

**COVID-19:**  
POLICY RESPONSES  
& IMPACTS ON WORLD  
ECONOMY



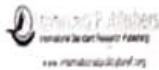
COVID-19: POLICY RESPONSES & IMPACTS ON WORLD ECONOMY

**COVID-19:**  
POLICY RESPONSES  
& IMPACTS ON WORLD  
ECONOMY

**Editors**  
Bassey Anam | Alozie, Elsie

**Research Experts:**  
Yusufu Ali Zoaka  
Dij Chukwuemaka  
Musa Yelbu  
Mussein Botchway  
Jur. Harida T. Massave

ISBN: 978-978-984-706-8



International Development Partners



## INTERACTIVE KNOWLEDGE (IK)

Interactive Knowledge (IK) is an International Multi-disciplinary Book Project for researchers. The readings are published bi-annually and provide opportunity for scholars, especially in the academia to learn, develop and publish book chapters in their various disciplines. IK platform combine the best of scholarship, technology and creative output geared toward the purpose of producing more engaging texts, both for students and researchers/educators

The primary focus of Interactive Knowledge publications is its classroom relevance. Authors develop their chapters within the context of their discipline so that when published, the literature can be cited as a reading material and source for research citations by their students and other researchers. Ideas developed are contemporary, empirical and practical.

Published by Advanced Quality Research Publishing in partnership with International Institute for Policy Review & Development Strategies and International Universities. Published Books are in Electronic and Print versions. Books are cited in International Facts Sheets/Achieves, Ulrich's Periodicals Directory, EBSCO Information Services, Canada, Brilliant Research e-Library, Advanced Research E-link and University Libraries.

COVID-19: POLICY RESPONSES AND IMPACTS ON WORLD  
ECONOMY

**Published by**

Advanced Publishers  
University of Calabar, Nigeria  
[www.internationalpolicybrief.org](http://www.internationalpolicybrief.org)

**First Published:** August, 2020

**Revised Edition:** April, 2022

**ISBN:** 978-978-984-706-8

**DOI:** 10.48028/iiprds/ap-22/c-19priwe.7068

**Managing Editor**

**Dr. Bassey Anam**

Institute of Public Policy and Administration  
University of Calabar, Cross River State  
Nigeria - West Africa  
[admin@internationalpolicybrief.org](mailto:admin@internationalpolicybrief.org)  
Tel: +234 8174 380 445

**Directorate of Policy & Research**

International Scientific Research Consortium  
Engr. (Dr.) Abdulazeez D. El-Ladan  
Conventry University, United Kingdom

**ED. Jonah Ulebor**

Lextra Education Ltd  
United Kingdom

**Hussein Botchway**

University of Energy & Natural Resources  
Sunyani, Ghana

**Chukwemeka J. Diji, PhD**

Kampala International University

**Editorial Board Members**

**Dr. Bassey Anam**

Institute of Public Policy and Administration  
University of Calabar, Nigeria

**Dr. Alozie, Elsie Nkemdilim**

Department of Home Science/Hospitality Management and Tourism,  
Michael Okpara University of Agriculture, Umuahia, Abia State

**Prof. Yusufu Ali Zoaka**

Department of Political Science,  
University of Abuja

**Asso. Prof. Diji Chukwuemeka**

Research, Innovations, Consultancy & Extension,  
Kampala International University

**Dr. Musa Yeldu**

Waziri Umaru Federal Polytechnic,  
Bennin Kebbi, Kebbi State Nigeria

**PT. Hussein Botchway**

University of Energy and Natural Resources,  
Sunyani, Ghana

**Dr. Iur. Hanifa T. Massawe**

Faculty of Law,  
Mzumbe University, Mzumbe-Morogoro, Tanzania

**International Copyright Law:** All right reserved under the International Copyright Law. This volume is published by the Advanced Publishers. This book-its cover page design and content may not be used or produced in any manner without written permission from the publisher.

**Designed & Produced by:**

Advanced Publishers  
University of Calabar, Nigeria

**DEDICATION**

Dedicated to the International Institute for Policy Review &  
Development Strategies for providing a platform and supporting  
Institutional and Collaborative Research and Sustainable  
Development.

**ACKNOWLEDGEMENT**

Contributors are greatly acknowledged for supporting research on Covid-19: Policy Responses and Impacts on World Economy.

## Content

### INTRODUCTION

**Covid-19 and World Economy: Assessing Competing Policy Objectives for Economic Recovery & Sustainability**

Dr Bassey Anam

1

### EXECUTIVE SUMMARIES

**COVID-19 Technical Mission of Experts to the Republic of Belarus: 8th –11th April, 2020**

World Health Organization Regional Office for Europe

4

**Impact of COVID-19 in Africa**

ReliefWeb

10

**Brief: Joint Statement on Nutrition during the COVID-19 Pandemic in Mena: Executive Summary**

The Food and Agriculture Organization of the United Nations (FAO)  
The United National International Children's Fund (UNICEF)  
The World Food Programme (WFP) and  
The World Health Organization (WHO)

14

**Policy Brief: Education during Covid-19 and Beyond**

United Nations

18

*Chapter 1*

**Comparing the Economic Effect of COVID -19 and Governments' Fiscal Palliatives in two Selected Sub-Sahara African Economies**

