purposively selected for this study (see Fig. 1). The settlements 'house' several migrants and located around the abandoned railway line in Kumasi, about 4.5 km east of the central business district (CBD).

Sawaba houses a greater number of migrants of different religions and socio-economic and cultural backgrounds, especially persons from the Northern part of the country. There exist 5,486 households with a total of about 23,741 people in the community as at 2010 (GSS 2012). It was projected that in 2021, the total population would be approximately 30,241 with about 7,447 households. Most of the residents in the community are engaged in commerce as their source of livelihood. Similarly, Aboabo is one of the largest informal settlements in Ghana with a total population of 43,148 and 6,626 households (GSS 2012). The population of the community was projected to have a total population of 61,353 and a total household population of 9,422 by 2021. It occupies a total terrestrial space of about 1.6km^2 (GSS 2012). Most of the residents in the community are engaged in commerce as their major source of livelihood. The community was developed in the year 1940s, receives higher number of migrants from the Northern part of Ghana but remains one of the most deprived areas in Kumasi.

The two communities are characterised by poor environmental and sanitary conditions, sub-standard housing, congestion, large household sizes, unapproved

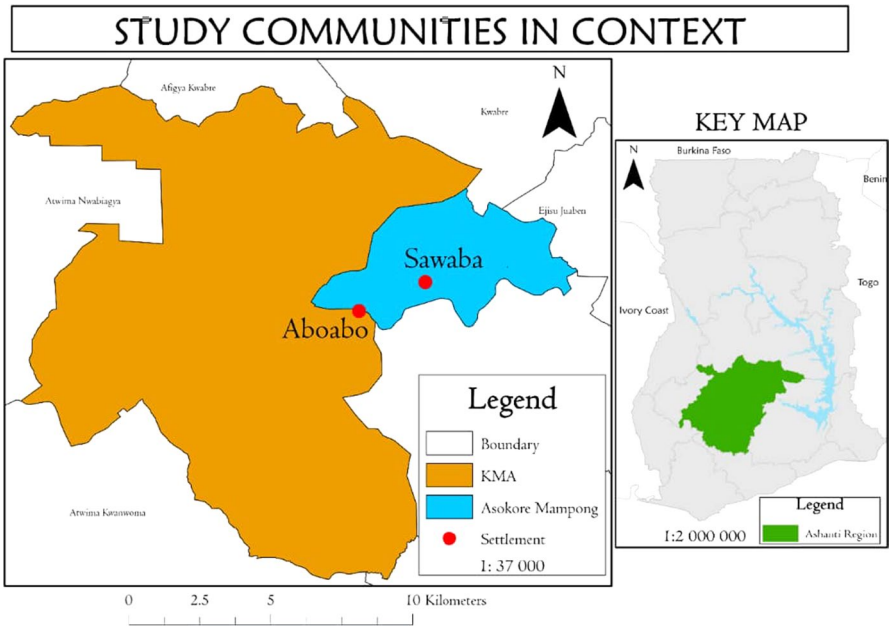

Fig. 1 Physical map of the study communities in Regional context

extension of buildings and limited provision of utility services, and depletion of ecologically sensitive resources (Asibey et al. 2019, 2021; Amoako and Cobbinah 2011). The communities remain some of the densely-populated suburbs in Kumasi with an average household size of six persons compared to five of the city. These informal neighbourhoods provide shelter for the poor but are however often neglected in formal planning schemes of city authorities (Asibey et al. 2021) mainly because they are perceived to pose threat to urban commons and regarded as ungovernable. This often traps residents in insecurity, perpetual poverty, inadequate infrastructure provision and deteriorating environmental landscape.

Research approach

The multi-case research approach was adopted for the study with focus on two major informal settlements in the Asokore Mampong Municipality. Specifically, the underlying principles of "how" and "why" type of questions were considered and oriented to investigate the phenomenon within its real-life context. The process commenced with review of relevant literature on urban planning, environmental sustainability and informal settlements at both local and international levels. On one hand, the international literature particularly focused on research publications on theories and concepts related to studies on informal settlements, urban planning and sustainable development by urban study scholars and international development organizations. The local literature on the other hand, centered on development documents such as

the medium-term development plan, population and housing census reports by the GSS and urban planning schemes and policies used in planning, development and management of settlements in the Municipal (e.g., GSS 2014a, b; Asokore Mampong Municipal Assembly 2014; Amponsah 2020; Omoboye et al. 2020; Sandoval and Sarmiento 2020). Specifically, the analysis of the documents was geared towards understanding the characteristics of the study communities, the contribution of informal settlements to the environmental sustainability of cities as well as the impact of urban planning practices in ensuring environmental sustainability of informal settlements in the city of Kumasi. The review process provided the basis for selecting the study communities, relevant local agencies and household participants for the study.

