

A Management Structure to Reduce Delays in Road Construction Projects of Kigali

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Abstract: *Failing to complete road projects on time upsets both the Government and the users of those roads who expect to benefit from the completed roads. The construction delay is disagreeable to both the Government and contractors, as it is expensive for both parties and has the potential to generate disputes. This study analyses the main delay causes encountered by the road construction industry of Kigali, and it recommends the most operational management structure with high prospective to minimize delays in road construction industry of Kigali. The approach used was initially to analyze critically pertinent available policy documents, published reports, studies, and applicable managing techniques applied in several cities. Then, with the help of specialists and professionals from the road construction industry in Kigali, a closed loop survey was constructed and used to collect qualitative data. Then, the individual responses were analyzed towards the delay causes in road construction projects, and the link between delay causes and the effects of delay were critically evaluated. The finance competence factors group and the shortcomings in feasibility studies were established to be the major origin of delays in road construction projects in Kigali. Some operative methods were proposed to moderate delays. At the end, strategies and a management structure were recommended to moderate delays in road construction of Kigali, this will avoid turning lucrative projects into loss-making projects.*

Keywords: *Road Construction, Delays, Delay causes, Effects, Kigali*

I. INTRODUCTION

“There is no value for money in delayed or abandoned contracts or projects as it results into waste of taxpayers’ money”, the Permanent Secretary at the Ministry of Justice has said at a workshop between the ministry and legal officers from about 150 public institutions in May 2017. In recent years, the Government of Rwanda has started a mission of boosting development through improved infrastructure.

The construction of road infrastructure projects played an important role in the socio-economic and politico development of Rwanda and they offer direct employment.

The increasing demand for road infrastructures in Kigali has attracted various contractors and consultants with variable experience, competences and management skills in road construction projects. The rising in number of these actors in this market has not seen a conforming perfection in the appropriate delivery of road projects, even if with new consultants and contractors on the market, there is increased competition among themselves and the Local Government have a better variation of service suppliers from which to select.

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Although certain actions were taken by the City of Kigali to moderate the delays in construction of road projects, the outcomes do not reflect significant amount of success in monitoring those delays.

The delay of road construction does not only disturb the construction industry but it affects the economy of a country. The failure to complete road projects on time upsets both donors’ agencies, road users and Local Government who expect to benefit from the completed roads.

Delays are well known as results of mismanaged events, which should have been monitored instead in efficient way to evaluate the consequences of that specific event on the implementation of road project and as well the way to reduce risks of extra delay. The main purpose of this study is to document and answer the following questions:

1. What are the root causes behind road project delays in Kigali?
2. How can the decision makers reduce the project delays and its impacts without affecting its effective functionality?
3. What is the influence of funds distribution procedures on the delays in timely completion of road projects in Kigali?
4. In which way, does government procedures and practices influence delays in timely completion of road projects in Kigali?
5. What are the possible strategies or structure that could be used to improve the management of road construction projects of Kigali?

II. RESEARCH PROBLEM

A considerable budget of City of Kigali is concentrated on the construction of road projects. Despite the importance of these roads infrastructure and the billions of dollars committed to them, road projects are never completed on time.

Time is money; delays in completing road construction project have significant financial impact to the government, the citizens and the contractor. Failure to complete these road projects on time brings financial and economic issues to the City, severe challenge to vehicular movement, loss of jobs as well as the citizens in the neighborhoods feeling uncomfortable due to dust and noise pollution.

III. AIM

The main objective of this study is to classify major causes of delays in road construction projects of Kigali and presents some important strategies and improved managing methods,

based upon an analysis of data collected from different actors via different methods, to help accelerate construction of good quality roads in Kigali, within project timeline and within the planned budget. This paper will help the main stakeholders understand what they can improve to mitigate delays in road construction projects of Kigali.

IV. LITERATURE REVIEW

The analysis of the literature reveals that project delay is the reality faced by all project managers during road construction all over the World. According to a study of Marzouk (2014) in Egypt, all stakeholders, especially the public, the City and the contractor, feel the negative effects of road construction delays. According to monthly reports of consultancy services for construction supervision for phase I infrastructure (roads and drainage) in six secondary cities in Rwanda, the topmost five important causes of construction delays in road projects in Rwanda are mainly Land expropriation process, differing site (ground) conditions, financial and payment problems, variation orders by the client and relocation of existing utilities.

