

## Key Contributors to Delays on Road Construction Projects in South Africa

Faheem Vahed<sup>1</sup> and Abimbola Windapo<sup>2</sup>

<sup>1,2</sup> University of Cape Town, Cape Town, South Africa  
[abimbola.windapo@uct.ac.za](mailto:abimbola.windapo@uct.ac.za)

### Abstract

Delays in road construction projects in South Africa are a common phenomenon. This research examined major contributors to delays on road construction projects. Limited research has been undertaken in South Africa, and the South African National Roads Agency, Limited (SANRAL) commissioned projects. The study used a quantitative research approach that employs a structured questionnaire administered to clients, consultants, contractors and stakeholders involved in SANRAL projects. At the end of the survey period, 64 responses were received, and the data collected were analysed using descriptive and inferential statistics. The study found that the primary cause of delay in road construction projects are: unrest/protest by local communities and the stoppage of work by construction mafia/neighbouring communities/wards. It also emerged that key effects of delays are: cost overruns, disputes and claims between contract parties. The study further found that the top delay minimising measures include: early engagement and improved communication with the community and timeous payment to contractors and consultants. The study concludes that the major contributor to delays on road construction projects are external-related and recommends the early involvement of the community stakeholders at the project inception stage through community liaison meetings and the establishment of a Public Liaison Committee (PLC).

### Keywords

Community participation, Cost overrun, SANRAL, Stakeholder Management, Time overrun

### 1. Introduction

According to Tsikai (2016), transport plays a major role in the the economic growth of a country. When a country's transport system is efficient, it results in economic and social opportunities and benefits that have positive effects such as better accessibility to markets, employment, and additional investments in the country (Rodrigue and Notteboom, 2020). On the contrary, when the transport system is deficient, it results in economic cost, reduced opportunities, and a lower quality of life (Rodrigue and Notteboom, 2020). The economic development of South Africa depends on reliable and sustainable road infrastructure to allow for the transportation of the country's produce from inland to the ports for export, commuting to work, shopping and tourism.

The South African government is focused on job creation through infrastructure development, and this is supported by the government's intention to unlock R1 trillion in infrastructure projects over the next couple of years (South African Government, 2020). At the 2020 State of the Nation Address, President Ramaphosa called on both public and private sectors to invest in infrastructure development projects that will stimulate the country's economy. This was followed by the transport minister's commitment to use road infrastructure development as a key contributor to job creation. The government aims to create more than 60 000 jobs for labour intensive maintenance and construction of municipal infrastructure and road projects (Nkgweng, 2020).

The word delay in the construction industry refers to a specified task not occurring as planned in the construction programme (Pickavance, 2005), the late completion of work as opposed to the agreed contract schedule (Vijekar and Ugle, 2015), actual completed construction work is slower than the planned schedule (Hamzah et al., 2011). Construction delays are categorised into four types: non-excusable delays, excusable non-compensable delays,

excusable compensable delays, and concurrent delays (Kikwasi, 2012). Project delays in the road construction industry are becoming more common in South Africa with SANRAL reporting a significant increase in construction delays on several major projects in the 2018/19 financial year (SANRAL, 2019). Multiple studies including Kaliba et al. (2009) and Aziz and Abdel-Hakam (2016) view project delays as a major problem in the construction industry globally. Contractors are noted to have voiced their concerns over the difficulty in overcoming construction delays due to their inability to identify the main reasons for the delays (Aziz and Abdel-Hakam, 2016).

Although studies like those of Sambasivan and Soon (2007), Kamanga and Steyn (2013), and Divya and Ramya (2015), amongst other studies, have been conducted in different parts of the world on this subject, limited research has been conducted on the causes of delays in road construction projects in South Africa and its unique environment. Because of the uniqueness of each project and its environment, the causes of delays may vary from region to region and country to country. There is also limited knowledge of project delays in South Africa and SANRAL commissioned projects, and current literature does not address the issues discussed above. Furthermore, there is limited information on external and internal factors causing delays, and which is the most significant contributor to construction project delays in South Africa. In addition, while most studies focus on delays during the construction phase, few studies have analysed delays during the planning and design phase (Halim and Zin, 2016; Yang and Wei, 2010). The limited research on delays during the planning and design phase and whether internal more than external factors is responsible for the delays creates a gap in the current literature on delays in road construction that are addressed in this study.

