

Assessing the nexus between the implementation of road infrastructural projects and social fragmentation in peri-urban areas in Accra, Ghana: The case of Accra-Kasoa road infrastructure expansion

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| ARTICLE INFO | ABSTRACT |
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| Submission: Mar 31/2022 | In the 21st century, there is an escalating rate of road infrastructures in Global South cities transforming their physical and social compositions to a large extent. However, despite the literature pointing out that social fragmentation comes with the implementation of road infrastructures, little knowledge is known in respect to the nexus between road infrastructure projects and social fragmentation within peri-urban areas. This paper, therefore, used concurrent triangulation mixed-method design to understand the nexus between road infrastructure and social fragmentation within peri-urban communities in Accra, Ghana by using the case of the Accra-Kasoa road infrastructure expansion project. The findings indicate that the Accra-Kasoa infrastructure project indirectly triggers social fragmentation through the process of displacement of residents during its implementation, as the road created barriers that limited social interactions and social networks within and between residents in the studied communities. Moreover, the findings reveal that the social fragmentation in peri-urban communities is caused by other factors such as customary land tenure systems and changes in the housing tastes of residents in those communities. The findings of this paper inform policymakers not to see the emergence of social fragmentation as only being triggered by physical infrastructure systems but socio-cultural ones as well. |
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Introduction

Many large infrastructural projects are being built around the world to promote economic development and improve the livelihoods of people (Wu, Chen, & Huang, 2018). In this quest, multi-national institutions like the World Bank, International Monetary Fund continually make financial support available to countries in the Global South for large infrastructures such as roads, dams, industrial markets, housing, amongst others (Thomas, 2002). Specifically, it permeates in the literature that the implementation of road infrastructure projects brings about not only changes in the physical landscapes of communities but their social structure (Khanani, Adugbila, Martinez & Pfeffer, 2020). The implementation of road infrastructural projects, which are complex to undertake, have profound social consequences, including social fragmentation. It is evident that roads continually displaced about 30-50% residents in their communities for the past decade and this negatively affects their level of social interactions (Torre, Sabir, & Pham, 2020). Also, in the literature, the social pre-emptive and prospective consequences are rarely considered in the implementation of road infrastructural projects. Meanwhile, it is established from the body of the literature that road infrastructural projects change the way cities and their citizens interact (Bocarejo, Portilla, & Melendez, 2015) due to the change in residential apartments into gated housing types.

Current debates amongst social scientists are that cities suffer from social fragmentation in the wake of road development projects and that such fragmentation remains a threat to their social cohesiveness on political planning and subjective-perceptive of life (Deffner & Hoerning, 2011). Social fragmentation is where a social group occupying a specific urban space loses its relationship with its surrounding urban continuum (Bocarejo et al., 2015). However, in the classic sociological view, social fragmentation is the disordering, dismantling, and disaggregation of formerly coherent societal structures. In the sociological dimension, fragmentation as a broad concept is perceived as a new principle of structuration triggered by economic, political, and social transformation processes (Deffner & Hoerning, 2011). Fragmentation in whatever form is a space-driven phenomenon, mainly used in the sense of connected or disconnected/excluded part of the city or society (Aoun, 2016). There is a link between road infrastructural projects and social fragmentation as a process that research has not profoundly interrogated. However, it is inferred from the literature that the implementation of road infrastructural projects in peri-urban areas triggers social fragmentation, especially with new transport-related infrastructure (Bocarejo et al., 2015), and yet still little is known about the nexus between road infrastructure projects and social fragmentation of those areas as means to inform policy-making to minimize social exclusiveness or disconnectedness in those areas (Deffner & Hoerning, 2011).

Therefore, this paper seeks to examine the nexus between road infrastructure projects and social fragmentation in peri-urban areas in Accra, Ghana using the Accra-Kasoa road infrastructure project as a case to make a proposition to address any adverse effects that come with that within peri-urban areas, at the community level to inform policy formulation. In the subsequent sections, this paper first provides the background context on road infrastructures and social fragmentation in peri-urban areas and the theories on which the conceptual framework is anchored. This is followed by the research methodology, case study area, results and discussion of results. It concludes with the summary of the social fragmented

processes triggered by road infrastructure projects within communities in peri-urban areas and their effects on social relationships amongst residents and reflects on how such empirical insights can inform policy-making.

Background Context on Road Infrastructural Projects and Social Fragmentation in Peri-urban Areas

In the 21st century, there is an escalating rate of road infrastructure development projects in the cities of the Global South, increasing and transforming not only their physical environments but also non-physical environments to a large degree. This rapid rate of road infrastructure development projects is leading to spatial patterns of planned, unplanned, and slum fragments (Balbo, 1993). Such developments are not limited to urban areas in the Global South but extend to peri-urban areas, which are considered as the emerging growth poles (Leinbach, 2000). Peri-urban areas are the destinations of most infrastructural development projects, especially for residential development in the Global South because of the availability of land at low cost and nearness to urban and rural areas (Ravetz, Fertner, & Nielsen, 2013; Simon, McGregor, & Nsiah-Gyabaah, 2004). Roads account for a significant level of such residential development in peri-urban areas as mobility systems that attract people from urban and rural areas into those areas (Ravetz, Fertner, & Nielsen, 2013).

