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Tracks of Change?: Unpacking the Population, Migration and Crime Impacts of Kenya's Standard Gauge Railway

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Abstract

Kenya's Standard Gauge Railway (SGR) has been heralded as a transformative infrastructure project, designed to boost economic growth, enhance regional connectivity, and facilitate trade. Since its inauguration, the SGR has significantly reduced travel times and costs, linking Nairobi with the port city of Mombasa. However, the broader socio-economic impacts of this massive project, particularly on population distribution, migration patterns, and crime rates, remain underexplored. Using mixed research methods and sampling residents along the SGR route, this research sought to investigate the impacts of Kenya's SGR on migration, population, and crime. The study revealed that the SGR construction has led to the migration of people to the areas along the SGR routes and towns, though the migration had a marginal effect on the population density of these areas; led to the displacement of people along the route to pave the way for the construction but with no significant impacts on crime rates along the route, at the stations, as well as areas surrounding the stations. These insights highlight the complex socio-economic consequences of large infrastructure projects, emphasizing the need for policies that address displacement and urban planning while ensuring security and stability.

Keywords

Kenya, Standard Gauge Railway (SGR), Migration Effects, Crime, Population Effects

1. Introduction

Historically, transport is a sector that is considered as one of the major economic drivers in Kenya. Currently, its growth and development are a necessary catalyst to boost Kenya's economy towards a middle-income economy by 2030 as

envisioned in Kenya's Vision 2030[1]. The transport sector is one of the components of the economic pillar of the "Government of Kenya (2007); Vision 2030", where Kenya aims to have stable connectivity of transport networks of roads, railways, airports, ports and telecom facilities, among others. Thus, Kenya is currently giving priority to transport infrastructural projects. In contrast to roads, rail transport has been neglected in Kenya until recently. Before the construction of the new Standard Gauge Railway (SGR), there had been minimal government investment in railways for more than 30 years (AfDB, 2015), and the Kenya Railway Corporation (KRC) had been unable to keep up with necessary maintenance.

In order to address the challenges of railway transport, in collaboration with the Government of the People's Republic of China, the Government of Kenya has undertaken to modernize Kenya's railway transport by constructing a modern Standard Gauge Railway. The new railway serves to supplement road transport (Ministry of Transport and Infrastructure, 2014). The 609 Km modern railway line is the largest infrastructure project in Kenya for Cargo and Passenger transportation from Mombasa (the largest Port in East Africa) to the capital city, Nairobi, and is a flagship project of Kenya's Vision 2030 (Mustapha & Greenhill, 2017). The phase 1A railway project[2] construction began in 2013 and was completed and launched in 2017 (Railway Gazette International, 2016). Through its report, the World Bank has pointed out that efficient railway transport offers major benefits in economic growth as well as trade integration in the East Africa Community (EAC) region and Kenya seeks to achieve these benefits by constructing the railway (World Bank Group, 2013).

Numerous studies on the connection between public infrastructure, mostly infrastructure on transport and development, have largely had developed economies like the USA as their empirical reference. Very few studies within this decade have tried to, respectively, examine the linkage between transport and socio-economic development in Africa. The limited scientific research focusing on Africa agrees in suggesting that the transport-infrastructure stock of a country and more so on railway positively contributes to its socio-economic development profile.

More to the limited literature about railway transport and developing countries, especially in Africa, there is little that is known about the social impacts of this kind of infrastructure (Standard Gauge Railway), given that it is a recent phenomenon in Africa (Sequeira, 2013). As a result, there is a need to explore the increasing role and prospects of railway transport particularly the standard gauge railway, which is gaining attractiveness in Africa. Gaining an understanding of the socio-economic impacts of railway transport in Kenya carries vital lessons for future planning in infrastructural investments for both Kenya and other African countries.

[1]Kenya Vision 2030 is the long-term development blueprint for the country and is motivated by a collective aspiration for a better society by the year 2030.

[2]The railway line connecting the port of Mombasa to Nairobi, the capital city. It is expected to eventually connect Uganda, Rwanda, South Sudan and Kenya thus reducing travel costs and simplifying transport operations across border as well as promoting economic development in the region.