However, causes related to delay in construction are not limited to the real practice of road construction. In their study, El-Razek et al., (2008) found that delayed payments, coordination difficulty, and poor communication were important causes of delay in Egypt. Agaba (2009) attributes delays in construction projects to poor designs and specifications, and problems associated with management and supervision. Sambasivan and Soon (2007) established poor planning, poor site management, inadequate supervisory skills of the contractor, delayed payments, material shortage, labor supply, equipment availability and failure, poor communication and rework, were the most important causes of delays in the Malaysian Construction Industry. Shehu and Akintoye (2009) articulate that the traditional approach to success in the construction industry places great importance on the capability to plan, monitor and execute projects. According to the British Standard for Project Management BS6079, the planning, monitoring and control of all aspects of a project and the motivation of all those involved are crucial in the accomplishment of the project objectives on time and to the specified cost, quality and performance.

V. RESEARCH METHODOLOGY

This paper analyse the reasons behind road delays, and recommend corrective actions and strategies to decrease delays in the road construction industry of Kigali. The study meant to have a combined method to analyse the project during the course of the project life cycle from planning to completion, mostly concentrating on the sequence of effects of causes of delay. To realise the objective of this research, an analysis of existing literature on delays in government construction projects was conducted. Afterwards, closed and opened-ended survey forms were distributed to respondents to provide accurate answers and data.

At the initial stage of the data collection process, useful literature on the definition of delays in government construction projects was revised. The literature gathered was considered to define the concrete causes of these delays

through designing questionnaire and the interview schedule (Saunders et al., 2007). Discussions were conducted with project contributors. Semi-structured interviews with specialists were also held to fill in the data gaps and specifically to increase perceptions into the indicators of the causes of delays. Qualitative data was analyzed through the guidelines and policy of Government and donors, and various project reports available were analysed. Quantitative data such as the claims, progress reports, and project performance reports were accessed from the project management of City of Kigali, donors and contractors.

The questionnaire comprised four sections: personal data associated to work experience and position in the firm, Factors that contributing to causes of road construction delays, Consequence the road construction delays, and Methods of minimizing road construction delays.

VI. DATA COLLECTION

To collect required information, a structure centering on the project management procedure sets known: Initiating, Planning, Executing, Monitoring & Controlling and Closing was designed as per the Project Management Body of Knowledge (PMBOK) Guide (2004). A combination of examination approaches were used as it was found to be well suited to collect the required data. This study was carried out to a macro level to find out the implication integrated in each phase and recommend applicable value addition to those processes in terms of delays.

From a wide-ranging literature review of several previous studies related to delay in road, the causes of delay and effects were established. Then from there an initial list of delay causes and effects was recorded, and shown to some road construction specialists. They were allowed to add or eliminate any of delay causes and effects in the preliminary list based on their experiences in that industry. Lastly, the final list of delay causes and effects was designed and approved by the specialists.

VII. DATA ANALYSIS AND DISCUSSION

OBJECTIVE 1: The root causes behind road projects construction delays of Kigali

7.1. Causes of Delays - Initiation

- Preparation of required documents;
- Shortcomings in feasibility studies;
- Shortage of technical professionals in the client's organization;
- Impact of Education Level and capacity building of Project Staff;
- Change of scope;
- Stakeholders and their participation;
- Shortage of the counterpart funds;
- Untimely release of funds;
- Delays in pre-construction activities;
- Land expropriation and compensation process;

7.2. Causes of Delays - Planning

The main cause in this phase was procurement process to hire the consultants for design, detailed design of the project and procurement process of contractors for construction of the road.

The procurement process of a consultant, a two to three months delay was observed mostly because of an involvement of a competing bidder, questioning the suitability of the competitor.

7.3. Causes of Delays - Execution

The concrete construction of the roads is carried out in this group, which is predisposed to important delays.

- Shortage of construction materials (bitumen or cobblestones);
- The adverse weather;
- Errors in contract drawings;
- Appeals of expropriations a.
- Poor feasibility studies and inadequacies in detailed designs;
- Variation orders by the client;
- Financial and payment problems;
- Financial status of the contractors
- Differing site (ground) conditions;
- Relocation of existing utilities;

7.4. Causes of Delays - Monitoring and Controlling

The aim of actions of this group is the general management of other events, done to implement the road project with the time set, under the planned budget and to the expected quality. It becomes more relevant for the Project Management Units of the pertinent stakeholders to take seriously their obligations.