Ugwuoke Okwudili Walter

22

*Chapter 2*

**COVID-19 Pandemic: Spillover Effect on Entrepreneurship Development in Nigeria**

John Nma Aliu

35

## Content

<i>Chapter 3</i> <b>The Role of Public Relations in Crisis Management in Nigeria: The Experience of Managing the Spread of Covid-19 Pandemic</b> Love Obiani Arugu	46
<i>Chapter 4</i> <b>An Evaluation of the Nigerian Government Social Policy Response to the Coronavirus Pandemic</b> <sup>1</sup> Wenibowei, Korikiye, <sup>2</sup> John, M. Sophia & <sup>3</sup> Warrant, S. Alexander	57
<i>Chapter 5</i> <b>After the Pandemic: The Hope of the Nigerian Power Sector for Economic Development by the Year 2025</b> <sup>1</sup> Osuji, Christopher Uche & <sup>2</sup> Ezeilo, C. J.	74
<i>Chapter 6</i> <b>Globalisation, Technology and Pandemic in International Relations</b> Chukwu, R. Doris	84
<i>Chapter 7</i> <b>Libraries and Library Services in the Era of COVID-19: Re-Strategizing to Overcome the Dreaded Pandemic</b> <sup>1</sup> Comfort O. Alabi, <sup>2</sup> Sani, Job Onekutu, <sup>3</sup> Danjuma Saidu & <sup>4</sup> Fatima, Momoh Jimoh	103
<i>Chapter 8</i> <b>Covid-19 and Emergency Remote Instructional Process: A Way Forward</b> <sup>1</sup> Nura Bawa & <sup>2</sup> Aisha Abdullahi Ibrahim	119
<i>Chapter 9</i> <b>A Holistic Approach to Strategic Planning and Cyclical Visions of Development in Africa</b> Imobighe, M. D.	134



## Content

*Chapter 10*

**Shift of International Trade to Domestic Rehabilitation**

Halima Ahmed Ibrahim

158

REVISED EDITION

*Chapter 11*

**Effect of COVID-19 Pandemic on the Delivery of Building Construction Projects in Abuja**

<sup>1</sup>Shittu, Abdullateef Adewale, <sup>2</sup>Salmon, Samuel Olamilekan, & <sup>3</sup>Anifowose, Maroof Opeyemi

166 ✓

*Chapter 12*

**COVID-19 and Transitional Organized Crimes in Nigeria**

<sup>1</sup>Cinjel Nandes Dickson & <sup>2</sup>Fortune Okwah Chujor

188

*Chapter 13*

**Strategic Marketing and Performance of Selected Micro Finance Banks in Lagos State, Nigeria**

<sup>1</sup>Ademola Joshua Adeniran & <sup>2</sup>Olukayode Longe

203

*Chapter 14*

**Assessment of Entrepreneurial Self-Efficacy of Selected Nigerian University Students**

<sup>1</sup>Olaposi, T. O., <sup>2</sup>Binuyo G. O. & <sup>3</sup>Ayanlade, O. S.

219

Chapter **11**

## Effect of COVID-19 Pandemic on the Delivery of Building Construction Projects in Abuja

<sup>1</sup>Shittu, Abdullateef Adewale,  
<sup>2</sup>Salmon, Samuel Olamilekan, &  
<sup>3</sup>Anifowose, Maroof Opeyemi

*Department of Quantity Surveying, School of Environmental Technology,  
Federal University of Technology, Minna, Niger State, Nigeria*

### Abstract

Studies have established that the problem of the COVID-19 pandemic has resulted in a halt in construction activities leading to poor cost and timely delivery of building construction projects. The study evaluated the effect of the COVID-19 pandemic on the delivery of building construction projects in Abuja with a view to identifying strategies for minimising the effects on project delivery. A quantitative research approach was adopted with the use of questionnaire survey to collect data from thirty (30) construction firms registered with Federal Capital Development Authority (FCDA), Abuja. Analysis of data was undertaken with the use of frequency counts, percentage and Mean Item Score (MIS). It was found that the most important factors hindering the success of construction project delivery as a result of COVID-19 are Restrictions of movement and lockdown (MIS = 5.00); Delays in material delivery (MIS = 4.97); and Price escalations (MIS = 4.97). The study shows that the most significant effects of COVID-19 on the cost delivery of building construction projects are Price escalation of material (MIS = 5.00); High cost of construction materials (MIS = 5.00); and Disruptions (MIS = 4.87). It was also shown that the most

significant effects of COVID-19 on the time delivery of building construction projects are Workforce availability due to illness (MIS = 4.63) and Shortage of equipment and labour (MIS = 4.57). It was also discovered that the most effective strategies for reducing the negative effects of COVID-19 on the delivery of building construction projects are Communication of information (MIS = 4.63); Design optimization (MIS = 4.53); and more effective actions by the government to generate faster healing in the construction sector (MIS = 4.53). The study concluded that the effect of the COVID-19 pandemic on the delivery of building construction projects in Abuja is significant. It was therefore recommended that construction firms should set up implementable mechanism that will accommodate all the effective strategies for reducing the negative effects of COVID-19 on the delivery of building construction projects with more focus on communication of information; design optimization; and effective actions by the government to generate faster healing in the construction sector.

**Keywords:** *Construction, COVID-19, Delivery, Pandemic, Projects.*

### **Background of the Study**

The construction industry plays a significant role in the nation's economic, societal, and political development. Global and dramatic spread of COVID-19 has traveled much faster than our response plan, and the risks such as this pandemic has been underestimated by governments, industries, and all others (Ozguler, 2020). The COVID-19 has already brought unprecedented economic and social impacts to many parts of the world and several sectors including, but not limited to business, schools, universities, travel, tourism, hospitality, aviation, agriculture, petroleum and oil, manufacturing industry and construction industries (Gamil and Alhagar, 2020). Due to this pandemic, all construction and engineering projects activities have stopped following the movement control order by the Federal Government of Nigeria. The safety measures such as travel restrictions, social distancing and quarantines have resulted in unprecedented delays, disruptions, increased construction cost, and uncertainty on construction projects with increasingly disrupting supply chains, contractor workforces and the availability of governmental personnel for project inspections (Robert *et al.*, 2020) and it is not yet clear how the construction industry will adopt once the recovery and rebuilding phase begins (Ozguler, 2020). Moreover, work from home may not be practical, as the physical activity must be conducted on-site. There would be a high impact on Nigeria's economic growth if any major construction projects get

delays (Zamani *et al.*, 2021). Therefore, finding approaches to reduce the adverse effects of COVID-19 is crucial to avoid negative economic growth in the nation that can eventually result in an economic recession. The "Roadmap to Recovery" prepared by Construction Leadership Council requires the construction industry to 'reinvent' by safeguarding construction businesses and work collaboratively. The Nigerian economy was negatively impacted especially in the country's capital (Abuja) and financial centre (Lagos). The challenging situation created insufficient revenues for some States to meet their immediate spending. Ogunnusi *et al.* (2020) reported that the prognosis for the growth of the construction industry has been reviewed downward with possibility of further cut if actions in the short-term are severely disrupted more than envisaged by the COVID-19.