This research in an attempt to provide answers to the research questions adopted the mixed-method study approach. The mixed-method approach consisting of both quantitative and qualitative data allowed for all inadequacies of a single method to be catered for by the researcher. This method also aided in integrating both qualitative and quantitative data collection and analysis thereby minimizing the limitations of the method. Participant observation, interviews, and semi-structured questionnaires were administered to collect the required data.

Using expert interviews, five development and planning related institutions within the Asokore Mampong Municipal Assembly (AMMA) were purposively engaged in discussions on the study objectives. The use of the technique ensured the selection of respondents with adequate knowledge on the research issue, specifically, the roles they play in the formulation, implementation and management of urban planning interventions in ensuring sustainable environmental conditions of settlements. The interviews were conducted with officials of the: (i) Physical Planning Department (PPD) responsible for spatial and settlement planning in Ghana (development planning, management and development control and enforcement); (ii) Waste Management Department (WMD) responsible for general waste management in the Municipality; (iv) Department of Environment Health and Sanitation (EHSD) responsible for addressing general environmental and health issues related to the unsafe environmental practices at the local level by enforcing legislations; (iii) Development Planning Unit (DPU) responsible for preparing plans for socio-economic development at the local level; and (iv) the Environmental Protection Agency (EPA). One respondent each (the head or any other official with adequate knowledge on the phenomenon) from the abovementioned institutions was interviewed with an interview guide. Additionally, four opinion leaders (two in each community), the Assembly member of the communities as well as three non-governmental organizations in the study communities (No Business as Usual, NEYORD and the Muslim Family Council) were interviewed for relevant data. The interviews were conducted in English and centered on three key themes, namely, (i) environmental sustainability literacy among respondents, (ii) factors influencing the current state of environmental conditions in the selected neighbourhoods and threaten their sustainability, and (iii) the urban planning interventions aimed at achieving environmental sustainability in the selected communities as well as the associated challenges in management efforts. Each interview lasted for an average of 65 min.

At the community level, a total of 376 household participants (221 in Aboabo and 155 in Sawaba) from a population of 16,869 households at 95% confidence level and 5% margin of error were engaged in the household survey (Table 1). The heads of the sampled households, focusing on both male and female heads, were subsequently engaged in interview discussions. Due to the absence of a sampling of the households, participants were conveniently (based on their willingness to participate in the study) and purposively (location in the communities for a minimum of 5 years) sampled. Similar to the expert interviews, the household survey gathered data on their perception on the concept of environmental sustainability, environmental state of the respective communities and factors contributing to the state as well as threatening their sustainability, and the urban planning interventions by local planning agencies in ensuring sound management and environmental sustainability of the neighbourhoods.

In addition to the interviews were observations of the physical conditions of the environment in the study communities to supplement the data gathered through the household survey and expert interviews. Two Focus Group Discussions (FGDs) were again held with some residents in the study communities to have a better understanding of the issues raised by the respondents on the phenomenon. The average number of participants of the FGDs was eight.

The collected data were largely analysed qualitatively using the content and thematic analyses. The content analysis was employed to analyse the qualitative data which was essentially description and explanation of perception on environmental sustainability and the influence of informal settlements on the environmental conditions of cities. Specifically, themes, codes and categories based on the interview transcripts were developed. Data from the expert interviews and household surveys were triangulated and results made available to the local planning institutions and local communities through community meetings for validation and to address any gaps and inconsistencies that occurred. The qualitative data were analysed and presented under three key themes, namely, (i) environmental sustainability literacy among household and local agency participants, (ii) factors influencing the current environmental conditions in the selected neighbourhoods and issues that threaten their sustainability, and (iii) urban planning interventions aimed at achieving environmental sustainability as well as the associated challenges in management efforts.

Table 1 Background characteristics of respondents ($n=376$)

No	Community	No. of households	Sample size
1	Aboabo	9422	221
2	Sawaba	7447	155
	Total	16,869	376

Results and discussion

Environmental sustainability literacy among respondents

The concept of environmental sustainability has been widely discussed in the extant literature. Sutton (2004) indicated that the concept often arises whenever the qualities of the environment, valued by people, are at risk of deterioration. This is to ensure that the qualities of the physical environment are valued, protected and well maintained which are central to attainment of relevant SDGs. Relatedly, with ongoing debates toward recognising the importance of planning for environmental sustainability in building resilient and sustainable human settlements, the appreciation of the concept in Ghanaian planning documents and community perspectives appear limited despite considerable local knowledge on its significance and applicability across the globe. It is widely documented that there exists some aspect of the environment that hinders the sustainability. For example, the poor disposal and management of waste impacts adversely on the quality of the environment and also causes extinction in some cases (Fulton et al. 2017). Considering that knowledge of environmental sustainability is central to putting in place measures to protect and sustain aspects of the environment, the perception of respondents on the concept was examined. Generally, the responses from the agency officials and household respondents showed a very good understanding of the concept and its importance in building sustainable and resilient cities, with some variations in conceptualisation.

