

Covid-19 Pandemic: Implications for Water Construction Projects in Nzoia River Basin, Kenya

Ernest Othieno Odwori

*Department of Water, Environment and Natural Resources,
Kakamega County, Kakamega, Kenya*

Abstract: Nzoia River Basin lies entirely within Kenya along the border with Uganda in the Lake Victoria Basin, and has a population of about 3.7 million people who rely on the construction industry to develop the infrastructure required for the provision of various services. The purpose of this study is to examine the COVID-19 pandemic implications on water construction projects in the basin. A cross-sectional research design was used in the study. Three counties were randomly selected from the basin for study with Busia representing the lower catchment, Kakamega middle catchment and Trans Nzoia upper catchment. A total of 80 water construction projects were identified in the study area of which 48 projects representing 60% of the identified projects were sampled. The global outbreak and rapid spread of COVID-19 has heavily impacted the construction industry worldwide. As a result of lockdowns and movement restrictions imposed by many countries around the world as a measure to slow the virus's spread, the construction industry has faced several challenges and obstacles in terms of contractual commitments, resource availability, deliverables, health and safety controls, and project delays or cancellations. The construction industry is a significant growth driver of the economy around the world; and with such disturbances culminating into partial and complete shut downs; and with all developments and projects being postponed until further notice; it is prudent to examine the COVID-19 pandemic implications for construction projects in Nzoia River Basin, Kenya. Water projects were chosen to meet this goal in representing construction projects in the basin as water projects like any other construction project do reflect all phases of a construction project and can be successfully used to examine the pandemic impacts and the accompanying implications for the construction projects in general. This study used questionnaire surveys, in-depth expert interviews (key informants) with selected stakeholders from the construction industry, academia and scientists, field observations, recently published literature and industry experiences to examine COVID-19 pandemic implications on water construction projects in the basin. The data were analyzed using descriptive statistics. The findings of the study revealed that construction projects in the basin like any other projects around the world have been badly affected through contractual obligations, availability of materials, personnel, equipment, health and safety measures, and project delays as a result of lockdowns and movement restrictions imposed by several countries around the world. The findings of this study shed light on the consequences of the sudden occurrence of a major pandemic and raise awareness of the critical impacts to the construction industry. The revelation of the implications shall inform the policy and decision-makers at national and county governments to devise effective mechanisms of addressing the challenges for the sustainability of the construction industry. We recommend similar studies in other

important sectors of our economy to establish the effects the pandemic has had and the possible mitigation measures.

Keywords: Nzoia River Basin, COVID-19 pandemic, Water construction projects, Mitigation of COVID-19 impacts.

I. INTRODUCTION

The coronavirus disease 2019 (COVID-19) has raised significant challenges to the construction industry around the world. The World Health Organization (WHO) declared COVID-19 as a "global pandemic" on March 11 and called for a swift global response. COVID-19's global outbreak and spread not only endangers public health (Bai et al., 2020), but also holds back global economic growth (Lai et al., 2020). According to Gita Gopinath of the International Monetary Fund (IMF), the global economy will enter a recession in 2020 as a result of the COVID-19 pandemic, and the economic growth rate will drop to 3%. (Gopinath, 2020). This result is 6.3 percent lower than the IMF's projection in its World Economic Outlook reported in January 2020. COVID-19 is projected to have a negative impact on the global economy for two reasons. First, the pandemic's rapid spread has directly resulted in a dramatic rise in economic growth uncertainty, creating turmoil in financial and capital markets (McKibbin and Fernando, 2020). Secondly, in order to contain the pandemic, countries have severely restricted people's movement and transportation, as well as economic activities (Fernandes, 2020), placing a strain on economic operations, both at consumption and production levels. Many analysts conclude that the COVID-19's economic effects will be greater than that of the 2008 financial crisis.

Contractors have experienced dramatic changes as countries around the world imposed lockdowns and other constraints, with many changing their working methods overnight. Contractors have had to strive to finish existing contracts while still protecting on-site staff, adhering to government requirements and travel restrictions, and managing supply chain delays and project suspensions. These problems have been exacerbated by country-by-country discrepancies in pandemic-related laws and restrictions. Many contractors were unable to procure raw materials during the early months of the pandemic, and prices were seen to have risen dramatically. Paying suppliers on time has proven to be crucial for many contractors, and it is likely to become even more relevant post-pandemic. Smaller subcontractors are often the least willing to accept risk, so paying them early

may help improve cash flow in a changing world where the ability to mobilize rapidly is crucial. Contractors, like most firms, can re-evaluate their supply chain management to prevent potential delays.

In recent months, the construction industry has depended heavily on liquidity and cash flow. During the COVID-19 outbreak, major construction companies around the world saw dramatic declines in stock valuations, reflecting a more competitive climate and major ongoing disruptions. During the pandemic, multinational contractors with diversified business models across various geographies and business sectors did better. For several multinational contractor companies, this is likely to be a long-term lesson. Contractors are more likely to explore how they can operate in different streams, particularly with the retail and residential sectors experiencing downtrends in the near future. Diversification will become much more relevant for the industry. The retail, leisure, and hospitality industries have been among the hardest hit, and development in these areas is likely to suffer as a result. Commercial real estate is also likely to face some difficulties, as demand and design plans may need to adjust.