Furthermore, past studies have reported that the construction industry became a victim of COVID-19 to the extent that it has brought its projects to a halt and significantly eroded the market of its beneficiaries (CIRT, 2020; Gamil and Alhagar, 2020; Ogunnusi *et al.*, 2020; Ozguler, 2020; Adhikaria *et al.*, 2021; Zamani *et al.*, 2021). For instance, CIRT (2020) reported that amid COVID-19, the construction industry has been hit hard and is being challenged by many obstacles regarding contractual obligations, availability of resources, deliverables, health and safety measures, and project delays or cancellations. In addition, Gamil and Alhagar (2020) found that the COVID-19 pandemic has posed serious threat to the economy of the construction industry. This is because the lockdown of many States in Nigeria has resulted in the long-term suspension of construction projects. This could result into cost overrun, time overrun, job loss and bankruptcy of some construction firms among other challenges. Unlike other industries, construction projects cannot accommodate distance working but facing challenges making on-time delivery impossible and therefore construction industry is at risk (Ghandour, 2020). Therefore, the construction industry has been faced with a lot of challenges as a result of the COVID-19 pandemic which could result into the poor delivery of construction projects which can result into economic downfall around the globe and cause increased inflation and these impacts could be prolonged. In view of the above background, it has been discovered that the COVID-19 pandemic has resulted into a halt in construction activities which has led to a multiplying effect on construction projects in the form of poor cost and time delivery. This effect can be felt both in the short-term and long-term.

### **Aim and Objectives**

In the light of the study's background and the research problem identified, this study set out to evaluate the effect of COVID-19 pandemic on the delivery of building construction projects in Abuja with a view to identifying strategies for minimising the effects on project delivery. In order to achieve this aim, the following objectives were pursued:

- i. To identify and examine the factors hindering the success of construction project delivery as a result of COVID-19 in Abuja.
- ii. To determine the underlying effects of COVID-19 on the cost and time delivery of building construction projects in Abuja.
- iii. To propose strategies for reducing the negative effects of COVID-19 on the delivery of building construction projects in Abuja.

### **Literature Review**

In order to solve the research problem and achieve the objectives set for the study, an extant review of literature related to the theme of the study was undertaken. The following sub-sections address this.

#### **Factors Hindering the Success of Construction Project Delivery as a Result of COVID-19 in Abuja**

Several studies, among which are Gamil and Alhagar (2020); Ghandour (2020); and Bala (2021), have been carried out to determine the effects of COVID-19 pandemic hindering the construction projects delivery in Nigeria. Such studies also reported that the negative effects of COVID-19 pandemic on construction sectors caused delays in material delivery, delays in inspections and securing permits, reduction in efficiency and production rate, slowing of ongoing projects and delay in the start of new projects, price escalations, additional costs, loss of revenue, payment delays, safety concerns, workforce shortages, expected increase in disputes, litigation, claims, among others. Summarizing the outcome of these studies, Table 1 presents a breakdown of these factors and the sources of the studies where the information was obtained.

**Table 1:** Factors Hindering the Success of Construction Project Delivery as a Result of COVID-19 in Abuja

S/No.	Factors Hindering the Success of Construction Project Delivery as a Result of COVID-19	Source(s)
1	Delays in material delivery	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
2	Delays in inspections and securing permits	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
3	Reduction in efficiency and production rate	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
4	Slowing of ongoing projects and delay in the start of new projects	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
5	Price escalations	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
6	Additional costs	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
7	Loss of revenue	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
8	Payment delays	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
9	Health and Safety Concerns	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
10	Workforce shortages	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
11	Expected increase in disputes	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
12	Litigation	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
13	Claims	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
14	Shortening construction activities	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
15	Effective management of workforce	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
16	Reduction in the number of workers at construction sites	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
17	Distruption of the supply chain management	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
18	Time and cost overrun	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)
19	Restrictions of movement and lockdown	Gamil and Alhagar (2020); Ghandour (2020); Bala (2021); Ogunnusi <i>et al.</i> (2021); Zamani <i>et al.</i> (2021); Umar (2021)

**Effects of COVID-19 on the Cost and Time Delivery of Building Construction Projects in Nigeria**

It has been discovered from past studies that the effects of COVID-19 have adversely affected all segments in the construction industry, both operationally and financially (Sodiye *et al.*, 2021). The delays, disruptions, suspension and termination of contracts, limited resources and therefore price escalation of material, equipment and labour, additional cost on maintaining site security and safety, and impacts on workforce availability due to illness and retention of key skilled employees have affected operational process of the industry. Additionally, such operational implications leading to cancellation of contracts has added financial difficulties in construction projects. In addition to this, it is observed that these effects can be categorized in terms of cost and time delivery of building construction projects. Table 2 gives a breakdown of these effects of COVID-19 on the cost and time delivery of building construction projects.