This research examines the main causes and effects of delays on South African road construction projects from the view of SANRAL Project managers, consultants, contractors, and others involved in the project, in order to determine whether external-related causes of delays are more significant contributors to construction project delays in South Africa. This study will assist policymakers such as SANRAL and the Department of Transport (DOT) in formulating appropriate strategies that address and reduce road construction delays that can be adopted at a national level.

## **2. Overview of the Transport Sector in South Africa, Construction Project Delays and Causes of Delays in Construction Projects**

### **2.1 Overview of the Transport Sector in South Africa**

South Africa has a road network 750 000km long, the longest in Africa and tenth longest in the world (DOT, Republic of South Africa, 2020). The South African government is the sole client for road construction projects while the DOT is responsible for the legislation and policies for rail, air, sea, road and pipelines in the country. SANRAL is a crucial state-owned entity that is responsible for the upgrading, maintenance and strengthening of national roads in the country, approximately 21 403kms long. The provincial departments of transport are responsible for approximately 47 348 km of road whereas 51 682km is managed by municipalities.

### **2.2 Causes of Delays in Construction Projects**

Construction delay is described as the untimely completion of construction work, or the project compared to the agreed contract schedule (Vijekar and Ugle, 2015). Several authors such as Bagues et al. (2020); Divya and Ramya, (2015); and Enhassi et al. (2006) have researched the causes of delays in construction projects with some research attempting to categorise the causes of delays based on the responsible stakeholder or project components such as labour, financial, material and equipment. Other notable studies on delays on construction projects were undertaken by Bekr (2018), Mashwama et al. (2018) in South Africa, Motaleb and Kishk (2010) in the UAE, Fugar and Agyakwah (2010) in Ghana, Odeh and Battaineh (2002), Muhwezi et al. (2014) in Uganda, Assaf and Al-Hejji (2006) in Saudi Arabia and Sambasivan and Soon (2007) in Malaysia. Although there are similarities in the findings of these studies, there are some geographical limitations which limit the application as a one solution finding in South Africa (Twana, 2015).

Delays on road construction projects in South Africa have been attributed to the project stakeholders. The Preferential Procurement Regulation framework prescribed by National Treasury on 01 April 2017 specifies that 30% of government projects must be sub-contracted to SMMEs to allow for job creation and skill development within local communities. This gave rise to the introduction of a "construction mafia" into the industry (Cokayne, 2018), where agents of radical economic transformation see the construction industry as an opportunity to gain economic benefit through violent disruptions (Donnell, 2019). This has affected the construction sector at a time where major contractors are filing for business rescue. More than 60 SANRAL projects were affected by disruptions by armed gangs

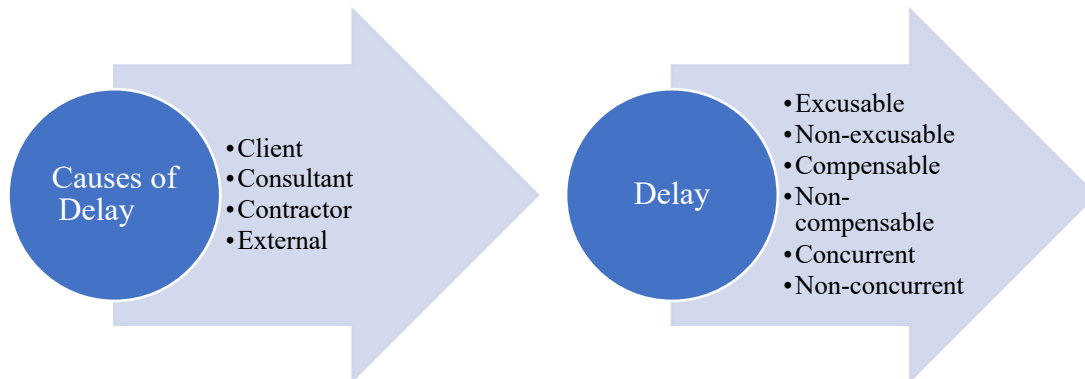
demanding a stake of at least 30% in the project in the 2018/19 financial year (Donnell, 2019). This accounts for almost a quarter of the agency's projects.