However, the rapid accelerated residential infrastructural development projects extending to peri-urban areas due to the implementation of road infrastructure projects have positive and negative effects in those areas. On the positive side, the rapid implementation of transport infrastructure projects which usually includes the improving or upgrading of road infrastructures boosts socio-economic opportunities which take care of the needs of residents in those areas (Khanani et al., 2020). For example, according to the United Nations, the spate of road development in the Global South countries increased improving the economic fortunes of residents of peri-urban areas and this reflects in the living conditions of some residents in those areas to a large extent (United Nations, 2012). Contrarily, the literature points out that transport infrastructure projects are inextricably linked to different kinds of fragmentation processes which include social fragmentation processes. These socially fragmented developments that come with road infrastructure development projects are envisaged in the declining levels of social interactions and social networks amongst residents in peri-urban areas (Yankson and Gough, 1999). Some existing studies emphasise that road infrastructure developments are spilling to peri-urban areas making them to growing in leaps and bands and that is also changing their social characters to a large degree, through limiting social interactions and social networks amongst residents (Khanani et al., 2020). In more exemplifying circumstance is that road infrastructure projects tend to attract newcomers of high-income groups, who eventually compete with old residents for various needs (Yankson & Gough, 1999). This phenomenon results in competing interests, practices and emerging perceptions capable of polarizing the connectedness in communities and displacing some marginalised groups within peri-urban areas. Hence such areas tend to be fragmented along with socioeconomic status and groups (Bocarejo et al. 2015; Cobbinah, Gaisie, & Owusu-Amponsah, 2015).

Furthermore, with the implementation of road infrastructural development projects, the residential morphologies of peri-urban areas transform, showing residential segregation between the rich and poor. This scenario tends to negatively affect the social interactions and social networks within such areas (Briggs & Mwamfupe, 2000), and this intrinsically socially fragments peri-urban areas. Previous studies point out that peri-urban areas have become places where there is poverty and social displacement, as they are the front line between the nuances of the city and the countryside due to the provision of road infrastructure development (Ravetz et al., 2013). Road infrastructural development projects have become a threat to the social cohesion of communities as they serve as barriers that limit social interactions and social networks between the rich and poor (Budiyati, Wahyu, & Gleave, 2014). In recent times, peri-urban areas are experiencing symbols of dual cities, that is the “haves” and “haves not” being seen living side by side and the implementation of road infrastructure projects are identified as one of the main drivers of this phenomenon (Aseidu and Arku 2009). This invariably affects the social compositions in peri-urban areas and this reinforces social fragmentation in those areas to a certain degree. Peri-urban areas appear to be at the receiving end of the consequences of road infrastructure development projects in urban centres, causing those areas to be socially fragmented. However, in the literature standpoint, little is known about the nexus between road infrastructural development projects and social fragmentation in peri-urban areas. The impact of road infrastructure in peri-urban areas are evident and noticeable not only at the landscape changes but social structural changes which impedes the manner in which society functions (Mehdipour & Fakheran, 2019). This affirms the fact that roads contribute to social changes in local economies of those areas to a large degree. Thus, road development are recipe for spatially dividing geographies which have the potential to limiting the interactions and networks between people (Inostroza, Baur, & Csaplovics, 2013).

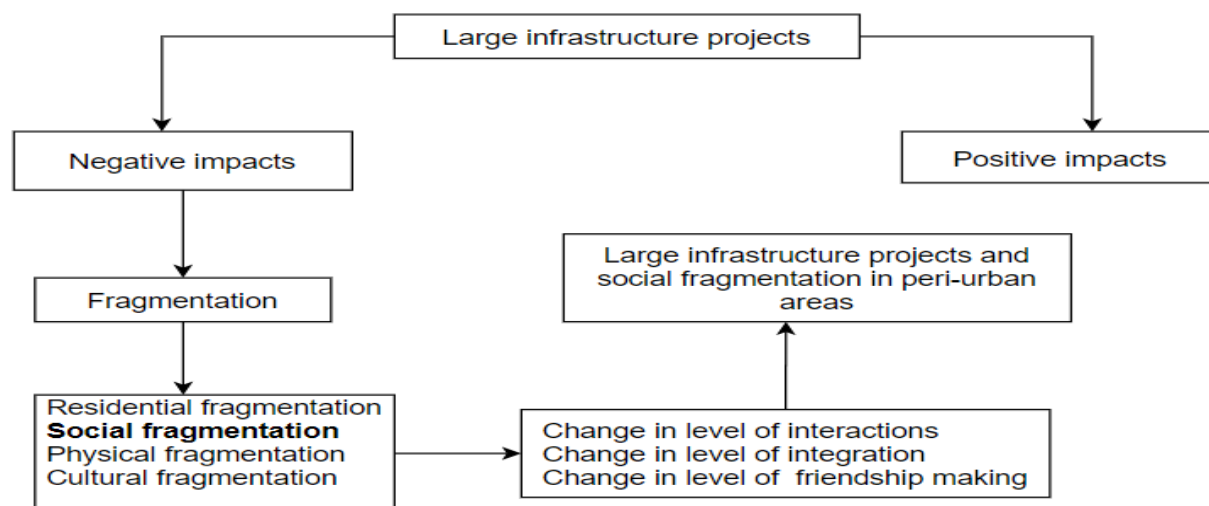
Related Work/Conceptual Framework

To answer the empirical question of how road infrastructural projects shape the urban fabric and the associated processes, and how that impacts the social fragmentation at the community level in Accra, the study employed a conceptual approach based on analytical categories level of interactions, integration, and mobility systems of residents. This analytical conceptual framework is based on theories of socio-spatial integration by researchers and academics stressed strong relationships between transport infrastructure project and socio-spatial polarization, and also urban fragmentation and mobility systems (Ruiz-Tagle, 2013; Sabatini, 2006; Bocarejo et al. (2015). Such relationships can threaten social cohesiveness and integration of communities, especially in the Global South, where socio-physical planning processes are fragile. Social changes likely to emerge during road development include social disintegration, social disarticulation and social fragmentation. Accordingly, in this study, we considered the dimension of social fragmentation with our case to understand how road expansion project adds to social fragmentation processes because not much is known of that in the body of literature.