Generally, three major themes were discussed by the participants, namely, maintaining the aesthetics of the environment, protection of the valuable qualities of the environment and the conservation of the natural and non-renewable resources. For instance, the PDD and EPA officials respectively remarked that:

> "Environmental sustainability is the responsible interaction with the environment to avoid depletion or degradation of natural resources and allow for long-term environmental quality. It involves making life choices that ensure an equal, if not better, way of life for future generations."
> "Environmental sustainability is simply meeting the current generation's resource and service needs without compromising the health of ecosystems that provide them but, more specifically, the term means, a state of balance, resilience and interconnectedness that allows the society to satisfy its needs while neither exceeding the capacity of its supporting ecosystems to continue to regenerate the necessary services to meet those needs nor by the human actions diminishing diversity".

The official of the DPU further stated that:

> "Environmental sustainability can be used to mean, the interaction between human society (informal settlements especially) and the natural environment; where the activities of the former do not undermine the resilience of the later"

Similarly, at the household level, 75% of the of household participants in Sawaba were of the view that environmental sustainability simply implies maintaining the beauty of the environment. The remaining 25% mentioned environmental sustainability to be the conservation of the existing natural resources. In Aboabo however, most of the respondents (70%) explained environmental sustainability to be the protection of valuable qualities in the physical environment whiles the remaining concluded that sustainability of the environment takes into consideration the maintenance of the aesthetics of the environment.

> "Environmental sustainability is the ability to maintain things or qualities that are valued in the natural and biological environment" (A discussant during a FGD at Aboabo)
> "To me, environmental sustainability is the responsibility to conserve natural resources and protect global ecosystems to support health and wellbeing, now and in the future" (A discussant during a FGD at Sawaba)

The household survey data generally showed that residents in the two study communities understand environmental sustainability to mean the protection and maintenance of the aesthetics of the environment to ensure a healthy living. This resonates the increased call to protect the natural environment with the aim of improving the living conditions of people and other species like clean water and air, and the livability and aesthetic of the environment, and and human life among others (UNEP 2021).

It is important to reiterate that informal settlements, as widely documented, are characterised by poor environmental conditions which arise out of poor attitudes, absence of adequate infrastructure, and a general low level of education and knowledge on better management practices, among others (Alhassan 2017; Moosavi 2011; Yadav et al. 2019). From the findings however, it was noticed that inhabitants generally have good understanding of the concept of environmental sustainability which can be an important pathway to put in place measures to protect and sustain the physical environment. The concept of environmental sustainability is intended to support the operationalization of sustainability itself by providing a sense of direction and purpose, regarding the importance of valuing ecological services (Jones 2017; 2018; Morelli 2011).

The above conceptualisations on environmental sustainability represent the views of all other agency officials interviewed as well as the opinion leaders. These definitions are consistent with what scholars discuss in the existing literature (e.g., UNEP 2021; Azunre et al. 2021; Asibey et al. 2021; Morelli 2011). Related to this study, the EPA official reiterated that sustainability is said to be attained in the informal settlements when they are able to withstand and recuperate from environmental shocks and tensions. Hence, any attempt to withstand such shocks should not undermine the resources or environmental conditions of the present and future generations (Jones 2018). In line with this, the DPU official commented that:

> "… It is necessary to ensure that urban planning inculcates the idea of conserving and protecting the assets nature has given to mankind. By so doing, informal settlement dwellers will gradually change their attitudes and behavior

towards the environment and this will go a long way to ensure that, the future needs of generations to come is not compromised".

This study posits that actions for environmental sustainability should encompass the adoption of buy recycled, patronization of renewable rather than non-renewable resources, and conservation of natural habitats (Omoboye et al. 2020).

Physical state and threats of informal settlements on environmental sustainability: Respondents' perspectives and observations

The planning and management deficiencies in informal settlements severely affect the quality of the environment (Moosavi 2011). For instance, Asibey et al. (2021) reported that the neglect of planning authorities has contributed to the increased solid waste management challenges, deteriorating health, wellbeing and economic conditions of residents in informal neighbourhoods, specifically, Asawasi and Aboabo. Specifically, in line with the global initiative of ensuring sustainable sanitation for all, there is the need to put in place effective and efficient systems to manage solid waste generation in informal settlements and cities in general. This research consequently examined the state of the physical environment of the communities as well as the factors that threaten their environmental sustainability. The survey findings showed a myriad of factors that contribute to the worsening environmental conditions and sustainability of the informal settlements.