In the study by Mashwama et al. (2018) in Gauteng Province of South Africa, the authors concluded that community unrest was the highest ranked factor that was of major concern to all project stakeholders (client, consultant, and contractor). The authors argue that the biggest threat to road construction projects is the delay due to the time spent in negotiations addressing community grievances and sometimes the unsettlement of issues that result in total abandonment of the project (Mashwama et al., 2018). Delays caused by communities included strikes, stoppages by business forums, interference by the construction mafia and councillors' interruptions (Mashwama et al., 2018).

For the purpose of this study, the delay causes were categorised into four categories: Client-related, Consultant-related, Contractor-related and External-related. These broad categories are similar to the ones adopted by previous authors (Amoatey and Ankrah, 2017; Bekr, 2018; Kaliba et al., 2009 and Muhwezi et al., 2014). Through a review of the available literature on the subject matter, the major causes and categories of delays were identified and summarised. It should be noted that the literature surveyed is not limited to road construction only, but the construction industry in general.

Figure 1 proposes that the client, consultant, contractor and external-related factors cause delays on construction projects. Furthermore, the delays lead to budget and schedule overrun, legal issues and negative social implications. The study will examine whether external-related causes of delays are more significant contributors to construction project delays in South Africa. The research hypothesis is given as:

*H<sub>1</sub>: External-related causes of delays are more significant contributors to construction project delays in South Africa than client, consultant, and contractor related causes.*



**Fig. 1.** Conceptual Framework of the Study

### 3. Research Methodology

This study adopted a quantitative research approach based on deductive reasoning because of the objective of the paper to determine the key causes of delay and to know the significant contributors to project delays which can only be undertaken quantitatively. The study is undertaken on SANRAL projects in South Africa. SANRAL is a state-owned entity with four regional offices, the organisation completes projects in all nine provinces in South Africa; therefore, information received from respondents who worked on projects will provide a holistic view of the causes of road construction delays in South Africa. The population of this study comprises project stakeholders including SANRAL project managers (clients), consultants, contractors and other external stakeholders who have worked on a SANRAL project. This study adopted a random sampling technique to allow for an equal chance of selecting all project stakeholders who worked on SANRAL projects. The number of stakeholders emailed per stakeholder group, number of responses per group received and response rate is shown in Table 1.

**Table 1.** Number of Questionnaires distributed and response rate per stakeholder category

Category of Stakeholder	Study Population	Completed Responses	Percentage Response
Client	40	21	53%
Consultant	34	24	71%
Contractor	22	13	59%
Other (public liaison officers)	10	6	60%
Total	106	64	60%

At the end of the survey period, a total of 64 responses were received from the 106 identified participants, representing a 60% response rate. This is above the minimum sample size of 30 proposed by Louanglath (2017) and adheres to the central limit theorem.

Section A of the questionnaire aimed at collecting the background information of the respondents, while Section B aimed at collecting project information and Section C obtained information on the causes of road construction delays. The questionnaire was set up using Microsoft Forms and a Likert scale was used to measure the degree to which the respondents ranked each of the causes of delays. The data collected from the questionnaire survey was cleaned to remove any errors (half completed questionnaire) to ensure accuracy of data being analysed. Data analysis methods used were the Relative Importance Index to determine the ranking of the causes of construction delays. Statistical software IBM SPSS Statistics 27 computer software in tandem with Microsoft Excel were used to analyse the data. The Kruskal-Wallis test was used in finding out whether there are significant differences in the perception of respondents when differentiated by their designation, while the Chi-square was used in testing the research hypothesis that: *External-related causes of delays are more significant contributors to construction project delays in South Africa than client, consultant, and contractor related causes.*