Based on the arguments from the literature on these theories, we developed a conceptual framework where specific indicators, relevant to the context of our case communities and their relations are depicted (See Fig. 1). The indicators were used to measure the possible connections

between the road infrastructure expansion project and social fragmentation processes at the community level.

Fig.1 Contextual conceptual framework showing connection between large infrastructure projects and social fragmentation in peri-urban areas.



Research Methods

The study was underpinned by pragmatic assumptions concerning how knowledge was gained and used in the study (Creswell & Creswell, 2018). Concurrent triangulation mixed-method design was used by combining qualitative and quantitative methods to understand how the implementation of road infrastructure projects link to social fragmentation in peri-urban areas (Creswell & Creswell, 2018). The purpose of this design was to help the data collection from the two (2) approaches to complement each other. Again, the design adds trustworthiness to the results that would be obtained. The quantitative data explains a numeric description while the qualitative data was important to provide first-hand observable information on how the provision of road infrastructure projects links to social fragmentation in peri-urban areas through interviews and literature reviews.

We selected two communities in Accra, Ghana, based on their geographical locations regarding road infrastructure expansion projects and contrasting characteristics concerning social dynamics. The study focused on Tuba and Mataheko communities lying opposite each other. The dimensions and associated variables in determining the link between road infrastructure projects and social fragmentation are presented in Table 1.

The study used primary and secondary data. The primary data included Key Informant Interviews (KIIs), Focus Group Discussions (FGDs) and field observations. Information was solicited from KIIs on how road infrastructural projects can trigger social fragmentation in peri-urban areas. One FGD was held in each community consisting of residents who had lived in the communities and witnessed the road infrastructure expansion considering the road was expanded over ten years. The FGDs (comprised six men and four women) were chosen through the Assembly members of the communities to reach out to opinion and community leaders who had adequate knowledge about the Accra-Kasoa road infrastructure expansion. Questionnaires

were administered to household heads above 18 years, both men and women who had lived in the communities for at least ten years or longer.

Random sampling was used to select respondents. A total of 310 questionnaires were administered in the household survey, 155 respondents each in Tuba and Mataheko to attain their perceptions of the road project on their living conditions. The household questionnaires were collected using the KoBoCollect software application. The variables adopted for analysing perceptions of residents on the nexus between the road expansion project and social fragmentation in peri-urban areas were chosen based on the local conditions of the studied communities. This study used household heads as a unit of data collection and community as a unit of data analysis in determining interaction/integration, friendship-making levels between different social groups within the studied communities (see Table 1).

The secondary data sources were population data (from Ghana Statistical Service), satellite imagery (sourced from google maps, 2018), road data (from Accra Planning Authority), as well as grey literature and reports from relevant agencies (for literature review). The satellite imagery was used for the classification of the studied communities as “better-off” and “worse-off” in terms of the spatial characteristics with field validation to analyse the two moments, “before and after”, of the road projects.

Table 1: Indicators to measure social fragmentation in peri-urban Accra.

| Dimension | Indicators | Description | Measured by | Supporting Literature |
|---------------|--------------------------------------|--|---|--|
| Social | Change in level of interaction. | Relationship of residents within and between communities. | Perception about Social networks (Support from friends, neighbours and relatives) and social interactions. | (Berhe, Martinez, & Verplanke, 2014; Lusher, Robins, & Kremer, 2010) |
| | Change in level of integration | Relationship of residents in undertaking communal activities/access communal properties. Rate of making friendships | Residents' perception about togetherness in undertaking/access communal services. Residents' perception on friendliness in neighbourhood | (Khaef & Zebardast, 2016; Sabatini & Salcedo, 2007) |
| | Change in level of friendship making | | | (Berköz, 2009) |

Data was analysed combining using qualitative, quantitative and spatial tools to arrive at a complete and comprehensive understanding of the nexus between the road infrastructure project and social fragmentation. The qualitative data was transcribed, open coded and analysed in ALTAS. The quantitative data were analysed in SPSS software using descriptive statistics to understand how the road infrastructure project caused social fragmentation based on the perceptions of the residents within the studied communities. The spatial data were analysed in

ArcGIS to visualize physical land uses after the implementation of the road infrastructure project with the potential of limiting social interactions and integration processes within the studied communities (see Figure 2).