Kenya's Standard Gauge Railway (SGR) has been heralded as a transformative infrastructure project, designed to boost economic growth, enhance regional connectivity, and facilitate trade (Githaiga & Bing, 2019). Since its inauguration, the SGR has significantly reduced travel times and costs, linking Nairobi with the port city of Mombasa (Githaiga, 2021). However, the broader socio-economic impacts of this massive project, particularly on population distribution, migration patterns, and crime rates, remain underexplored. These aspects are critical as they influence urban planning, resource allocation, and security policies. Understanding these dynamics is essential for harnessing the full potential of the SGR while mitigating unintended negative consequences. This study aims to fill this research gap by examining how the SGR has reshaped Kenya's socio-economic landscape in these aspects.

The main objective of this research was to explore the social impacts of the SGR in Kenya and establish whether the results will conform to what is obtainable in the literature. This is very important because there is minimal literature on the contributions of the previous meter gauge colonial railway in Kenya's socio-economic development, going by what is documented. One of the significant contributions of this study is that it has supplemented literature on transport infrastructure with a focus on railway transport, an area that is severely lacking in developing countries and more so in Africa in comparison with research on road transport. There is an increase in demand for railway transport due to its competitiveness in cost compared to other means of transportation, reduced carbon emissions as well as the ability to transport huge volumes of goods and people. Thus, the railway is likely to play a crucial role in transport infrastructure, especially in developing countries like Kenya, and therefore, this area warrants research.

Problem Statement

Kenya's Standard Gauge Railway (SGR) represents a significant infrastructural advancement, promising economic growth and improved connectivity. However, its broader socio-economic implications are insufficiently studied. The SGR's influence on population distribution, migration patterns, and crime rates is not well-documented, raising concerns about unanticipated negative outcomes. Migration driven by new economic opportunities may strain urban resources and intensify inequality, while changes in crime patterns pose security challenges. Understanding these impacts is crucial for policymakers to mitigate adverse effects and harness the railway's potential benefits, ensuring sustainable development and social stability in Kenya and similar contexts in developing nations.

2. Literature Review

2.1. Migration and Population Impact of the Railway Transport

Research on the effects of railway transport on the migration of people and population effects has attracted a mixed debate. Railway transport is expected to enhance population growth since, first, people relocate to the region under construction as

they continue commuting to work, and second, economic development in a region results in more labor demand within the region, which attracts new inhabitants. Different researchers have debated these arguments. There are those researchers that support the thesis that rail transport leads to population increase; Using GCE model in Hume region of Australia, the research found out that high-speed railway would lead to 4464 more residents in the Hume Region, an increase of 1.6% compared to the current Hume population (AECOM, 2013). The most noteworthy railway effects in England were observed in the areas and cities near London; the urban centers that highly benefitted from both population and employment growth in knowledge-intensive business services were one hour away from London. The businesses were specifically knowledge-intensive (Ollivier & Zhang, 2014). In Kenya and Uganda, the colonial rail network led to population increase around the railway since the cultivation of cocoa needed more labor, which led to the creation of villages. Additionally, there was an emergence of cities and towns as trading centers; regions along the railway became more economically developed and relatively urbanized (Omondi & Kamau, 2017).

Various researchers, however, conclude that rail construction does not affect the population. (Atack, Bateman, Haines, & Margo, 2009) Examined whether railway stimulated or followed economic growth in the Midwest of America between 1850-1860 employing a newly developed GIS transportation database. The study focused on population density and the segment of the population residing in urban areas, which are two indicators of more comprehensive economic change. The difference-in-difference approximations strongly indicated that the railroad construction had insignificant or no impact on the growth of the population. Nonetheless, the findings implied that the railway led to the urbanisation of the Mid-Western region which accounted for more than half of the growth in the population residing in the urban regions in the 1850s.In order to verify the impact of rail transport on economic development, Bollinger and Ihlanfeldt (1997) used a simultaneous model of census tract population and employment to analyze the economic effects of the MARTA railway in Atlanta between 1980-1990. The findings revealed that the railway had no noticeable impacts on the overall employment or population in the station areas. However, the railway had transformed the composition and structure of employment in these regions favoring the public sector (Bollinger & Ihlanfeldt, 1997).