Several studies have attempted to examine the effect of COVID-19 on the construction industry; however, the reviews are incomplete due to the current pandemic's uncertainty. According to Venkitachalam, J. (2020), the Indian real estate sector has been severely impacted and a substantial decline has been reported. Ghandour, A. (2020) researched on the effects of the COVID-19 pandemic on project execution in the United Arab Emirates, with a specific emphasis on the construction industry. The study found that the COVID-19 pandemic had a statistically important impact on the number of days it took to complete projects in the UAE construction industry. The pandemic triggered a shortage of raw materials and manpower, causing project completion to be delayed. The research discusses the impact of COVID-19 on built asset acquisition and future opportunities for the construction industry through quantitative analysis. Ogunnusi et al (2020) reports on the effects and prospects in the construction industry of the COVID-19 pandemic. The survey of built asset procurement professionals uncovered several problems in the areas of workflow and supply chain instability, new policy concerns, worker anxiety, and a study of COVID-19 vs force majeure in standard contract forms. Modern procurement preparation, the need for remote working, and special design requirements have all opened up new possibilities. Gamil, Y., and Alhagar, A. (2020) examined the effect of COVID-19 pandemic crisis on the construction industry's survival. Through the recruitment of construction experts and professionals, the impacts and implications have been assessed and evaluated. Economic, human resource and other impacts have been divided into various categories. The study used two data collection methods: exploratory interviews and questionnaire surveys, with the findings revealing that COVID 19 has the most important impacts on project suspension, labor effect and work loss, time overrun, cost

overrun, and financial consequences.

Stiles, et al. (2020) give a commentary on healthy construction during and after COVID-19, concentrating on the human factors, obstacles, and practicalities of putting COVID-19 measures into action. The main point is that COVID-19 should be incorporated and promoted as part of a wider risk management plan, in part because this takes into account various goals for safety risks rather than relying exclusively on COVID-19, and in part because COVID-19 mitigations can be amplified by integrating with preexisting safety processes. Al-Deen Bsisu, D. (2020), "examines the Jordanian engineers' perception on how they faced lockdowns, the outcomes they expect and how they see the future of civil engineering and construction industry. This cross-sectional study based on online questionnaires reveals that design civil engineers were able to work from home with reasonable efficiency while construction site civil engineers do not believe that after the lockdown is lifted the construction workers will adhere to the social distancing and to wearing essential personal protective equipment". Using an agent-based modeling methodology, F. Araya (2021) examines the possible effect of COVID-19 on construction workers. Workers' activities are categorized as low, medium, or high risk, and the spread of COVID-19 among construction workers in a project is simulated. Due to the spread of COVID-19, a construction project's workforce could be reduced by 30% to 90%, according to this report.

The existing literature underscores that the conditions presented by the rapid spread of COVID-19 pandemic have heavily impacted certain aspects of the construction industry worldwide. Consequently, given the current pandemic context faced by the construction industry, it is fundamental to understand COVID-19 pandemic implications for the water construction projects in Nzoia River Basin, Kenya. Water construction projects were chosen to aid the goal in understanding the implications of COVID-19 on the general construction industry in the basin because water projects like any other construction project reflects all phases of a construction project and can be successfully used to investigate the pandemic impacts and the accompanying implications for the construction projects in general. The revelation of the implications will inform the policy and decision-makers at national and county government levels to devise effective ways of addressing the challenges for the sustainability of the construction industry.

II. MATERIALS AND METHODS

2.1 Study area

Nzoia River Basin is located between latitudes $1^{\circ} 30' N$ and $0^{\circ} 05' S$ and longitudes $34^{\circ} E$ and $35^{\circ} 45' E$ in Western Kenya and covers an area of $12,959 \text{ km}^2$ with a river length of 334 km up to its outfall into Lake Victoria (Figure. 1). The area has a population of approximately 3.7 million people that is rising rapidly with the majority of the people living in rural areas. The basin covers the nine counties of Elgeyo/Marakwet, West

Pokot, Trans Nzoia, Uasin Gishu and Nandi (in former Rift Valley province); Kakamega, Bungoma and Busia (in former Western province) and Siaya (in former Nyanza province). The basin is characterised by three physiographic regions namely; the highlands (characterised by Mt. Elgon and Cherangani hills); the upper plateau (which includes Eldoret and Kitale); and the lowlands (which includes Busia that experiences the majority of flooding in the basin). The dominant topography consists of rolling hills and lowlands in the Eldoret and Kitale plains. Nzoia river is one of the largest rivers in Western Kenya which drains into Lake Victoria contributing to the waters that form the source of River Nile (Odwori, et.al 2018).

The Climate of Nzoia River Basin is predominantly tropical humid, but it varies from county to county due to varying landscape and elevations in the basin. Due to the inter-tropical convergence zone (ITCZ), the area experiences four seasons; however, the local relief and influences of Lake Victoria change the daily weather patterns. There are two rainy seasons: short rains (October to December) and long rains (January to March) (March to May). The months of January to February and June to September are the dry seasons. The mean monthly rainfall in the basin for the period 1970 to 2001 varies from about 16.26 mm in January and December (Chorlim ADC. Farm) to about 300.79 mm in April (Kaimos Tea Estate).