The quality of research is achieved through the measurement of the validity and reliability of the study. To improve on the quality of the questionnaire and to ensure that the identified causes of delays are relevant to the South African road construction industry, the questionnaire was reviewed by an expert and four senior construction managers working for SANRAL, representing SANRAL's four regions who were not part of the respondents. Cronbach's Alpha was used to measure the reliability of the data obtained. It is common in scientific research to consider an alpha value of 0.70 as a sufficient measure of reliability of an instrument (Taber, 2018). The results of the Cronbach's Alpha are presented in Table 2.

**Table 2.** Results of Cronbach's Alpha Showing Reliability of Survey Items

No.	Category of Results	Cronbach's Alpha
1	Client related causes of delays	0.827
2	Consultant related causes of delays	0.928
3	Contractor related causes of delays	0.924
4	External related causes of delays	0.843

Table 2 show Cronbach's Alpha values all above 0.7 with a minimum alpha value of 0.827. This shows the consistency of the results and the accuracy of the instrument in producing the same results.

The research adhered to the following ethical considerations: Respondents were assured of confidentiality throughout the research. Respondents were anonymised and not induced to participate in the study. The aim and objective of the study were clearly explained to all participants. The researchers ensured that the sample size was a true representation of stakeholders working on road projects in SANRAL and did not favour one stakeholder over another to create bias. The research acknowledged the work of previous studies by using citations and referencing where applicable.

#### **4. Data Presentation, Analysis and Discussion**

The results of the analysis of the background profile of the respondents, gender and age, professional experience and project information - location of the project, type, budget and if any delays occurred, and causes of delay is presented below.

#### **4.1 Background profile of the study respondents and identified projects**

The results show that 70% of the respondents are male, while 30% are female. The distribution of respondents by age indicates an even distribution of respondents within three of the age groups, 36-40 years, 41-45 years, and 46-50 years all having (12.50%) respondents each. Furthermore, 38% of the respondents are in the Consultant group - design consultants, contract engineers and resident engineers; while 33% of the responses were from the Client group (SANRAL) – project managers, community development specialists, a project leader; followed by 20% from the Contractor group – contract and construction managers and project leaders; and 9% from the ‘Other’ (public liaison officers) group.

The analysis of years of respondents’ experience and number of projects completed in the last five years reveal that 54.70% of respondents have over ten years of relevant experience, while 45.30% have less than ten years’ experience in the road construction industry. While in terms of the number of projects respondents were involved in, in the last five years, the analysis revealed that 23.44% of the respondents completed more than ten projects, followed by 17.19% who completed two projects in the last five years, while 14.06% of respondents completed three, four and five projects within the last five years.

The type of project provides an understanding of the project’s budget and the complexity associated with the project. Analysis of the projects identified by the respondents showed that new works, upgrades and strengthening projects consisted of the highest number of submissions (63.49%), followed by Routine Road Maintenance projects (14.29%). The remainder of the projects submitted were, operational maintenance (7.94%), special maintenance (6.35%), periodic maintenance (4.76%) and community development (3.17%).

The study sought to know whether the identified project experienced delays in the design phase and the construction phase. The results for percentage delays during the design phase and construction phase reveal an almost equal split between projects experiencing delays during the design phase with 48% of respondents indicating delays occurred and 52% indicating delays did not occur during the design phase. The same is not true for projects during the construction phase, with 90% of respondents indicating delays did occur and 10% indicating that delays did not occur. The above results indicate that delays are more frequent during the construction phase of projects in road projects in South Africa. The causes of the delays will be analysed and discussed subsequently.

#### **4.2 Analysis of the causes of delay**

A total of 47 causes of delays were identified through the literature review (see Table 1) and expert review of the pilot questionnaire. The causes of delays were categorised into four major groups: Client-related, Consultant-related, Contractor-related and External-related causes. The causes for each group were analysed statistically and ranked using their relative importance index (RII).

