ISSN: 2524-1354 (Online), ISSN: 2519-7851 (Print)
Africa Habitat Review Journal
Volume 14 Issue 3 (December 2020)
http://uonjournals.uonbi.ac.ke/ojs/index.php/ahr

Challenges Faced in the Implementation of Planned Safety Measures in Mega Infrastructure Projects:

A Case Study of Road Safety on Thika Superhighway

Gladys N. Maina* and Isabella N. Wachira-Towey

Received on 22nd May, 2019; Received in revised form 24th August, 2020; Accepted on 16th September, 2020.

Abstract

The aim of this paper is to report on a study that investigated the impact of failure of planning phase on a mega construction as exemplified by road safety challenges on the Thika Superhighway, Kenya. Accordingly, the study covered the various challenges faced in the implementation of the planned safety measures in mega infrastructure projects. The study relied on purposive sampling of the key informants/ opinion leaders i.e. the Employer (Kenya National Highways Authority), Traffic Police, Design Engineers (APEC Consulting Engineers Limited), the umbrella body of resident associations in Kenya (KARA) and the Contractors (China Wu Yi / Sino Hydro / Shengli) who had been directly involved in the project. The data was collected via interviews, questionnaires and focus group discussions (FGDs) for residents living along the highway. The research findings indicated that there were various challenges faced during the implementation of the planned road safety measures such as poor road infrastructure design, poor human behavior, and inadequate resources, which was an indication of failure by planners to consider road safety during the planning phase of the project. These failures were exemplified by multiple accidents during the construction of the superhighway. The study recommends the adoption of a context-sensitive approach to roadbuilding. The government should also emphasize the need for public participation and stakeholder engagement during the planning phase of mega road infrastructure projects in line with the Constitution of Kenya (2010). This will further ensure that all stakeholders 'own' the project.

Keywords: Accident, Mega infrastructure projects, Planning phase, Road safety, Stakeholders.

INTRODUCTION

Before plans for Nairobi-Thika Superhighway were designed, few would have imagined that this grand infrastructure project, one of the key pillars of Kenya's Vision 2030, would lead to a complete transformation of Nairobi. That is exactly what the Nairobi-Thika Superhighway, which links Nairobi and the industrial and agricultural towns of Ruiru and Thika, has done (Kabukuru, 2011) According to CES & APEC (2008), the project road is part of International Trunk Corridor (A2) which connects Kenya with Ethiopia and is located in the central part of Kenya. The road lies within Nairobi and Kiambu counties. The project road starts from Globe Cinema Roundabout inside the Nairobi City and ends in Thika near the bridge across Thika River after the flyover leading to Thika Town. Starting from Globe Cinema roundabout, the project road transverses towards northeast following the Murang'a road up to Muthaiga roundabout passing through Pangani roundabout. The length of this link is about 3.5km. The project road continues in northeast direction towards Thika Town connecting the towns of Kasarani, Githurai, Ruiru and Juja enroute and ends at Thika near the Thika bridge across Thika River on A2. The total length of the project road from Globe Cinema to Thika is about 42.0km. The City Arterial Connectors comprises improvement of three Major Arterials connecting Nairobi-Thika Road at Pangani roundabout with Uhuru Highway (A104) at different locations along it. Total length of these connectors is 12.4km (CES & APEC, 2008).

Construction of this highway began in January 2009, undertaken by three Chinese construction giants. The highway was split into three sections for construction works of the multiple lane road.

**Corresponding author:*
***Gladys N. Maina**, Department of Construction Management & Quantity Surveying, University of Nairobi, Kenya.*
Email: g.maina@uonbi.ac.ke

These sections were Uhuru Highway to Muthaiga Roundabout, Muthaiga Roundabout to Kenyatta University (KU) and KU to Thika (Lugaria, 2012). The key objective for the road expansion was to decongest the city and reduce the numerous traffic snarl-ups associated with this road, which is estimated to carry 70,000 vehicles daily, transiting between Nairobi and the countryside. Thika Road construction project involved changing the road from a four to eight-lane superhighway (Kabukuru, 2011). The project whose initial cost was estimated to be Ksh.27 billion ended up costing Ksh.31 billion due to inflation and additional features that changed design work (Ngetich, 2012). The project included construction of interchanges, flyovers, box culverts and standard pipe culverts (Lugaria, 2012).