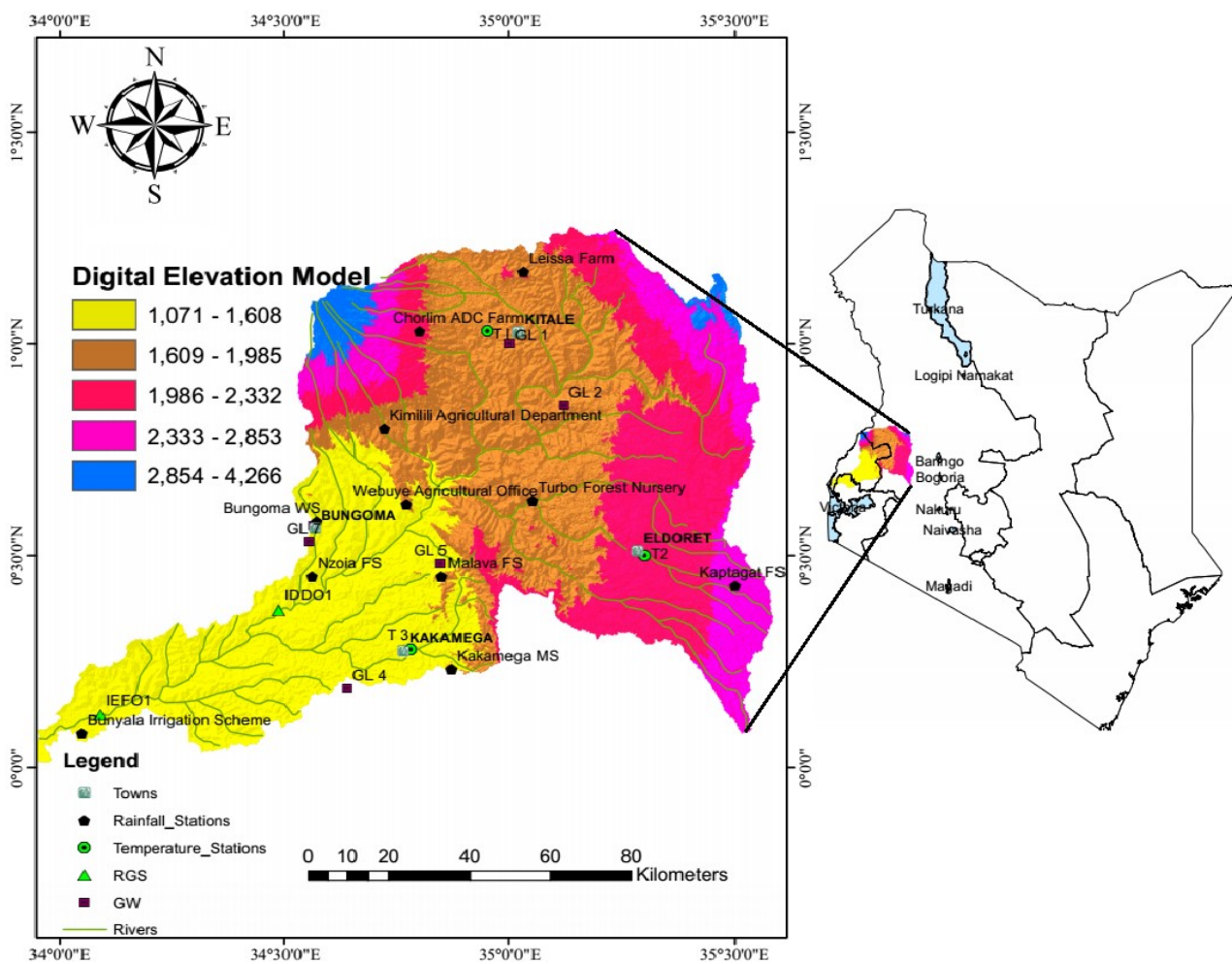


Figure. 1: Map of Nzoia River Basin, Kenya

(Source: Researcher, 2020)

The basin experiences lowest monthly maximum temperatures occurring in July at 16.1 °C (Eldoret), minimum temperatures in January, July and September at 10.0 °C (Eldoret) and mean temperatures in July at 16.1 °C (Eldoret) whereas the highest monthly temperatures in the basin for the maximum occurs in

February and March at 29.5 °C (Kakamega), minimum in April at 15.1 °C (Kakamega) and mean in March at 22.0 °C (Kakamega). Temperature trends in the basin are linked to altitude since the lowest temperatures are found at highest altitudes and highest temperatures at lowest altitudes.