7.5. Causes of Delays - Closing

This is the final stage of the project, where the road project is constructed, commissioned and handed over for operation, and the project is 'signed off' and closed down. However, there were no records on delays registered at this stage in road project of Kigali.

As per the law, the period for the defects liability is one year for road projects in Kigali and Rwanda as well.

OBJECTIVE 2: THE IMPACTS OF DELAYS IN ROAD CONSTRUCTION PROJECTS OF KIGALI

The delays have many negative effects such as time and cost overruns, lowering the quality of completed roads, major disturbances in traffic movement, desertion or termination of some projects, and client satisfaction will decrease if the cost of project or schedule exceeds the planned budget. All these consequences lead towards additional costs, and such issues should be observed in relation to the limited budget available for road construction projects at the Kigali City and national level. The findings shown that in the finance group of causes, cost overruns have a large effect on delay in road construction projects, followed by time overruns.

Other delaying factor of the implementation of road project may also result in increased costs due to inflation. The longer the construction period is, the more the price increase due to inflation will have to be taken into account. The

initial cost estimations must take into account the amount to be paid when the project is actually implemented.

The rate of inflation varies from one Member State to another and can be, per year, between 1 and 2% for the lowest rates and 10% for the highest.

Although inflation was taken into account in the first estimations, the initial cost estimations can be exceeded if the inflation rate increases beyond the level expected during the construction period.

OBJECTIVE 3: DELAYS CAUSED FROM THE GOVERNMENT SIDE, CONTRACTOR, CONSULTANT, AND SITE/DESIGN ENGINEERS' PERSPECTIVE

The following section will analyze the outcomes obtained in the questionnaires.

Causes related to the contractor:

- Poor planning and scheduling of project;
- Poor communication between contractor and other project parties;
- Inexperience and shortage of labor;
- Improper site management and supervision;
- Lack of materials and equipment;
- Problems in project funding;

Causes related to the owner, the City of Kigali:

- Delay in decision-making;
- Interruption of work by owner;
- Budget availability for the project;
- Modification of project scope;

Causes related to the consultant:

- inadequate experience,
- Modification of design during construction phase,
- delay in resolving design problems,
- Poor project cost estimation,
- delay in approving modifications of the scope of work,
- and inconsistencies between specifications and drawings.

Results showed that these causes are related to inadequate experience of the consultant's staff.

Causes related to the services and utilities:

The causes related to services and utilities were categorized as regular and severe. This indicates the implication of this category in the delays of road construction.

- Most of the utilities are unidentified or incorrectly located;
- Unavailability of designs and exact location maps;
- Undefined positions of services networks in drawings. This changed the schedule because the newly discovered pipe or cable is required to be relocated which requires extra time and money.

Causes related to the external environment:

- Traffic deviation;
- Scarcity of materials in the market;
- Rain season effect on construction activities;

OBJECTIVE 4: HOW GOVERNMENT PROCESSES AND PRACTICES INFLUENCES DELAYS OF THE ROAD CONSTRUCTION PROJECTS IN KIGALI

- Tendering structure requirement of choosing the lowest bidder;
- Land expropriation process;
- Delay in progress payments by the Government;
- Timely release of funds, mostly the counterparts funds;
- Shortage of experienced technical staffs;
- Lack of policies or mechanism to retain their valuable experience staffs;

OBJECTIVE 5: SUGGESTED STRATEGIES TO MINIMIZE DELAYS IN ROAD CONSTRUCTION PROJECTS IN KIGALI

Respecting the initial schedule of road construction needs a lot of coordination from different actors. The following presents the general recommendations to reduce delay in road projects:

Contractor should focus on the following points:

- Dedicate much attention to the planning phase and devote more time and money for it;
- Do proper planning and scheduling;
- Develop human resources through continuous training programs;
- Allocate adequate number of labors that should be encouraged to improve their output;
- Properly manage the financial resources and plan cash flow;
- Assign appropriate administrative staff to manage and supervise the works, and ensure to deliver the project within the specified cost, time and quality;
- Review the lessons learned from the previous effective road projects;
- Update the latest construction technology and techniques;

The City of Kigali is recommended to:

- Minimize modifications during construction;
- to avoid interruption of work, the City is recommended to have a contingency plan in the case of any unforeseen events;
- Instead of making decisions individually, it should be made collaboratively;

- Involve services' authorities in the planning and design phases. This will help in identification of their needs, accommodate them during planning, and design phases. This approach gives the services authorities a chance to plan their work packages and manage the procurement of the required materials, such that there will be minimal negative impact on the road project;
- Select the bidder whose resources, capabilities and experience qualify him to construct the project, not the one offers the lowest offer;
- For land acquisition, involve the land's owners in the planning and design phase, understand and accommodate their needs, and compensate them on time.