The gains of the expanded Thika Road cannot be overemphasized, but some crucial social implications may have been overlooked such as the negative effects that were likely to occur during and after the completion of the project ranging from health, economic, social, environmental and road safety (Muiruri, 2011).

Construction of the project was accompanied by a number of road safety challenges. In an ideal situation, such challenges should have been considered during engagement with stakeholders in the planning phase; suggesting possible failure by the planners to consider stakeholder concerns. Accordingly, the following questions beg answers: Were the various stakeholders involved during the planning phase of the project? If yes, were the issues raised by them factored in during the planning phase? If yes, were they adequately implemented and what were the challenges faced in the implementation thereof? This paper therefore reports the findings of a study that aimed to investigate the impact of failure in the planning phase of a mega construction project as exemplified by road safety challenges on the Thika Superhighway. In particular, the study sought to identify the challenges faced in the implementation of the planned road safety measures.

THEORY

Road safety refers to the methods and measures used to prevent road users from being killed or seriously injured while using the road. Road safety has generally been pursued using the tools of enforcement, education, and engineering. Enforcement is assumed to lead to reduced risk taking among motorists, education provides a means of improving driving skills and increasing awareness of potential risks, while engineering is aimed at improving both the crash integrity of the vehicle, survivability of crashes, and changes to the road infrastructure to reduce crashes and their severity -i.e., making the road itself more 'forgiving'- (Noland, 2013).

Enforcement at a road work zone concerns various aspects of driver behaviour but is primarily focused on traffic speed. Even if work zone speed limits are appropriately chosen, there is still the danger that a significant proportion of drivers will ignore them, or that other important traffic rule, such as overtaking prohibitions, will be disregarded. Enforcement entails speed control, training and supervision and medical check. Education involves creating awareness among the road users on how to use the highway and entails education of road users and safety drives. Engineering generally concerns design of the road and this includes safety measures such as weaving, merging and diverging, road safety audits, road safety devices, traffic calming measures, traffic signs and construction work zone devices. It has therefore been argued that for road safety to be successful, the three components should be incorporated to ensure safety of all road users (Timcon Associates, 2012). Despite putting in place these safety measures, accidents continue to occur further compromising the safety of the various road users. Heinrich, Haddon and Wilde in the 1940s, 1960s and 1980s respectively, developed theories to try explain why accidents happen as follows:

Causal Theories

Causal theories of accidents claimed that only an exact knowledge of the real factors causing accidents can help to prevent them. This can be distinguished into two main trends in causal accident theories: deterministic (sequence of events) and probabilistic (set of factors) (Jamroz, 2008). Heinrich is considered the precursor of the theory based on the sequence of events. Heinrich

developed the 'domino theory' which is based on the assumption that an accident consists of a single event with a cause. Consequently, better safety, according to this theory, requires that the cause of the accident is established and eliminated. The most developed theories are those of multi-linear event sequences, which assume that accidents are an element of a series of events and suggest a process approach to accidents (Jamroz, 2008). Human factors are a major research problem. Many of the studies since the 1960s suggested a strong contribution of the human factors in causing accidents. It is estimated that as much as 60% of accidents in industry, 70-80% of accidents in aviation and 85-95% of road accidents are connected with human factors. There have been a number of studies on the influence of the human factor on traffic user behaviour and road safety. The causal approach to analysing accidents was based on the assumption that the real causes of accidents can only be identified by detailed studies of each accident and the events leading up to the accident (Jamroz, 2008).