Agriculture is the dominant land use in the region and the agricultural activities of the basin mainly depend on rainfall as most of the crops are under rain-fed agriculture with very limited irrigation being practiced. The main food crops grown are maize, sorghum, millet, bananas, groundnuts, beans, potatoes, and cassava while the cash crops include coffee, sugar cane, tea, wheat, rice, sunflower and horticultural crops. The inhabitants of the basin also practice dairy farming together with traditional livestock keeping. Nzoia river and its many tributaries provide water for domestic use, agriculture, industrial and commercial sectors. Nzoia River Basin has the soil type textures forming: clay (77%), loamy (9%) and sandy (14%). In the basin, the Ferralsol form well drained soils found mostly on level to undulating land. The Acrisols in the basin form clay-rich soils associated with humid tropical climates and supports forestry; whereas Nitisols compose deep well drained red tropical soils found mostly in the highlands occupying more than 75% of the catchment.

2.2. Study design

The study employed Cross-sectional survey research design.

2.3. Study population

According to Saunders et al. (2009), a population is the full set of cases from which a representative sample is taken for detailed study. The study population consisted of (1) water construction projects in Nzoia River Basin; (2) the national and county government construction professionals in Architecture, Project management, Building engineering, Civil and structural engineering, Electrical engineering, Mechanical engineering, Quantity surveying; (3) Consultants; (4) Contractors; (5) Construction project clients; (6) Academia and scientists. The experts were described in this study as elaborated by Gamil et al., 2017; which defines a construction expert as an individual who has worked in the industry for more than ten years, is over the age of 30, and has held assignments to a managerial role within construction industry firms. Field observations were also carried out in the study area. Field observation involved watching stakeholder activities and processes, and documenting processes and results. The Field observations had the added benefit of enabling the Researcher to identify processes or activities that may have been missed during surveys or in-depth expert interviews. The study also depended heavily on recently published literature on the subject and the industry experiences.

2.4. Sampling procedure and sample size

According to Noe and Gelfand (2018), "sampling is the process of selecting respondents from a population such that the group arrived at has representative features of the general population". This study randomly selected three counties from Nzoia River Basin with Busia representing the lower catchment, Kakamega middle catchment and Trans Nzoia upper catchment to study COVID-19 implications for water construction projects. A total of 80 water construction

projects were identified in the study area of which 48 projects representing 60% of the identified projects were sampled with Busia county having 16 projects, Kakamega 16 projects and Trans Nzoia 16 projects. 100 questionnaires were sent out to national and county government construction professionals purposively chosen as follows: Architecture - 10, Project management -10, Building engineering -10, Civil and structural engineering -10, Electrical engineering -10, Mechanical engineering -10, Quantity surveying -10; and Consultants -10, Contractors -10, Construction project clients -10; to collect information on the number of water construction projects as classified under the categories of "fully operational construction sites; partially operational construction sites and stalled/closed construction sites" and the implications of COVID-19 pandemic on water construction projects. This was followed by 36 No. in-depth expert interviews (key informants) conducted with selected stakeholders from the construction industry, academia and scientists purposively chosen to share and express their insights and opinion on the current state of the construction industry in the phase of COVID-19; challenges faced by construction projects arising from COVID-19; preparations construction projects could undertake to mitigate the effects of COVID-19; construction projects contractual obligations under FIDIC [Federation Internationale Des Ingenieurs – Conseils] (from French, the International Federation of Consulting Engineers) and NEC (the New Engineering Contract) terms of contract in the phase of COVID-19 pandemic; and any other issues on COVID-19 and construction projects. The 36 No. experts (key informants) from construction industry, academia and scientists were purposively chosen because "purposive sampling helps in ensuring that the persons selected met the criteria for selection before being allowed into the study" (Sinclair, Jullien, & Garner, 2016). "The advantage of this sampling method is that it ensures that the individuals who are targeted and meeting the study criteria are considered for the study. It also prevents other people who may not be knowledgeable in the study area from participating in the research" (Noe & Gelfand, 2018). Field observation involved watching stakeholder activities and processes, and documenting processes and results. The Field observations had the added benefit of enabling the Researcher to identify processes or activities that may have been missed during surveys or in-depth expert interviews. The study also depended heavily on recently published literature on the subject and the industry experiences. The in-depth expert interviews were conducted using an interview guide prepared by the Researcher.

2.5. Type of data

In this study, primary data was first collected through questionnaires sent to county governments of Busia, Kakamega and Trans Nzoia in form of the number of water construction projects under: (1) Fully operational construction sites, (2) Partially operational construction sites, and (3) Stalled/closed construction sites. Secondly, primary data was also collected

through in-depth expert-interviews (key informants) with national and county government construction professionals purposively chosen from Architecture, Project management, Building engineering, Civil and structural engineering, Electrical engineering, Mechanical engineering, Quantity surveying; and Consultants, Contractors, and Construction project clients. Thirdly, field observations were also carried out in the study area. Field observation involved watching stakeholder activities and processes, and documenting processes and results. The Field observations had the added benefit of enabling the Researcher to identify processes or activities that may have been missed during surveys or in-depth expert-interviews. The study also collected secondary data which entailed the collection and analysis of published materials and information. The study used both published and unpublished reports that had some relevant information. Secondary data were gathered from textbooks, internet sources and journals and periodicals, conferences and workshops.

2.6. Data analysis

In this study, the number of water construction projects reported as fully operational construction sites, partially operational construction sites, and stalled/closed construction sites were analyzed using descriptive statistic of frequency counts and percentages in order to compare the differences across the basin as well as the counties and then presented in Tables.