Consultant should look to the following issues:

- Employ competent, experienced and qualified engineers;
- Develop staff through training courses and workshops;
- Apply punishment method for any employee who is slow in reviewing and approving changes requested by the City of Kigali.

All project stakeholders are recommended to:

- Work as a team, and every member own the project;
- Communicate effectively,

VIII. THE MANAGEMENT FRAMEWORK DEVELOPMENT

Based on the analysis of findings from the questionnaire and from the focus group sessions on the strategies to recommend that will reduce the delays in construction projects in Kigali, a structure was developed to enhance the management of a project from the initiation to the completion of the project. The design of the structure was based on the "stage-door" approach, to monitor the progress made in the project activities and ensures that, due to the requirements that need to be met in order for the project to pass through the "gate".

This model was designed in the Project Control Framework handbook (Information Policy Team, t.N.A, 2013) with the aim to ensure the completion of the project and its handover at the planned time and within budgeted price.

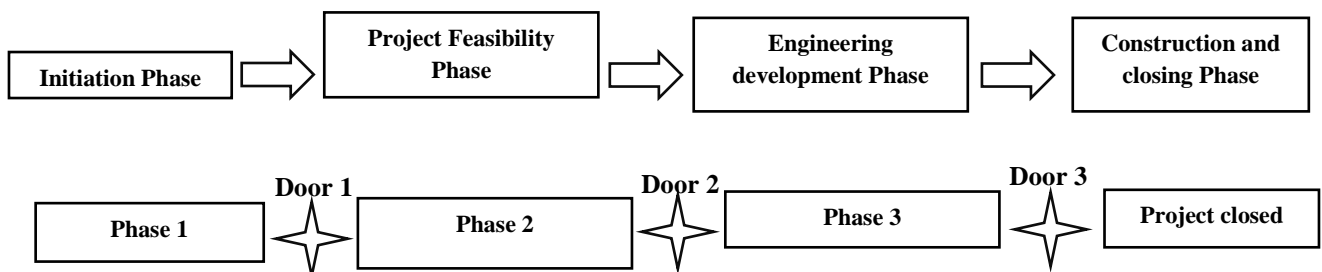


Fig 1: Stage Door Process Movement.