Furthermore, as people migrate to the surrounding areas, others are displaced and have to relocate to pave the way for the construction of the railway. Development-induced displacement is a common occurrence that affects the general living conditions of displaced families, mainly the low-income and vulnerable groups. Previous research shows that development projects-such as railway -require land, and often large quantities of that limited resource. One of the most noteworthy consequences of such projects, therefore, is the disruption and displacement of the residents and communities (Ahsan, 2016). People have significant social and cultural values attachment to their land apart from the economic

considerations (Samanta, 2017). Ethnic and ancestral societies have sacred geographies that are not acknowledged by the economic perspective of land as a commodity; local rituals and myths are profoundly linked to land and its elements. Researchers indicate that essential displacement features include loss of place and material possessions, as well as losses of identity, social ties, and meaning (Downing & Garcia-Downing, 2009; Wet, 2006).

2.2. Crime Impacts of the Railway Transport

Crime is another externality of migration of people, as argued by scholars. Some researchers have argued that the migration of people to areas along the railway route may lead to an increase in criminal activities while others dispute this. Theoretically and from public perception, it is generally agreed that development of new rail lines has the potential to increase criminal activities to the adjacent areas. However, empirical research on the subject is relatively mixed. The construction of new rail lines is occasionally alleged to escalate crime rates in stations' neighborhoods; affluent societies have regularly claimed that rail lines transport criminals to the suburbs. Railway networks are argued to influence crime patterns since railway centers function as activity hubs, locations with a "high land-use intensity" level (Angel, 1968). The general theory of crime argues that depending on population and population density, increased intensity in land use should escalate criminal activities due to an increased number of potential criminals and victims close to each other. Significantly, railway networks are thus claimed to be criminal movers through the improvement of commuters and criminals mobility, which leads to serious concerns that affect the communities that can be accessed through railway as well as more distant residential communities (Block & Block, 2000).

Some researchers hold that closeness to the rail stations increases the chance of criminal activities taking place in a particular area. This is because criminals have both a higher number of targets (train users) as well as the freedom of movement in the surroundings (Bowes & Ihlanfeld, 2001; Cervero & Landis, 1997). This negatively affects the value of a property as well as the choice of commuters on where and how to use the train while boarding (Kim, Ulfarsson, & Todd Hennessy, 2007). In their research, (Bowes & Ihlanfeld, 2001) carried out an analysis of the impacts of light rail on economic development through examination of the effects on changes in local crime rate, the value of a property, as well as local retail businesses, increase. Their research revealed that there was an interplay of all the three variables with local development more so in the regions near to the rail stations.

Additionally, research shows that crime rates resulting from rail are higher in areas with better commercial development (like Kensington) than in residential areas around the stations (like Indiana Creek) (Poister, 2018). Poister found that the effect of Atlanta railway on crime rate if any was marginal since robberies showed no significant change over time; though a few crimes were observed during and immediately after the Atlanta rail opening, they were comparatively insignificant and short-term and eventually fell back to the pre-transit levels. A study on the Greenline

railway network in Los Angeles which examined the impacts of transit on crime in the neighboring areas also found minimal evidence on the rail line's substantial impacts on crime tendencies, dislocation of criminal activities in the station neighborhoods and transportation of crime to the suburbs from the inner city (Liggett, Loukaitou-Sideris, & Isek, 2003). However, in the Bronx, 50% of all street burglaries were found to have had happened within approximately 700 meters of a railway station but not at the railway stations. The study concluded that this was due to the high level of security at the stations, which negated a substantial number of would-be targets; instead, crime was moved to the close environs (Block & Block, 2000).

Other studies have gone so far to show that transit can also lead to a reduction of criminal activities in an area. Billings (2011), used a quasi-experimental model to examine the effects of both the announcement and construction of a railway station in Vancouver's SkyTrain rail and Charlotte's Lynx light rail and found that criminal activities may decline due to the implementation of railway services (Billings, 2011). This, as the study explained, could be due to many reasons among them increased security surveillance on the streets resulting from the rail system opening, the would-be robbers getting meaningful employment from the rail system, and/or improved life quality around the stations due to the new investment. Generally, there is no apparent connection between crime and railway networks since crime patterns may be too ambiguous to separate from the transit effects while community features may be too relevant to control.