III. RESULTS AND DISCUSSION

Water has always been an essential element for the population since it is present in all the daily activities of our lives. We use it for drinking, cooking and cleaning or personal hygiene. In addition, water is essential for disease prevention. In the midst of the present COVID-19 pandemic, water is of great importance, because the key measures for pandemic control advocated by governments around the world are isolation and hand washing. "Wash your hands with soap and water for twenty seconds and several times a day". Soap and water will save your life. In these exceptional moments, water has become our great ally to guarantee hygiene and disinfection. Washing your hands is a simple gesture that saves lives every day and prevents the spread of the virus. The rapid spread of COVID-19 pandemic has affected all sectors of the global economy including the construction industry. The construction industry is a significant growth driver of the economy around the world; and with the disturbances faced since the onset of the COVID-19 pandemic, it is prudent to examine COVID-19 pandemic implications on the construction projects. Water construction projects were chosen to aid the goal in understanding the implications of COVID-19 on the general construction industry in the basin because water projects like any other construction project reflects all phases of a construction project and can be successfully used to examine the pandemic impacts and the accompanying implications for the construction projects. This study examines COVID-19 pandemic implications on

water construction projects in Nzoia River Basin, Kenya by assessing the current state of the construction projects in the phase of COVID-19; challenges faced by construction projects arising from COVID-19; preparations construction projects could undertake to mitigate the effects of COVID-19; and construction projects contractual obligations under FIDIC [Federation Internationale Des Ingénieurs – Conseils] (from French, the International Federation of Consulting Engineers) and NEC (the New Engineering Contract) terms of contract in the phase of COVID-19 pandemic by using questionnaire surveys, in-depth expert interviews, field observations, recently published literature on the subject and the industry experiences.

3.1 Construction projects in the phase of COVID-19 pandemic and the challenges faced

This study adopted a cross-sectional research design where three counties were randomly selected from Nzoia River Basin with Busia representing the lower catchment, Kakamega middle catchment and Trans Nzoia upper catchment. A total of 80 water construction projects were identified in the study area of which 48 projects representing 60% of the identified projects were sampled with Busia County having 16 projects, Kakamega 16 projects and Trans Nzoia 16 projects. The scope of water construction works at the sampled projects included: construction/rehabilitation/extension of full treatment water supply projects; construction/rehabilitation of gravity water supply schemes (some with partial water treatment by chlorination); drilling new boreholes and rehabilitation of existing boreholes; construction of new water springs and rehabilitation of old springs; construction of new hand dug wells and rehabilitation of old wells; construction of new rainwater harvesting roof catchment systems and rehabilitation of the old systems; and rehabilitation of small earth dams and water pans. Table.1 shows the status of the 48 construction projects sampled in Nzoia River Basin after the onset of the COVID-19 pandemic. The water sector agencies involved in the construction projects are national government, county governments, non -governmental organizations, United States agency for international development (USAID), community based organizations, and private institutions and individuals.

Table 1- Status of water construction projects after the onset of COVID-19 pandemic in Nzoia River Basin, Kenya

Project status	Busia county	Kakamega county	Trans Nzoia county	Nzoia River Basin
No. of construction sites sampled	(16) (100%)	(16) (100%)	(16) (100%)	(48) (100%)
Fully operational construction site	(3) 17%	(3) 21%	(6) 37%	(11) 23%
Partially operational construction site	(5) 30%	(2) 9%	(3) 19%	(8) 16%
Stalled/closed construction site	(8) 53%	(11) 70%	(7) 44%	(29) 61%

Source: Researcher (2020)

Table.1 shows that the number of fully operational construction sites and partially operational construction sites were fewer than the stalled/closed construction sites in the basin. The majority of the water construction projects in the basin stalled/closed after the immediate onset of the COVID-19 pandemic. The county with the highest number of stalled/closed construction sites was Kakamega followed by Busia and then Trans Nzoia. For the fully operational construction sites, the county with the highest number of sites was Trans Nzoia followed by Kakamega and then Busia.

The experts through the in-depth interviews were also asked to compare the basin and county figures for water construction sites recorded in Figure.1 for the year 2020 (after the onset of COVID-19 pandemic), with two years backwards preceding the pandemic, 2019 and 2018. Their observations indicated that the number of fully operational construction sites had drastically fallen in the year 2020 as compared to the two years backwards preceding the pandemic, 2019 and 2018. The number of partially operational construction sites also portrayed a similar trend to the fully operational construction sites. For the stalled/closed construction sites, they indicated that the number had increased drastically in the year 2020 as compared to the two years backwards preceding the pandemic, 2019 and 2018.