It was observed that the quality of the environment in the study communities is currently degraded, which is manifested in the inability to even manage sanitary conditions and services. Generally, observations of the current state of the physical environment in the study communities showed deteriorated conditions with both short- and long-term implications on the health of inhabitants, which also exacerbate poverty conditions and further pushes inhabitants to live in environmentally unsafe areas such as waterlogged areas, flood plains and open drains. The environmental issues that were outlined by the respondents to be posing threats to environmental sustainability revolved around two key issues with several outcomes, namely, weak urban planning regimes and poor attitudes of residents towards the environment resulting in flooding, poor solid waste management, and the unapproved developments and extension of buildings.

First, a number of factors have been perceived to be responsible for the growth in population of informal settlements within the sub-Sahara African region and consequently, their impact on the environment. For instance, the expansion of informal settlements in cities have been associated with increasing rural–urban migration, especially among the youth, for non-existent economic and employment opportunities. While in the cities, these new migrants are met with the harsh realities of urban life which require them to get decent accommodation, pay their rents and utility bills. Informal settlements, similar to Aboabo and Sawaba, develop as a result of the inability of city authorities to meet the housing and social infrastructural needs of the growing populations of the poor migrants. Thus, the development of the informal settlements results from rapid and uncontrolled urbanization and inability of the

city governance and planning systems to provide decent employment and accommodation for the ever-increasing population. Consequently, the two study communities remain some of the densely populated informal neighbourhoods in the city with deteriorating environmental conditions and outcomes without conscious efforts by city authorities to spatially and sustainably plan for the neighbourhoods. It was reported by the agency officials and households that the urban poor in the informal settlements, due to high land rents, locate into areas which are deemed inhabitable, dangerous and vulnerable to natural disasters such as floods (Takyi et al. 2020; Uddin 2018).

The interview findings showed that the formation of informal settlements and worsening environmental conditions is highly as a result of poor planning schemes. The rapid population growth, coupled with growing housing deficits in Kumasi are reported to have resulted in the formation and growth of the informal settlements. The household participants stated that with inadequate incomes, many of them are unable to afford decent housing with adequate supply of other services. There has thus been the unauthorized extension of buildings which often puts the approved planning scheme of these areas into disarray.

In relation to the above, the EPA and PPD officials remarked that failed formal urban planning regimes, policies and governance in Ghana have over the years, largely resulted in excluding the urban poor in relevant infrastructure provision and governance issues, forcing them to develop settlements outside the formal planning regulations. It was further revealed through interviews with the Assembly members, opinion leaders and agency officials that marginalised by the urban governance and formal planning systems, the residents in these informal settlements are left with no other choice than to settle on lands deemed inappropriate for human habitation. According to the EPA official, which was confirmed by all respondents:

> "These informal settlements evolved at the current marginal and vulnerable locations along river banks and steep slopes, along express highways and major railway line where the residents make their livelihoods as the only source of their survival. Consequently, their locations have been associated with several disasters mainly perennial flooding and its associated adverse impacts"

The PPD official further remarked that.

> "The spatial outlook of the two study communities does not depend much on the spatial planning schemes of city authorities, but rather on coping mechanisms based on preferences by the inhabitants".

Most respondents in the study communities (88% in Aboabo and 95% in Sawaba), indicated flooding to be the major environmental issue they face with numerous social, economic and environmental implications. Some of the mentioned implications are loss of lives, damage of properties, psychological stress, outbreak of waterborne diseases, contamination of ground water, pollution of soil and water courses and the destruction of infrastructure.

Fig. 2 Poor sanitation and solid waste management in some parts of Sawaba. Source: Field Survey, July 2021

Second, the informal neighbourhoods were reported by the WMD, EPA and EHSD officials to be some of the major contributors/generators of solid waste in Kumasi. It is important to reiterate that improving solid waste management (SWM) and achieving the SDG sanitation-related target in developing economies needs measures to scale up management systems particularly in urban informal settlements (Asibey et al. 2019; Oteng-Ababio et al. 2017). Specifically, the SDG 4.1 emphasizes access to drinking water, sanitation and basic handwashing facilities (United Nations 2015). Relatedly, the effective growth and development of an economy and sustained poverty reduction can be achieved through effective and proper collection, transportation and disposal of solid waste (Oteng-Ababio et al. 2017). In Ghana, the Local Governance Act 936 of 2016 empowers city or local authorities to ensure proper sanitation for all, including the urban informal settlements. The above notwithstanding, the failure of city authorities to promote efficient and effective waste management has been eminent in most informal settlements including Aboabo and Sawaba.

Observations and interview findings showed that in spite of households having good understanding of environmental sanitation, poor sanitation was a major challenge that threatened the sustainability of the environment (see Figs. 2 and 3). The Assembly member for Sawaba specifically mentioned that:

> "Due to the absence of most of the essential basic facilities such as toilet facilities in the homes and in the community, some inhabitants defecate in open spaces and in some instances dispose of their fecal substances and solid waste in gutters and water bodies. Also, skip containers that are filled with refuse are left in the community for about 2–3 weeks before taken to the landfill site".