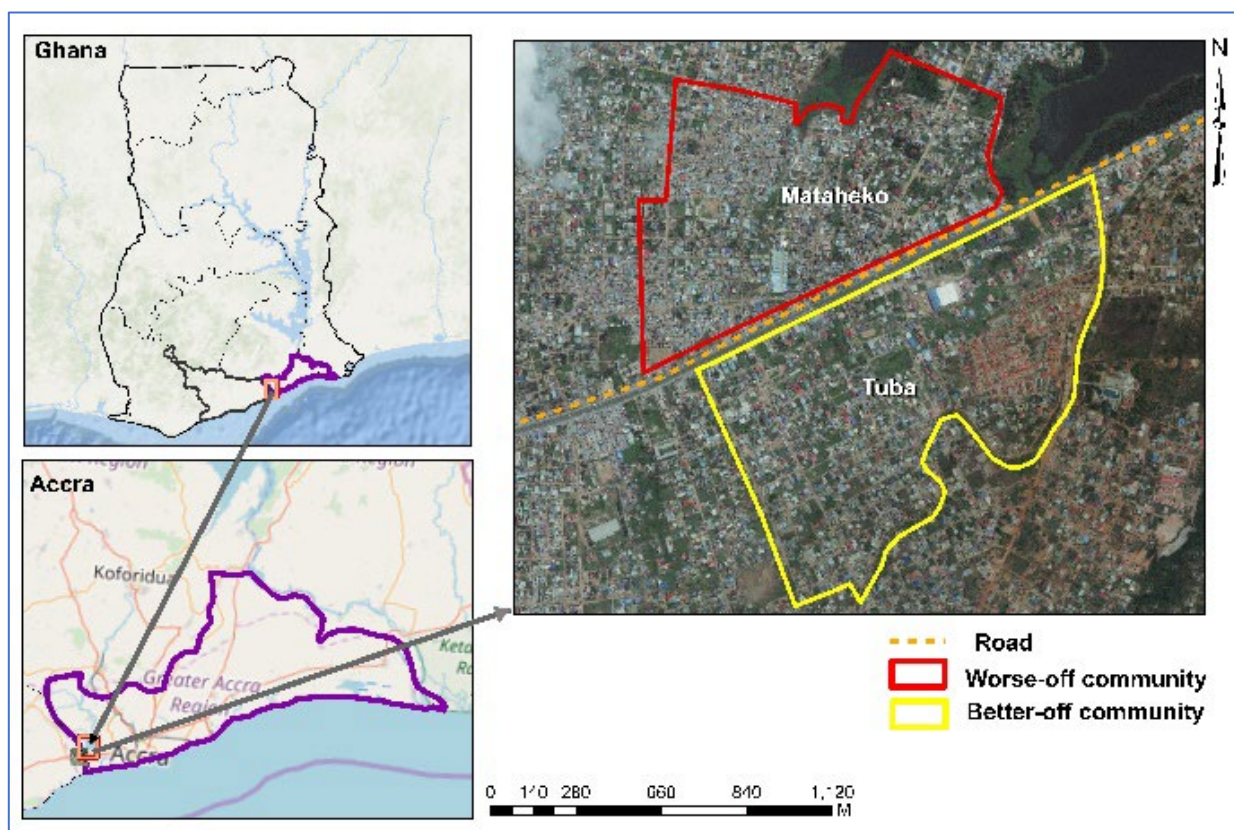
Case study area

Ghana is foreseeing a lot of physical infrastructure expansions over the few decades, which has the potential to increase urban development processes not only in its major cities like Accra, Kumasi, and Takoradi but including its peri-urban towns like Kasoa, Dodowa and Aburi (Doan & Oduro, 2012). Like many other cities in Sub-Saharan Africa, Accra the capital city of Ghana is urbanising rapidly, making it one of the fastest-growing cities within the West Africa sub-region. Accra is the most populous city in Ghana, with a major restructuring of its physical infrastructural development projects by the government to meet the needs of its residents (Grant & Yankson, 2003). The introduction of the liberalization policies in the 1980s is regarded as the main contributory factor to Accra's growth. Its economic and residential development is associated with its physical infrastructural boom. Present-day Accra is characterized by fragmented economic and residential geographies, capable of exacerbating its unsustainable urban development if left unchecked (Ghana Statistical Service, 2012). As Accra is seeing a lot of large physical infrastructural projects including road, housing, market infrastructures and the like in its inner core, its peri-urban areas are becoming the next destinations for some of these projects.

The growth of Accra as a city is expected to extend in a few decades, as evidenced by the fact that peri-urban towns like Kasoa, Dodowa and Aburi have become functionally connected to Accra Central, serving as dormitory towns (Doan & Oduro, 2012). Peri-urban agricultural lands are diminishing day in and day out following the influx of real estate developers to develop housing for rentals and sales (Grant & Yankson, 2003). This, therefore, compels successive governments in the country to extend and increase physical infrastructural development projects like roads, markets to peri-urban zones within Accra leading to not only negative environmental changes but social and economic changes as well. Socially, interactions among residents decline and vices increase amongst the population due to the population explosion derived partly by road projects. There are economic factors accounting for these developments, thus rising living costs due to increase in rentals, prices of foodstuff causing the displacement of poor groups of people (Boakye & Godwin, 2009; Yeboah & Shaw, 2013).

The Accra-Kasoa Road being used as a case sets the locus for the direction of peri-urban communities along with it and transforming them into cosmopolitan towns 'overnight' leading to disintegration of socio-economic compositions with certain ramifications including social fragmentation (Khanani et al. 2020). Considering the two communities, Tuba and Mataheko are unplanned since they are in peri-urban Accra, in a transition zone that does not have planning schemes and they are also categorised as "better-off" and "worse-off" communities respectively as in Figure 2.

Fig.2 Contextual location of Tuba and Mataheko communities in Accra (Source: Google Earth and DIVA-GIS).



Results and Discussion

This section of the paper presents the results of the analysis of the data to contextualise what transpired in the studied communities as a result of the implementation of road infrastructure expansion and the social developments that came with that over time regarding the assertions in the body of literature.