Systemic Theories

The main assumption of the systemic theory was that accidents result from failure to adjust when the components of the safety system interact. According to the theory none of the elements can be considered more important than the others. People make mistakes, but why? The answer offered by the systemic theory is: mistakes are made because the system has the wrong design and does not match human abilities (Jamroz, 2008). Consequently, this theory combines information from individual accidents and creates an area of knowledge on the system and its stability, because the individual layers (levels) of the system increase the risk of an accident. The high reliability systems theory says that many accidents of dangerous technologies could be avoided through prevention such as good quality design, construction and system management. The theory of systems applied to road transport is designed primarily to eliminate accidents by modifying the technical elements of the transport system. The systemic theory is so far the best. The improvements in the roads system, traffic enforcement and vehicle design have significantly reduced accident rates and casualties in western motorized countries (Jamroz, 2008).

Behavioural Theories

A new approach was put forward in 1980 by Gerald Wilde giving the basis for behavioural theories. The basic assumption of all behavioural theories is how people assess risk and accept it as a very important determining factor of accidents (Jamroz, 2008). Similarly, to the previous theories, there are several groups of theories here as well: homeostasis of risk, behavioural adjustment and change of health behaviour. Homeostasis is the body's ability to maintain a constant interior environment which is possible thanks to adjustment mechanisms based on feedback irrespective of external factors. Wilde found that every community only has as many accidents as it wants to have and the only way to change this is by changing the desired risk level (desired level of safety). The theory of the homeostasis of risk takes account of all road users (motorised and non-motorised). Many scientists agree that Wilde has identified important mechanisms in his theory when he said that safety measures do not yield the expected results on all roads. There is no doubt that road safety relies on the successes of road safety programmes. The more the public want to prevent accidents, the greater the acceptance of more stringent road safety measures (Jamroz, 2008).

The above theories show that road safety is a complex phenomenon and one that needs deep insight. The theories proposed so far have not produced a general theory, one that could be used as a basis for identifying all causes of accidents. Each of the proposed theories however, has some truth in it. And as the construction of mega infrastructure projects become multifaceted, the complexities in managing them also arise. The construction of the Thika Superhighway was no exception. Several studies have been carried out with a view of identifying the various challenges faced in the implementation of road safety measures. Ngeso (2009) explored ways of addressing the road safety challenges in Kenya and identified poor legal and institutional framework, poor road infrastructure, poor road maintenance, poor human behavior and attitude of commuters, drivers and other road users, poor traffic enforcement, lack of accurate data on road safety matters and lack of funding as the main challenges in the implementation of road safety measures

in Kenya. Asingo & Mitula (2007) analyzed the implementation of road safety measures in Kenya and identified the challenges as weak policy, weak legal and institutional framework for road safety, behavioural and attitudinal problems of road users, poor road infrastructure design, inadequate road markings and road signs, poor street lighting and inadequate parking space, inconveniently located and poorly designed bus stops, lack of compliance with legal requirements and that the existing training programme for the police are inadequate.

Odero, Khayesi & Heda (2003) identified the impediments to road traffic injury prevention as ineffective coordination among stakeholders, inadequate resources and personnel, limited capacity to implement and monitor interventions. Sikdar et al. (2009) explored the major issues in managing road safety as inadequate planning and designing for safety, poor traffic legislation and enforcement, weak institutional framework, poor traffic management, inadequate road safety education and publicity, and poor road traffic aspects such as encroachment and parking, control devices and road user behavior and skills. Chiduo & Minja (2001) examined the problems of road safety in Tanzania as poor organization of road safety work, inadequate road user education, lack of accurate accident data, poor road engineering, high speed limits, inadequate vehicle inspection and driver training. Rizavi (2011) further examined the road safety challenges in developing countries and identified crash data collection/reporting, traffic/transportation management, policies and strategies, insurance, community initiatives, road safety responsibility and action and enforcement, and legislation as the elements important in the management and implementation of road safety. The challenges are summarized in **Figure 1**.

RESEARCH METHODS

A case study approach of research design was adopted in this study because Thika Superhighway, being the first superhighway to be built in Kenya, would be ideal in exemplifying the impact of the planning phase on the success of future mega projects. Purposive sampling was used since the main focus of the study was on in-depth information analysis which dealt only with officers that worked on the Thika Superhighway (key informants). The key informants include the Employer (Kenya National Highways Authority), Traffic Police, Design Engineers (APEC Consulting Engineers Limited), the umbrella body of resident associations in Kenya (KARA) and the Contractors (China Wu Yi/Sino Hydro/Shengli) who had been directly involved in the project. The researcher also sought to obtain information from the residents living along the highway who were directly affected by construction of the superhighway especially with regard to road safety. Stratified random sampling was therefore used where the superhighway was divided into three lots and simple random sampling was used within each lot to obtain a sample size which was representative of the whole population and so that each resident had an equal chance of being selected.