3. Research Methodology

This research employed a mixed research method, which creates a synergy between quantitative (questionnaire) and qualitative (interviews, observation, document analysis) methods. The combination of the two methods enhanced the validity of this study. The research design adopted in this research was descriptive in the form of a survey. Quantitative and qualitative data from both primary and secondary sources was used. Quantitative data was collected through questionnaires and analyzed through SPSS, while qualitative data was collected through interviews, observation and document analysis. The target population was inhabitants along the SGR route, with a particular emphasis on coast province, where the SGR begins and which forms the bulk of the SGR route. It has an estimated population of 3.325 million people.

This research used Yamane's (1967) sampling formula $n = N/(1 + Ne^2)$ for the sample size determination as posited in (Yamane, 1967) where n represents the size of the sample, N represents the size of the population and e represents the marginal error, for example at 95% level of confidence. As per the formula, the sample size for ordinary train users was calculated as follows:

Sample size = $3{,}325{,}000/(1 + 3{,}325{,}000\ (0.05^2)) = 399$

Stratified sampling technique was employed to divide the respondents sample size into five strata for the five main routes covered by the SGR in coast province: Mtito Andei, Mombasa, Voi, Mariakani and Miasenyi. Each had 80 respondents. Simple random sampling was then used to select the respondents. In this method,

every member of the sample population has a known and equal chance of being selected (Kothari, 2004). Those identified and selected filled and submitted the questionnaires voluntarily. Purposeful sampling was also used to select 30 residents for interviews from these areas.

4. Results

4.1. Response Rate

Out of the 399 questionnaires distributed to the respondents, 343 of them were found complete and valid for analysis representing 86per cent response rate. Additionally, thirty residents were interviewed. The high response rate implied that the data collected was sufficient to carry out the study (Fincham, 2008).

The quantitative and qualitative results and discussion of the social impacts of the three main themes, namely migration, population, and crime, as reported from the questionnaires and interviews, are presented below.

4.2. Migration

Table 1 shows the results of the migration effects of the SGR. The means for the individual items were below 2.5 on a 5point Likert scale indicating that all the items had a strong impact. Besides, the items revealed a small deviation from the mean which is an indicator that the responses were close to the mean (homogeneity). On average, participants agreed that the SGR construction has led to the displacement of people along the route (mean = 2.06) as well as led to the migration of people to the areas along the train routes and towns (mean = 1.88). The respondents, on average, also agreed that there had been no significant changes in the growth of old towns and urban areas along the SGR route (mean = 1.92). Majority of residents who were interviewed also noted that there has been a migration of people to towns and areas along the SGR route mainly the SGR employees as well as property and landowners.

Table 1. Descriptive statistics for migration.

	N	Minimum	Maximum	Mean	Std. Deviation
SGR has led to displacement of people	289	1	5	2.06	0.831
Migration of people to areas along the train routes and towns	289	1	4	1.88	0.609
No significant changes in the growth of old towns and urban areas along the SGR route	289	1	5	1.92	0.710
Valid N (listwise)	289				

4.3. Population

This was a qualitative question through the interviews from residents of selected areas along the SGR. On average, majority of the respondents noted that there has been increased movement and migration to the areas along the SGR route by SGR workers and people who had purchased property and land along these regions.

However, the migration has not had any significant impacts on the population density; for instance, there were hardly any changes in the number of school-going children in these areas. In line with this, they noted that there has hardly been the development of any new facilities like schools and churches in their areas. For instance, one of the respondents noted;

"*I was born and bred in Voi and I also have a business here. I have also witnessed the construction of the SGR and it is a magnificent project for Kenya's transport modernization process in the transport sector. Some people have migrated to Voi since the construction started and since its launch. Most of these are SGR employees, both casual and skilled workers. Most of them are not permanent residents in Voi since they work here on weekdays and go back to their families on weekends. Their families do not live with them… The effect of these migrants has been marginal on the population of Voi. Since the SGR phase one was completed, most of the casual labourers that were involved in the project have relocated to other areas in search of employment or maybe gone back to their homes*".