It was revealed through the FGDs that due to challenges of distance and flexibility of the existing waste disposal, collection and management mechanisms to the households, most households either resort to burning and burying, creation of unapproved communal points or open disposal of solid waste behind homes and open drains. These practices, according to the WMD and ESHD officials however have enormous environmental and health risks on dwellers, which further traps them in poverty. Relatedly, all respondents in the Sawaba and Aboabo communities expressed their ill feeling towards the poor sanitation condition and management practices in the communities, which to them pose a threat in attaining environmental sustainability. The households however mentioned that they resorted to burning and burying, creation of unapproved communal points and open disposal of solid waste behind homes and open drains because of the absence of formal waste disposal and collection points. The finding supports the general assertion that environmental sanitation and SWM in most informal settlements in Ghana are largely inefficient, resulting from increasing urbanization coupled with poor institutional structures to manage waste generation and management. The inefficiencies, were reported to have resulted in increased intensity in informal solid waste collection activities in even formal urban neighborhoods. Within both urban formal and informal settlements in the city of

Fig. 3 Poor sanitation and solid waste management in some parts of Aboabo. Source: Field Survey, July 2021

Kumasi, there is evidence of public toilet facilities owned and operated by private individuals who charge users for the use. This often arise when the private sector investors take advantage of the informal and insecure property rights and operate 'public services' shower and toilet businesses (Paller 2014; King et al. 2012), as observed in the study communities.

Despite efforts made by central and local governments to improve environmental conditions through policy and plan formulation to implementation, informal settlements face poor and deteriorating environmental conditions (Amoako and Cobbinah

2011). Considering that informal communities, including Aboabo and Sawaba, are major generators of solid waste but are often cut-off from efficient waste collection services, there have been increased calls and recommendation for private sector participation in solid waste management as was observed in the settlements. Due to the inefficiencies in the formal waste management systems, the informal waste management sub-sector (informal tricycle operators) is gradually becoming part of the waste management system in the areas of scavenging, sorting and recycling. Although this is argued to be prudent in managing waste, their operations also threaten the sustainability of the environment and consequently, pose health threats. Specifically, activities of these tricycle operators resulted in the spillage of solid waste on major roads of the city during the collection and transportation of the waste to final dumpsite which is over 15 km from the communities. All agency officials remarked that this practice dirties the city and threatens the health and general sustainability of wider city.

Lastly, due to land conflicts that often confront informal settlers and threaten tenure security, they often face force evictions. For instance, in Kumasi, the competition for land, coupled with limited financial and technical capacities of local planning authorities and competing land uses have resulted in worsening infrastructure and housing problems (Amoako and Cobbinah 2011; Cobbinah et al. 2019). Due to this, it was observed that most of the settlers use poor quality materials to build sub-standard houses (wooden and makeshift structures) as a risk mitigation measure. Further, the inadequacy of urban spaces particularly for housing development and the continuous upsurge in population growth in the study communities have contributed immensely to the proliferation of illegal appendages to residential buildings (Adinyira and Anokye 2013). This, according to the PPD and DPU officials, most developers put up structures without prior approval and consent from recognized institutions or authorities. Observations made during the survey was that water bodies in the study communities have been encroached. Containers and other temporary infrastructure have been put up on waterways and floodable areas which pose serious threats to the environment, lives and property. Again, the respondents mentioned that the poor housing conditions have resulted in increased number of fire outbreaks with enormous destruction (due to the densely packed wooden structures) and flood occurrence (due to the location on marginal lands). There was also observation of unapproved building extensions (see Fig. 4) to accommodate the increasing number of dwellers in the communities. These unapproved extensions were reported to pose threat on residents and the environment at large (see Table 2).

Discussions with the PPD and EPA officials and observations showed that there are barely distances between built houses to serve as passage way for inhabitants or emergency services such as fire tendering and ambulance services. This notwithstanding, the agency interviews and household survey revealed irregular and infrequent visits by local planning authorities to inspect physical developments at unauthorized places. The authorities blamed this on the unguarded population increase in many of the informal communities (a characteristic of most Ghanaian cities) and the many institutional challenges confronting them (inadequate personnel and logistics and low budgetary allocation). The foregoing has

Fig. 4 Formation of uncontrolled development in parts of Aboabo

Table 2 The effects of unapproved appendages on buildings and occupants

No	Effect on occupants	Effect on buildings
1	Impedes access for fire service in times of fire outbreak	They deface buildings
2	Poses health hazards by blocking ventilation access	They disturb the structural stability of the building
3	Impede access to service providers	They devalue the buildings

Source: Adapted from Adinyira (2013)

adverse implications on achieving an effective and sustainable environment in the city as well as the attainment of the SDGs.