Primary data was collected through direct interviews, focus group discussions and questionnaires. This data helped to evaluate the challenges faced in the implementation of the planned road safety measures given that evidence from the research conducted by the umbrella body of resident associations between August and September 2011 indicated that residents kept raising the same concerns as had been factored in during the planning phase. Direct observation and photography were also incorporated to find out the impact of failure of appropriate planning and plan implementation on mega infrastructure project. For purposes of data analysis, Ms Excel- a computer program used for statistical analysis- was used. The data so analyzed was presented in form of bar charts and plates.

RESULTS AND DISCUSSION

The main findings of the study can be summarized as shown in **Figure 2**. The main challenge faced by the Contractors, Employer and Design Engineers in the implementation of the planned safety measures was poor road infrastructure design (**Figure 2**). People with disabilities, such as the blind and disabled, were not taken into consideration in the design and implementation of the project. This made it difficult for the disabled person to cross from one side of the highway to the other without risking being knocked down by speeding motorists. Moreover, there were no

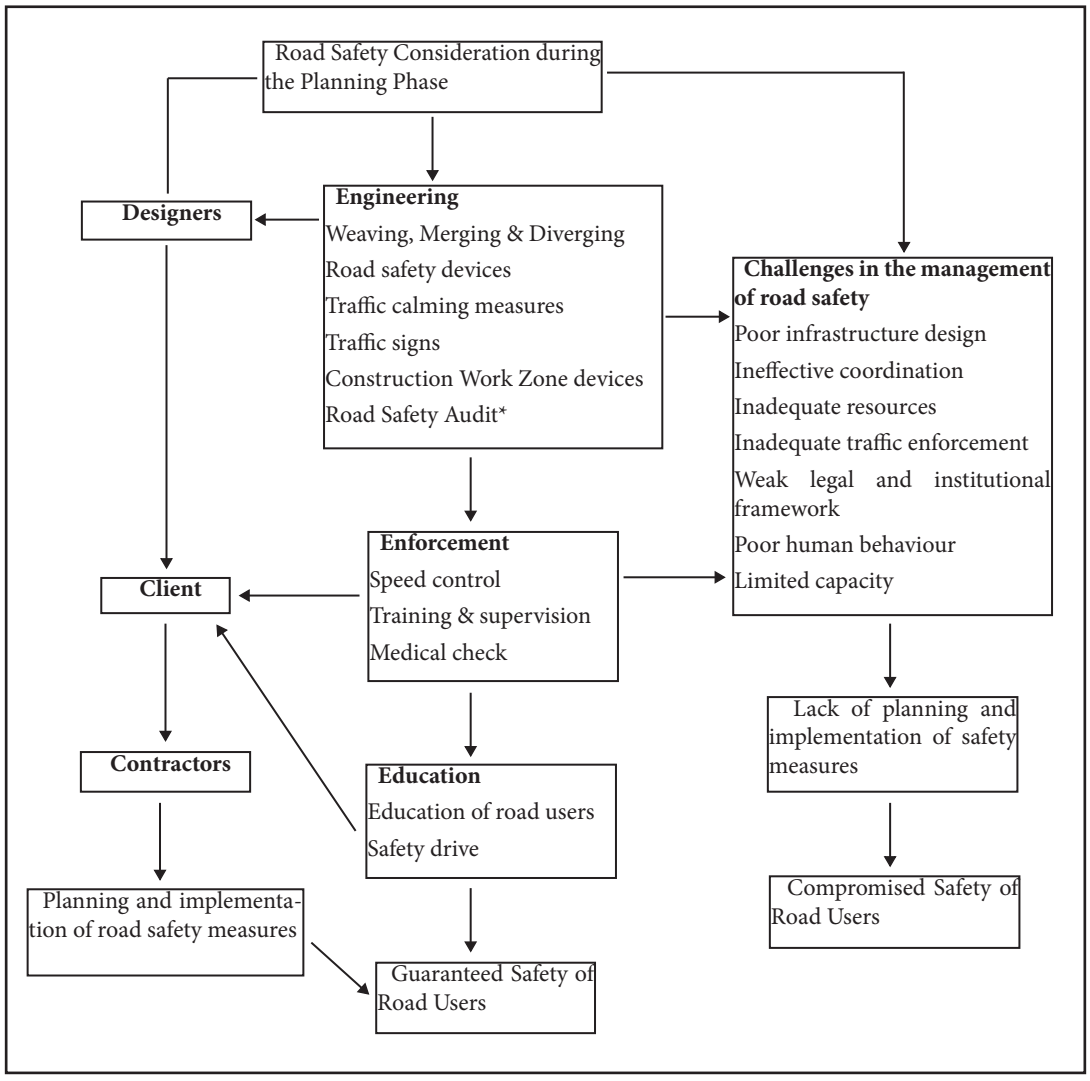

FIGURE 1
Conceptual Framework
Source: Author 2015

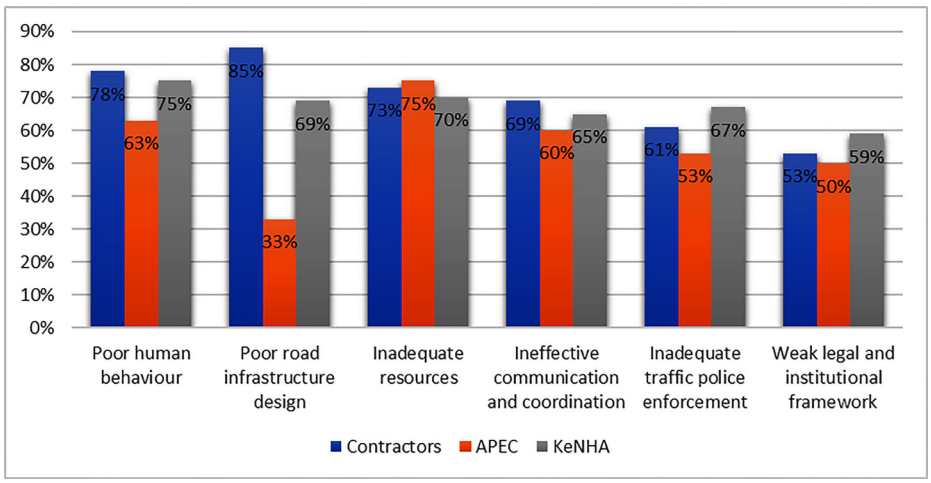

FIGURE 2
Challenges faced by Employer, Design Engineers and the Contractors
Source: Field survey 2015

space provisions for cars that broke down or ran out of fuel while on the highway and needed to pull aside to fix the problem. The footbridges were also far apart which tempted pedestrians to cross the high speed highway at non-designated areas. Speed bumps/zebra crossings were located next to footbridges hence confusing pedestrians on which one to use. Bus stops were not provided with enough space forcing buses and 'matatus' (minibuses) to pick and drop passengers at the main carriageway and the bus stops were located away from where people were coming from. Hand cart pullers were not accommodated on the cycle lanes forcing them to use the main carriageway. This is illustrated on **Plates 1** and **2**. Poor infrastructure design was further attributed to the lack of accurate data on road safety matters. This meant that at times, the contractors had to redo the work to capture emerging safety issues which had not been envisaged earlier in the design, hence incurring additional cost and time for the project. Poor infrastructure design was also cited by Asingo & Mitula (2007) as a challenge in the management of road safety.