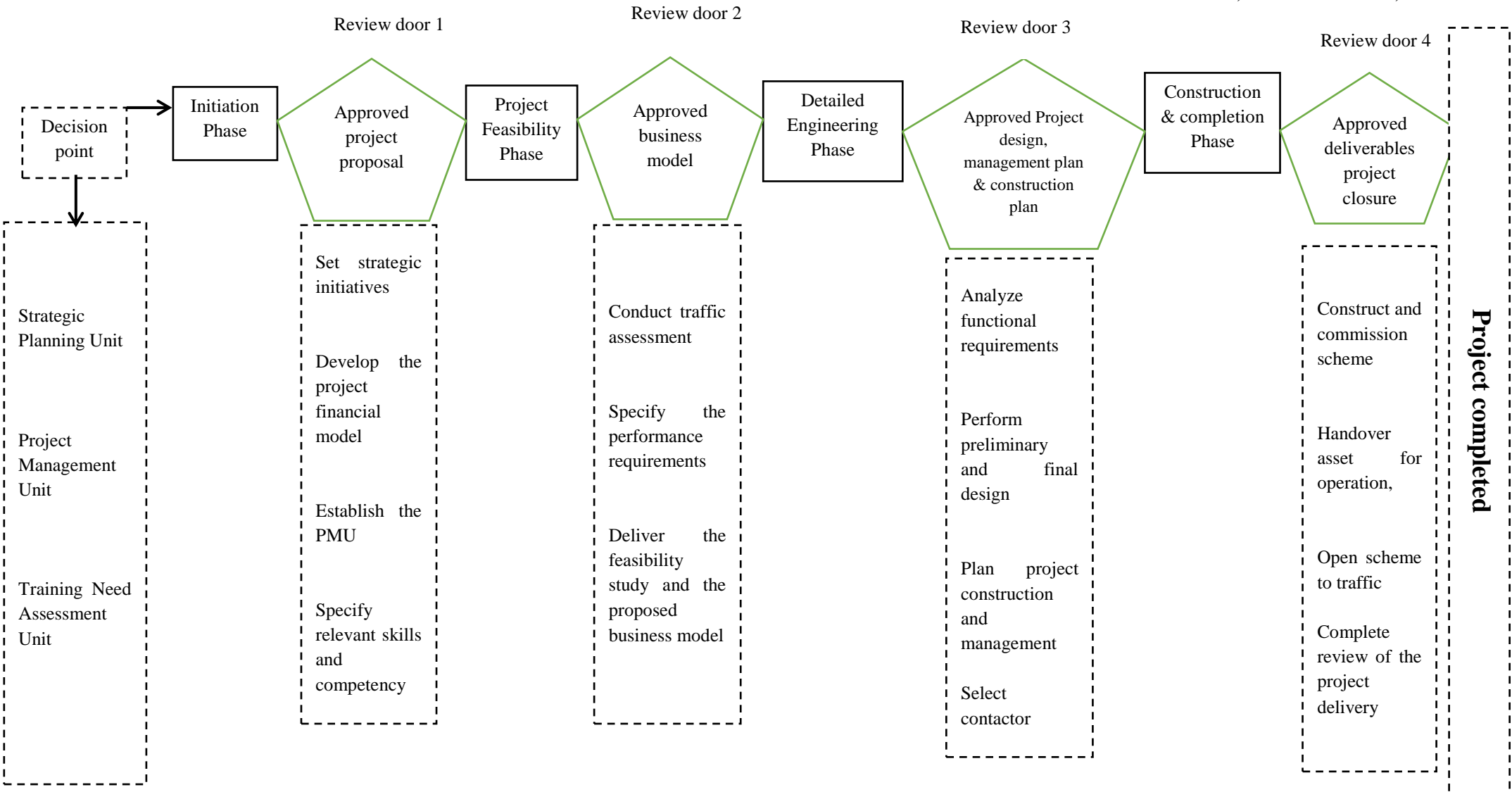


Fig 2: Proposed Management Structure

The above stage-door method promises to be very valuable instrument in facilitating to reduce losses and maximize returns.

IX. RECOMMENDED STRATEGIES OF THE STUDY TO ENHANCE THE MANAGEMENT SYSTEM CONTROLLING DELAYS IN ROAD CONSTRUCTION PROJECTS IN KIGALI

There are no straightforward solutions to the challenge of delays in road construction projects. However, there are steps that can be taken into consideration to minimize their roots and consequences, the main one being the use of effective project management tools and practices. For the specific factors that cause delays in road construction projects in Kigali, the following recommendations and strategies are important:

1. **Proper design and planning of feasibility studies, Site Visits** - The City of Kigali should reexamine the planned time and budget assigned to the feasibility studies and site investigations. Sufficient site investigations should be carried out both during feasibility study and conceptual design phase of the project, to avoid interruption of activities during the construction phase to address design and site challenges.
2. **Design errors** - It can be seen that issues related to design were among the most critical factors that cause the road construction works to delay. Design errors as well as design complexities and uncertainties has led to redesign, and the approval process is time consuming and costly. Some major recommendations in preventing these errors are:
 - Government must adopt a law on liability of designers regarding the delays due to their design errors in feasibility studies;
 - Take the peer reviews of the proposed design by the experienced reviewers on such road project;
 - Employ the designers with adequate experience in the type of target road project, and hire high-profile designers for the more complex or large-scale road projects;
 - Provide the sufficient resources and time to complete the design in order to avoid causing a hurry in the design when trying to meet the irrational deadlines;
3. **Incontrollable Government procedures, procurement procedures** - Selecting the consultant and contractor should be based on their good experience, performance in that field and price qualification not only on lowest price, as it is the case for now.
4. **Politician's Interference** - design policies to minimize political interference in the project life cycle. The government should also have long-term plan for road construction policy that may help the scope of works of road construction projects not be changed or construction works put on hold when change in government policies such as financial and fiscal policies that may increase in the cost of construction materials and equipment.
5. **Land expropriation** - Moreover, the land expropriation process should commence immediately

after getting the signs of "proceed" from the design of feasibility study. This process should also involve the utilities companies and start the expropriation process of their existing utilities.