Road Infrastructure Expansion Project Shape and Influence Residential Development in Peri-urban Areas

The Accra-Kasoa road infrastructure expansion attracted different groups of people including the middle to high-income groups of people, who moved into the studied communities to settle, after its construction in 2018 since travel time to the Accra central reduced to about 20-30 minutes unlike before which took about 3-4 hours. Table 2 shows that for example in Tuba, residents perceive their interaction within community and interactions with other neighbourhoods worsened; meaning the studied communities moved away from a position considered ideal for them. This changed the urban forms of the communities over time, with massive residential development emerging in a form of gated housing types which led to limited interactions amongst residents as a lot of the newcomers were staying in gated apartments after the road expansion project as depicted in Table 2. Table 2 shows that, residents in Tuba perceive a decline in interacting within community and interacting with other neighbourhoods with means scores increased from 2.65 (before) to 2.89 (after) and 3.35 to 3.40 respectively after the road expansion. While in Mataheko, residents perceive the same for the two variables

with means scores increased from 2.50 (before) to 3.37 (after) and 3.23 to 3.54 respectively after the road expansion. This is aligned with the narrative that as peri-urban areas become the destination for physical infrastructure development projects that not only lead to changes in their physical urban forms but limits social interactions amongst residents (Yankson and Gough, 1999; Khanani et al. 2020; Doan & Oduro, 2012). In the FGDs, members expressed the view that most newcomers' residents in the studied communities were people of middle to high-income brackets after the road construction, who mostly lived in the gated housing apartments as shown in Figures 3-1(a-b) and 3-2(a-b). This made it difficult for interactions as lifestyle was more secluded in a manner unlike before the implementation of the road infrastructure expansion. The studied communities became cosmopolitan 'overnight' with their populations increasing. One of the KIs reported that: "As the road was expanded people were now rushing to get a parcel of land to build in Kasoa because they can move in and out to their workplaces. At the end of the day the road expansion has influenced land uses, let say residential use" This presupposes that the growing leaps and bands of the residential development in the studied communities is partly due to the road infrastructure expansion and because of that a lot of people now built in Kasoa. The reduction in travel time to and from Accra central accounted for the rush of people to settle in the studied communities. However, with residential development in the studied communities is in a fragmented manner with 'better-off' and 'worse-off' apartments lying side by side, that is Tuba and Mataheko respectively as emphasised (by, Briggs and Mwamfupe, 2000) in their study in Tanzania.

Road Infrastructure Expansion Project and Social Fragmentation in Accra Peri-urban

The Accra-Kasoa road infrastructure expansion brought about physical and social development changes with the potential of leading to social fragmentation within the studied communities. In the first place, the implementation of the road expansion negatively affected the social structure and social fabric of the studied communities through the displacement of the poor by the rich. Thus, the implementation of the road infrastructure drove in more newcomers' residents with some being mainly expatriates which made living costs in the form of rentals, prices of foodstuff and land among others to rise beyond the ordinary man. Hence the poor in the studied communities moved into hinterlands and this spatially not fragmented the studied communities (Ravetz et al., 2013) but resulted in social fragmentation. Also, the road attracted

Fig.3.1 Contextual location of Tuba and Mataheko communities in Accra (Source: Google Earth and DIVA-GIS).

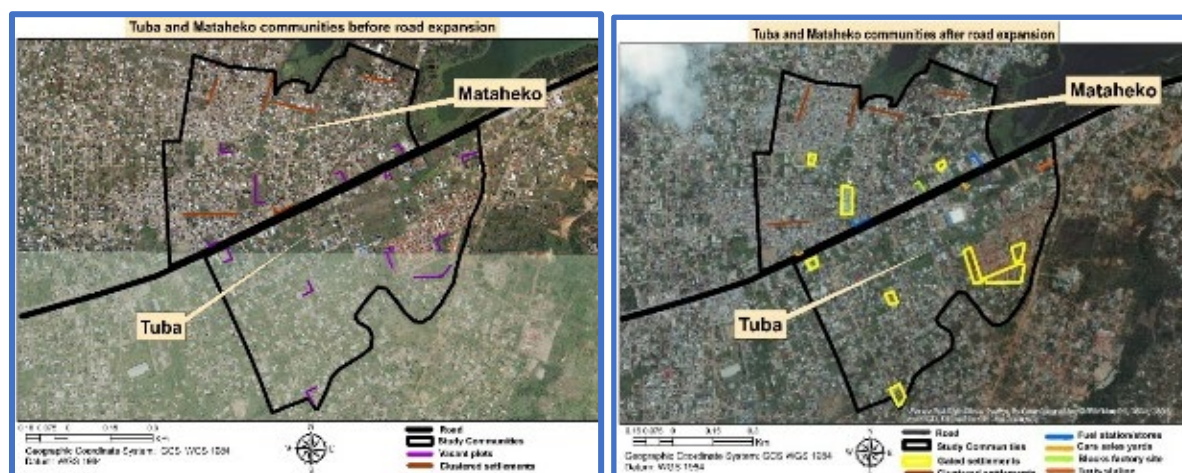
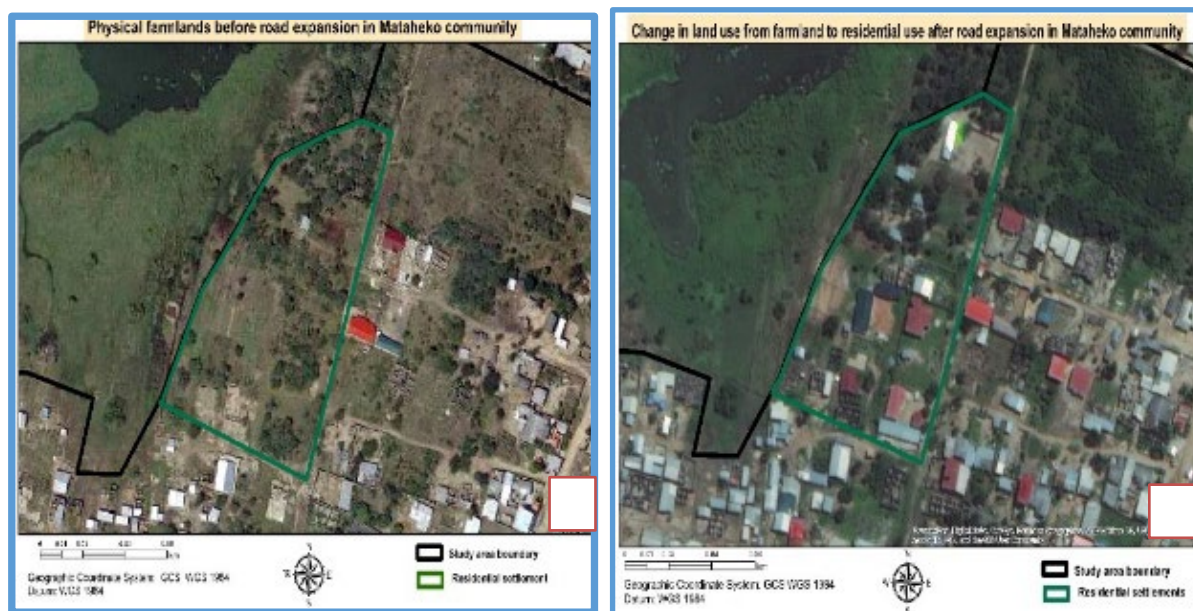