Table 2: Effects of COVID-19 on the Cost and Time Delivery of Building Construction Projects in Abuja

S/No.	Effects of COVID-19 on the Cost and Time Delivery of Building Construction Projects	Source(s)
1	Disruptions	Ghandour (2020); Kabiru and Yahaya (2020); Olanrewaju (2020); OSHA (2020); Osuizugbo (2020); PWC (2020); Adhikari and Poudyal (2021); Bala (2021); Husien <i>et al.</i> (2021); Sodipe <i>et al.</i> (2021); Zamani (2021)
2	Time and cost overrun	Ghandour (2020); Kabiru and Yahaya (2020); Olanrewaju (2020); OSHA (2020); Osuizugbo (2020); PWC (2020); Adhikari and Poudyal (2021); Bala (2021); Husien <i>et al.</i> (2021); Sodipe <i>et al.</i> (2021); Zamani (2021)
3	Suspension and termination of contracts	Ghandour (2020); Kabiru and Yahaya (2020); Olanrewaju (2020); OSHA (2020); Osuizugbo (2020); PWC (2020); Adhikari and Poudyal (2021); Bala (2021); Husien <i>et al.</i> (2021); Sodipe <i>et al.</i> (2021); Zamani (2021)
4	Limited resources	Ghandour (2020); Kabiru and Yahaya (2020); Olanrewaju (2020); OSHA (2020); Osuizugbo (2020); PWC (2020); Adhikari and Poudyal (2021); Bala (2021); Husien <i>et al.</i> (2021); Sodipe <i>et al.</i> (2021); Zamani (2021)
5	Price escalation of material	Ghandour (2020); Kabiru and Yahaya (2020); Olanrewaju (2020); OSHA (2020); Osuizugbo (2020); PWC (2020); Adhikari and Poudyal (2021); Bala (2021); Husien <i>et al.</i> (2021); Sodipe <i>et al.</i> (2021); Zamani (2021)
6	Additional cost on maintaining site security and safety	Ghandour (2020); Kabiru and Yahaya (2020); Olanrewaju (2020); OSHA (2020); Osuizugbo (2020); PWC (2020); Adhikari and Poudyal (2021); Bala (2021); Husien <i>et al.</i> (2021); Sodipe <i>et al.</i> (2021); Zamani (2021)
7	Workforce availability due to illness	Ghandour (2020); Kabiru and Yahaya (2020); Olanrewaju (2020); OSHA (2020); Osuizugbo (2020); PWC (2020); Adhikari and Poudyal (2021); Bala (2021); Husien <i>et al.</i> (2021); Sodipe <i>et al.</i> (2021); Zamani (2021)
8	Shortage of equipment and labour	Ghandour (2020); Kabiru and Yahaya (2020); Olanrewaju (2020); OSHA (2020); Osuizugbo (2020); PWC (2020); Adhikari and Poudyal (2021); Bala (2021); Husien <i>et al.</i> (2021); Sodipe <i>et al.</i> (2021); Zamani (2021)
9	High cost of construction materials	Ghandour (2020); Kabiru and Yahaya (2020); Olanrewaju (2020); OSHA (2020); Osuizugbo (2020); PWC (2020); Adhikari and Poudyal (2021); Bala (2021); Husien <i>et al.</i> (2021); Sodipe <i>et al.</i> (2021); Zamani (2021)



### Strategies for Reducing the Negative Effects of COVID-19 on the Delivery of Building Construction Projects

Since it has been established that there exists a potential negative effect of COVID-19 on the delivery of building construction projects, it is very important to plan out a mechanism for reducing the negative effects of COVID-19 on the delivery of building construction projects. In order to achieve this, studies have identified the three strategies facing the design and construction during COVID-19, which are project delivery, design optimization, and communicating information among project stakeholders (Kabiru and Yahaya, 2020; Zamani *et al.*, 2021). Table 3 gives a comprehensive breakdown of the strategies for reducing the negative effects of COVID-19 on the delivery of building construction projects as identified from extant review of literature.

**Table 3:** Strategies for Reducing the Negative Effects of COVID-19 on the Delivery of Building Construction Projects in Abuja

S/No.	Strategies for Reducing the Negative Effects of COVID-19 on The Delivery of Building Construction Projects	Source(s)
1	Design optimization	Djalantea <i>et al.</i> (2020); Kabiru and Yahaya (2020); Ogunnusi <i>et al.</i> (2020); Rahman and Fauzi (2021); Zamani <i>et al.</i> (2021)
2	Communication of information	Djalantea <i>et al.</i> (2020); Kabiru and Yahaya (2020); Ogunnusi <i>et al.</i> (2020); Rahman and Fauzi (2021); Zamani <i>et al.</i> (2021)
3	The extension of disaster risk governance	Djalantea <i>et al.</i> (2020); Kabiru and Yahaya (2020); Ogunnusi <i>et al.</i> (2020); Rahman and Fauzi (2021); Zamani <i>et al.</i> (2021)
4	Strengthening community-level preparedness and response.	Djalantea <i>et al.</i> (2020); Kabiru and Yahaya (2020); Ogunnusi <i>et al.</i> (2020); Rahman and Fauzi (2021); Zamani <i>et al.</i> (2021)
5	More effective actions by the government to generate faster healing in the construction sector	Djalantea <i>et al.</i> (2020); Kabiru and Yahaya (2020); Ogunnusi <i>et al.</i> (2020); Rahman and Fauzi (2021); Zamani <i>et al.</i> (2021)
6	Effective communication with industry players	Djalantea <i>et al.</i> (2020); Kabiru and Yahaya (2020); Ogunnusi <i>et al.</i> (2020); Rahman and Fauzi (2021); Zamani <i>et al.</i> (2021)

### **Research Methodology**

This study undertook a quantitative research approach with the use of questionnaire survey. The study covered the effect of COVID-19 on the cost and time delivery of building construction projects. The area of study is Abuja. The analysis of data was undertaken with the use of descriptive statistical tools. The population for the study was made up of thirty (30) construction firms registered to execute projects for Federal Capital Development Authority (FCDA) in Abuja. The reason for this is that FCDA is saddled with the responsibility of awarding construction projects to different construction firms within Federal Capital Territory. Aside that, there are considerable construction activities that take place in Abuja, which is also a significant source of employment for a considerable number of Abuja residents. Unfortunately, there were restrictions and lockdown due to high cases of COVID-19 pandemic in Abuja. This limited the number of construction firms that were active at that period to thirty (30).