The results of client related causes of delays reveal that from a ranking perspective, the respondents perceive that the five major client related causes of delay are delays due to regulatory approval processes, delay in decision making by the client, delay in reviewing and approving drawings and documentation, changes in design and changes in project scope. The results of the consultant related causes of delays reveal that from a ranking perspective, the respondents ranked errors in the contract documentation, poor communication between client and contractor, unclear and inadequate details in construction drawings, inadequate experience/skills of consultants and changes in design during construction.

The contractor related causes of delays analysis show that from a ranking perspective, the respondents ranked poor management of sub-contractors, employee strikes, late payment to subcontractors, poor management and supervision by contractors and cash flow difficulties as the major causes of contractor related construction delays. The external related causes of delay revealed that the top five causes of delays are unrest by local communities, stoppages of work by construction mafia/neighbouring communities/wards, poor engagement with the local community, lack of acceptance of the project by the community and land acquisition delays.

To get a holistic view of the most important causes of delays in SANRAL road construction projects, all causes of delays were analysed together and the top five causes of delays are presented in Table 3. It can be seen from Table 3, that from a ranking perspective of the 47 identified causes of delay, the external related causes of delays account

for a significant 80% of the top five causes of delays. Only one of the top five identified causes of delays are client related with no consultant and contractor related causes of delays in the top five causes. The number one ranked overall delay is unrest by the local communities followed by stoppages of work by construction mafia/ neighbouring communities and wards. The delay due to regulatory approval by the client is ranked third. The external delays due to poor engagement with local community and lack of acceptance of the project by the community are ranked fourth and fifth respectively.

**Table 3.** Top five overall cause of delays in SANRAL road construction projects.

Ranking	Cause of Delay	Category of delay	RII
1	Unrest by local communities	External	0.8406
2	Stoppages of work by construction mafia/ neighbouring communities/ wards	External	0.8063
3	Delays due to regulatory approval processes	Client	0.7719
4	Poor engagement with local community	External	0.7625
5	Lack of acceptance of project by community	External	0.7563

#### 4.3 Kruskal-Wallis Test of differences in perspectives of respondents based on designation

The Kruskal-Wallis test results are presented in Table 4. The test was carried out at the 5% confidence level.

**Table 4.** Kruskal-Wallis Test Statistics for Causes of Road Construction Project Delays

Top Five Major Causes of Delays	
Kruskal- Wallis H	.679
Df	3
Asymp. Sig.	.878

Grouping Variable: All Project Stakeholders

The Kruskal-Wallis test shown in Table 4 reveals that there is no statistically significant difference in the respondents perception of the causes of road construction project delays when differentiated by their designation ( $\chi^2(3) = 0.679, p = 0.878$ ). The calculated Kruskal-Wallis H value of 0.679 is lower than the critical value of 7.815 for three degrees of freedom and the calculated  $p$ -value of 0.878 is greater than the significance level of 0.05. Therefore, it can be inferred that there is no significant difference in the perception of the respondents on the causes of delays on construction projects when differentiated by their designation.

#### 4.4 Chi-square test of the category related cause of delays on construction projects

The Chi-square test results of the Chi- square tests are presented in Table 6.

**Table 5.** Testing for Hypothesis using Chi-square Test

Cause of Delay	Client-related	Consultant-related	Contractor-related	External-related
Chi-square	31.94	34.28	48.03	54.13
Critical Chi-square	9.488	9.488	9.488	9.488

The calculated Chi-square values for all categories of causes of road construction delays on SANRAL projects presented in Table 6 are greater than the critical Chi-square value at 4 degrees of freedom and 5% level of confidence. Since the calculated Chi-square for external-related causes of 54.13 is greater than the client-related (31.94), consultant-related (34.28) and contractor related (48.03) groups, and it is greater than the critical value of 9.488 at 4 degrees of freedom and 5% level of confidence, the null hypothesis is rejected, and the alternative hypothesis is accepted. It can therefore be inferred from the Chi-square test that external causes of delays are more significant contributors to SANRAL construction delays in South Africa than client, consultant and contractor related causes.