Fig.3. 2(a-b): Farmlands transformed into residential uses in Mataheko after road expansion (Source: Google Earth, 2008 and 2018).



investment and employment opportunities which kept residents busy and they had little time to engage in social events such as football games as means of socialising unlike before. The household surveys conducted in the studied communities point to the fact that the level of friendship making has declined after the implementation of the road infrastructure expansion project (See Table 3). For example, in Table 3, residents in Tuba perceive that the level of making friendships declined with means scores for level of friendliness and knowing one another worsened from 2.14 (before) to 2.35 (after) and 2.43 to 2.57 respectively after the road expansion. While in Mataheko, residents also perceive a decline in the two variables after the road expansion. Thus, social events that were grounds for the making of friends dwindled with the inception of the road expansion. Some of the residents attributed such phenomenon to the economic boom that came up with the road infrastructure and kept people busy with income-generating ventures at the expense of socially interacting. Communal activities took a dip because residents were busily looking for ways and means to meet the livelihood needs of their families. After all, the road expansion increased living costs beyond the reach of the ordinary resident. One member of the FGDs stressed that: “Before the road was expanded we could organize outdoor games like football games with other communities and we play together and go our various ways without any troubles. After this road expansion, all the residential buildings are self-contained types which keep households from interacting easily with one another as it was the case before the expansion with the predominantly compound types¹ of buildings”. This

¹ Compound house is a type of multi-building with a common entrance where several households live in different rooms but share the same yard and other sanitary facilities such as bath and toilets

argument affirms that of the outcome that infrastructure development projects are a threat to social integration and cohesion of communities through the displacement of low-income residents due to harsh economic conditions (Budiyati, Wahyu, and Gleave (2014).

Table 2: Variables for measuring the impact of road infrastructure project on interaction in Accra peri-urban communities.

| Variable | Tuba community N=155 | | Mataheko community N ² =155 | |
|---|-------------------------|-------|---|-------|
| | Before | After | Before | After |
| Interacting within community *a | | | | |
| Mean (m) | 2.65 | 2.89 | 2.57 | 3.37 |
| Standard deviation | 0.98 | 0.80 | 1.13 | 0.96 |
| Interacting with other neighbourhood *b | | | | |
| Mean (m) | 3.35 | 3.40 | 3.23 | 3.54 |
| Standard deviation | 0.86 | 0.82 | 0.88 | 0.77 |

Likert Scale 1-5: *a: 1-Very well and 5-Not very well

Likert Scale 1-5: *b: 1-Always and 5-Never

Table 4 shows the worsening of variables of integration after the implementation of the road infrastructure expansion project such as a sense of pride and sense of belonging within the studied communities. Table 4 shows that residents in Tuba perceive a decline for sense of pride and sense of belonging with means scores from 1.86 (before) to 3.19 (after) and 2.25 to 2.71 respectively after the road expansion. In Mataheko, residents also perceive a decline for the two variables after the road infrastructure expansion.

Table 3: Variables for measuring the impact of road infrastructure project on making friendship in Accra peri-urban communities.

| Variable | Tuba community N=155 | | Mataheko community N=155 | |
|--------------------------|-------------------------|-------|-----------------------------|-------|
| | Before | After | Before | After |
| Level of friendliness *a | | | | |
| Mean (m) | 2.14 | 2.35 | 2.04 | 2.15 |
| Standard deviation | 1.05 | 1.15 | 1.03 | 1.56 |
| Knowing one another *b | | | | |
| Mean (m) | 2.43 | 2.57 | 2.24 | 2.46 |
| Standard deviation | 1.08 | 1.02 | 1.10 | 1.12 |

Likert Scale 1-5: *a: 1-Very friendly and 5-Not very friendly

Likert Scale 1-5: *b: 1-Very well and 5-Not very well

Table 4: Variables for measuring the impact of road infrastructure project on integration in Accra peri-urban communities.

| Variable | Tuba community N=155 | | Mataheko community N=155 | |
|-----------------------|-------------------------|-------|-----------------------------|-------|
| | Before | After | Before | After |
| Sense of Pride *a | | | | |
| Mean (m) | 1.86 | 3.19 | 1.85 | 3.10 |
| Standard deviation | 0.91 | 1.03 | 1.10 | 1.43 |
| Sense of belonging *b | | | | |
| Mean (m) | 2.25 | 2.71 | 2.45 | 2.85 |
| Standard deviation | 0.84 | 0.85 | 0.91 | 0.97 |

Likert Scale 1-5: *a: 1-Very well and 5-Not very well Likert Scale 1-5: *b: 1-Always and 5-Never.