Generally, the findings confirm the dominant narrative where studies evidently show that environmentally, many informal settlements emerge in or around ecologically sensitive and unapproved areas such as wetlands; major dump sites; old and/or abandoned industrial areas; and unused state lands ((Yadav et al. 2019; UN-Habitat 2013; Adamtey et al. 2018). In some cases, the informal settlements result from displacement of communities affected by natural disasters or forced eviction by the state. Several examples of informal settlements can be mentioned in the major Ghanaian cities including Old Fadama, Agbogbloshie, Glefe, Chemuna, Gbegbeyise and Avenor in the Accra Metropolis (Ministry of Inner-City and Zongo Development 2019); Aboabo, Sawaba and Asawase (Takyi et al. 2020) in Kumasi; and European Town in the Sekondi-Takoradi Metropolis (Adamtey et al. 2018).

Urban planning attempts towards achieving environmental sustainability in informal settlements: Respondents' perspectives

Eviction is reported to be the commonest approach to addressing the growth and expansion of informal settlements and subsequently, improving environmental sustainability. The incidence of eviction, calls for the reallocation of residents. They are mostly moved into the outskirts or at the fringes of the city or in new towns (Nassar and Elsayed 2018). Some also, who cannot afford rent, resort to water logged areas for residential purposes. During the rainy seasons, they are faced with the challenge of flooding which destructs livelihood. Similarly, in Ghana, urban planning has over the years considered demolishing to be the easiest way of getting rid of informal settlements and improving environmental conditions. The demolition of Nairobi's informal settlements in 1990 for example, gives a clear indication of the attempts by authorities in curbing informal settlements. Urban planners who believed in this method are often of the view that the city should depict its glamourous side through the eruption of modern buildings.

The above notwithstanding, interviewed city authorities and residents indicated that eviction is not the best practice towards improving the environmental sustainability of informal settlements. As such, several interventions (largely piecemeal) from local authorities and NGOs were mentioned to have been implemented over the years, although have achieved marginal success in ensuring improved environmental conditions in the settlements since several of these urban planning measures are in their early stages.

First, urban planners indicated that creation of green areas as an attempt to improve the environmental conditions and sustainability of the communities is imperative. According the EPA official, green infrastructure remains central towards awakening the quality of life and the environment by harnessing benefit for people's livelihood and also addressing constraints to greenery. To the EPA and PPD officials, relevant greenery programs and policy initiatives which uses participatory, low cost and socio-economic empowering strategies are needed in the informal urban areas. Specifically, it was mentioned that more than 200,000 varied tree seedlings ranging from coconut, teak, guava among others, as part of the National Tree Planting exercise were planted across the city, including the study communities. In an interview with a representative from the PPD, more than 200,000 trees were planted in various communities including the study communities through the collaborative effort of the inhabitants, religious bodies and the traditional members. This was confirmed by the residents during the FGDs. This was done to ensure that the environment is kept clean, maintained and improve its natural aesthetics. The major challenge was however the inability to plant the trees across the landscape due to the poor physical conditions of the communities' environment. This notwithstanding, the exercise was deemed important to restore the aesthetic nature of environment. The promotion of greenery environment is also a way of educating and sensitizing dwellers on the need to improve the environmental conditions through greening.

Further, official of the EHSD pointed out that monthly house-to-house sensitization on environmental cleanliness is undertaken. This, according to the official,

is done to educate households on the environment and the adverse implications of their practices on it and consequences if not well managed and cared for.

> "It is believed that if one is made aware of his actions (why it is necessary for him to do one thing and not the other) and his responsibilities and duties as a citizen and as a member of a community, he/she would act accordingly" [Interview with the EHSD official].

The regular sensitization and education exercise was however refuted by most of the households in the study communities interviewed who indicated that no such exercise has been going on; hence, requested that city officials undertake such exercises.

> "We have not seen or had any official undertake education exercises on maintaining the environment, although we deem it to be important. If they claim they do so, we have to see the impact. They should take it up and do that. We will accept them in good faith and practice whatever they teach" [Discussants during a group discussion in Sawaba]

Environmental sustainability programs comprise all actions to reduce physical non-renewable resource usage, adoption of a recycle everything/ buy recycled method, high usage of renewable resource than the non-renewable resources and the restoration of natural habitats and valuable qualities of the environment (Sutton 2004; Tanni et al. 2014). To protect, improve and sustain both renewable and non-renewable resources for future generational usage, the recycling, reuse and repackaging approaches to waste management were mentioned to be adopted by authorities (both government and private sector organizations) in the study communities. The findings from the survey revealed that a partnership has been built with some private organizations such as Environment 360 to help ensure the recycling of all plastic wastes in the study communities. Specifically, residents who freely engage in the collection/scavenging of plastic waste from the environment are paid an amount as a form of motivation. Also, Das Biogas and Construction Limited was reported to be one of the organizations operating in the study communities and is determined to achieve a zero-waste in the Municipality. According to the WMD official, the organization installs both domestic and institutional biogas plants to treat domestic and institutional wastes at an affordable cost, all geared towards improving the sanitation situation in the communities.