#### 4.5 Discussion of Findings

There are many causes of delays in road construction projects as indicated in previous studies (Divya and Ramya, 2015; Kamanga and Steyn, 2013; and Sambasivan and Soon, 2007), and studies such as those of Twana (2015)

indicated the geographical isolation of these delays. The causes of delays are discussed according to the client related, consultant related, contractor related, and external related causes. An overall view of the top five major causes of delays in road construction projects in South Africa is also presented and discussed. Moreover, the Kruskal-Wallis Test has revealed that there is no statistically significant difference in the perception of top five major causes of road construction project amongst the project stakeholders.

#### *Client related causes of delays*

The delay due to regulatory approval, ranked first as a client related delay was identified after the pilot review of the questionnaire by experts in the industry. The main factor contributing to this cause is the delay in finalising the tender proforma document. SANRAL is a state-owned entity that awards work through the tender process. Each element of the project whether design, construction, environmental, health and safety or drilling gets awarded via tender. Without a proforma tender document, the work cannot be awarded, and progression of work is affected resulting in the project experiencing delays. This is further supported by the comments of one respondent who stated “delay in procurement” under the reason of other causes of delays not listed in the questionnaire, not identified in the literature review or identified through the pilot testing of the questionnaire. Delays ranked second and third are closely related and involve the decision making by the client. This is aligned to previous research by Assaf and Al-Hejji (2006) who found that clients’ delays in decision making is a major cause of construction delays.

#### *Consultant related causes of delay*

The following are the consultant related causes of delay from a ranking perspective: errors in the contract documents, poor communication by the consultant between the client and contractor, unclear and inadequate details in construction drawings and inadequate experience and skills of the consultant were both ranked third, while delay due to changes in design during construction drawings was ranked the fifth. This is in total agreement with Bekr (2018), who also ranked errors in design and contract documentation as the most influencing delay causing factors that are consultant related.

#### *Contractor related causes of delay*

Poor management of subcontractors was ranked first for contractor related causes of delays followed by employee strikes, late payment to subcontractors, poor management and supervision by contractor and cash flow difficulties. The top five causes of contractor related delays can be grouped into two themes, which are management and supervision and financial difficulties. The delay due to poor management of subcontractors (ranked first) is supported by the study by Bekr (2018). In South Africa, subcontractors are listed in Grade 1 to Grade 6 CE, and have very little knowledge in the construction industry. They are start-up construction firms looking to join the industry. Poor management of these subcontractors will result in construction project delays as seen in the results in this study.

#### *External related causes of delay*

The top five external related causes of delays listed in order of rank include unrest by local communities, stoppages of work by construction mafia/neighbouring communities/wards, poor engagement with local community, lack of acceptance of the project by the community and land acquisition delays. The central cause of external related delays from the analysis is due to community issues. The delays arise from the time spent in negotiations with the community addressing their grievances. These finding is consistent with finding of previous research by Mashwama et al. (2018) who based on a study undertaken in South Africa identified community unrest and the activities of the local community as major factors that resulted in projects experiencing delays respectively. The results due to stoppage of works support earlier studies by Oshungade and Kruger (2017) who found that when the community are not benefiting from employment on a construction project, they stop the work, resulting in project delays until grievances are addressed.