6. **Create institutions to approve and handle expropriation for public interest** - there is a need for a designated government institution to manage the different road projects of expropriation and ensure compliance with the applicable laws, smooth coordination and the scheduled timeline. If not, the City should hire dedicated staffs to handle expropriation process only;
7. **Relocation of existing utilities** - Utility companies must be part of the planning process, to enable the synchronization and collaboration in localizing and repositioning their services before the concrete construction works of road starts. Goodrum et al (2009) recommend the establishment of utility corridors and systematic location of facilities. In consideration of the lack of data on the exact location of existing underground utilities, the study recommends the minimization of services relocations by mapping underground utility data that was unidentified, using subsurface utility engineering early in the design phase. Utility organizations must produce precise as-built drawings of their utility lines.
8. **Independent Delay Analyst** - it is recommended to hire an independent analyst with the expertise and knowledge to fast and successfully assess the effects of delays, and render an independent decision.
9. **Project Management Units** - Appoint at the very initial stages of the project, not at the execution stage, the Project Manager and establish Project Management Units to manage the project.
10. **Competent personnel** - To minimize errors, poor supervision and improve coordination on sites, the implementation of a road project requires skilled and experienced staffs. City of Kigali, Consultants and Contractors must have the right staffs with the right skills to manage the road construction projects.
11. **Shortage of technical staffs (engineers and staffs assigned to the project) & capacity building** - All three parties (City of Kigali, contractor and consultant), should put in place policies or a mechanism that will help them keep their valuable staff, in that way increase their high staff income.
12. **Capacity Building** - All three parties should conduct continuous training programs to enhance the skills of staffs working on their designs, supervision and construction at all stages, not just at the top, but also all the way down to craftsmen and casual staffs;
13. **Finance and payments of completed work** - City of Kigali should improve its financial management systems, to be able to pay contractors on time. Kamanga and Steyn (2013) suggest that while it is common practice for contracts to include a performance guarantee clause, there should also be a payment guarantee clause so that

if the client does not pay a duly issued payment certificate within the stipulated period, the contractor may demand his payment from the guarantor.

14. **Proper timing and scheduling of the project** – Except for long contracts, the planning and timing of the project should consider the seasons, in such a way that most of the implementation works be implemented in seasons of pleasant weather. The projects should be executed between early May and early December, which is not the rainy season in Kigali. The procurement and planning procedures need to take this into consideration.
15. **Perfectly define the scope of work** - For all road projects, the scope of work must be well-defined from initiation to closure. The modification of scope of works leads often to claims and interruption of work, to enable further studies.
16. **Identification and Management of stakeholders** - The stakeholder must be involved at an early stage, to help in defining the scope of the project. This will minimize scope variations during the implementation of the project. The study recommends the establishment of communication plan, to keep all the stakeholders updated on the status of the project.
17. **Avail Counterpart Funding** - it is recommended to plan issuing the amount of counterpart funding required in the first period of the road project and ensure to plan ahead that amount in the fiscal year budget and the amount is within a manageable amount for the Treasury.
18. **Continuous Monitoring** - to constantly monitor the evolution of the project at different levels and ensure to speedy the implementation of donor assisted projects, in respect with the planned budget.
19. **Introduction of electronic system to monitor** - The study also recommends that incorporating new technology and techniques into the project management process. This will make the information accessible easily to all concerned actors;.
20. **Information System** – Creation of an improved Geographic Information System (GIS) for the entire City and record all the pertinent geo-technical investigation information in detail.
21. **Use of local materials to fight the shortage of construction materials** – the study recommends the development and the use of locally available materials. This will inspire international investors and contractors to invest in these domains to develop and produce materials, it is necessary for the host government to relax ‘interventionist monetary policies’ and other strict economic measures (Mansfield et al 1994).
22. **Lessons Learnt Document** – after completing each road project, emphasis should be given in writing a “lessons learnt document” to record all the vital data that will be useful during the planning of the next project. Specially, the problems come across that need to be recorded for future reference.
23. **Evaluating new versus existing procedures** - it is recommended for all parties involved in the project to evaluate the existing procedures vis a vis to the new

procedures with due care and diligence. Especially the contract administration and existing bureaucracy used to accept a request. This evaluation must consider a collective effort that will moderate the time delays in road construction projects.

24. **Partnering Process and involvement of the public** – the study recommends an implementation of a partnering system that will address the issue of coordination of local community, the City and utility companies. The study also recommends the involvement of the public in the design stage of the road to facilitate their collaboration during the implementation.
25. **Public Private Partnership** - The major cause of road project delays in Kigali City is the financial factor. The study also recommends the involvement of the private sector in financing road projects of Kigali through Public Private Partnerships. It recommends the adoption of law allowing the PPP method to fund the road project.

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