Additionally, the paper showed conscious attempts by local planning authorities to halt the expansion and development of informal settlements and improve the environmental conditions in existing neighbourhoods. The interventions are however largely piecemeal with minimal impact on ensuring the environmental sustainability of the communities A notable project is the Kumasi City Development Strategy (KCDS) designed with broad local participation with government of Ghana and National Association of local Government (NALAG) and aimed drawing up a long-term development plan for the city of Kumasi to be implemented between 2006 and 2020. The study areas form part of targeted communities for the strategy. The strategy, according to the agency officials is to expand the opportunity for a broader

proportion of the society to engage and participate in decision making, generating increased revenue and social capital. Most importantly, the KCDS sought to improve waste management, construct toilet facilities, drains, provide potable water facilities and prevent the formation of new informal settlements in the Aboabo community and generally improve the environmental conditions of the settlement. The strategy had a marginal impact on improving the environmental conditions of Aboabo due its abandonment as a result of financial constraints, further indicating the piecemeal and ad-hoc nature of urban planning interventions as widely reported in the extant literature (see Asibey et al. 2019, 2020, 2021; Amoako and Cobbinah 2011).

Another intervention mentioned by city authorities was forced eviction aimed at informal settlement eradication and hindrance of new ones in the Sawaba community. This approach, according to the officials, became necessary when city authorities realized the significant damages of perennial flooding due to the developments on unapproved lands and waterways. Although the intervention was reported to be a good one, it did not achieve its overall purpose because, most of the victims relocated to other areas (the periphery) within the community, resulting in overcrowding, inaccessibility and increasing the density of such areas and consequent environmental deterioration, which was confirmed by all households interviewed in the Sawaba community. This goes back to support earlier assertions of some scholars (e.g., Nassar and Elsayed 2018) that forced evictions are not always the best approach since they only cause residents to relocate to the outskirts or at the fringes of the city, which are often flood prone areas.

This paper posits that informal settlements ought to be understood by government authorities as structural. By this, informal settlements are becoming an integral part of the urban fabric, contributing significantly to the social, economic and environmental development of cities. Consequently, agency officials indicated that self-help upgrading can be an important avenue to improve the environmental and socio-economic conditions of such communities. They however stated that the self-help upgrading approaches are expensive and requires great political will, improved local government and community participation in promoting basic service provision, tenure security and access to credit. Generally, the household participants and agency officials mentioned that the self-help project, initiated in 2020, has had successful influence in Sawaba community in terms of improving the environmental conditions and enhancement of social cohesion. Again, on self-help upgrading initiatives, urban planners look for and address the root causes of informal settlements rather than just making a decision. Pugh (1990) mentioned that most informal settlements gradually better their living areas and homes as their environment improves. This makes it better to upgrade informal areas than to just relocate and/or evict them which tends to lead to loss of lives, home and properties (Asibey et al. 2020; 2021). In the quest to supporting the low-income earners in the city, the EPA official mentioned that new communication tools and inclusive methods to modelling outcomes need to be developed. Regulations that are supportive and negotiable can provide a better and sustainable outcomes (UN-Habitat 2016).

Other initiatives mentioned were the Descgut Community Sanitation Programme, designed by some youth to improve the sanitation of informal communities which the study area was a beneficiary. The programme was mainly designed to desilt

Fig. 5 Descgut desilting of choked gutters in Aboabo

choked gutters and all types of drains and is done yearly in Aboabo (see Fig. 5). Interviews with the residents and city authorities however showed that the programme for the past 3 years, has not been undertaken for reasons unknown to them. Another intervention is the Municipal Environmental and Sanitation Programme which is a medium-term programme of 7 years (started in 2017) aimed at assisting the dwellers to construct their own private toilet facilities (pit latrine). The programme, according to the ESHD officially, is undertaken by the Asokore Mampong Municipal Assembly in collaboration with other stakeholders to improve sanitation in the communities within the Municipality including Aboabo and Sawaba. This programme is done by encouraging the community dwellers to convert one of the household room into pit latrine. The programme since its inception was reported to have resulted in the provision of over 100 toilet facilities in the Aboabo and Sawaba communities.

In all of the above, city authorities mentioned that most of the urban planning interventions have not achieved maximum success in ensuring environmental sustainability due to inadequate funds, limited human resource and technical expertise. The DPU official stated that the internally generated fund (IGF) of the Assembly is very low to undertake several of its planned interventions. Again, the high influx of people into the settlements were reported to largely impede efforts in improving living and environmental conditions rate of migration. Immigration rate was reported to be very high in the study communities due to the location of the informal settlements close to CBD (Asibey et al. 2021). Due to this, pressure is put on the existing facilities and services, including the physical environment.