Factors Driving Social Fragmentation in Peri-urban Areas

This study revealed that several factors drive social fragmentation in peri-urban areas but the major causative factors of that in Accra peri-urban include displacement of residents by the implementation of road infrastructures, customary land tenure and change in tastes in housing. During Accra-Kasoa Road expansion, some residents were displaced due to socio-economic hardships precipitated by high rentals, prices of foodstuff and loss of farmlands. Such developments engineered residents to take up more livable opportunities to able to meet the hardship conditions within their communities hence they tend to socially interact less with neighbours as they try to meet the daily needs of their families by undertaking economic activities (Bocarejo et al., 2015). Residents perceive minimal social interactions after the implementation of the road infrastructure expansion within and between the communities (Torre, Sabir, & Pham, 2020). The attraction of some middle and high-income people into the communities led to the poor being ‘displaced’ further hinterland. Therefore, this invariably with time segregated some poor, with the rich living along or near the road and the poor, who could not cope with the rising living costs further displaced residents into the hinterlands (Torre, Sabir, & Pham, 2020).

The nature of the customary land-tenure system was realized to partly contribute to the social fragmentation processes in the studied communities. This is because the customs, norms and values of the land-tenure system empower chiefs within the studied communities seriously influenced the distribution of residential development in peri-urban areas. Thus, in that stead, chiefs give out parcels of land at the whims and caprices without recourse to the statutory planning authorities which results in non-inclusive-led development type hence social fragmentation within communities. The 1980s Structural Adjustment Programme by the Government of Ghana led to commodification of land which served as an incentive for some chiefs in the studied communities to seize land from low-income class with weak tenure security and to sell it to high-income individuals to develop, hence which invariably segregate such communities.

The change in residential development style amongst real estate developers also accounted for the decline in social interactions which eventually triggered social fragmentation within the studied communities. This is attributable to changes in cultural norms and values of people in the communities, which have altered the beliefs of people in the nature and manner of development (Deffner & Hoerning, 2011). The rapid changes in lifestyles of the community people have translated into the change in living in compound housing types to self-contained apartments which intrinsically limits the social interactions amongst residents. The new forms of housing being developed have naturally limited the interactions amongst residents and changed their urban forms in Figure 3-1 (a-b). In the FGDs, one member expressed that: “with the inception of this major road expansion, the taste of residential development has completely changed and people now lived in self-contained apartments instead of compound houses where people eat and drink from the same pot and do things together”. This implies that the road influenced the lifestyles of people towards housing within the studied communities by making them to prefer to build gated types of apartments.

Conclusion

This paper sought to assess and understand how the implementation of road infrastructure projects influences social fragmentation in peri-urban areas to conclude the way forward on the social consequences of road infrastructure projects. It relates to this phenomenon by using the Accra-Kasoa road infrastructure expansion project in Ghana to know the extent to which the implementation of the road triggered social fragmentation within two communities. The findings of the paper revealed fact that the implementation of road infrastructure projects connects to social fragmentation at different scales and dimensions of life within communities. In this study, the Accra-Kasoa shaped the residential development in the studied communities into fragments, that are subtly carved into “better-off” and “worse-off” community zones and that limited the social interactions amongst residents.

The implementation of the Accra-Kasoa road infrastructure project caused a change in the social structure and social fabric processes within the communities which have invariably fragmented them socially. With the implementation of the road infrastructure project, the development pattern of the studied communities transformed into gated types of housing which limit social interactions between and amongst residents within and between the communities to a large extent.

We also found out that the causative factors of social fragmentation in peri-urban communities are varied, namely the implementation of road infrastructures, customary land tenure and change in tastes on housing and that associated with cultural and behavioural nuances amongst residents. Thus, the gradual change in residential building styles from compound housing types to self-contained housing types, coupled with customary land tenure systems influence the interactive levels of residents. In short, the implementation of road infrastructure projects is intrinsically linked to the urban development processes within peri-urban communities through diminishing their social interactions and integration processes.

This study comes with certain limitations. The case study approach adopted in this study in analysing how road infrastructure project links to social fragmentation may not allow for generalizations of its findings. This paper recommends that future research may consider

examining specifically how the social fragmentation process with the implementation of road infrastructure projects affects the quality of life of residents in peri-urban communities.

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Conflict of Interest

The authors declare that they have no competing interests.