PLATE 1
Carts present on carriageway along Muthaiga Roundabout to Uhuru Highway
Source: Field survey 2015

PLATE 2
Buses stopping on the main carriageway
Source: Field survey 2015

Since completion of the highway, only four additional footbridges have been constructed at Witeithie, Njomoko (Mang'u), Survey of Kenya and Garden City (Garden Estate Junction) despite the frequent accidents involving motorists and pedestrians. The total number of footbridges now stands at 18 with 10 more designed but yet to be erected due to lack of funds. There has also been construction of additional service roads and bus bays on each side of the road to ensure passenger and pedestrian safety. This is in addition to removal of existing speed bumps and restoration of the road surface at those sections. The construction of the additional footbridges has brought massive traffic snarl ups. A case in point is during the erection of the Witeithie footbridge which interrupted traffic flow at Witeithie as a result of poor traffic management (**Plate 3**).

PLATE 3
Witeithie footbridge
Source: Field survey 2020

Poor human behavior was identified as a challenge. This included reckless driving, people crossing at non-designated areas, vandalism of road furniture such as traffic signs and guard rails. Cycle lanes and foot paths were invaded by hawkers and motorbikes thus discouraging cyclists and pedestrians from using them. Footbridges

which were meant to be used by pedestrians and even people with disabilities were being used as shortcuts by 'bodaboda' motorbike operators to move from one side of the highway to the other. There was also dumping of debris on the foot paths and cycle lanes thus discouraging pedestrians and cyclists from using them, and instead they used the main carriageway. Many of the footbridges have turned into hideout for criminal gangs which operate at night. Members of the public can only find safety in numbers while using the footbridges at night. The footbridges that have become infamous for mugging incidents include those in Witeithie and Ruiru. However, some footbridges are secure and safe day and night such as the one located at Kahawa Wendani right outside the Kahawa Barracks along the Thika Superhighway.

Poor human behavior can further be attributed to the failure by the planners to plan for and implement road safety awareness programmes and also failure to involve the residents during the planning phase of the project meant that they didn't 'own' the project. Ngeso (2009) cited poor human behavior as a challenge in the management of road safety. The clutter on the sidewalk means insufficient space for pedestrians. Lack of maintenance has the same effect as if the sidewalk was not present. Poor human behaviour is illustrated on **Plates 4** and **5**.

PLATE 4
Carriageway along Muthaiga Roundabout to Uhuru Highway zone
Source: Field survey 2015

Inadequate resources were also cited as a challenge. This was in terms of space/land, finances and time. The amount of money which had been provided for in the contract sum for implementation of the safety measures was inadequate therefore the contractors were not able to implement some of the safety measures. Land/space for accommodating

PLATE 5
Pedestrians crossing at non-designated areas
Source: Field survey 2015

some of the safety measures was insufficient. Physical design for example, which was meant to separate the traffic from the road work zone was not adequately implemented due to insufficient land. This meant that motorists, especially those driving at high speeds, could easily collide with the construction equipment and materials. There was also high likelihood that the speeding motorists could run into construction workers and fall into open excavations. There was also pressure to meet the project time deadline such that the road was opened up to the public even before some of the safety measures, such as footbridges, road markings, street lighting, etc., were in place. This agrees with the findings of Odero, Khayesi and Heda (2003) who identified inadequate resources as a challenge in the management of safety.

Ineffective communication and coordination among the different project stakeholders led to each party assuming the other will perform certain roles, for example, in the carrying out of road safety education programs between the Traffic Police and the Employer. Response to safety issues raised by either party, that is, Contractors or Design Engineers or even the Employer took too long to be addressed due to long channels of communication further compromising on the safety of road users. Communication during the implementation of the project, such as when and where diversions would be made, was not effectively provided to local residents and users of the highway. There was also lack of knowledge both by motorists and pedestrians on how to use the highway. Ineffective coordination was also identified as a challenge in the management of road safety by Odero, Khayesi and Heda (2003).

Inadequate enforcement of traffic regulations was a challenge as the traffic police did not have the mandate to arrest and prosecute rowdy contractors for example, contractors who left construction plant and equipment, construction materials and waste on the roads especially at night, when visibility was limited, contributing to an increased number of accidents. The traffic police could also not arrest and prosecute vandals and road users who damaged road furniture due to lack of stringent laws. Lack of modern technology which could have assisted the police in tracking down traffic offenders, such as CCTV surveillance cameras, further exacerbated the challenge. Sikdar et al. (2009) also noted that inadequate enforcement of traffic regulations was a challenge in the management of road safety.