The largest number of fully operational construction sites and partially operational construction sites belonged to the smaller water sector entities (non-governmental organizations, community based organizations, and private institutions and individuals); whereas the majority of the stalled/closed construction sites were for the larger entities, national government and county governments. This is because as a measure towards managing the impact of COVID-19 on water services, national and county governments are now delaying anticipated capital construction; reducing anticipated maintenance and repair schedules; and suspending capital construction that was in progress so as to avail money for operations and emergency programmes. The national and county governments have also made spending adjustments in response to COVID-19 affecting areas such as travel for training/conferences; capital improvements; travel for other business reasons; workforce - hiring freeze; training or continuing education budget; repairs; workforce - pay cuts/wage freeze; workforce - furloughs or layoffs; and marketing/public outreach. Others responses made towards spending adjustments are: not buying anything we do not need at this time in office supplies, etc.; hazardous pay for field personnel; reduced or delayed contracts; and putting off unnecessary purchases until later on.

This study has established that the COVID-19 pandemic affected water construction projects in the basin as observed through fully operational construction sites, partially operational construction sites and stalled/closed construction sites. At the initial stage of the lockdowns some construction sites were fully closed for fear of staff getting infected with COVID-19 and later on they returned to business partially.

With the easing of lockdowns, some construction activities have resumed though with a lot of problems. Some governments in the world have offered relief packages to assist the construction industry attain sustainability during this period of COVID-19 pandemic, eg. relief packages in the form of tax or VAT waiver in the United Kingdom, or furlough are offered to corporate organisations to save the economy (CIOB, 2020). The study found that the COVID-19 pandemic has the following effects on construction projects: project suspension, labor impact and job losses (workforce shortage), time overrun, cost overrun, financial impact, supply shortage, disruption of preparation and scheduling, restriction of movement on the job and travel bans, shortage of materials to sustain operating projects, and unexpected volatility in material prices. On both private and public water construction projects, these effects were observed. The study found that project suspension, labor effects and job losses, time overrun, cost overrun, and financial impact are the most important factors. The economic effect is important for all project stakeholders and the workforce, according to the in-depth expert interviews. To stop and slow the spread of the virus, the project developers work hard to mitigate the effect by reducing the number of staff on-site and promoting off-site work. Contractors will almost certainly face legal problems as a result of non-compliance with contractual terms triggered by the suspension of project work and abrupt increases in material costs.

The study also examined the perception of construction industry professionals on the long-term effects of COVID-19 on construction industry for both office and field works. Some industry professionals were worried that they might lose their jobs as a consequence of COVID-19. Legal implications due to delays in projects were a major concern for most industry professionals. A number of the professionals were also aware of the presence of sections for unforeseen events as an acceptable cause for delays in their contracts: (1) force majeure, and (2) contractual provisions concerning changes in law (and directions given by public authorities). The professionals are already deep into negative financial effects, however, they are also aware of the presence of financial aid for businesses negatively affected by COVID-19 pandemic.

The lockdowns imposed by many governments around the world and the restrictions on international travel, has constrained the production of goods, provision of services, movement of cargo and mobility of workers with the consequence of disrupting global supply chains. This has made it difficult for the ongoing and newly initiated construction projects to access the required supplies in terms of construction materials, equipment and workforce to continue with implementation in the phase of COVID-19 pandemic. COVID-19 is having a major effect on construction projects, although the legal consequences differ by country and contract. On the contractual side, much attention is now being given to the wording of standard forms such as FIDIC and NEC, where they are used. As the COVID-19 situation

progresses, new problems arise. COVID-19 is not making projects difficult to complete at this time, but it is slowing them down, causing delays and shortages under the present disrupted supply chains. Many projects have also come to a halt, with the intention of continuing at a later time. Governments have also ordered the closing down of some activities. The construction industry, on the other hand, has seldom been subjected to forced shutdowns. This is for a number of reasons such as, ‘the importance of the continuation, if possible, of construction and infrastructure projects; and also the fact that the health and safety risks of COVID-19 vary from project to project’. People who work outdoors and are not physically close to one another, for example, may be in a better position to obey the latest health and safety precautions than those who work in an enclosed area. Where work continues, however, health and safety risk assessments must be performed in compliance with medical, science, and government standards, as well as the contractors' obligation to provide a healthy working environment.

Contractually, unforeseen incidents like the COVID-19 pandemic usually trigger contractual clauses dealing with the effects of such events. These clauses are generally classified into two categories: one, "force majeure," and two, contractual provisions relating to changes in the law (and directions given by public authorities). Under the Kenyan Law of contracts, COVID -19 pandemic has created a number of issues for the project owners, contractors and financial lenders/donors. With the Covid-19 pandemic persisting around the world, there is need to review existing contracts and those coming on board in detail and evaluate the ability of the parties to carry out the contractual obligations. As a general rule, a failure to perform obligations under a contract will result in a breach and one must therefore assess the terms of each contract to determine how best to either enforce its terms or obtain relief, as necessary. The occurrence of a major unexpected event that is likely to prevent or have an effect on the performance of a party's contractual obligations under an arrangement is generally referred to as force majeure. There is no statutory doctrine of force majeure in Kenyan law. Rather, the availability of force majeure as a remedy is a contractual matter that is contingent on the agreement's precise language and governing law. Most force majeure provisions stipulate that: (1) the event or situation must be beyond the affected party's fair control; (2) the event or circumstance cannot be adequately foreseen by the affected party; (3) the affected party cannot reasonably be expected to avert or escape the event or circumstance or its consequences; and (4) the event or circumstance must have a foreseeable result. Usually, force majeure provisions provide a non-exhaustive list of events or circumstances that would qualify as force majeure events, with the effect that other events or circumstances may be considered force majeure. However, it is important for the parties to carefully review their contract to see if it includes an exhaustive (closed) list of force majeure events, removes particular events, or restricts the force majeure in any way.