## **5. Conclusions and Recommendations**

The study sought to find out the major causes of delay on road projects and whether external-related causes of delays are more significant contributors to construction project delays in South Africa than client, consultant, and contractor related causes. Forty two causes of delays emerged from the review of relevant literature about causes of construction delays and five were suggested by experts during the review of the pilot questionnaire resulting in a total of 47 causes of delays used in the study categorised into four major groups: client-related, consultant-related, contractor-related, and external-related causes of delay. The results showed that four of the five overall causes of delays in SANRAL road construction projects in South Africa from a ranking perspective are: unrest by local communities; stoppages of

work by construction mafia/neighbouring communities/ wards; delays due to regulatory approval processes; poor engagement with local community; and lack of project acceptance by the community. The study found no statistically significant difference between the views of stakeholders on the causes of delay on road construction projects. Furthermore the test of the hypothesis showed that external-related causes of delays are more significant contributors to construction project delays in South Africa than Client, Consultant, and Contractor related causes. Based on these findings, the study concludes that a focus on addressing the external related causes of delays that involves communities will help minimise delays on road construction projects.

The study therefore recommends that the community should be involved early in the project through the establishment of community liaison meetings and the establishment of a Public Liaison Committee (PLC). Any concerns of the community should be addressed through the PLC without disrupting the project's schedule. SANRAL should improve its administrative processes towards improving the time it takes to make a decision with regard to the proformas and tendering criteria. Furthermore, clients should ensure timeous payments to consultants and contractors for completed work. This will assist contractors with cash flow, allow them to pay site staff and subcontractors on time and reduce the identified delays of employee strikes and late payment to subcontractors. It will also assist contractors in the payment for materials and for the servicing and maintenance of their equipment. Future research that examines the involvement of the local community in the planning of road construction projects in South Africa is also recommended.

## Acknowledgement

The authors would like to express their gratitude to all people involved in the completion of this research. Sincere thanks to the research participants. This work is supported by SANRAL and N.R.F. (Grant Number-120843). Opinions and conclusions are those of the authors and are not necessarily attributable to the N.R.F. or SANRAL

## References

- Amoatey, C. T. and Ankrah, A. N. O., 2017. Exploring critical road project delay factor in Ghana. *Journal of Facilities Management*, 15(2), pp. 110-127.
- Assaf, S. A. and Al-Hejji, S., 2006. Causes of delay in large construction projects. *International Journal of Project Management*, 24(4), pp. 349-357.
- Aziz, R. F. and Abdel-Hakam, A. A., 2016. Exploring delay causes of road construction projects in Egypt. *Alexandria Engineering Journal*, 55, pp. 1515-1539.
- Bagues, H., Rivera, L. and Yeom, C., 2020. A Study on Causes of Delay in Road Construction Project across 25 Developing Countries. *Infrastructures*, 5(84), pp. 2-16.
- Bekr, G. A., 2018. Study and Assessment of Causes and Effects of Delay in Large Public Construction Projects in Jordan. *International Journal of Applied Engineering Research*, 13(8), pp. 6204-6210.
- Cokayne, R., 2018. *SANRAL to engage contractors on construction mafia delay penalties*. [Online] Available at: <https://bit.ly/41xy4XB> [Accessed 1 October 2019].
- Department of Transport, Republic of South Africa, 2020. *Welcome to Roads Branch*. [Online] Available at: <https://www.transport.gov.za/roads> [Accessed 10 January 2021].
- Divya, R. and Ramya, S., 2015. Causes, Effects and Minimization of Delays in Construction Projects. Place: *National Conference on Research Advances in Communication, Computation, Electrical Science and Structures (NCRACCESS-2015)*, pp. 51-52.
- Donnell, L., 2019. Rise of the new construction "mafia". *Mail and Guardian*, 12 April 2019.
- Enhassi, A., Al-Hallaq, K. and Mohammed, S., 2006. Causes of contractors' business failure in developing countries: The case of Palestine. *Journal of Construction in Developing Countries*, 11(2), pp. 1-14.
- Fugar, F. D. and Agyakwah-baah, A. B., 2010. Delays in Building Construction Projects in Ghana. *Construction Economics and Building*, 10(1-2), pp. 103-116.
- Halim, A. H. A. and Zin, R. M., 2016. Causes of delays in the planning and design phases for public works department construction project. *Malaysian Journal of Civil Engineering*, 28(3), pp. 481-502.
- Hamzah, N., Khoiry, M., Arshad, I., Tawil, N. and Che Ani, A., 2011. Causes of Construction Delay - Theoretical Framework. *Procedia Engineering*, 20, pp. 490-495.
- Kaliba, C., Muya, M. and Mumba, K., 2009. Cost escalation and schedule delays in road construction projects in Zambia. *International Journal of Project Management*, 27(5), pp. 522-531.