The other challenge faced was the weak legal and institutional framework. The Thika Superhighway was the first mega road infrastructure project to be built in Kenya, and thus there was lack of a clear structure on the planning of the project especially as far as road safety was concerned. There was no stringent law to regulate the scrap metal industry which is the main market for vandalized road furniture like traffic signs and guardrails. There was also no stringent law on motorists who damaged road furniture, for example knocking down guard rails during an accident, and road users such as pedestrians who destroyed or removed guardrails in order to be able to cross the road at non-designated areas. It is important to note that the guidelines for road safety in Kenya, though elaborate, are not anchored in any law but exist in a manual, which is not a legal document and whose breach attracts no specified penalties. Weak legal and institutional framework was also identified as a challenge by Sikdar et al. (2009).

From the findings, the various challenges faced by the project implementers were an indication of failure by the planners to consider aspects of road safety during the planning phase of the project. Poor human behavior, for example, could have been avoided by carrying out public participation and stakeholders' engagement right at the planning phase of the project. This could have ensured the road users - especially the local residents - 'owned' the project thereby reducing incidences of vandalism of the road furniture, dumping of debris on the footpaths and cycle lanes, reckless driving and crossing the highway at non-designated areas. The roles of the different stakeholders and the channels of communication should have been spelt outright during the planning phase of the project to avoid the duplication of roles and conflicts which were observed during the implementation of the project which further compromised the safety of road users.

The various resources required for the implementation of the road safety measures should also have been considered during the planning phase of the project, for example, the availability of space/land to accommodate the various safety measures such as bus stops, footbridges, cycle lanes, physical design etc. should have been considered. This is so because even though bus stops were provided, they had inadequate space forcing buses and 'matatus' to pick and drop passengers on the main carriageway further compromising on the safety of the road users.

CONCLUSION

The study concludes that the various challenges faced during the implementation of the planned road safety measures were an indication of failure by planners to consider road safety during the planning phase of the project such as the road infrastructure design, human behaviour, availability of resources and communication and coordination of project implementors. There was also failure to include all the stakeholders during the planning phase of the project which led to some of them not 'owning' the project.

From the foregoing, failure to consider road safety measures during the planning phase can have serious repercussions throughout the various phases of a road construction project. This is exemplified by the road safety challenges on the Thika Superhighway, such as frequent accidents, particularly on the densely populated parts of the highway. Lack of adequate provision for the Non-Motorized Transport (NMT) increased the chances of accidents. The existing footbridges were spread wide apart and pedestrians were tempted to cross the highway even where there

was no footbridge hence increasing the incidences of pedestrians being knocked down. People with disabilities such as the blind and disabled were not taken into consideration in the design and implementation of the project making it difficult for the disabled person to cross from one side of the highway to the other without risking being knocked down by speeding motorists.

Moreover, there were no space provisions for cars that broke down or ran out of fuel while on the highway and needed to pull aside to fix the problem. This was bound to lead to accidents as vehicles at high speeds could easily hit the stationary vehicle. The inadequate signage on the road, especially for diversions, had also been blamed for the numerous accidents (Rajab, 2011). The contractors had also been accused of not putting up enough traffic safety management system in the course of construction, an allegation they had denied, blaming it on vandals (Sangira, 2012). This further confirms the research proposition that the road safety measures identified during the planning phase were not adequately implemented leading to increased accidents on Thika Superhighway.

RECOMMENDATIONS

This study recommends that there is need for more engagement by professionals to make government officials and practicing engineers more aware of the need for context sensitive roadbuilding (getting input from users and those affected by the road prior to design and construction) and of their responsibilities in designing safe roads.

Public participation and stakeholders' engagement should be taken into consideration right from the planning phase of road infrastructure projects, along with other mega infrastructures, in line with the Constitution of Kenya 2010 (ROK, 2010), for example, road safety awareness-creation initiatives and public events to educate citizens on highways and transportation plans and policy.