Epidemics and pandemics may be specifically included as force majeure events, in which case the impact of COVID-19 on the party's performance obligations must be assessed. If the imposition of laws or actions by a government or public authority is explicitly stated as a force majeure event in the agreement, the parties can assess whether any governmental restrictions have been imposed that have a negative impact on performance. The agreement's inclusion or exclusion of these force majeure events does not imply that force majeure relief will be granted. To successfully invoke the force majeure clause, the affected party must demonstrate that it was able to fulfill its contractual obligations except for the occurrence of an identifiable force majeure event. After determining the specific force majeure event, the party seeking force majeure relief must show that the procedural requirements outlined in the agreement have been met, including: (1) Notification obligations: Many force majeure clauses require the affected party to notify the other contract parties of the occurrence of the force majeure event within a certain time frame. The notice will almost always be required to include enough information about the force majeure event and how it will affect the affected party's ability to fulfill its obligations under the agreement. Furthermore, force majeure clauses frequently require the affected party to provide regular updates to the other contract parties; (2) Mitigation, where force majeure clauses frequently require the affected party to show that it was unable to mitigate the consequences of the force majeure event in order for the claim to succeed. Finally, the agreement's consequences of a force majeure claim must be considered. In most cases, force majeure clauses call for the suspension of performance obligations for a set period of time, followed by the termination of the contract.

The common law doctrine of dissatisfaction may provide additional relief from contract performance. When an incident happens that makes the original contract physically or commercially difficult to fulfill, frustration may be counted on. To be eligible for this relief, a group must be able to demonstrate the following: (1) that the incident occurred after the agreement was made; (2) that performance is unlikely due to practical impossibility (e.g., delivery of equipment), illegality, or that it would be inherently different from what the parties intended; (3) that the event was not anticipated in the agreement; and (4) the non-performance cannot be attributed to either of the parties. A successful frustration claim results in the agreement being canceled going forward, and the impact of this termination on things like advance payments must be considered. Parties must also consider whether a reform in the law (whether in Kenya or elsewhere) makes the performance of an existing contract unlawful. If this is the case, the contract must be terminated under Kenyan law.

Certain contracts, such as construction contracts, enforce liquidated penalties on the contractor if the construction is not completed within a specified time frame. These contracts also exclude a contractor from having to pay liquidated damages if

such events, referred to as delay events, occur. The contractor will then request an extension of time to complete the contract. Changes in legislation, delays by officials, force majeure incidents, and delays by the employer or other contractors are all examples of delay events. If the contractor is effective, an extension to complete the contract will be given, and no delay damages will be charged. If the contractor fails, the liquidated losses will be paid until they exceed a pre-determined limit, after which the employer will have the right to cancel the contract. Changes of law relief clauses are also included in certain contracts. If compliance with a change in law triggers a delay in performance or a rise in costs, a party may request relief from meeting its contractual obligations.

3.2 Construction projects preparation to mitigate the impacts of COVID-19 pandemic

The COVID-19 pandemic has had far-reaching effects on the construction industry as established by this study conducted using questionnaire surveys, expert in-depth interviews, field observations, and recently published literature. The construction industry has been hit hardest, and it faces various problems in terms of contractual commitments, resource availability, deliverables, health and safety legislation, and project delays or cancellations. On March 11, 2020, the World Health Organization (WHO) called the COVID-19 outbreak a pandemic. Many people can believe that COVID-19 is a force majeure case from a logical standpoint. A contractual provision referred to as "force majeure" applies to an unusual occurrence outside the control of the party that prohibits it from meeting its contractual obligations on time. Without a reference to pandemics in the force majeure clause, the announcement of a pandemic by WHO would not immediately cause a force majeure clause, and conflicts between parties are likely to arise amid other project delays. Contractual provisions such as project termination, force majeure clauses, notice conditions, change order demands, right to time extensions, impact of denied time extensions, cost inflation, resource availability, and health and safety measures may require to be evaluated by project owners. As the situation evolves, it is important for owners to navigate those changes in order to plan for the future of their projects and successfully manage them. Owners should think about the following things when it comes to risk management: (1) What circumstances entitle contractors to a time extension? (2) What are the consequences of either halting or terminating the project? (3) What is the effect of this delay on the mutual risk and cost? (4) Does the contract take into account the possibility of rising material and labor costs? (5) Is it necessary to conduct an audit of invoices in order to evaluate progress and spot improvements relevant to COVID-19 delays? (6) Do performance bonds have cost-effective ways to handle or minimize contractor performance issues? (7) What additional health and safety measures must be taken before the project can resume? Contractors may also evaluate their contractual commitments and the consequences of failure to meet agreed-upon deadlines and scope.