- Kamanga, M. J. and Steyn, W. J. M., 2013. Causes of delay in road construction projects in Malawi. *Journal of The South African Institution of Civil Engineering*, 55(3), pp. 79-85.
- Kikwasi, G. J., 2012. Causes and Effects of Delays and Disruptions in Construction Projects in Tanzania. *Australasian Journal of Construction Economics and Building Conference Series*, 1(2), pp. 52-59.
- Louanglath, P. I., 2017. Minimum Sample Size Method Based on Survey Scales. *International Journal of Research and Methodology in Social Sciences*, 3(3), pp. 44-52.
- Mashwama, N. X., Mushatu, W. S. and Aigbavboa, C. O., 2018. Challenges Faced by Stakeholders in Road Construction Projects in Gauteng Province of South Africa. *Creative Construction Conference 2018*. Ljubljana, Slovenia: CCC 30 June- 3 July 2018.
- Motaleb, O. and Kishk, M., 2010. An investigation into causes and effects of construction delays in UAE. In: C. Egbu (Ed.), *Procs 26th Annual ARCOM Conference (1149-1157)*. Leeds, UK: Association of Researchers in Construction Management, 6-8 September 2010.
- Muhwezi, L., Acai, J. and Otim, G., 2014. An assessment of the Factors Causing Delays on Building Construction projects in Uganda. *International Journal of Construction Engineering and Management*, 3(1), pp. 13-23.
- Nkgweng, T., 2020. *Job creation at the centre of economic recovery plan: Ramaphosa*. [Online] Available at: <https://bit.ly/3mAFvON> [Accessed 15 February 2021].
- Odeh, A. and Battaineh, H., 2002. Causes of construction delay: traditional contracts. *International Journal of Project Management*, 20(1), pp. 67-73.
- Oshungade, O. and Kruger, D., 2017. A comparative study of causes and effects of project delays and disruptions in construction projects in the South African construction industry. *Journal of Construction Engineering and Project Management*, 7(1), pp. 13-25.
- Pickavance, K., 2005. *Delay and disruption in construction contracts*. 3rd ed. UK: Informal Legal Publishing.
- Rodrigue, D. J-P. and Notteboom, D. T., 2020. *The Geography of Transport Systems*. 5<sup>th</sup> ed. New York:Routledge.
- Sambasivan, M. and Soon, Y. W., 2007. Causes and effects of delays in Malaysian construction industry. *International Journal of Project Management*, 25(5), pp. 517-526.
- SANRAL, 2019. *Status of major projects initiated during 2018/19*. [Online] Available at: <https://bit.ly/3L14AM1> [Accessed 16 February 2021].
- South African Government, 2020. *President Cyril Ramaphosa: Infrastructure South Africa Project Preparation Roundtable and Marketplace*. [Online] Available at: <https://bit.ly/3obvKae> [Accessed 15 February 2021].
- Taber, K. S., 2018. The use of Conbach's Alpha when developing and reporting research instruments in science educations. *Research Science Education*, 48, pp. 1273-1296.
- Tsikai, E., 2016. *Transport - a catalyst for socio-economic growth and development opportunities to improve quality of life*. Proceedings of the 35th Southern African Transport Conference.
- Twana, A., 2015. *Delays in Construction Projects*. Sulaimani: The American University of Iraq.
- Vijekar, D. S. and Ugle, B. A., 2015. Construction Project Delays and Approach of Management. *International Journal of Engineering Research and Applications*, pp. 96-100. (NCRMC – 08 & 08 October, 2015)
- Yang, J. B. and Wei, P. R., 2010. Causes of delay in the planning and design phases for construction projects. *Journal of Architectural Engineering*, 2(80-83), p. 16.