There should also be planning for:

- Known human behavior e.g. consider the use of alternative materials such as fibre and plastic material for safety signs and other road furniture to replace iron guard rails and other metallic road fixtures which are targeted by vandals,
- Sufficient project resources e.g. acquisition of land for road construction and expansion right at the planning phase of the project, and
- Adequate funding e.g. by floating an infrastructure bond via the private public partnerships (PPPs) and developing a concession of target roads to mitigate infrastructure costs.

Finally, project planning should leverage on modern technology such as real time surveillance systems e.g. CCTV surveillance cameras and speed cameras to track down and prosecute traffic offenders such as motorists and vandals.

CITED REFERENCES

Asingo, P.O. & Mitullah, W.V. (2007). *Implementing Road Transport Safety Measures in Kenya: Policy Issues and Challenges*. Institute for Development Studies. University of Nairobi.

CES & APEC. (2008). *Feasibility Study, Detailed Engineering Design, Tender Administration and Construction Supervision of Nairobi – Thika Road (A2): Road Safety Review Report.* Republic of Kenya.

Chiduo, C.W. & Minja, P. (2001). *Road Safety in Tanzania: What are the problems?* The TRIS & ITRD database. Retrieved August 15, 2012 from https://trid.trb.org/view/688247.

Jamroz, K. (2008). Review of Road Safety Theories and Models. *Research Gate.* Retrieved February 5, 2020 from https://www.researchgate.net/publication/259000758.

Kabukuru, W. (2011). *Kenya's Superhighway to Quality Homes, The Free Library.* Retrieved 2 August, 2012 from http://www.thefreelibrary.com/Kenya%27s+superhighway+to+quality+homes%3A+the+construction+of+the...-a0262145487.

Lugaria, P. (2012). Thika Road Construction Project Overview. *Construction Business Review.* Retrieved August 2, 2012 from http://www.constructionkenya.com/1676/thika-road-construction-design.

Muiruri, P. (2011). The flipside of Thika Supehighway. *Standard Digital.* Retrieved 2 August, 2012 from http://www.standardmedia.co.ke/?id=2000046428&cid=470&articleID=2000046428.

Ngeso, C.J. (2009). *Confronting "Death on Wheels". Addressing Road Safety Challenges in Kenya; A Critical Look Beyond the Existing Legal and Institutional Framework* (unpublished thesis). University of Nairobi, Nairobi.

Ngetich, P. (2012). Kibaki to officially open Sh.30bn Thika superhighway. *Daily Nation.* Retrieved December 5, 2012 from http://www.nation.co.ke/News/Kibaki-to-officially-open-Sh30bn-Thika-superhighway/-/1056/1612572/-/qb6b44/-/index.html.

Noland, R.B. (2013). "From Theory to Practice in Road Safety Policy: Understanding Risk versus Mobility." *Research in Transportation Economics.* 43(1): 71-84.

Odero, W., Khayesi, M. and Heda, P.M. (2003). "Road Traffic Injuries in Kenya: Magnitude, Causes & Status Intervention." *Injury Control and Safety Prompotion.* 10(1-2), 53-61.

Rajab, R. (2011). Kenya: Educate Motorists and Pedestrians on Thika Superhighway, KARA Advices. *The Star*. Retrieved August 2, 2012 from http://allafrica.com/stories/201110270070.html

Republic of Kenya. (2010). *The Constitution of Kenya, 2010.* Nairobi: Government Printers.

Rizavi, A. (2011). *Safety Challenges in Developing Countries.* The TRIS & ITRD database. Retrieved August 2, 2012 from https://trid.trb.org/view/1103795.

Sangira, S. (2012). Blame game over Thika Superhighway deaths. *The Star.* Retrieved August 2, 2012 from http://the-star.co.ke/.../blame-game-over-thika-superhighway-deaths.

Sikdar, P.K. and Bhavsar, J.N. (2009). Road safety scenario in India and proposed action plan. *Transport and Communications Bulletin for Asia and the Pacific*. 79, 1-16.

Timcon Associates. (2012). *Transportation Engineering and Modelling. Thika Road Superhighway Traffic Operational Assessment and Safety Audit Study.*