The study used questionnaire survey to collect data from various construction companies. The questionnaire was established based on a five-scale known as Likert Scale Format. The questionnaire was developed based on the research objectives to generate relevant information that would help in answering the research questions. The research questionnaire was divided into four parts. Part (a) addressed the general information of respondents. Part (b) addressed the factors hindering the success of construction project delivery as a result of COVID-19 in Abuja. Part (c) addressed the underlying effects of COVID-19 on the cost and time delivery of building construction projects in Abuja. Part (d) addressed the strategies for reducing the negative effects of COVID-19 on the delivery of building construction projects in Abuja. The structured questionnaires were self-administered with the respondents required to fill them within few days. The collected data were cross-checked to ensure that the respondents responded to all the questions in the questionnaire. Analysis of data was carried out using descriptive methods of analysis which include Frequency count and Mean Item Score (MIS). Frequency counts and percentages were employed to analyse data on the profile of respondents while MIS was used to analyse data related to the objectives of the study. Table 4 gives a summary of the decision rule to be used for the MIS analysis.

**Table 4:** Decision Rule for Data Analysis

Scale	MTS	Interpretation		
		Level of Importance	Level of Significance	Level Effectiveness
5	4.51 - 5.00	Very Important	Very Significant	Very Effective
4	3.51 - 4.50	Important	Significant	Effective
3	2.51 - 3.50	Fairly Important	Fairly Significant	Fairly Effective
2	1.51 - 2.50	Less Important	Less Significant	Less Effective
1	1.00 - 1.50	Least Important	Least Significant	Least Effective

Source: Adapted and Modified from Shittu *et al.* (2015)

## Results and Discussion

### Presentation of Respondents' Profile

The profile of the respondents is presented in Table 5. The profile of respondents is on respondent's designation in the organisation; respondent's profession; respondent's highest academic qualification; respondent's professional qualification; and years of experience of respondent. This profile indicates that the respondents are educated, experienced and qualified to provide reliable information that be used for the study to draw conclusion and inferences.

**Table 5: Respondents' Profile**

<b>Respondent's Designation in the Organisation</b>	<b>Frequency</b>	<b>Proportion (%)</b>
Managing Director / CEO	8	26.67
Project Architect	3	10.00
Project Builder	1	3.33
Project Building Engineer	2	6.67
Project Civil Engineer	1	3.33
Project Manager	4	13.33
Project Quantity Surveyor	2	6.67
Site Architect	2	6.67
Site Engineer	5	16.67
Site Quantity Surveyor	2	6.67
<b>Respondent's Profession</b>	<b>Frequency</b>	<b>Proportion (%)</b>
Architect	7	23.33
Builder	8	26.67
Engineer	9	30.00
Quantity Surveyor	6	20.00
<b>Respondent's Highest Academic Qualification</b>	<b>Frequency</b>	<b>Proportion (%)</b>
ND	0	0.00
HND	9	30.00
BSc/BTech	9	30.00
MSc/MTech	12	40.00
PhD	0	0.00
<b>Respondent's Professional Qualification</b>	<b>Frequency</b>	<b>Proportion (%)</b>
MNIA/ARCON	7	23.33
MNIOB/CORBON	8	26.67
MNSE/COREN	9	30.00
MNIQS/QSRBN	6	20.00
<b>Years of Experience of Respondent</b>	<b>Frequency</b>	<b>Proportion (%)</b>
1 – 5 years	0	0.00
6 – 10 years	0	0.00
11 – 15 years	7	23.33
16 – 20 years	13	43.33
Above 20 years	10	33.33
<b>TOTAL</b>	<b>30</b>	<b>100.00</b>

**Results of Factors Hindering the Success of Construction Project Delivery as a Result of COVID-19 in Abuja**

The result of the MIS analysis used to rank the opinions of respondents on the of factors hindering the success of construction project delivery as a result of COVID-19 in Abuja is presented in Table 6.

**Table 6:** Factors Hindering the Success of Construction Project Delivery as a Result of COVID-19 in Abuja

CODE NO.	Factors Hindering the Success of Construction Project Delivery	MIS	RANK	DECISION
B19	Restrictions of movement and lockdown	5.00	1st	Very Important
B1	Delays in material delivery	4.97	2nd	Very Important
B5	Price escalations	4.97	2nd	
B17	Disruption of the supply chain management	4.90	4th	Very Important
B6	Additional costs	4.87	5th	Very Important
B9	Health and Safety Concerns	4.87	5th	Very Important
B18	Time and cost overrun	4.80	7th	Very Important
B4	Slowing of ongoing projects and delay in the start of new projects	4.60	8th	Very Important
B16	Reduction in the number of workers at construction sites	4.60	8th	Very Important
B10	Workforce shortages	4.57	10th	Very Important
B15	Effective management of workforce	4.47	11th	Important
B14	Shortening construction activities	4.33	12th	Important
B8	Payment delays	4.30	13th	Important
B7	Loss of revenue	4.23	14th	Important
B3	Reduction in efficiency and production rate	4.07	15th	Important
B2	Delays in inspections and securing permits	3.07	16th	Fairly Important
B11	Expected increase in disputes	3.03	17th	Fairly Important
B12	Litigation	2.90	18th	Fairly Important
B13	Claims	2.87	19th	Fairly Important
<b>Group MIS</b>		<b>4.28</b>		<b>Important</b>

It can be seen from Table 6 that nineteen (19) factors were identified to be hindering the success of construction project delivery as a result of COVID-19 in Abuja. Of these factors, the most important are Restrictions of movement and lockdown (MIS = 5.00); Delays in material delivery (MIS = 4.97); and Price escalations (MIS = 4.97). The least important factors hindering the success of construction project delivery as a result of COVID-19 in Abuja are Expected increase in disputes (MIS = 3.03); Litigation (MIS = 3.90); and Claims (MIS = 2.87). On the average, all the factors hindering the success of construction project delivery as a result of COVID-19 in Abuja are important (Group MIS = 4.28). The studies of Ogunnusi *et al.* (2021) and Zamani *et al.* (2021) agree with this study because these past studies reported that the negative effects of COVID-19 pandemic on construction sectors caused delays in material delivery, delays in inspections and securing permits, and project timelines due to shortening

construction activities and late approvals by related authorities among others. It is therefore necessary to mitigate the effect of these factors hindering the success of construction project delivery as a result of COVID-19 through well evaluated strategies.