4.4. Crime

Table 2 shows results on the impacts of the SGR on the crime levels along and around the route. All the items had a strong impact since the means were below 2.5 on a five-point Likert scale. Additionally, the items displayed a small deviation from their means, an indication that the responses were homogeneous. On average, majority of the respondents agreed that there were no criminal activities to and from the stations (mean = 2.06), they felt safe to and from the stations (mean = 2.19), there was no presence of idlers to and from the station (mean = 2.04), they had not experienced petty thieves to and from the station (mean = 1.98), they had not lost personal items between the station and the main roads (mean = 1.93) and there were no idlers at the stations (mean = 2.06). Additionally, from the interviews, the majority of the respondents noted that there had been no significant/observable impact of the SGR on the crime levels in their towns and regions.

Table 2. Descriptive statistics for crime.

	N	Minimum	Maximum	Mean	Std. Deviation
There are hardly any criminal activities to and from the station	289	1	5	2.06	0.690
I feel safe to and from the main road to the station	289	1	5	2.19	0.780
There are no idlers to and from the station	289	1	4	2.04	0.652
I have not experienced petty thieves to and from the station	289	1	5	1.98	0.666
I have not lost personal items to thieves between the station and the main road	289	1	5	1.93	0.765
There are no idlers at the stations	289	1	5	2.06	1.026
Valid N (listwise)	289				

5. Discussion of Results

5.1. Migration and Population

In the case of migration and population effects, the findings suggest that the SGR construction has led to a migration of people to areas along the route though the migration has had a marginal effect on the population density along these areas. This is consistent with what has been found in previous research by Kreciglowa (2018) which concluded that individuals relocate to areas with better job opportunities, which is a significant pull factor. Previous research has shown that Railway transport is expected to enhance population growth since, first, people relocate to the region under construction as they continue commuting to work, and second, economic development in a region results in more labour demand within the region, which attracts new inhabitants (AECOM, 2013). In Kenya and Uganda, the colonial rail network led to population increase around the railway since the cultivation of cocoa needed more labour, which led to the creation of villages. Additionally, there was an emergence of cities and towns as trading centres; regions along the railway became more economically developed and relatively urbanized (Omondi & Kamau, 2017).

In the SGR context, various reasons are led to the migration of people and among them, infrastructure jobs are location-dependent, meaning the workers must be on the job site to work, which could have led to this migration. Additionally, as people purchase land and property along the SGR route, some have already built structures and relocated to these places as their new areas of residence as others are expected to relocate to their new property, causing movement to areas along the SGR route. However, since job creation in this sector tends to have a low to medium level of sustainability, since most of the workforce is dismissed after the completion of the construction project, requiring fewer people for operation and maintenance of as discussed by (Corre, Pujol, Cardoso, & Andrade, 2017), the effect on the population density was marginal; workers relocated to other areas in search of greener pastures or back to their original homes. This was also echoed by (Atack et al., 2009) who concluded that railroad construction had insignificant or no impact on the growth of population in the Midwest of America between 1850-1860.

Further, as the results suggest, there is no significant growth of the old towns and urban areas along the route even as people migrate which could explain the marginal effect on the population density. These findings corroborate research done in China on the effects of the High-Speed Railway, which indicated that railway does not always lead to growth opportunities as there is shrinkage of cities in China as a result of the HSR (Deng, Wang, Yang, & Yang, 2019). As results suggest, there has been a gradual collapse of some of the towns along the SGR corridor, which greatly depended on long-distance trucks due to reduced economic activities. For instance, in Mombasa town, there has been a decrease in economic activities especially with the lodgings, hotels, food vendors and garages as noted by some of the respondents. As the SGR replaces trucks in the transportation of

cargo in Kenya, market centres and towns that greatly depended on trucks for their business (hotels, bars, lodgings, and garages) are facing a threat of economic collapse as a result of lack of clients. There will be loss of livelihood with the collapse of these enterprises and they will be forced to change professions or migrate in search of opportunities which is an expensive process and consumes a lot of time.

Since the railway will be a long-term project and the trucks might largely be edged out in long-distance transportation of cargo in Kenya, there is need for these enterprise professionals and owners to look for alternative sustainable ways of earning a living which could include enhancing or changing their skill sets to venture into other opportunities that may crop up or migrate to other areas altogether.