To cope with the effects of COVID-19, project stakeholders will require to develop a unique strategy for assessing the overall success of their projects and developing a recovery plan. A more effective method of assessing future costs and schedule mitigation strategies is to: (1) Examine contracts to define contract clauses and determine which terms and relief entitlements are claimable due to the current pandemic. The object of a force majeure clause is to shield a contractor from unforeseen and unforeseeable events beyond his or her control. Clauses that are silent on pandemics or don't mention viral outbreaks may be insufficient to support COVID-19 as a force majeure argument. COVID-19 should be evaluated in light of the contract's terms to see whether it qualifies as a force majeure case. If the provision is not available, a conversation between the owner and the contractor is required to establish a project strategy for the current pandemic. (2) Examine the project's effect to see whether the owner has granted a force majeure claim; if so, the contractor must show the losses caused by the COVID-19 pandemic. Price, timetable, personnel, logistics, and efficiency are the five categories in which a project's impacts can be categorized. COVID-19 costs should be tracked separately, with losses and performance barriers being assessed. The cost estimate should be focused on the scope of work that is affected, idle machinery, general circumstances, and additional preventive measures including thermal readings, employee screening, and facility management. The project schedule should be analyzed to assess and measure idle time, expense incurred to date, and schedule delays caused by this incident. The contractor should determine the current situation and adjust the schedule to reflect the new activity late-start and late-finish dates, as well as the revised project completion date. Examine the services available due to illness and social distancing guidelines. Examine logistics to see how they affect inventory, shipments, and essential component lead times. The effect of quality on completion, a shortage of trade/professional workers, and insufficient travel of skilled resources should all be considered. (3) As a result of the pandemic, the risk registry should be modified to allow the owner and contractor to recognise potential threats, assign ownership, and develop a contingency plan to resolve the risk components in order to complete the project successfully. COVID-19 emerged as an unknown danger without the necessary controls in place to mitigate it. Now that COVID-19 has arrived, the responsible party has a better understanding of the current situation and can outline a contingency strategy for COVID-19-related risks so that the project can be completed. Material and labor inflation; resource availability and social distancing guidelines; number of cases increasing due to lack of a vaccine; reduced productivity; and additional PPE and sanitizing requirements are only a few of the main risks to consider. (4) Making a schedule that shows how the remainder of the project's tasks will be carried out. This entails assessing the project's projected milestone dates in light of COVID-19's effect on the project's business goals, developing contingent criteria for the remaining job, personnel resources and

preparing implementation, and fast-tracking the timeline as an opportunity to reduce the project's time by focusing on some activities in parallel. (5) Put the plan into action by directing and overseeing project work to incorporate the agreed improvements in order to satisfy the demands of stakeholders and meet the project's goals. (6) Communicate the strategy-One of the most important factors in ensuring stakeholder loyalty and buy-in for the solution moving forward is communication. A structured notification schedule, tiers of notification, and frequency should be identified in this phase. A communication plan's goal is to meet the objectives of the established plan while also communicating the efficacy of implementation.

IV. CONCLUSION

Water construction projects in Nzoia River Basin, like any other project around the world, have been negatively impacted through contractual commitments, the availability of materials, staff, and equipment, health and safety controls, and project delays as a result of global lockdowns and movement restrictions imposed by several countries. COVID-19 is having a significant effect on construction projects, although the legal ramifications differ by country and contract. Considering COVID-19 as a force majeure event, it will entitle contractors to time extension for crucial delays caused, but not reimbursement of costs incurred during the duration of delay, except in agreed-upon circumstances as under the FIDIC and NEC forms of contract. The exact wording of the relevant clause(s) is important. In most cases, force majeure can only justify non-performance of certain duties that are directly impacted by the incident. This poses issues such as whether certain tasks (such as design activities) can be continued but others cannot. The requirement that the effects of force majeure be irreversible is also theoretically important, so that a contractor would be able to take steps to enable the work to proceed, but at a reduced rate. On this basis, certain employers are refusing to recognize the reality of a force majeure situation.

Construction and engineering programs are also affected by governments passing laws or legislation, or even providing orders, intended to counter the pandemic; as per the second contractual clause concerning changes in law (and directions provided by public authorities). Restricting the movement of people or goods within or within countries, as well as demanding that such people be 'locked down,' is typically a legal reform that has a greater effect on the contractor's ability to complete work than the pandemic itself. In comparison to force majeure, change in law provisions in construction and engineering contracts may give the contractor the right to both a time extension and compensation for the inevitable costs incurred as a result of the change in law (see, e.g., Sub-Clause 13.7 of the 1999 and 2017 FIDIC forms).

Many governments are assisting individuals and companies that have been adversely impacted by the COVID-19 situation. Even if a contractor may not have a statutory or

legal right to reimbursement for costs incurred as a result of work being substantially postponed or disabled, state assistance may be available to help defray some of the ongoing costs or provide financial relief. Employers may also be eligible for these government assistance programs. The findings of this study shed light on the consequences of the sudden occurrence of a major pandemic and raise awareness of the critical impacts to the construction industry. The revelation of the implications shall inform the policy and decision-makers at national and county governments to devise effective mechanisms of addressing the challenges for the sustainability of the construction industry. We recommend similar studies in other important sectors of our economy to establish the effects the pandemic has had and the possible mitigation measures.

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