### **Results of Effects of COVID-19 on the Delivery of Building Construction Projects in Abuja**

The study identified nine (9) effects of COVID-19 on the delivery of building construction projects in Abuja. These effects were ranked separately in terms of cost and time delivery as presented in Tables 7 and 8 respectively.

**Table 7: Effects of COVID-19 on the Cost Delivery of Building Construction Projects in Abuja**

CODE NO.	Effects of COVID-19 on the Cost Delivery of Projects	MIS	RANK	DECISION
C1.5	Price escalation of material	5.00	1st	Very Significant
C1.9	High cost of construction materials	5.00	1st	Very Significant
C1.1	Disruptions	4.87	3rd	Very Significant
C1.6	Additional cost on maintaining site security and safety	4.87	3rd	Very Significant
C1.2	Time and cost overrun	4.83	5th	Very Significant
C1.3	Suspension and termination of contracts	4.47	6th	Significant
C1.4	Limited resources	4.40	7th	Significant
C1.8	Shortage of equipment and labour	4.20	8th	Significant
C1.7	Workforce availability due to illness	1.70	9th	Less Significant
<i>Group MIS</i>		<i>4.37</i>		<i>Significant</i>

Table 7 shows that the most significant effects of COVID-19 on the cost delivery of building construction projects in Abuja are Price escalation of material (MIS = 5.00); High cost of construction materials (MIS = 5.00); Disruptions (MIS = 4.87); and Additional cost on maintaining site security and safety (MIS = 4.87). The least significant effect of COVID-19 on the cost delivery of building construction projects in Abuja is Workforce availability due to illness (MIS = 1.70). On the average, all the effects of COVID-19 on the cost delivery of building construction projects in Abuja are significant (Group MIS = 4.37). This finding is in line with findings from previous studies. Osuizugbo (2020) discovered that the costs of most construction materials have gone up due to the lockdown in the country, and the rate at which the construction materials are going up is making

most clients to stop construction works due to the pandemic. Sodipe *et al.* (2021) found that the effects of COVID-19 have adversely affected all segments in the construction industry, both operationally and financially. Therefore, it is essential to work out strategies for reducing the effects of COVID-19 on the cost delivery of building construction projects.

**Table 8:** Effects of COVID-19 on the Time Delivery of Building Construction Projects in Abuja

CODE NO.	Effects of COVID-19 on the Time Delivery of Projects	MIS	RANK	DECISION
C2.7	Workforce availability due to illness	4.63	1st	Very Significant
C2.8	Shortage of equipment and labour	4.57	2nd	Very Significant
C2.6	Additional cost on maintaining site security and safety	4.43	3rd	Significant
C2.1	Disruptions	4.17	4th	Significant
C2.4	Limited resources	4.10	5th	Significant
C2.9	High cost of construction materials	4.07	6th	Significant
C2.3	Suspension and termination of contracts	3.97	7th	Significant
C2.2	Time and cost overrun	2.87	8th	Fairly Significant
C2.5	Price escalation of material	2.67	9th	Fairly Significant
<b>Group MIS</b>		<b>3.94</b>		<b>Significant</b>

Table 8 revealed that the most significant effects of COVID-19 on the time delivery of building construction projects in Abuja are Workforce availability due to illness (MIS = 4.63); Shortage of equipment and labour (MIS = 4.57); and Additional cost on maintaining site security and safety (MIS = 4.43). The least significant effects of COVID-19 on the time delivery of building construction projects in Abuja are Suspension and termination of contracts (MIS = 3.97); Time and cost overrun (MIS = 2.87); and Price escalation of material (MIS = 2.67). On the average, all the effects of COVID-19 on the time delivery of building construction projects in Abuja are significant (Group MIS = 3.94). This finding also agrees with findings from previous studies. Ghandour (2020) discovered that the COVID-19 lockdown has negative implications on building construction projects,

considering that the deliverables would not be realized within the set timeframes. Bala (2021) reported that the social distancing directive provides that all persons should avoid social gatherings. This leads to a reduction in the project management team. This had impacted the progress of the construction works considering that the fewer the number of workers, the longer it takes to realize each of the stated deliverables. In the light of this it is imperative to work out strategies for reducing the effects of COVID-19 on the time delivery of building construction projects.

### **Results of Strategies for Reducing the Negative Effects of COVID-19 on the Delivery of Building Construction Projects in Abuja**

The result of the MIS analysis used to rank the opinion of respondents on the strategies for reducing the negative effects of COVID-19 on the delivery of building construction projects in Abuja is presented in Table 9.

**Table 9:** Strategies for Reducing the Negative Effects of COVID-19 on the Delivery of Building Construction Projects in Abuja

CODE NO.	Strategies for Reducing the Negative Effects of COVID-19	MIS	RANK	DECISION
D2	Communication of information	4.63	1st	Very Effective
D1	Design optimization	4.53	2nd	Very Effective
D5	More effective actions by the government to generate faster healing in the construction sector	4.53	2nd	Very Effective
D3	The extension of disaster risk governance	4.50	4th	Effective
D4	Strengthening community-level preparedness and response.	4.47	5th	Effective
D6	Effective communication with industry players	4.37	6th	Effective
<i>Group MIS</i>		<i>4.51</i>		<i>Very Effective</i>

It was revealed from Table 9 that six (6) strategies for reducing the negative effects of COVID-19 on the delivery of building construction projects in Abuja were identified from this study. The most effective strategies for reducing the negative effects of COVID-19 on the delivery of building construction projects in Abuja are Communication of information (MIS = 4.63); Design optimization (MIS = 4.53); and more effective actions by the government to generate faster healing in the construction sector (MIS = 4.53). the least effective strategy for reducing the



negative effects of COVID-19 on the delivery of building construction projects in Abuja is Effective communication with industry players (MIS = 4.37). On the average, all the strategies for reducing the negative effects of COVID-19 on the delivery of building construction projects in Abuja are very effective (Group MIS = 4.51). The finding of this study in this area agrees with the findings of the studies of Ogunnusi *et al.* (2020); Djalantea *et al.* (2020); Rahman and Fauzi (2021); and Zamani *et al.* (2021). All these studies agree that effective mechanism to reduce the negative effect of COVID-19 pandemic on the delivery of building construction projects should be developed through effective communication with industry players. In addition, these studies emphasized that an effective responding plan can be developed to reduce the damages caused by the pandemic to the barest minimum. It is therefore very necessary to implement effective strategies to reduce the negative effects of COVID-19 pandemic on the delivery of construction projects.