Additionally, the construction of the SGR has led to the displacement of people along the route to pave the way for construction. Besides, unrestrained sale of land along the SGR route by the locals seeking to cash out on the SGR project has led to this displacement. Previous research shows that development projects-such as railway-require land, and often large quantities of land. One of the most noteworthy consequences of such projects, therefore, is the disruption and displacement of the residents and communities (Ahsan, 2016). In Kenya, it is common for displacement and resettlement of people due to development in infrastructure. Though there is often adequate compensation for the displaced, relocating to begin life afresh is usually not an easy task despite the compensation. Displacement and relocation often lead to loss of land for the indigenous people, loss of income and employment, disruption of the traditional living patterns and culture as well as disruption of the social structure. Resettlement of the displaced people often becomes a daunting challenge to social sustenance.

5.2. Crime Impact

The results suggest that there have been no significant impacts of SGR concerning crime rates along the route, at the stations, as well as areas surrounding the stations. This corroborates previous research by (Poister, 2018) who found that the effect of the Atlanta rail system on crime rate if any was marginal since robberies showed no significant change over time. A study on the Greenline railway network in Los Angeles which examined the impacts of transit on crime in the neighbouring areas also found minimal evidence on the rail line's substantial impacts on crime tendencies, dislocation of criminal activities in the station neighbourhoods and transportation of crime to the suburbs from the inner city (Liggett et al., 2003).The insignificant impacts of SGR concerning crime rates along the route, at the stations, as well as areas surrounding the stations could be as a result of various possible reasons: SGR stations are located close to the main roads making it hard for criminals to hide or attack passengers; the train operates during the day which means increased surveillance; increased security surveillance at the stations and on the streets resulting from the rail system opening; the would-be robbers getting

meaningful employment from the rail system; most stations are located in areas with less commercial development and more residential areas hence comparatively hard to harbour criminals. Additionally, the SGR being a long-distance train makes it not convenient for significant robberies and mugging. As previous research shows, crime rates resulting from rail are higher in areas with better commercial development (like Kensington) than in residential areas around the stations (like Indiana Creek) (Poister, 2018). Further, previous research shows that high level of security at the stations negates a substantial number of would-be targets (Block & Block, 2000). Further, the general theory of crime argues that depending on population and population density, increased intensity in land use should escalate criminal activities due to an increased number of potential criminals and victims close to each other (Block & Block, 2000). In line with this, the population effects on the SGR corridor as a result of the SGR have been marginal hence arguably, no much increase in the number of potential targets. This study finding thus suggest that the effect of the SGR on criminal activities is marginal.

6. Conclusion

The purpose of this research was to explore the social impacts of the SGR on Kenya's development. The research results revealed that the SGR construction has led to the migration of people to the areas along the train routes and towns. This was mainly found to be due to employment as a pull factor as well as settlement by those who had purchased land and property. The migration was however found to have a marginal effect on the population density of these areas since most of the project's workforce was temporary and had to relocate after completion of the project in search of green pastures or back to their families. The findings also suggest that the SGR has led to the displacement of people along the route to pave the way for the construction. Besides, unrestrained sale of land along the SGR route by the locals seeking to cash out on the SGR project could have led to this displacement. The results also suggest that there have been no significant impacts of SGR concerning crime rates along the route, at the stations, as well as areas surrounding the stations. This could majorly be attributed to various factors including increased security surveillance at the stations and on the streets resulting from the rail system opening; the would-be robbers getting meaningful employment from the rail system; most stations are located in areas with less commercial development and more residential areas hence comparatively hard to harbour criminals.

Investments in railway systems and other transport infrastructure in developing countries like Kenya bring about gains that often extend beyond economic advancement and growth to social change and transformation. In this regard, migration of Kenyans to the areas along the SGR route in search of greener pastures as others relocate to their newly purchased property as revealed by this research could result in enhanced socio-economic development along the route.

These insights highlight the complex socio-economic consequences of large

infrastructure projects, emphasizing the need for policies that address displacement and urban planning while ensuring security and stability. This study serves as a foundation for further research and policy formulation aimed at sustainable development in similar contexts.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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