Generally, the institutional and political causes of deteriorating environmental conditions in informal settlements in urban Ghana are rooted in poor urban planning and land governance practices (Amoako and Cobbinah 2011). In the face of these institutional challenges, low-income informal settlement dwellers are forced build

substandard structures on unsecured lands to meet their housing and other urban infrastructure needs. In addition to these planning and management challenges, the poor commitment of successive governments to implement medium to long-term urban development policies, programmes and projects have resulted in encroachments and uncontrolled developments. Private sector contributions in urban housing provision have also targeted the middle and high income groups. Thus, the emergence of informal settlements in Ghana and deteriorating environmental conditions generally reflect uncontrolled urbanization rates, and the inability of current urban planning and management structures to address all the associated overwhelming consequences.

Conclusion

Informal settlements are becoming integral part of the urban fabric, contributing significantly to the social, economic and environmental development of cities—providing shelter for the poor and sources of livelihood. This notwithstanding, they are often neglected in formal planning schemes of city authorities mainly because they are perceived to pose threat to the urban commons and regarded as ungovernable. This often traps residents in insecurity, perpetual poverty, inadequate infrastructure provision and deteriorating environmental landscape. In an attempt to improve environmental conditions towards sustainability, urban planning is reported to be an important pathway to achieve this. It however remains unclear the applicability and extent of influence of urban planning initiatives in addressing the numerous environmental challenges and ensuring environmental sustainability in African countries, including Ghana, where there is evidence of emerging and expanding informal settlements with worsening conditions.

Using two major informal settlements (Aboabo and Sawaba) in Kumasi, Ghana's fastest growing city, as cases, the paper examines: (i) environmental sustainability literacy of respondents; (ii) existing issues that threaten environmental sustainability; and (iii) urban planning responses toward ensuring environmental sustainability of the settlements. Generally, the findings from the agency officials and household respondents showed a very good understanding of environmental sustainability and its importance in building sustainable and resilient cities. This is deemed central in putting in place measures to protect and sustain aspects of the environment. The study showed that contrary to the dominant narrative that urban informal settlements are often neglected and not considered in formal planning schemes, this study showed otherwise. There have been conscious attempts to streamline activities of these informal neighbourhoods into formal urban planning schemes so as to improve upon the environmental conditions and largely contribute towards the sustainable development of the city. These efforts (creating green areas, education and sensitisation, recycling of waste, etc.) were however observed to be piecemeal and had marginal success. All agency officials interviewed reported poor attitudes of households towards waste management and housing development, human, logistical and financial constraints, weak agency framework and coordination, as some of the systemic

challenges impeding efforts to promote environmental sustainability of informal settlements.

Premised on the findings, the study calls for the revision of existing interventions to explicitly integrate environmental sustainability of informal settlements into urban planning efforts. As such all relevant stakeholders (including the communities) should be involved in the entire process. There should also be efforts to identify and address the many institutional challenges, improve awareness on the need to ensure environmental sustainability, and develop and enforce efficient urban planning interventions (policies and plans) towards environmental sustainability and consequently, build the resilience of cities. Most importantly, the involvement of private sector agencies (identifying relevant agencies, emphasising roles and accountabilities, and designing institutional and collaborative mechanisms) to consciously design and promote environmental sustainability strategies and plans remain important. There should also be the need to intensify public education and awareness creation exercises on the causes, effects and implications of poor sanitary and environmental conditions, quarterly sanitation activities and behavioral change sensitization programs, institutional strengthening and collaboration amongst the institutions, traditional leaders and recognizable community groups and the provision of appropriate solutions to address the unplanned growth of informal settlements in order to ensure sustainable environment of informal settlements in Kumasi.

While the findings indicate that urban planning has not yet had a significant impact on promoting the environmental sustainability of informal settlements, this study contends that urban planning is still useful as an overarching framework for ensuring how well informal settlements and cities are progressing towards achieving an all-inclusive and resilient development.

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Author contribution The first author, VH spearheaded the research by undertaking the data collection, data collation and cleaning and analysis of the data used for this paper. The second author (co-author), ST supervised the writing of the paper, assisted in the data collection and inferences, and made the relevant inputs in the writing of the paper. The corresponding and third author MOA supervised the entire writing of the paper and ensured that the descriptions made are accurate and agreed by all authors. The fourth author (co-author), OA assisted in the writing of this manuscript by making inputs/comments to shape the final output.

Data availability Data of this manuscript will be made available upon request.

Declarations

Conflict of interest None.

Ethical approval We submit the manuscript of our article for review and consideration for publication in your esteemed journal. With the submission of this manuscript we undertake that we directly participated in the planning, execution, or analysis of this study; we have read and approved the final version submitted; the contents of this manuscript have not been copyrighted or published previously; and the contents of this manuscript are not under consideration for publication elsewhere.

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