### **Conclusion and Recommendations**

The study revealed that the most important factors hindering the success of construction project delivery as a result of COVID-19 are Restrictions of movement and lockdown; Delays in material delivery; and Price escalations. It was found that the most significant effects of COVID-19 on the cost delivery of building construction projects are Price escalation of material; High cost of construction materials; and Disruptions. The most significant effects of COVID-19 on the time delivery of building construction projects in Abuja are Workforce availability due to illness; Shortage of equipment and labour; and Additional cost on maintaining site security and safety. On the average, all the effects of COVID-19 on the time delivery of building construction projects in Abuja are significant. It was also found that the most effective strategies for reducing the negative effects of COVID-19 on the delivery of building construction projects are Communication of information; Design optimization; and More effective actions by the government to generate faster healing in the construction sector. It can therefore be concluded that the effect of the COVID-19 pandemic on the delivery of building construction projects in Abuja is significant. It is therefore imperative to work out a mechanism for mitigating the negative effect of COVID-19 pandemic on the delivery of building construction projects in Abuja.

In view of the findings and conclusion of this study, the following recommendations have been suggested:

- i. In order to address the factors hindering the success of construction project delivery as a result of COVID-19, construction firms should focus more attention on strategies that will make construction activities cost and time effective in the event of restrictions of movement and lockdown; delays in material delivery; and price escalations.
- ii. Construction firms should focus their policies more towards strategies for addressing the issue of price escalation of material; high cost of construction materials; and disruptions. This will help in mitigating the effects of COVID-19 on the cost delivery of building construction projects.
- iii. In order to mitigate the effects of COVID-19 on the time delivery of building construction projects, construction firms should focus their strategies more on the ways for addressing issues of workforce availability due to illness; shortage of equipment and labour; and additional cost on maintaining site security and safety.
- iv. Construction firms should set up implementable mechanism that will accommodate all the effective strategies for reducing the negative effects of COVID-19 on the delivery of building construction projects with more focus on communication of information; design optimization; and effective actions by the government to generate faster healing in the construction sector. This will assist in the reduction of the negative effects of COVID-19 on the delivery of building construction projects in Abuja.

**References**

- Adhikaria, K. & Poudyala, L. (2021). Future of construction industry: COVID-19 and its implications on construction projects and risk management – A Review, Department of Civil, Environmental, & Construction Engineering, Texas Tech University, Lubbock, USA.
- Afaha, J. S., Alalade, E., Oluwole, E. A., Oyinlola, A. & Akintola, Y. (2021). *Effect of covid-19 on the Nigerian oil and gas industry and impact on the economy*. University of Ibadan, Oyo State, Nigeria.
- Bala, K. (2021). *The Nigerian Construction Industry and the Economic Recovery Plan of the Federal Government: The Post Covid - 19 Era Ahmadu Bello University, Zaria, Nigeria, Being the text of paper presented at the 2021 Annual Distinguished Lecture Series organized by the FCT Chapter of the Nigerian Institute of Quantity Surveyors held at Merit House, Maitama, Abuja on 9th December 2021.*
- CIRT (2020). *Impact of covid-19 on construction projects: The construction recovery roadmap to mitigate the aftermath of covid-19. CIRT Sentiment Index: Second Quarter Report, FMI. Page 6.*
- Djalante, R., Shaw, R. & Dewit, T. A. (2020). *Building resilience against biological hazards and pandemics: COVID-19 and its implications for the Sendai Framework, Progress in Disaster Science*. Elsevier Ltd.
- Dushime, A. & Osele, O. (2021). *An overview of the economic impact of the coronavirus pandemic in Nigeria.*
- Gamil, Y. & Alhagar, A. (2020). *The impact of pandemic crisis on the survival of construction industry: A case of covid-19. Faculty of Civil and Environmental Engineering, University Tun Hussein Onn Malaysia, Jalan FKAAB Universiti, Tun Hussein Onn, 86400 Parit Raja, Johor, Malaysia. Mediterranean Journal of Social Sciences, 11(4), 122-134. DOI: <https://doi.org/10.36941/mjss-2020-0047>*

- Ghandour, A. (2020). The impact of covid-19 on projects delivery: A perspective from the construction sector in The United Arab Emirates, College of Business, Al Ain University, UAE. *Article History: Humanities & Social Sciences Reviews*, (8)5, 169-177. DOI: <https://doi.org/10.18510/hssr.2020.8516>
- Global Alliance for Improved Nutrition (2021). Impact of covid-19 on food systems, situation report. Retrieved from <https://www.gainhealth.org/sites/default/files/publications/documents/impacts-of-covid-19-on-small-and-medium-sized-enterprises-in-the-nigerian-food-system>. Retrieved in June, 2021.
- Haas, O. & Markovič, P. (2021). Negative effects caused by covid-19 on critical path of construction projects, Department of Corporate Finance, Faculty of Business Management, University of Economics, Bratislava, Slovakia, *SHS Web of Conferences* 115, 03005. <https://doi.org/10.1051/shsconf/202111503005>
- Husien, I. A., Borisovich, A. A. & Naji, A. A. (2021). COVID-19: Key global impacts on the construction industry and proposed coping strategies, *Web of Conferences* 263, 05056 (2021) FORM-2021, Department of Civil Engineering, Don State Technical University, Rostov-on-Don, 344000, Russia.
- Kabiru, J. M. & Yahaya, B. H. (2020). Can covid-19 be considered as a force majeure event in the Nigerian construction industry? *International Journal of Scientific Engineering and Science*, 4, 34-39.
- Lain, J. & Vishwanath, T. (2021). The COVID-19 crisis in Nigeria: What's happening to welfare? New data call for expanded social protection in Africa's most populous country. *Africa Can End Poverty*, 1, 21-34.
- National Bureau of Statistics (2021). Q4 & Full year 2020 – Q1 2021.
- Ogunnusi, M., Omotayo, T., Hamma-Adama, M., Awuzie, B. & Egbelakin, T. (2021). Lessons learned from the impact of COVID-19 on the global construction industry. *Journal of Engineering, Design and Technology*. Retrieved from <https://doi.org/10.1108/JEDT-05-2021-0286>