References

- Aoun, O. (2016). "Urban Megaprojects-Based Approach in Urban Planning: From Isolated Objects to Shaping the City The Case of Dubai (PhD Dissertation)." Faculty of Applied Sciences-Université de Liège, Liège.
- Aseidu, A. B., & Arku, G. (2009). "The Rise of Gated Housing Estates in Ghana: Empirical Insights from Three Communities in Metropolitan Accra." *Journal of Housing and the Built Environment* 24(3):227–47. doi: 10.1007/s10901-009-9146-0.
- Balbo, M. (1993). "Urban Planning and the Fragmented City of Developing Countries." *Third World Planning Review* 15(1):23. doi: 10.3828/twpr.15.1.r4211671042614mr.
- Boakye, A., & Godwin, A. E. (2009). "The Rise of Gated Housing Estates in Ghana : Empirical Insights from Three Communities in Metropolitan Accra." 227–47. doi: 10.1007/s10901-009-9146-0.
- Bocarejo, J. P., Portilla, I., & Melendez, D.(2015). "Social Fragmentation as a Consequence of Implementing a Bus Rapid Transit System in the City of Bogota." 53(19):1617–34. doi: 10.1177/0042098015588739.
- Briggs, J., & Mwamfupe, D. (2000). "Peri-Urban Development in an Era of Structural Adjustment in Africa: The City of Dar Es Salaam, Tanzania." *Urban Studies* 37(4):797–809.
- Budiyati, S., Wahyu, Y. F. M, & Gleave, G. (2014). *The Social Impact of Road Improvement in Kabupaten Dompu, Nusa Tenggara Barat (NTB) Child Poverty and Disparities View Project*. Jakarta-The SMERU Research Institute.
- Cobbinah, P. B., Gaisie, E., & Owusu-Amponsah, L. (2015). "Peri-Urban Morphology and Indigenous Livelihoods in Ghana." *Habitat International* 50:120–29. doi: 10.1016/j.habitatint.2015.08.002.
- Deffner, V., & Hoerning, J. (2011). *The Struggle to Belong Dealing with Diversity in 21st Century Urban Settings: Fragmentation as a Threat to Social Cohesion? A Conceptual Review and an Empirical Approach to Brazilian Cities*. Amsterdam.
- Doan, P., & Oduro, C.Y. (2012). "Patterns of Population Growth in Peri-Urban Accra, Ghana." *International Journal of Urban and Regional Research* 36(6):1306–25. doi:

10.1111/j.1468-2427.2011.01075.x.

Ghana Statistical Service. (2012). *2010 Population and Housing Census*.

Grant, R., & Yankson, P. (2003). "City Profile Accra." *Cities* 20(1):65–74. doi: 10.1016/S0264-2751(02)00090-2.

Huby, M., Cinderby, S., White, P., & De Bruin, A. (2009). "Measuring Inequality in Rural England : The Effects of Changing Spatial Resolution." 41:3023–38. doi: 10.1068/a425.

Inostroza, L., Rolf B., & Csaplovics, E. (2013). "Urban Sprawl and Fragmentation in Latin America: A Dynamic Quantification and Characterization of Spatial Patterns." doi: 10.1016/j.jenvman.2012.11.007.

Khanani, R. S., Adugbila, E.J, Martinez, J. A., & Pfeffer, K. (2020). "The Impact of Road Infrastructure Development Projects on Local Communities in Peri-Urban Areas : The Case of Kisumu, Kenya and Accra, Ghana." *International Journal of Community Well-Being*. doi: <https://doi.org/10.1007/s42413-020-00077-4>.

Leinbach, T. R. (2000). "Mobility in Development Context: Changing Perspectives, New Interpretations, and the Real Issues Q." *Journal of Transport Geography* 8:1–9.

Martínez, J. (2009). "The Use of GIS and Indicators to Monitor Intra-Urban Inequalities. A Case Study in Rosario, Argentina." *Habitat International*. doi: 10.1016/j.habitatint.2008.12.003.

Mehdipour, N., & Fakheran, S. (2019). "Road-Induced Fragmentation and the Environmental Value of Roadless Areas in a Partly Protected Landscape in Central."

Ravetz, J., Fertner, C., & Nielsen, T. S. (2013). "The Dynamics of Peri-Urbanization." in K. Nilsson et al. (eds.), *Peri-urban futures: Scenarios and models for land use change in Europe*. Verlag Berlin Heidelberg: Springer-Berlin Heidelberg.

Ruiz-Tagle, J. (2013). "A Theory of Socio-Spatial Integration: Problems, Policies and Concepts from a US Perspective." *International Journal of Urban and Regional Research* 37(2):388–408. doi: 10.1111/j.1468-2427.2012.01180.x.

Sabatini, F. (2006). *The Social Spatial Segregation in the Cities of Latin America*. Washington, D.C: Inter-American Department Bank, Sustainable Development Department, Social Programs Division.

Simon, D., McGregor, D., & Nsiah-Gyabaah, K. (2004). "The Changing Urban-Rural Interface of African Cities: Definitional Issues and an Application to Kumasi, Ghana." *Environment&Urbanization* 16(2):235–48.

Thomas, K. J. A. (2002). "Development Projects and Involuntary Population Displacement : The World Bank ' s Attempt to Correct Past Failures." 339–49.

Torre, A., Sabir, M., & Pham, H.(2020). "Socioeconomic Conflicts and Land - Use Issues in Context of Infrastructural Projects." *Asia-Pacific Journal of Regional Science* (0123456789). doi: 10.1007/s41685-020-00157-5.

William, P., Yankson, K., & Gough, K. V. (1999). "The Environmental Impact of Rapid Urbanization in the Peri-Urban Area Of." *Geografisk Tidsskrift-Danish Journal of Geography* 99(1):89–100. doi: 10.1080/00167223.1999.10649426org/10.1080/00167223.1999.10649426.

Wu, C., Chen, D, & Huang, S. (2018). "Complexity of Construction Mega Infrastructure Project." *Complexity* 2018. doi: 10.1155/2018/7382083.

Yeboah, E., and Shaw, D. P. (2013). "Customary Land Tenure Practices in Ghana: Examining the Relationship with Land-Use Planning Delivery." *International Development Planning Review* 35(1):21–39. doi: 10.3828/idpr.2013.3.