- Oladinrin, T. O., Ogunsemi, D. R. & Aje, I. O. (2012). Role of construction sector in economic growth: Empirical evidence from Nigeria. Department of Quantity Surveying, Federal University of Technology, P.M.B. 704, Akure, Nigeria. School of Environmental Sciences, Modibbo Adama University of Technology, Yola, Nigeria. *FUTY Journal of the Environment*, 7(1), 50-62. Retrieved from <http://dx.doi.org/10.4314/fje.v7i1.4>.
- Olanrewaju, A., Abdulaziz, A, Preece, C. N. & Shobowale, K. (2021). Evaluation of measures to prevent the spread of COVID-19 on the construction site. *Cleaner Engineering and Technology*. 5(2), 89-101. Retrieved from <https://doi.org/10.1016/j.clet.2021.100277>.
- Olatunji, S. A., Oke, A. E., Akinyemi, S., Aghimiena, D. O. & Seidu, S. A. (2019). Effect of construction project performance on economic development of Nigeria. *Journal of Economics and Sustainable Development*, 7(12), 56-64.
- Olubusoye, O. & Ogbonna, A. E. (2021). COVID-19 and the Nigeria economy: Analysis of impacts and growth projections. *Centre Petroleum Energy Economics and Law*, University of Ibadan, Oyo State, Nigeria.
- Organization of Petroleum Exporting Countries (OPEC) (2021). Monthly oil market report
- Osuzugbo, I. C. (2020). Disruptions and responses within nigeria construction industry amid covid-19 threat. Department of Building Technology, College of Environmental Sciences, Bells University of Technology, KM 8 Idiroko Road, Benja Village, Ota, Ogun State, Nigeria. *Covenant Journal in Research & Built Environment*, (8)2, 2384-5724.
- Rahman, R. A. & Fauzi, M. A. (2021). Mechanisms for addressing the impact of covid-19 on infrastructure projects. University of Malaysia, Pahang, Malaysia. *4th National Conference on Wind and Earthquake Engineering (NCWE): IOP Conference Series Earth and Environmental Science*, 682(1), 17-30. DOI: 10.1088/17551315/682/1/012047.
- Reynolds, D. J. (2020). *The effects of COVID-19 on a commercial construction company: A case study of San Luis Obispo*. CA: California Polytechnic State University.

- Salami, B. A., Ajayi, S. O. & Oyegoke, S. A. (2021). Tackling the impacts of covid-19 on construction projects: an exploration of contractual dispute avoidance measures adopted by construction firms. *International Journal of Construction Management*, 2(1), 11-22. <https://doi.org/10.1080/15623599.2021.1963561>
- Shibani, A., Hassan, D. & Shakir, N. (2020). The effects of pandemic on construction industry in the UK. School of Energy, Construction and Environment, Coventry University, CV1 5FB, Coventry, United Kingdom. *Mediterranean Journal of Social Sciences*, 11(6), 76–84.
- Shittu, A. A., Ibrahim, A. D., Ibrahim, Y. M. & Adogbo, K. J. (2015). Assessment of level of implementation of health and safety requirements in construction projects executed by small firms in Abuja. In D. R. Ogunsemi, O. A. Awodele and A. E. Oke (Eds). *Proceedings of the 2<sup>nd</sup> Nigerian Institute of Quantity Surveyors Research Conference*. Federal University of Technology, Akure.
- Sodipe, O., Alabi, A., Bewaji, K. & Yusuf, A. (2021). The efficacy of the Nigerian response to covid-19: challenges, lessons and opportunities. University of Ibadan, Oyo State, Nigeria.
- The Central Bank of Nigeria (2021). Economic Reports. <https://www.cbn.gov.ng/FeaturedArticles/2021/articles/Covid19Grant.asp>
- The United Nations Development (2021). [www.ng.undp.org/content/nigeria/en/home/presscenter/pressrelease/2021/20-percent-of-the-fulltime-workforce-in-nigeria-lost-employment](http://www.ng.undp.org/content/nigeria/en/home/presscenter/pressrelease/2021/20-percent-of-the-fulltime-workforce-in-nigeria-lost-employment)
- Timilsina, S. P., Ojha, S. K. & Dhungana, B. R. (2021). Impact of covid-19 on Construction Industry of Nepal. Lincoln University College, Kelantan, Malaysia., Pokhara University, Lekhnath, Nepal. *Modern Economy*, 12(8), 26-39. DOI: 10.4236/me.2021.128064.
- Zakaria, S. A. & Singh, A. K. (2021). Impacts of covid-19 Outbreak on Civil Engineering Activities in The Malaysian Construction Industry: A Review, School of Civil Engineering (SoCE). Universiti Sains Malaysia (USM) (Engineering Campus), Malaysia. *Journal Kejuruteraan*, 33(3), 477-485. Retrieved from [https://doi.org/10.17576/jkukm-2021-33\(3\)-10](https://doi.org/10.17576/jkukm-2021-33(3)-10).

Zamani, S. H., Rahman, R., Fauzi, M. A. & Yusof, L. M. (2021). Effect of COVID-19 on Building Construction Projects: Impact and Response Mechanisms, *IOP Conference Series: Earth and Environmental Science 682 012049*, 4th National Conference on Wind & Earthquake Engineering IOP Conf. Series; Faculty of Civil Engineering Technology, Universiti Malaysia Pahang, 26300 Gambang, Pahang, Malaysia, IOP Publishing. DOI:10.1088/1755-1315/682/1/012049